Cognitive Benefits of Language Learning: Broadening our perspectives
Final Report to the British Academy

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EXECUTIVE SUMMARY

Although there has been a surge of interest in recent years on the specific cognitive benefits of bilingualism, this has not been well integrated with research on the social and economic benefits of language learning. As well as reviewing research on the relationship between bilingualism and executive function, literacy, and health, this project has included reviews of such areas as creativity, social and affective cognition, and the learning of signed as well as spoken languages, linking bi/multilingualism with a broader perspective on cognition including intercultural understanding. We have also included public understanding of the cognitive benefits of multilingual skills. We have provided both an overview of existing research and an identification of current practice and policy implications across a range of topics, and including both signed and spoken languages.

The project comprises i) a literature review and meta-analysis, ii) an exploration of public attitudes, and iii) stakeholder interviews, leading to an action plan based on understanding of not only conventional research evidence but also implications in relation to existing and future policy and practice, through a structured synthesis of the different information sources. Throughout the project, engagement with key stakeholders, including teachers, learners, employers, and policy makers – and the general public – has enabled an assessment and enhanced understanding of the research evidence and implications beyond the research community. The review of the literature used a wide variety of resources, and was based in design as far as possible on Cochrane systematic reviews: defining the review question(s) and developing criteria for including studies; searching and selecting studies; assessing and addressing bias; analysing data; presenting and interpreting results and drawing conclusions.

Research evidence has included peer-reviewed UK and international academic publications on cognition and cognitive functioning in relation to language learners and bilingual and multilingual language users across the lifespan. We have considered specific cognitive effects of different kinds of language learning and language use on different age, gender and socio-economic groups, taking a broad perspective on bilingual language abilities to include different ages at which language learning has taken place, different language experiences and functions, different levels of skills, and the best available evidence in terms of strength and consistency of research findings. Of particular importance, we have taken a broad perspective on 'cognitive benefits', going beyond executive function, literacy, and health, to include such areas as creativity, social and affective cognition. We have also included a section on cognitive benefits associated with sign language learning.

To assess and ultimately enhance understanding of research evidence and the implications of research for policy and practice, our reviews also encompassed grey literature, such as social media and practitioner-focussed publications. Priority was given to UK-based studies that have direct connections with policies and practices but we have also reviewed the evidence from Europe and other parts of the world with the goal of informing UK policy and practice.

We have collected stakeholder views on the current state of knowledge about language learning and cognition (broadly defined), and implications of such findings; central and local government departments concerned with policy in relation to language learning and teaching in nurseries, schools and adult education; and language teaching professionals. We intend our research findings to speak to a

variety of audiences including academics, policy makers, employers and the general public, with impact objectives that include a broader understanding of cognitive benefits of language learning, identifying gaps in knowledge and research evidence and directions for future research, and potential intervention strategies.

Key findings:

- Existing research on cognitive benefits of bilingualism is limited in scope to executive functions, and tends not to include social cognitive capacity such as empathy and creativity. The relationship between executive function skills and language learning success is complex and inconsistent.
- There is a growing body of literature which suggests that the cognitive relationship between language learning and age of exposure is dependent on a multitude of varying factors, and is not as clear as initially predicted.
- There is some evidence, and popular belief, that language learning can positively enhance creativity.
- There is evidence of cross-curricular benefits of language learning, but most of the studies are conducted on speakers of other languages learning English. This is an issue that parents and policy makers are particularly interested in, therefore further research within the UK context would be desirable.
- There is also evidence that foreign language learning programmes aimed at older populations may help to build cognitive reserve because language learning engages an extensive brain network that is known to overlap with the regions negatively affected by the aging process. Research should test this potentially fruitful hypothesis, including the provision of specially designed English language programmes for elderly non-English speakers in the UK.
- Both the educator and civil service interviews indicated the importance of demonstrating concrete benefits of language learning. For educators, cross curricular benefits are seen as the key to influencing families to have a positive view towards language learning; for policymakers, broad cognitive benefits such as enhanced resourcefulness, and creative thinking are key.

CONTENTS

1. INTRODUCTION

Language learning touches on everyone's lives. Yet the cognitive benefits of language learning seem to be less well understood. The project *Cognitive Benefits of Language Learning: Broadening our perspectives* was funded by the British Academy as part of a broader initiative related to language teaching and learning. The project began in March 2016 and finished in January 2018.

It was designed to include a systematic literature review and meta-analysis, and collection of data on stakeholder perspectives. In relation to the first of these, the review questions were defined at the start of the project, together with the development of criteria for including studies, methods for searching and selecting studies, and analysis of data. The research evidence collected has included peer-reviewed UK and international academic publications on cognition and cognitive functioning of bilingual and multilingual language users across the lifespan, language teaching and learning, including informal as well as formal language learning environments (home, nursery, school, supplementary school, on-line, and other settings. We established an initial database of around 800 publications, developing a set of keywords for categorisation.

With the review completed, it became clear that in contrast to the substantial literature on the cognitive advantages (in particular executive function) of being bilingual, there has been far less concern with the cognitive benefits of language learning (whether in relation to end states of fluency, or to the process of learning itself) and this finding shifted our focus more tightly to studies of language learning. In relation to bilingualism and executive function, as well as a large literature, there have been a number of systematic reviews. For example, Lehtonen et al (2018) synthesised comparisons of bilinguals' and monolinguals' performance in six executive domains using 891 effect sizes from 152 studies on adults and found no evidence for a bilingual advantage, concluding that the available evidence does not provide systematic support for the widely held notion that bilingualism is associated with benefits in cognitive control functions in adults.

Because of the relatively small number of studies identified on the cognitive benefits of language learning, and the spread of these across different domains of cognition as well as the diverse range of learner types and learning environments, we have adopted a more narrative approach in presentation, highlighting those areas of particular interest and relevance. Meta-analysis and meta-synthesis were carried out on two specific themes as the scope of the existing literature warranted such an endeavour.

In addition to the review, we have also collected stakeholder views through the creation of two on-line questionnaires exploring attitudes to language learning and perceived cognitive benefits, one for adults, and the other for children and youth. Over 740 responses were received to the adult questionnaire; only 40 young people responded to the child and youth questionnaire, but data on both of these will be presented below. The questionnaire responses were analysed and perceived benefits reported by respondents were compared with the studies in the review to explore gaps between beliefs and research findings. A series of interviews were held with individuals and groups, including educators and policy-makers.

The work of the project team was supported and guided by the project Advisory Committee, and by British Academy staff. Project research findings were presented in workshops and seminars and at the

International Society for Bilingualism conference in Limerick in June 2017 (see Appendix 6 for list of project outputs to date).

In the following sections we begin (Section 2) with a summary of the systematic review of the literature on the cognitive benefits of bilingualism and the cognitive benefits of language learning, including a section on sign language learning. This is followed by two sections: Section 3, describing the literature on cross-curricular benefits of language learning; and Section 4, describing the literature on cognitive benefits relating to creativity. Section 5 is an analysis of grey literature, and Section 6 describes the findings of two surveys (adult and youth) conducted by the project on attitudes to language learning. A series of focus group interviews are described in Section 7: held with modern languages tutors, PGCE languages students, and with a senior civil servant. The final section summarises the report and outlines action points for future work.

2. SYSTEMATIC REVIEW AND META-ANALYSIS

We gathered a substantial amount of published research and undertook a systematic review of the literature relating to the cognitive benefits of language learning, interpreting the term 'cognitive benefits' broadly, beyond the most frequently described area of executive function. Below we describe the main classifications we are using for this, followed by a brief description of key points identified to date under each heading. On the basis of the review, we selected two themes for meta-analysis where there is a reasonable amount of literature to warrant such analyses. This will be reported in Sections 3 and 4.

We first look at cognitive functions, including cognitive flexibility and multi-tasking. Then we look at social cognition, including empathy and global mind-set followed by a brief review of attitude and motivation. This is followed by discussions of health, curriculum benefits and attention. The section ends with a summary of the issue of language learning and age of exposure.

2.1. Cognitive Functions

2.1.1. Cognitive Flexibility/Multi-Tasking

There is a substantial body of research literature supporting a link between cognitive flexibility and bilingualism, but most studies are not focussed on language learning but on individuals with end-state fluency. These studies also include bimodal bilingualism (fluency in a signed and spoken language, Giezen et al., 2015). Cognitive flexibility is referred to in a large number of studies relating to bilingualism (Prior & MacWhinney, 2010; Poarch & Bialystok, 2015; Adesope, Lavin, Thompson, & Ungerleider, 2010; Segalowitz & Frenkiel-Fishman, 2005). Prior and MacWhinney note that “lifelong experience in switching between languages may contribute to increased efficiency in the ability to shift flexibly between mental sets” and “bilingual advantages in executive function most likely extend beyond inhibition of competing responses, and encompass flexible mental shifting as well” (2010). There is substantial research in task-switching, and some studies show links between (linguistic) multi-tasking and bilingualism (Poarch and Bialystok, 2015). However, studies suggesting a specific multi-tasking improvement as a result of language learning are few.

Studies specifically of the process of language learning include Kroll and Bialystok (2013), who note “parallel activation of the two languages has been demonstrated for second language learners and appears to be present even when distinct properties of the languages themselves might be sufficient to bias attention towards the language in use.” Zavaleta (2014) states “Results show some group effects for executive function and language learning tasks, but the results are not consistent with previous research. Furthermore, the relationship between executive function skills and language learning success is complex and inconsistent, suggesting that further research is needed.”

In the meantime, a number of studies dispute the cognitive benefits of bilingualism (e.g., Paap & Greenberg, 2013). A recent meta-analysis by Lehtonen et al. (2018) suggest that there was no evidence for a bilingual switching or inhibition advantage, and language learning in older adults did not show systematic advantage in task switching (Ramos et al., 2017).

2.1.2. Attention

There is evidence that studying a new language improves attention and mental alertness after only a week of study, an improvement which is maintained with practice. These cognitive improvements were only found in those learning a second language, not in those learning another subject, and were found in all age groups (Bak et al., 2016). After one week of intensive study, improvements in attention were found in groups participating in intensive courses, but only those learning a second language were significantly better than those not involved in any courses. This improvement was found for all ages, from 18 to 78 years.

2.1.3. Perspective-Taking

A number of studies have explored the effects of bilingualism on perspective-taking in language processing, a domain thought to place particular demands on the executive control system. Greenberg et al. (2013) compared bilingual and monolingual children in a task involving calculating an observer's view from different positions. The bilingual children were more accurate, suggesting that bilingualism might have implications for academic achievement in non-linguistic areas. In contrast, Ryskin et al.'s (2014) experiments on perspective-taking abilities in monolingual and bilingual adults did not support the hypothesis that bilingualism improves the ability to appreciate the perspective of another person during language comprehension, and indicated, in contrast that bilinguals seemed to have more difficulty interpreting spatial language than monolinguals. In relation to both of these studies, see Section 3.3.3 below on the cognitive benefits of learning a sign language for reviews of several studies which indicate enhanced spatial processing abilities associated with sign language learning.

2.**2. Social Cognition**

2.2.1. Empathy

Guiora et al. (1972) is perhaps the most heavily-cited research when it comes to the relationship between language learning and empathy; the study "confirms the original hypothesis that empathy … is positively related to the ability to authentically pronounce a second language". Mishan (2005) reported that "The sensation felt by some people that they are 'a different person' when they speak the L2 supports the Guiora et al. (1972) analysis." Other studies of that era and also more recently (Kleinmann, 1977; Mishan, 2005) show that empathy is a useful trait for successful language acquisition, though there is limited research directly concerned with empathy as a direct outcome of language learning.

2.2.2 Global mind-set

Global mind-set refers to the consequences on global outlook of language learning, rather than being motivation for language learners and students (i.e. those interested in enhancing employment and travel opportunities). There is little research which looks at this specifically. Song (2011) looks at transnational learners who live abroad to learn a language, but wish to retain a strong affiliation with their home country; the study calls on ESL and EFL teacher education programmes to help teachers "develop a broader, globalization-responsive perspective in their teaching practices as their local language teaching and learning context becomes more global via this emerging population of transnational learners" (p. 756).

2.3. Attitude and motivation

Attitude can be sub-divided into attitudes towards the language itself, attitudes to speakers of a language, and to the target language culture. “Texts drawn from the culture of the target language tend to be more involving to the learner and can thus be more emotionally demanding. This requirement for involvement in a sense tests the learner's attitude towards the target culture. A positive socio-cultural attitude is displayed by a willingness to become involved with the input, which helps promote language learning” (Mishan, 2005). There are suggestions but little evidence that in the same way that success in acquisition of an L2 has been shown to breed positive attitudes towards the target culture (Larsen-Freeman & Long 2014), involvement with the target culture through authentic texts might create a positive socio-cultural attitude and predispose the learner to language acquisition” (Mishan, 2005). Macintyre, Baker, Clement, & Donovan (2002) found that students’ willingness to communicate, perceived competence, and frequency of communication in French increased from grades 7 to 8 and was maintained between grades 8 and 9, even in the context of a drop in motivation and a steady level of anxiety across the three grades.

2.4. Health

Age-related cognitive decline is a major societal issue. Bilingualism appears to be a safeguard against cognitive decline and pro-actively administered cognitive training regimens may provide effective protection. Accordingly, Antoniou, Gunasekera, & Wong (2013) have suggested that synthesizing these two lines of research may promote healthy cognitive ageing and that therefore foreign language learning is likely to protect against decline. They propose that foreign language learning programmes aimed at older populations are an optimal solution for building cognitive reserve because language learning engages an extensive brain network that is known to overlap with the regions negatively affected by the aging process. They recommend that future research test this potentially fruitful hypothesis. We note, however, that a recent meta-analysis (Mukadan et al., 2017) disputes the strength of the argument with regard to the effect of bilingualism on dementia prevention.

2.5. Cross-curricular benefits

A small amount of research has been conducted on what benefits language learning has on other areas of the curriculum, particularly with regard to different socio-economic or non-‘urban’ groups. Some studies (Valentino and Reardon, 2015) examine academic achievements associated with language learning, dual-language immersion (DLI), or bilingualism, but do not necessarily focus on socio-economic factors. A study looking at the responses of British Bangladeshi children in two East London (Tower Hamlets) primary schools (Kenner, Gregory, Ruby, and Al-Azami, 2008), using their language repertoire in the mainstream curriculum, found cultural and cognitive benefits, including: “conceptual transfer, enriched understanding through translation, metalinguistic awareness, bicultural knowledge and building bilingual learner identities” (p. 120). Although specific mention of socio-economic factors is not made in the study, Tower Hamlets has the highest rate of child poverty in the UK, with high levels of unemployment and deprivation. Similar studies (Christian, 1996; Swain, 2010; Tuafuti and McCaffery, 2005; Potowski, 2007; Valentino and Reardon, 2015; Steele et al., 2015) which look at the academic advantages of bilingual and DLI language learning, show analogous findings of above-average levels of

academic proficiency, indicating similar benefits of language learning across socio-economic staus groups.

Although media and institutional reports advocating for improved language policy within schools often mention the employability and fiscal advantages of language learning, the possibility of benefiting academic or curriculum areas is seldom made, with focus more on general long-term, fiscal, and cognitive benefits instead. A noticeable trend in research in this area – where in the past there was no clear picture on the relationship between second language learning and academic achievement (Hawson, 1996) – now shows a loose positive correlation.

2.6 Sign language

Studying a sign language has become increasingly popular in recent years. American data indicate that American Sign Language (ASL) is the language with the third most enrollments among higher education students, behind only Spanish and French (Goldberg et al., 2015). Recent plans announced by the Department for Education in the UK to introduce a GCSE in British Sign Language (BSL) will provide a new context for exploring possible benefits of sign language learning.

Formally, research on the various cognitive benefits of sign language learning should be integrated with the discussion of those benefits in relation to spoken language learning. For example, there are a number of studies of whether cognitive benefits are associated with bimodal bilingualism (e.g. bilingualism in a spoken language and in a signed language, cf. Giezen et al., 2015). However, they are presented here in a separate section because they often have a different focus (for example, whether learning to sign has benefits for acquisition of a first spoken language in infancy). In this section, the studies reviewed are restricted to those related to sign language learning by hearing children and adults, as the literature in relation to sign language learning by deaf children is much more concerned with sign language as a first language.

In recent years, there has been an enormous expansion of “baby sign” programmes designed to teach signs to hearing infants, based on claims that sign language can be acquired earlier than spoken language, and that its use facilitates communication between adult and child, enhances cognitive development (including claims for increase in IQ), and reduces frustration. However, there is very little supporting research for these claims. Nelson et al., (2012) undertook a metanalysis of published research relating to the supposed benefits. They describe 5 studies in terms of age (8 months to pre-kindergarten), sample size (1-90), author conclusions and methodological quality. The studies for the most part are seriously methodologically flawed. Validity issues include non-randomised participant selection, absence of control groups, participants not blind as to study purpose, reliance on parental reports of child progress, etc. Better controlled studies have for the most part failed to show benefits of such programmes, other than general benefits relating to increased contexts and opportunities for early parent-child interaction.

In relation to social cognition, Brereton (2008) explored sign language learning in pre-school settings, focussing on how the use of sign language in the classroom enhanced the learning community's appreciation of diversity, including appreciation of diverse language and diverse ways of communicating and appreciation of cultural diversity.

There are a number of well-designed studies of the effects of learning sign language on (hearing) school-age children and adults. Research has found that that hearing signers have enhanced face-processing skills (Arnold & Murray, 1998). Keehner and Gathercole (2007) examined spatial cognition – specifically, spatial transformation abilities in hearing people who acquired sign language in early adulthood. Their performance was compared with that of hearing people with no knowledge of sign language, matched for age and gender. Using an adapted Corsi blocks paradigm, hearing signers performed significantly better than non-signers on a task that entailed 180° rotation, which is the canonical spatial relationship in sign language discourse. In a second experiment, they found that signers did not show the typical costs associated with processing rotated stimuli, concluding that sign language experience, even when acquired in adulthood by hearing people, can give rise to adaptations in cognitive processes associated with the manipulation of visuospatial information.

Vercellotti (2008) reports the findings of four experiments, comparing students in students in second semester American Sign Language (ASL2) classes, students in fourth semester ASL (ASL4) classes, and students learning Spanish, and as in the Keehner and Gathercole study, providing evidence that the spatial-visual modality of ASL impacts the effects of language learning. Participants completed two face-processing tasks, the Benton Facial Recognition Test (BFRT) and the Mooney Faces Closure Test (MFCT), and two spatial relations tasks, a Mirror Reversal/Mental Rotation test (MR) and the Differential Aptitude Test-Space Relations (SR). Deaf late learners of ASL and hearing signers outperformed hearing non-signers on the BFRT (Bettger et al., 1997), although, on the MFCT, signers showed a slight disadvantage. The scores of the ASL learners on the MR task were significantly different from the Spanish group.

2.7. Language learning and the age of exposure

A number of studies detail the relationship between language learning and age of exposure. Most consider the benefits on language learning of early exposure, rather than whether cognitive benefits vary depending on age of exposure. Muñoz (2006) states “Exposure needs to be intense and to provide an adequate model. Initial age of learning seems more relevant for skills that can be acquired implicitly, whereas age at learning can be seen as a factor explaining the rate of learning of more skills. The fact that this distinction has not been sufficiently highlighted goes some way towards explaining the somewhat confused ideas that have prevailed in relation to age effects in second language acquisition” (p. 33). There is a growing body of literature which suggests that the cognitive relationship between language learning and age of exposure is dependent on a multitude of varying factors, and is not as clear as initially predicted. More research in this field should look to determine and clarify variables.

3. SYSTEMATIC REVIEW OF THE CROSS-CURRICULAR BENEFITS OF LANGUAGE LEARNING ON ACADEMIC ACHIEVEMENTS

Little research has systematically examined the relationship between language learning and learners' academic achievements. However, recently a growing number of studies have begun to acknowledge that language skills can help improve speakers' general academic performances in a variety of content areas such as English language learning (e.g. Padilla et al., 2013), literacy (e.g. Lindholm-Leary, 2014), and maths and science. (e.g. Steele et al, 2017).

Despite most recent studies demonstrating a positive effect of language learning, some studies have reported no effect or a negative impact. Additionally, the magnitude of effects in each study has remained unclear. In this section we present the results of a meta-synthesis of the relevant literature from 2008 to 2017, examining the relationship between learners' academic achievements and language learning. Specifically, this study focuses on investigating 1) what kinds of cross-curricular benefits can be brought by learning multiple languages and 2) how the cross-curricular effects vary in terms of different language learning mode, language combinations and socio-economic status. Similarities and differences across different studies are analysed and synthesised in terms of methodology, measured outcomes and factors that may influence the outcomes.

3.1. Methods

3.1.1. Inclusion and Exclusion Criteria

To include all relevant studies on cross-curricular benefit of language learning, specific inclusion and exclusion criteria were developed. All studies included learners of a second or additional language in different educational systems. Studies meeting the following criteria were deemed eligible:

a. Studies published in peer-reviewed research papers such as journal articles, book chapters and academic books between 2008 and 2017.
b. Studies closely related to the theme of "cross-curricular benefits of language learning" rather than "the advantages of being bilingual". Thus, studies with bilingual speakers who had already developed equal proficiency in two languages were excluded.
c. Studies with a control group of monolingual speakers and an experimental group of speakers with at least a second language.
d. Studies with clearly stated measured outcomes. These include cross-curricular benefits of language learning in various content areas such as English learning, literacy, maths and science. Studies examining the benefits of language learning on other domains were excluded (e.g. executive function, metalinguistic awareness).
e. Studies including empirical evidence and sufficient data to report on the impact of language learning on the measured outcomes. Studies with no information about how the research was conducted were excluded.

3.1.2. Data Sources

A preliminary screening was conducted using primary and subordinate search terms. Primary search terms included 'cross-curricular benefits' and 'language learning'. Subordinate terms consisted of items

specific to the curriculum (e.g. Mathematics, Literacy and English language learning etc.), targeted population (e.g. English learners, second language learners, dual language learners etc.) and different modes of language learning (immersion, foreign language learning, bilingual education etc.). Based on the key items, a systematic literature search was conducted in the following databases: Google Scholar, ERIC, PsychInfo and Elsevier.

3.1.3. Data Extraction and Synthesis

A total of 52 studies were obtained through the key word search. The selection criteria described above were applied. Articles that did not meet the selection criteria were excluded (Figure 1). Data from the selected articles were systematically extracted for presentation in a data chart which included information on sources of the study, different content areas of the curriculum, language combinations, research methods, mode of language learning, and effect size (see Appendix 1).

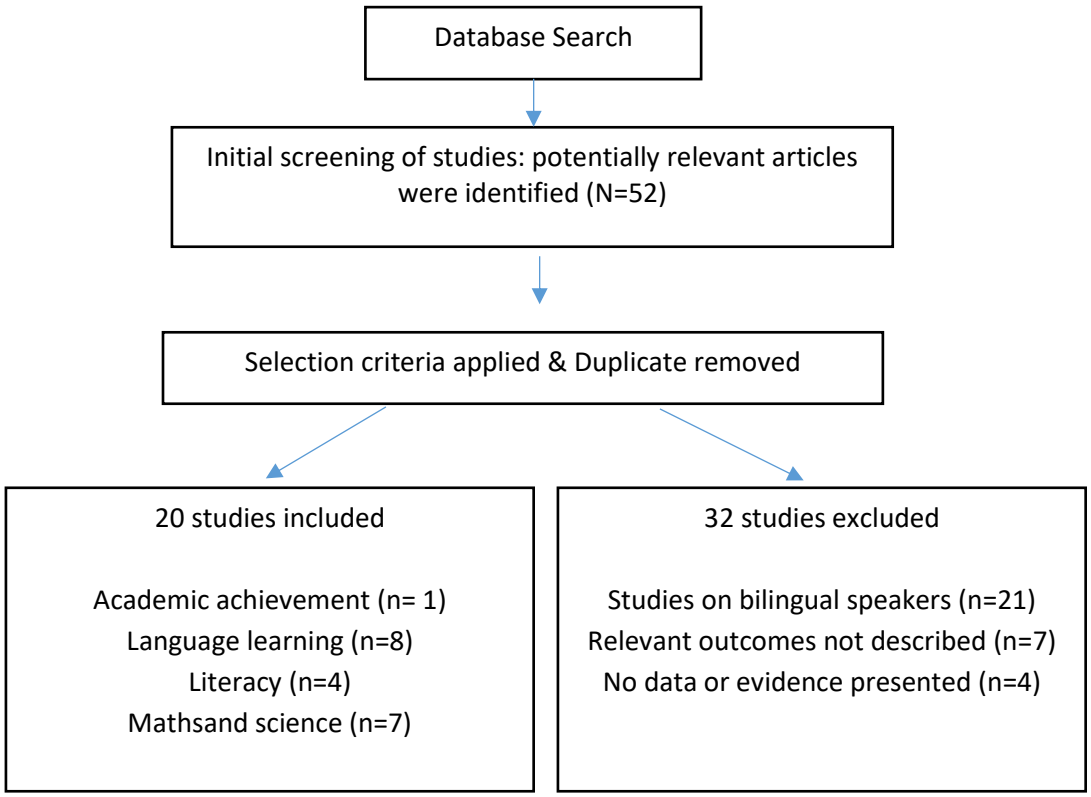

Figure 1. Flowchart of search process

3.2. Research Questions

1. What are the cross-curricular benefits associated with language learning?

2. What factors may influence the cross-curricular benefits of language learning? Factors under examination are: language combinations, language learning mode, socio-economic status (SES), different school settings and education levels.

3.3. Results

3.3.1. Description of the samples in the selected articles

Twenty studies reported in 16 papers were included for the final analysis. The sample in the selected studies differed in terms of language combinations, language learning mode and educational levels and socio-economic status.

3.3.1.1. Language combinations

Eight types of language patterns were reported in the selected studies (Table 1), with the majority of studies focusing on learners with English as a second language (N=17, 85%). Spanish-English is the most intensively investigated combination (N=10, 50%), followed by Chinese (N=4, 20%), while limited research has been conducted with students of other languages.

Language combinations	N
Spanish-English	10
Mandarin-English	2
Cantonese-English	2
Polish-English	1
Italian-English	1
Mixed-English	1
English-mixed	1
Hebrew-Russian	2

Table 1. Language combinations in studies of cross-curricular benefits of language learning

3.3.1.2. Language learning mode

Participants involved in the selected studies came from relatively simple language learning backgrounds with limited modes of language learning. The majority of studies (N=18, 90%) recruited participants who were enrolled in dual language or two-way immersion programmes where both the home language and English are used as the instructional languages on a permanent basis. One study (5%) involved learners from transitional bilingual education where the home language and English are used on a temporary basis, with the goal of eliminating the use of the home language and establishing an English-only learning environment. One study (5%) included language learners from a two-year foreign language immersion programme.

3.3.1.3. Education levels of the participants

Participants in the studies were of varying school ages and education levels. Six studies (30%) involved preschool children and kindergarteners. The majority of studies (N=13, 65%) recruited students across different grade levels from the elementary school. One study (5%) included adult learners from the 2nd year of university. In addition, while the majority of studies recruited typically developing language learners, one study (5%) examined learners with reading disabilities or learning impairment.

3.3.1.4. Socio-economic status of the participants

The sample also varied in terms of the participants' socio-economic status (SES). Seventeen studies (85%) provided clear information on the participants' SES, which was usually indicated by parent education or family income. Six studies (35%) involved participants from upper-middle income families whereas the other eleven studies (65%) recruited participants with low SES and who spoke a minority language.

3.3.1.5. Methodology used in the research design

The selected studies employed a wide range of research methods. Fourteen studies (70%) were cross-sectional. Five studies (25%) were longitudinal, with the majority of data collected a at least three points in time. One study (5%) was quasi-experimental. In terms of measurement used, the most frequently-used measurement tools cover two broad types: curriculum-based assessment measures such as standardised tests (e.g. GCSEs), GPA scores, and tasks specially designed for the intervention programme.

3.3.2. Findings relating to cross-curricular benefits of language learning

Findings have been summarised and analysed for the following subject areas: general academic achievement (N=1), English language learning (N=8), Literacy (N=4), and Mathematics and Science (N=7). Studies with mixed results have been reviewed separately in relation to each subject.

3.3.2.1. Academic achievement

One study (Pope, 2008) measured the cross-curriculum effect of foreign language learning on overall academic abilities for 2nd year university students training to be Mormon missionaries. The results indicate no difference in GPA between students training to work in an English-speaking mission and those being trained in a foreign language to serve as missionaries abroad.

3.3.2.2. English language

Eight studies investigated the cross-curricular benefits of language learning on English reading and English language arts. Participants in all studies were enrolled either in a two-way or dual language immersion programme with their achievements measured by a wide range of standardised tests such as GCSEs, the California Standards Test (CST) and the Oregon Assessment of Knowledge and Skills (OAKS).

Participants in the studies were of various education levels and socio-economic backgrounds. One study examined the English language proficiency of higher SES students attending either an English mainstream or a Mandarin two-way immersion programme (Padilla et al, 2013). In the immersion programme, instruction was in Chinese for 50%-90% of the time, with the remaining teaching delivered

in English. Using the California Standardized Testing and Report (STAR) for English language arts, students from the English mainstream programme initially achieved higher scores on English reading in Grades 2 and 3. However, the Mandarin immersion students caught up and scored above the English mainstream students in Grades 4 and 5.

Two of the studies examined low SES students who were minority language speakers. Lindholm-Leary and Block (2010) assessed the English achievements of 659 low SES Hispanic students enrolled either in mainstream programmes using English, or in segregated dual language immersion programmes, in Grades 4 to 6. In the segregated immersion programme, classroom instructions were initially given predominantly in Spanish, moving to predominantly English. Students were classified as English proficient learners (EP) or English Language learners (ELL) prior to the study. Results showed that on the California Standards Test (CST) both EP and ELL students in dual language immersion outperformed their comparable mainstream English speaking peers in English language arts. Students in the immersion programme also made faster progress across grades than the monolingual counterparts in developing their English proficiency. A similar study (Lindholm-Leary, 2014) involving 283 low SES Hispanic children reported that although children enrolled in the English mainstream programme initially had a higher level of English proficiency, this advantage gradually disappeared within one or two years, while children in the immersion programme outperformed their English-only counterparts in English and Spanish standardised tests. The results suggested that the significant loss of Spanish proficiency made the English mainstream children less bilingual, which may have slowed their improvement in both English and Spanish. The authors concluded that dual language learning could benefit low SES students and help them to attain a higher level in their academic achievement.

The results of this study were confirmed by another study of 732 Grade 4 to 8 Latino low SES students with varying levels of English proficiency, enrolled in a dual language immersion programme (Lindholm-Leary and Hernández, 2011). Students' achievements in English reading and writing were examined using the CST. Results showed that the dual-language immersion group outperformed monolingual Spanish-speaking and English-speaking peers in both English and Spanish. The study further suggested that SES background and proficiency in the native language had significant effects on reading achievement.

Two other studies further investigate the role of SES in language development, recruiting participants with mixed SES backgrounds. The first study, involving 320 students from a Chinese two-way immersion programme, demonstrated advantages in English learning compared with non-immersion peers (Lindholm-Leary, 2016). The other study compared the benefits of dual language learning with minority-language (low SES) and majority-language (high SES) students (Marian et al, 2013). The minority-language group comprised native speakers of Spanish who were taught in their second language – English, while the majority-language group were native speakers of English, enrolled in the Spanish immersion programme. Participants' English language proficiency was measured by means of two standardised tests and the scores of each group were compared with their peers in mainstream classrooms at Grades 3, 4 and 5. The overall results showed that while for both minority-and majority-language students, English reading scores increased across grades, the benefits of language learning manifested earlier in the majority-language group (Grade 3) than the minority-language group (Grade

5). The authors interpret this as indicating that regardless of demographic location and SES, students can benefit academically from dual language learning. However, the benefits for low SES learners may take a longer time to become apparent.

One study demonstrated the cross-curricular benefits of language learning without analysis of participants' SES. In this study, more than 1,600 students of English language learners as well as native English speakers were randomly selected and enrolled in a dual language immersion programme (Steele et al., 2015; 2017). This study found:

- Students randomly assigned to immersion outperformed their peers in English reading by about 7 months in grade 5, and about 9 months in grade 8.
- No statistically significant benefit, but also no detriment, was found for maths and science performance. There was suggestive, but not statistically significant evidence, that the immersion benefit in reading was higher for students in Spanish immersion programmes, while maths benefits were higher for students in the less-commonly-taught languages (Japanese, Mandarin, and Russian). This may reflect increased phonological awareness (hence benefiting English reading) when learning to read another language using the same orthography (Spanish), and increased symbol decoding skills (benefiting mathematics) when learning to read a language with a different writing system.
- On average, immersion students reach intermediate levels of partner-language proficiency by Grade 8, with somewhat higher performance in Spanish and Chinese (intermediate mid-to-high) than in Japanese (intermediate low-to-mid).

This study does not differentiate between socio-economic groups, focusing instead on DLI learning across the whole public school system of an urban area.

The last study in this group examined the benefit of language learning on pre-school students with learning disabilities (Simon-Cereijido and Gutierrez-Clellen, 2014). Students with learning impairment were randomly selected for enrolment in a dual-language intervention programme where classroom instructions were given half of the time in the target language - English - and half in the partner language - Spanish. Using elicited narratives to measure lexical density, the results demonstrated that the dual language learners made greater improvement in both English and Spanish than mainstream peers. Moreover, the results also demonstrated that learning two languages can bring benefits to students with special learning needs.

In conclusion, there is evidence that dual language learning can exert positive influence on English reading outcomes regardless of the participants' SES.

3.3.2.3. Literacy

Four studies measured the impact of dual language learning on the literacy development of young language learners.

Duran et al. (2013) conducted a three-year longitudinal study examining the literacy development of Spanish-speaking pre-schoolers enrolled in a transitional bilingual education (TBE) programme. Using various standardised tests to measure participants' receptive vocabulary and literacy skills, the findings

showed that although in Year 1the TBE group had lower proficiency in English compared with the English monolingual peers, they attained a higher level of proficiency in literacy in both English and Spanish after three years' language immersion.

Similar results were reported from three groups of Italy-English and Hebrew-English language learners of mid-level SES. In the first of these, Montana (2013) conducted a small-scale longitudinal study examining the literacy development of 60 students enrolled in a dual language immersion programme in Grades 1-3. Children developed strong literacy skills in both English and Italian compared with English monolingual peers. A second pair of longitudinal studies investigated the literacy development of 4-year-old Russian-Hebrew pre-schoolers living in Israel. Results suggested that children attending the bilingual programme developed the same-level of literacy (Schwartz and Shaul, 2013) and narrative skills (Schwartz, 2013) as their Hebrew-only peers, and also maintained a high level of Russian, which could in turn help boost development of Hebrew.

The overall results indicate that learning two languages at the same time does not have negative effects. Rather, thinking in and using two linguistic systems appeared to be of benefit.

3.3.2.4. Maths and Science

The cross-curricular benefits of language learning are not confined to the improvement of learners' language and literacy skills, but appear in other content areas as well. In this section, seven studies reporting the effects of dual language learning on the academic achievement of Mathematics and Science are described. The studies reported mostly positive effects although there were some studies which showed no differences.

Padilla et al. (2013) reported that elementary school students enrolled in either a Mandarin-English immersion programme or an English-only mainstream programme performed equally on mathematics standardised tests until Grade 3, with the immersion students outperforming their non-immersion peers in Maths in Grade 4. No differences in Science tests were found between the two groups in any of the Grades. Similar results were reported in another longitudinal study (Han, 2012) following children's academic development from kindergarten until Grade 5. Maths scores in standardised tests across grades, showed that although students in the immersion programme had lower initial scores compared with the native English-speaking peers, the gap was fully closed by Grade 5. These results were supported by another study indicating that dual language learners in two-way immersion programme advanced further in maths than non-immersion peers (Watzinger-Tharp, 2016), and that students' maths achievements were closely related to maintenance of proficiency in their home language and degree of proficiency in their second language.

Much of the research on academic achievements in Mathematics has focused on students with low SES backgrounds. Two studies reported that low SES Hispanic students achieved better scores in Mathematics at upper Grades than monolingual peers (Lindholm-Leary & Block, 2010; Choi et al., 2017). The longitudinal study conducted by Choi et al. (2017) examined the effect of language learning by low-income students on standardised measures of maths achievement. This study involved three groups of low-income kindergarten children who varied in English proficiency: Spanish-English bilinguals, dual language learners with limited English skills (DLLs) and English monolingual children. Results showed

that Spanish-English bilinguals with proficiency in both languages presented the most rapid development of maths skills and achieved the highest scores on standardised assessments. Moreover, the DLLs group that began with limited English proficiency made greater improvements in maths compared to English monolinguals.

Marian et al. (2013) examined whether results would be similar for Spanish-speaking children with low SES and English-speaking peers with high SES enrolled in the same dual language programme. The mathematics scores from the standardised tests at Grades 3-5 were compared. English-speaking students outperformed their non-immersion peers in Grades 3-5, whereas Spanish-speaking students from the immersion programme outperformed Spanish mainstream peers. This study indicates that language learning can benefit academic achievement of students from different SES backgrounds but that there may be a delay of effect for the low SES groups.

3.3.3. Discussion

Based on the data from these 20 studies, the possible cross-curricular effect of language learning has been identified in four main content areas: general academic performances, English language learning, Literacy, and Mathematics & Science. Of the 20 studies, 18 studies (90 %) reported a positive impact while 2 studies (10%) reported no impact of language learning on academic achievements. The dual language learners in these studies exhibited a great diversity of characteristics. Participants varied in country of origin, languages spoken, exposure to different languages, SES and education of parents.

3.3.4. Factors that may influence the cross-curricular benefits of language learning

3.3.4.1. Length of immersion

Based on the review, the length of participation in a dual language programme has been found to have an impact on the measured outcomes. Several studies have reported that dual language learners in an immersion programme often presented an initial lag in the academic performances within the first three years compared with the monolingual peers. But they caught up and even surpassed their peers in the academic performances (e.g. English reading or Mathematics) after several years' immersion.

3.3.4.2. Learner type and different school settings

Results of several studies have demonstrated that dual language learners with proficiency in both languages tend to benefit most across the curriculum from the experience of language learning. This is further supported by the fact that students from a minority-language background tend to have better academic performances in English reading and Mathematics if they maintain a high level of proficiency in their native language.

3.3.4.3. Socio-economic status

The overall findings from the review demonstrated a positive relationship between SES and the measured outcomes. That is, dual language learning tends to benefit learners with both high SES and low SES background compared with their monolingual peers. However, students with higher SES background tend to achieve higher academic standards compared with those of lower SES background. In addition, the benefits for low SES learners may take a longer time to manifest and the effect may be lower compared with learners with high SES.

3.4. Conclusions

The overall analysis shows that there is a positive correlation between language learning and academic achievements. It is suggested that the dual language learning is effective not only in promoting learners' English language proficiency and literacy skills, but also brings about academic advantages in the core subjects such as mathematics, and science. In addition, the cross-curricular benefits of language learning are applicable for learners from different ethnic communities, with different education levels and socio-economic backgrounds, and with different language combinations, even for typologically-different language combinations (e.g. Chinese-English). However, most of the studies are American, and focused on the two-way/dual-language immersion type with Spanish and English as the language combination. Further research in the UK context is necessary.

4. COGNITIVE BENEFITS RELATING TO CREATIVITY

Many studies have indicated enhanced creativity levels in bilinguals. However, the cognitive benefits of learning a foreign language have received far less attention. A meta-analysis was conducted following a comprehensive search for primary studies testing foreign language learning with measured outcomes of creativity. A systematic search of UCL Explore, Linguistic and Language Behaviour Abstracts and Google Scholar databases for studies published between 1966 and 2016 identified 294 articles. Data from 6 studies (involving 502 participants) was extracted and analysed following established protocols and procedures for conducting systematic reviews and meta-analysis. Standardised effect sizes varied from large to medium according to verbal and figural measures of creativity and were strongest in sub-scales of creative flexibility, followed by creative originality and lastly, creative fluency.

The following section discusses the potential relationship between language learning and creativity. A review of research examining bilingualism and creativity reveals that most studies report that bilingualism increases creativity on measures such as the Torrance Test of Creativity (TTCT) (Adescope et al, 2010; Gowan and Torrance, 1965; Konaka, 1997; Lasabagaster, 2000; Okoh, 1980). One of the most heavily cited pieces of research on this topic is Ricciardelli's (1992) review, which reported that bilinguals were superior to monolinguals in measures of creativity for 20 out of 24 studies. Similarly, Konaka (1997) found advantages for bilingual children aged 9-11 years (Japanese and English-speaking) when compared to monolingual counterparts on tasks requiring divergent thinking skills. In a more recent study, Adescope et al. (2010) conducted a systematic review of cognitive correlates of bilingualism and found that abstract and symbolic representation produced one of the strongest mean effect sizes (0.57 across 8 studies).

To examine the direct relationship between foreign language learning and creativity, we explored whether there are significant differences between foreign language learners (FLLs) and monolingual students in relation to creativity, and if there were interactions between level of proficiency, age group, or gender in relation to creativity.

4.1. Methods

4.1.1. Selection Criteria

To capture all relevant studies on the effects of foreign language learning on creativity, specific criteria for inclusion were developed. Studies were deemed eligible if:

- Foreign language learner participants (FLLs) were reported to be studying a language separate to their native language in a classroom context. Thus, participants who presented a bilingual background (acquiring a second language in a home environment or through social interactions) were excluded from this meta-analysis.
- They had an experimental group of FLLs and a control group of monolingual participants (who only spoke one language and were not involved in a FLL programme).
- Measured outcomes of creative/divergent thinking were clearly reported.
- They were publically available, either online or in library archives.

4.2. Location and Selection of Studies

Databases were searched for dates of publication from 1966 onwards. The primary search was conducted using a series of Boolean AND/OR operators within each of the databases for the terms 'creativity 'divergent thinking' 'innovation' in addition to one of the following: 'foreign language learning', 'bilingualism' or 'second language'. This search yielded a total of 294 articles. Articles that did not meet the criteria were excluded. A total of 24 studies were retained for secondary screening. The next stage involved ancestry (searching the references of included articles) and descendency searches (searching articles citing included articles) to locate further primary articles of potential relevance. These were then also screened using the inclusion criteria. However, after duplicate studies were excluded, this process generated only 6 unique primary studies.

4.3. Results

4.3.1. Data Description

Table 2 displays a summary of the variables coded for the 6 individual studies. This includes the total number of participants involved in each study, age group, correlates of creativity measured, language-combinations used, and measure of creativity utilised. A more detailed summary of the research design involved for each study is outlined in Appendix 2.

Study	**Bamford & Mizokawa (1991)**	**Landry (1974)**	**Ghonsooly & Showqi (2012)**	**Mendonça & Fleith (2005)**	**Rezaei & Almasian (2007)**	**Showqi & Ghonsooly (2015)**
Other correlations	Gender, age	Gender, age	Age	Gender, age	Language proficiency	Metacognitive awareness
Measures of creativity	Raven's Coloured Progressive Matrices	TTCT (1966)	TTCT (1966)	TTCT (1966)	Creative Personality Measurement Questionnaire	TTCT (1974)
Languages	English-Spanish	English-Unknown	Persian-English	English-Portuguese	Persian-English	Persian-English
N	38	80	120	115	29	120
Age group	Grade 2	Grades 4-6	16-18	14-57	18-20	16-18

Table 2. Summary of coded studies in the current study.

NB: N=number of participants

a. Age groups (displayed in years/grade level): grade levels refer to American school grading systems (for example 7th grade refers to the 7th school year after kindergarten).

b. Language combinations depict native-foreign language (e.g. English-Spanish means that the participants were native English speakers who learnt Spanish in a foreign language programme.

The first of the studies listed in Table 2 is a longitudinal experiment conducted by Bamford and Mizokawa (1991). Results showed a significant group-by-time interaction in favour of the Spanish-immersion group, demonstrating a superior growth in non-verbal problem solving abilities over the course of the school year. Landry (1974) found that fourth and sixth graders who had learned a second

language at school performed better on measures of creativity than their monolingual counterparts. The Hoffman Bilingual Schedule (Hoffman, 1934) was used to eliminate any possible influences of a second language learnt in the home on performance of creativity measures.

Ghonsooly & Showqi (2012) compared creativity levels between a group of advanced English learners (who had studied English for at least 6 years) to 60 monolinguals and found that advanced FLLs significantly outperformed monolinguals in all four measures of the TTCT. Similar results were found by Mendonça & Fleith (2005).

A meta-analysis was conducted to formally answer the question of whether there are significant differences between foreign language learners (FLLs) and monolingual students in relation to creativity. Table 3 displays standardised mean differences between language groups (foreign language learners and monolingual students) and calculated standard errors on three studies conducted across different time periods and which all utilised the same measure of creativity (TTCT).

Study	**Statistics for each study**			**N**	**Age group**	**Measure of creativity**
	Difference in means	(SE)	P value			
1.Landry (1974)	Verbal flexibility	3.60 (0.91)	<0.05	80	Grade 6	TTCT (1966)
	Verbal originality	5.45 (1.22)				
	Verbal flulency	5.65 (2.32)				
	Figural flexibility	1.55 (0.79)				
	Figural originality	3.65 (1.36)				
	Figural fluency	3.18 (1.32)				
2.Mendonca & Fleith (2005)	Verbal flexibility	3.2 (0.64)	<0.01	115	14-57 years	TTCT (1966)
	Verbal originality	1.8 (0.49)				
	Verbal fluency	6.3 (1.32)				
	Figural flexibility	3.4 (0.76)				
	Figural originality	2.6 (0.71)				
	Figural fluency	3.9 (1.11)				
3.Ghonsooly & Showqi (2012)	Flexibility	1.92 (o.32)	<0.001	120	16-18 years	TTCT (1974)
	Originality	4.08 (o.55)				
	Fluency	3.94 (0.69)				
	Elaboration	2.19 (0.43)				

Table 3. Differences between FLLs and monolinguals across measures of creativity

4.4. Demographic variables: gender and age

Landry (1974) found no significant gender differences. Bamford and Mizokawa (1991) also found no gender or age differences between FLLs and monolinguals. Mendonça and Fleith (2005), on the other hand, found some significant differences between male and female students in relation to verbal creativity ($F[1,113] = 4.515$, $p<0.05$, F>M). Across the various studies, strong effect sizes were found for language learning and creativity across a range of age groups (7-57 years old), suggesting that foreign language learning has a beneficial effect on creativity across the lifespan.

4.5. Discussion and conclusions

Overall, analyses indicate strong positive correlates between creative flexibility, fluency, originality and foreign language learning. The strongest effect sizes across the various studies were for measures of creative flexibility. Effect sizes were largest next for creative originality, and smallest for creative fluency, though this was still moderately large at 0.51. Effect sizes varied depending on verbal versus figural measures of creativity; generally, larger effect sizes were found for verbal measures (such as verbal flexibility and verbal originality).

The remarkable superiority found for FLLs may have several explanations. Students may be affected by the cognitive practices involved in learning a new language. Landry (1974) attributed his findings to "the willingness and adoptability to change" in FLLs facilitating creative development. The findings presented here highlight creativity as a positive outcome of language learning and the value of foreign language learning programmes.

In conclusion, the significant associations found between language learning and creativity parallel previous findings in bilingualism research. However the underlying mechanisms behind the enhancement of this cognitive function are still unclear. Cognitive benefits in this area may be attributed to processes of language switching (as in bilingualism) or the rigorous practice and study involved in language learning. Further research is needed to assess creative thinking across genders, age and learning strategies in order to gain a better understanding of how creativity is fostered in bilinguals and foreign language learners.

5. GREY LITERATURE

Because one of the aims of this project was to explore the relationships between public policy, public attitudes and research relating to the cognitive benefits of language learning, materials reviewed included not only academic publications in the field, but also grey literature. Grey literature is broadly defined as: non-formally published scholarly or substantive information (often found on the internet and in specialised resources) and often not formally peer-reviewed. Although most of grey literature is less prestigious, reliable, and "official" than publication in a peer-reviewed journal, the topics covered and content are highly relevant to this project. **5.1. Database**

A search was conducted for on-line material on the topic of cognitive benefits of language learning. The search included on-line press coverage, newspapers, magazines, newsletters and social media but not personal blogs. A total of 179 items were identified that appeared between 2012 and 2017 (see Appendix 3).

5.**2. Categorisation**

The 179 items fell under 17 headings, which can be subdivided into 6 categories. In the majority of cases, the grey literature supported the view that language learning had cognitive benefits, although it should be noted that recent reviews in the academic literature such as Lehtonen et al. (2018) which suggest a re-evaluation of the benefits of bilingualism on executive function appeared after the completion of the grey literature review. Category 1 (cross-curricular benefits) include items about academic achievements and literacy; Category 2 (acquired neurological impairments) covers articles on dementia and recovery from stroke. The third category (the brain) falls outside the main focus of this study, but grey literature items relating to brain size, brain structure, and ageing of the brain have been included here as these are often linked in content with statements about cognitive function. Category 4 covers the various areas of cognitive function, considered broadly. As well as executive function, these include items about metalinguistic awareness, memory, problem-solving, mental agility and decision-making, as well as auditory perception. Empathy and global identity are covered under Category 5, and a group of items dealing with multiple benefits of language learning are grouped together under Category 6 (see Appendix 4).

5.3. Conclusions

The grey literature review indicates substantial public interest in and recognition of the cognitive benefits of language learning, with most items based on findings from academic research. One striking exception was the Opinion piece by Simon Jenkins, published in the Guardian on 25 August, 2017. Titled *Ignore the panic. There's little point learning languages at school* , it argued that the only reason for promoting the study of modern languages was that it was easy to score performance.

This opinion piece elicited a number of angry responses which drew on relevant research studies to argue against Jenkins' view, but it is clear that the case to the public and policymakers has clearly not been made strongly enough. In the following section we describe the results of two surveys which explored public attitudes to language learning.

6. QUESTIONNAIRE SURVEYS

In order to assess the match or mismatch between what people perceive as the benefits of language learning and what has been evidenced in the published studies, we specifically designed a pair of questionnaire surveys (Adult and Youth) for the project.

Ethics approval was obtained from the UCL Graduate School Ethics Committee. The questionnaire was completed on-line, using SurveyMonkey; all responses were anonymous. Information about the survey was circulated via posters in schools, organisations of language teachers, university students, etc. A list of the questions for the adult and youth questionnaires are in Appendix 5.

Each questionnaire had 50 items, divided into 3 sections: cognitive benefits of language learning; personal experiences of language learning; and personal data. The first section, on cognitive benefits of language learning, asked participants to indicate their agreement or disagreement with a number of statements about language learning on a 6-point Likert scale ranging from 'strongly agree' to 'strongly disagree' – for example, in the adult questionnaire, *Learning a new language helps to develop thinking/analytical skills*; and in the youth questionnaire, *Language learning is fun*. The second section asked about personal experiences of language learning, including questions about which languages they knew and used, and also provided opportunities for adding detailed comments in response to questions such as *What aspects of language learning do you least enjoy?* and *Does learning new languages when you are older have any particular benefits?* The third section included questions about gender, age, background, etc.

6.1. Adult questionnaire

There were 741 respondents to the adult questionnaire. 77% were female. The median age of respondents was between 40 and 49 (Figure 3)[1].

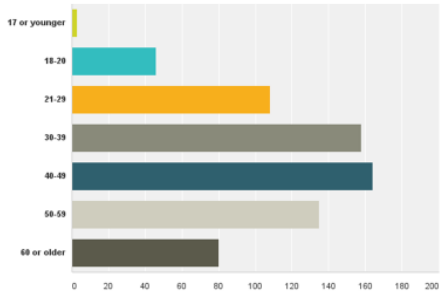

Figure 3. Age distribution of respondents

Sixty-three percent of respondents were working in education, with a variety of other occupations reported (Table 1). Answers were analysed separately for those working in education and the other respondents, but the only significant differences between responses of the two groups were in 4 items:

[1] Total numbers on each question may be less than 741, as some participants did not answer all questions.

Q4*: Learning a new language helps to focus your attention*; Q5: *Learning a new language helps to prevent memory loss and loss of concentration in older age*; and Q17: *Learning a new language can affect your first language,* which all received stronger agreement ratings from educators; and Q18: *Learning a new language that is very different from your first language has more benefits than learning a language that is similar to your first language,* which received higher agreement ratings from non-educators.

Accounting	2
Automotive	1
Banking	3
Carpenter/Electrician	2
Chemicals/Plastics/Rubber	1
Construction	1
Consumer electronics	1
Education	436
Engineering	3
Environmental services	3
Fashion	1
Film/TV/Advertising	1
Public sector	23
Healthcare	14
Hospitality/Tourism	6
Human Resources	3
IT	13
Insurance	2
Law	4
Market research	3
Marketing/sales	2
Media/entertainment	6
Non-profit/social services	4
Property	1
Retail	2
Not working	57
Other	97

Table 4. Occupations of respondents

As well as the Likert scale questions, there were open-ended questions about respondents' experiences. These will be reported in detail in a separate publication, but a few examples are given here to illustrate the complexities and individual qualities of responses. For example, in response to the request to *List all the languages you know in order from most to least fluent*, one respondent wrote:

> English, German, French, Italian, Greek... and I have studied at least 7 others: some I read quite well, some I once spoke (broken), some I still want to get fluent in! 2 of these 12 are non-European, the other 10 are related (Indo-European, of 4 families); it's those 2 others that I found really hard. My languages are in 4 scripts.

and in response to *What is your preferred language*, another respondent wrote:

> For what? My main working/professional language is Scottish Gaelic, with my partner I speak English, German with my family except for my mother with whom I speak German & Cantonese. I have no preferred language. If you ask me to which language I have the strongest emotional attachment (of those I speak), that would be Basque.

Respondents had positive views about the cognitive benefits of language learning. The percentage of responses indicating agreement or strong agreement with the various statements in the questionnaire are given in Table 5 below.

No.	Statement	% agreeing/ strongly agreeing
1	Learning a new language helps to develop thinking/analytical skills	90
2	Learning a new language helps to develop multi-tasking skills	70
3	Learning a new language helps to improve your memory	84
4	Learning a new language helps to focus your attention	77
5	Learning a new language helps to prevent memory loss and loss of concentration in older age	71
6	Learning a new language has positive benefits for your health	57
7	Learning a new language makes you more creative	67
8	Learning a new language helps to make you more expressive	75
9	Learning a new language helps you to understand other people's emotions	63
10	Learning a new language helps to keep your emotions stable	18
11	Learning a new language helps you to make more friends	77
12	Learning a new language helps with understanding other cultures	95
13	Learning a new language gives you better employment opportunities	86
14	Learning a new language helps to improve your school/academic achievements	81
15	Learning a new language helps with learning other things	88
16	Learning a new language can change your identity	58
17	Learning a new language can affect your first language	61
18	Learning a new language that is very different from your first language has more benefits than learning a language that is similar to your first language	30
19	Learning a new language that has a different writing system to your first language has more benefits than learning a language that has a similar writing system	20
20	Learning a new language is only suitable for academically successful children	3
21	Learning a new language is not suitable for children with special educational needs	3
22	Learning a new language is useful	96
23	Learning a new language has no particular benefit	1
24	Learning a new language can have negative effects	3
25	Learning a new language takes a lot of time and effort	71

Table 5. Percentage of agreement/strong agreement responses

In general, respondents were largely in agreement with the statements and with each other, with the exception of Statements 6, 10, 16-21, and 23-24. Strong disagreement was expressed in relation to only a small number of the statements. It was clear that respondents felt that language learning opportunities should be made available to all children regardless of their academic ability or presence of special needs. In most cases responses were aligned with research studies in these areas, although there were some differences, which will be discussed in the Research Review section of the report.

A number of yes/no questions with opportunities to add comments were asked about respondents' own language use and experiences (Table 6).

No.	Question	% yes responses
27	Do you mix languages in the same conversation	69
28	Are you fluent in other languages	75
30	Are there any languages you can speak/listen to and understand, but not write or read	30
32	Are there any languages you can read or write but not speak/listen to and understand	32
37	Did or do you have any anxieties about learning languages	39
39	Would you encourage your own children to learn new languages	99
40	Do you think it is better to learn new languages when you are younger	86
42	Does learning new languages when you are older have any particular benefits	86

Table 6. Respondents' language experiences

6.**2. Youth questionnaire**

The youth questionnaire received only 40 usable responses, as a number of questionnaires were completed by individuals aged over 17, or living outside the UK, and their responses had to be excluded. The gender distribution was very similar to the adult questionnaire (78% female). The mean age of participants was 14; 82% had been born in the UK.

	Statement	%*
Q1	Learning a new language is fun	75
Q2	Learning a new language helps me to improve my thinking	67
Q3	Learning a new language helps me to remember things better	53
Q4	Learning a new language helps me to focus better.	44
Q5	Learning a new language makes me smarter.	75
Q6	Learning a new language makes me more creative	67
Q7	Learning a new language makes me express things better	67
Q8	Learning a new language helps me to understand other people's feelings better	50
Q9	Learning a new language helps me to make more friends	61
Q10	Learning a new language helps when I go on holidays	75
Q11	Learning a new language will help me get a good job	81
Q12	Learning a new language helps me with my school work	78
Q13	Learning a new language helps with learning other things	61

Q14	Learning a new language changes my first language	36
Q15	Learning a new language requires a lot of time and effort	81
Q16	Learning a new language makes me anxious	8
Q17	I particularly like learning languages that are very different from my first language	47
Q18	I particularly like learning languages with a different writing system from that of my first language	22
Q19	Learning a sign language would be fun	61
Q20	Learning a sign language would be useful	61

*Percent agreeing or strongly agreeing.

Table 7. Responses to Youth Questionnaire

The responses to the youth questionnaire generally mirror those of the adult questionnaire, with positive or strongly positive responses to most of the statements, including the positive benefits on schoolwork and learning more generally.

As well as classroom learning, around half of the respondents reported that they make use of on-line language resources, with a large number listed. As well as on-line language learning resources, such as Duolingo, Babbel, Verb2Verbe, Linguascope, Memrise, Quizlet, Languages Online, and Aprender, several mentioned using other web resources such as Google Translate, on-line dictionaries, and foreign language websites (for news and hobbies/interests).

7. FOCUS GROUP INTERVIEWS

Two focus group interviews were conducted by Li Wei with 3 teacher-trainers on the UCL IOE Modern Foreign Languages (MFL) Post Graduate Certificate in Education (PGCE) on 13 March 2017, and with the PGCE MFL students on 27 November 2017. The latter was a very large group of over 60 trainee teachers. Li Wei gave a presentation on the project and the literature review and the questionnaire survey and then conducted a discussion with the group. The questions asked by Li Wei were the same for both groups.

A further meeting was conducted on 7 March 2018 with Heads of Schools participating in the Mandarin Excellence Programme at the IOE Confucius Institutes for Schools. Li Wei gave a presentation to the group and invited them to participate in a study that will focus on cross-curriculum benefits of learning Mandarin. A questionnaire has been specially designed for this study, as a follow-up from the BA project. Schools were asked to provide school test results data in all subjects for the children who take Mandarin as part of the MEP. It is hoped that the participating schools will begin to gather these data from Autumn 2018. A blog from Melbourn Village College in Cambridgeshire on how the introduction of Mandarin helped to improve the school's Ofsted results can be found at https://ciforschools.files.wordpress.com/2018/02/melbourn-village-college-report3.pdf.

7.1. Summary of focus group interviews/discussions with educators and trainee teachers

1. *Are schools, teachers and parents generally aware of the messages about the various advantages of bilingualism as often presented by the press? And have they had any effect on the MFL teaching and learning in schools?*

   Tutors: Yes, the messages are out there and people have heard about all the good things of being bilingual. But it is not something that schools and teachers can use to promote more uptake of MFLs at GCSE level. There are many different factors. Many families face challenges in their everyday lives, e.g. financial, health, employment, parental literacy, and they find it hard to accept that learning a foreign language can help to improve their situations. For some parents, the message that foreign language may help their kids to get better jobs in the future is attractive. But if they are struggling with other school subjects already, especially English, maths and science, then they probably wouldn't want to give more time to foreign languages. That's why it would be really useful if your research can demonstrate concrete benefits of language learning for other school subjects.

   PGCE: The messages get across differently to different groups of parents. Often families from either minority backgrounds are already bilingual or even multilingual in their home/community languages, and they are very happy with the idea that being bilingual is good for you. But their attention may be on something else, maybe English, or other subjects, not necessarily French or German or some other school language. For the English-speaking kids, they may think that learning languages is for others, those of ethnic minority backgrounds.

2. *What kinds of messages do you think may be (more) useful to encourage more students to do MFLs?*

Tutors: It really depends on the local situation. It there is evidence that language learning could benefit the pupils' school work generally, then that'll be very useful. Other messages may depend on the community's priorities.

PGCE: Benefits for their other school subjects – overall improvement. And better employment prospects. Not health (preventing dimension) – can't imagine that works, especially for families in hardship.

3. *Is the global status of English an issue here?*

   Tutors: To some extent yes.

   PGCE: Definitely yes. Lots of people think there is no point in learning foreign languages because the rest of the world is learning English.

4. *What can help to improve MFL teaching and encourage more MFL uptake in schools?*

   Tutors: Inspirational teachers and inspirational teaching. It's not the policies or messages that can change the situation. When you go to schools and talk to the kids, they will tell you that they like a subject and they do well in a subject because they have a good inspirational teacher who can inspire them in the class. That's what makes a real difference.

   PGCE: More time in the curriculum. Good and interesting material. Good teaching. Brexit – when people realise actually you need other languages to communicate with the rest of the world, they may change their mind and think learning languages are useful. Cross-curriculum benefits again.

5. *What do you think the benefits of language learning are, cognitive or otherwise?*

   Tutors: If the research is to be believed, then there are all the health benefits. Employment definitely. Cultural awareness. Maybe thinking skills, but then again other subject teachers might want to argue that too – every subject thinks theirs is the most important and useful. If there is evidence that language learning can improve the pupils' core subjects, English, maths and science, then it'll be really helpful.

   PGCE: all that's been talked about in research. Maybe flexible thinking and analytical skills. Not sure if the health benefits are true because if you look at the communities in Africa, they are all bilingual and multilingual, and many are really poor and have serious health issues.

6. *What kinds of research may be needed on this topic?*

   Tutors: Cross-curriculum benefit research would be really helpful.

   PGCE: benefits of language learning for other school subjects.

7. *Is there any way to improve the messages to schools, families and children?*

   Tutors: It's a complex one. Language learning is hard. It takes time and hard work. So we can't sell it for fun, because it is not really fun. You need to be fairly resilient to do it well. And you can't say that only the clever ones should do language either. So it is hard. But schools definitely

need more time for teaching languages. Maybe technology will help. But nothing can change it fundamentally on its own.

PGCE: Language is a good subject for the kids and it can help their other subjects.

8. *Any other issues/points?*

Tutors: The Mandarin Excellence Programme is great. But schools do get incentives to participate and a lot more time (8 hours a week). If the same applied to all languages, then we might well have a different result. Schools certainly need more time and resources for language teaching.

They should stop promoting 'strategically important' languages. Mandarin is important and Arabic is important. But all languages are important. They did invest in Japanese and thought t would ibring in lots of jobs. But it wasn't the case. Priorities change. They should promote languages in general, not specific languages at certain languages and keep changing them.

7.2. Policy-maker interview

A further interview was held with a senior civil servant in the Foreign Office who is also the Whitehall foreign languages champion. Questions focused on what sort of information about cognitive benefits of language learning would influence a change in policy, in particular the sort of evidence that would be most likely to be taken up by the government in relation to policy-making about language learning across the lifespan. It was recognised that researchers often felt that their research had produced substantial evidence but policymakers felt was not the sort of evidence that would support a change in policy .

The interviewee noted that the government's industrial strategy does not mainstream languages as being across Whitehall. Within the Foreign Office, there is a very local and functional approach to languages, with no awareness of possible cognitive enhancements associated with language learning, and with a focus only on the end state of language skills and their relevance for specific jobs. She suggested that instead, interest in language learning might be used to recruit people for posts which did not require language skills. The Foreign Office hasn't thought about recruiting people who have language skills as being better thinkers, with cognitive underpinnings for a sense of different identities.

From her own experience, for example, she felt that it would be useful if there were evidence available on how learning a language might improve agreement-reaching skills, as part of the flexibility in thinking associated with language learning. She also felt that there should be consideration of the impact of not understanding other languages on confidence, resourcefulness etc.

The points raised in this interview provide insights into how work might be developed further which could be directed at providing the sorts of information about language learning which would be relevant to policy-makers and employers.

8. SUMMARY AND ACTION POINTS

The translation of the findings of this project into changes in policy and practice remains a challenge, but one which is likely to be of substantial benefit to the UK in the future.

Action Point 1. Development by the British Academy of a programme of dissemination activities on the cognitive benefits of language learning

This project has taken a broad perspective on language learning and cognition, through reviews of such areas as the relationship between bilingualism and executive function, literacy, health, creativity, social and affective cognition, and the learning of signed as well as spoken languages. We have provided both an overview of existing research and an identification of current practice and policy implications across a range of topics.

We intend our research findings to speak to a variety of audiences including academics, policy makers, employers and the general public, with impact objectives that have identified gaps in knowledge and research evidence and directions for future research, and potential intervention strategies. Both the educator and civil service interviews indicated the importance of demonstrating concrete benefits of language learning. For educators, cross curricular benefits are seen as the key to influencing families to have a positive view towards language learning; for policymakers, broad cognitive benefits such as enhanced resourcefulness, and creative thinking are key.

Action Point 2. Support for development of an intervention and research programme on the cognitive benefits of language learning, with emphasis on two key areas: 1) language learning for older populations; 2) cross-curricular benefits of language learning in the school years

It is clear that the relationship between executive function skills and language learning is complex and inconsistent. For example, there is a growing body of literature which suggests that the cognitive relationship between language learning and age of exposure is dependent on a multitude of varying factors, and is not as clear as initially predicted. More research in this field should look to determine and clarify variables.

The implications of enhanced creativity, empathy, problem-solving skills, confidence and resourcefulness as outcomes of language learning should be further explored. Foreign language learning programmes aimed at older populations may help to build cognitive reserve because language learning engages an extensive brain network that is known to overlap with the regions negatively affected by the aging process. Research should test this potentially fruitful hypothesis, including the provision of specially designed English language programmes for elderly non-English speakers in the UK.

There is evidence of cross-curricular benefits of language learning, but these studies are not directly comparable with the UK language learning environment. This British Academy project has already served as a catalyst for a study of the cross curriculum benefits of learning Mandarin, specifically the Mandarin Excellence Programme led by the UCL Institute of Education. The design of that project is very much informed by the findings of this project, and

the Schools Minister, Nick Gibb MP, is keenly monitoring the project. The UCL Centre for Behaviour Change has supported a post-graduate project exploring how to best convey messages about the cognitive benefits of language learning to parents and schools.

Well-designed UK studies are in demand from schools, parents, health services and policymakers. The outcomes of such studies will impact strongly on messaging about language learning, and in turn to ensuring the place of language learning across the lifespan.

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Appendix 1. Sources of studies in the meta-analysis of the Cross-Curricular Benefits of Language Learning (2008-2017)

Study	Grade range	N	Language patterns	Mode of language learning	Subject measured	Measurement
1. Benefits of bilingualism: Evidence from Mormon missionaries (2008)	University students	1,700	English-mixed	Foreign language learning	Academic achievement	GPA scores Cross-sectional
2. A Mandarin/English Two-Way Immersion Program: Language Proficiency and Academic Achievement (2013) Padilla et al., 2013	G1-G5	40	Mandarin-English	Two-way immersion	English language learning	Standardised tests; Cross-sectional
3. Student Outcomes in Chinese Two-Way Immersion Programs: Language Proficiency, Academic Achievement and Student Attitudes (2016) Lindholm-Leary, 2016	Grade 4-8	320	Chinese-English	Two-way immersion	English language learning	Standardised tests; Cross-sectional
4. Bilingual Two-Way Immersion Programs Benefit Academic Achievement (2013) Marian et al, 2013	G 3-5	2,009	Spanish-English; English-Spanish	Two-way immersion	English language learning	Standardised tests; Cross-sectional
5. Achievement in predominantly low SES/Hispanic dual language schools (2010) Lindholm-Leary and Block, 2010	G 4-6	659	Spanish-English	Dual language immersion	English language learning	Standardised tests(CST); cross-sectional
6. Effects of Dual-Language Immersion Programs on Student Achievement: Evidence From Lottery Data (2017) Steele et al, 2017	Pre K- Grade 8	1,625	Polish-English	Dual Language immersion	English language learning	Standardised test (OAKS)
7. Achievement and language proficiency of Latino students in dual language programmes: native English speakers, fluent English/previous ELLs, and current ELLs (2011) Lindholm-Leary and Hernández, 2011	G 4-8	732	Spanish-English	Dual language immersion	English language learning	Standardised test
8. Bilingual education for all: Latino dual language learners with language disabilities (2013)	Pre-schoolers	74	Spanish-English learners with language impairment	Dual language immersion	English Language learning	quasi-experimental
9. Bilingual and Biliteracy Skills in Young Spanish-speaking Low-SES Children: Impact of Instructional Language and Primary Language Proficiency Lindholm-Leary, 2014	K1-G2	254	Spanish-English	Dual language immersion	English language learning	Standardised tests; Cross-sectional
10. A Mandarin/English Two-Way Immersion Program: Language Proficiency and Academic Achievement (2013)	G1-G5	40	Mandarin-English	Two-way immersion	Maths	Standardised tests; Cross-sectional

11. Bilingual Two-Way Immersion Programs Benefit Academic Achievement (2013)	G 3-5	2,009	Spanish-English; English-Spanish	Two-way immersion	Maths	Standardised tests; Cross-sectional
12. Achievement in predominantly low SES/Hispanic dual language schools (2010)	G 4-6	659	Spanish-English	Dual language immersion	Maths	Standardised tests; Cross-sectional
13. Effects of Dual-Language Immersion Programs on Student Achievement: Evidence From Lottery Data (2017)	3-9	3,457	Mixed	Dual language immersion	Maths and Science	Standardised tests; Cross-sectional
14. Academic achievement of students in dual language immersion (2016) (Watzinger-Tharp, 2016)	3-4	4,811	Spanish	Dual language immersion	Maths	Standardised tests; Cross-sectional
15. Dual language learning, inhibitory control, and math achievement in Head Start and kindergarten (2018)	Kindergarten	3,349	Spanish-English	Dual language learning	Maths	Longitudinal
16. Han, W. J. 2012. “Bilingualism and Academic Achievement.”	K1-G5	16000	Mixed-English	Dual language immersion	Maths	Longitudinal
17. Montanari, S. 2013. “A Case Study of Bi-literacy Development among Children Enrolled in an Italian–English Dual Language Program in Southern California.”	G1-G3	60	Italian-English	Dual language immersion	Literacy	Case study Standardised tests
18. Spanish-Speaking Pre-schoolers' Early Literacy Development: A Longitudinal Experimental Comparison of Predominantly English and Transitional Bilingual Education (2013)	Pre-schoolers (38-48 months)	31	Spanish-English	Transitional bilingual education	Literacy	Longitudinal
19. Schwartz, M., and Y. Shaul. 2013. “Narrative Development among Language-minority Children: The Role of Bilingual Versus Monolingual Preschool Education.”	Pre-schoolers	46	Hebrew-Russian	Dual language immersion	Literacy	Longitudinal
20. Schwartz, M. 2013. “The Impact of the First Language First Model on Vocabulary Development among Preschool Bilingual Children.”	Pre-schoolers	32	Hebrew-Russian	Dual language immersion	Literacy	Longitudinal

Appendix 2. Creativity - Methodological features of studies

Paper	Sample characteristics	Measured outcomes
Bamford & Mizokawa (1991)	Within-subjects design with a sample of 19 students from a Spanish immersion programme and a comparison group of 19 monolingual students from a different school in the same community with similar socio- economic (SES) status.	Non-verbal problem solving abilities using the Raven's (1977) Coloured Progressive Matrices (CPM).
Ghonsooly & Showqi (2012)	Matched pairs design with a sample of 60 advanced English learners compared to 60 monolinguals in the same age range. All participants were female, and mean age was 16.4 years old (SD=1.04). Variables such as IQ was controlled (range of 122-127).	Divergent thinking ability using the Torrance Test of Creativity (1966).
Landry (1974)	Matched pairs design with samples recruited from elementary schools (one which had a foreign language programme (FLLP) and one where FLLP was absent. Students from first, fourth and sixth grade were examined. Social factors such as SES was controlled.	Divergent thinking ability using the Torrance Test of Creativity (1966).
Mendonça & Fleith (2005)	Independent groups design including 115 students recruited from an English-Portuguese Binational Centre which provides tutoring services for English in Brazil. Mean age was 22.31, ranging from 14-57 years.	Divergent thinking ability using the Torrance Test of Creativity (1966).
Rezaei & Almasian (2007)	Correlational study with a sample of 29 students who are studying English Language and Literature at the University of Tehran (22 females, 7 males).	Creativity measured using the Creative Personality Measurement Questionnaire (from the American Association for Personality Assessment). Language proficiency assessed using the Nelson Quick Check test.
Showqi & Ghonsooly (2015)	Matched pairs design with a sample of 60 advanced English learners (Mean age=17, S.D.=1.04) paired with beginner level counterparts (M=16.4, S.D.=0.6). All participants were female and recruited in Iran.	Divergent thinking ability measured using the Torrance Test of Creativity (1966). Metacognitive awareness measured using the Schraw and Dennison Metacognitive Awareness Inventory (Schraw and Dennison, 1994).

Appendix 3. Summary of sources used in the systematic review of the grey literature (2012-2017)

	No. of articles available	Examples of articles
Professional magazines		
Psychology Today (online)	27	Multilingual Environments Enrich Our Understanding of Others: Exposure to multiple languages improves the ability to see another perspective. (Posted May 13, 2015) https://www.psychologytoday.com/blog/the-athletes-way/201505/multilingual-environments-enrich-our-understanding-others
The ASHA Leader (American Speech-Language-Hearing Association)	19	Language Switching May Give Bilingual Children Problem-Solving Boost http://leader.pubs.asha.org/article.aspx?articleid=2527041
Magazines for teachers	4	Issue 12-2016
Babel (the language magazine)	3	Bringing Up Bilingual Children - Annika Bourgogne explains the advantages of growing up with more than one language. Babel No 6 (February 2014)
The Psychologist		*No article is closely related.*
Modern Language Association		Newsletter: *No article is closely related.* Bulletin: *No article is closely related.*
Newsletters		
Medical News today	5	Language learning boosts brain plasticity and ability to code new information http://www.medicalnewstoday.com/articles/312708.php
Language Map Login	4	People Who Learn Foreign Languages Have Bigger Brains, Here's Why: https://www.lingholic.com/people-learn-foreign-languages-bigger-brains/
National Institutes of Health (NIH)	4	Bilingual Effects in the Brain https://www.nih.gov/news-events/nih-research-matters/bilingual-effects-brain
Press Coverage		
BBC News	10	The amazing benefits of being bilingual http://www.bbc.com/future/story/20160811-the-amazing-benefits-of-being-bilingual

The New York Times-Sunday Review	6	Why Bilinguals Are Smarter http://www.nytimes.com/2012/03/18/opinion/sunday/the-benefits-of-bilingualism.html?_r=3&src=me&ref=general
UChicago News	5	Children exposed to multiple languages may be better natural communicators https://news.uchicago.edu/article/2015/05/11/children-exposed-multiple-languages-may-be-better-natural-communicators
Medical Press	25	Study shows cognitive benefit of lifelong bilingualism https://medicalxpress.com/news/2013-01-cognitive-benefit-lifelong-bilingualism.html
South China Morning Post	5	It's never too early for children to learn a second language, say experts http://www.scmp.com/lifestyle/family-education/article/1499201/its-never-too-early-children-learn-second-language-say
The Economist	5	Johnson: What is a foreign language worth? http://www.economist.com/node/21598844?fsrc=scn/tw/te/bl/ed/languagestudywhatisaforeignlanguageworth
The Telegraph	14	Students should learn second language to prevent dementia in later life http://www.telegraph.co.uk/news/science/science-news/12156709/Students-should-learn-second-language-to-prevent-dementia-in-later-life.html
The Atlantic	9	For a Better Brain, Learn Another Language The cognitive benefits of multilingualism https://www.theatlantic.com/health/archive/2014/10/more-languages-better-brain/381193/
Science Daily	4	Language learning makes the brain grow, Swedish study suggests https://www.sciencedaily.com/releases/2012/10/121008082953.htm
Social Media Websites		
Facebook		Usually linked to the source website.
Twitter		Usually linked to the source website.
Language Map Login	5	People Who Learn Foreign Languages Have Bigger Brains, Here's Why. https://www.lingholic.com/people-learn-foreign-languages-bigger-brains/
Live Science	8	Speaking More Than One Language Eases Stroke Recovery https://www.livescience.com/52860-bilingual-language-stroke-recovery.html
Rosetta Stone-language learning blog	17	Bilinguals Can "See" Into Others' Minds http://blog.rosettastone.com/bilinguals-can-see-into-others-minds/
Total	**179**	

Appendix 4. Varying grey literature perspectives on research topics x dominant cognitive benefits measured*

*Where methodology, mode of learning, etc. are left blank for an entry, the item relates to the information in the preceding entry

1. CROSS-CURRICULAR BENEFITS: a. Academic Achievements

Reference	Methodology (Sample + tasks)	Mode of language learning	Languages	Citation
1. Dual-language Programmes Improve Reading Skills Language Magazine (2016) https://www.languagemagazine.com/2016/05/dual-language-programs-improve-reading-skills/	Children from Portland public schools The Oregon Assessment of Knowledge and Skills in reading	Dual language immersion education	Spanish, Japanese, Mandarin, Chinese, and Russian as an L2	peer-reviewed journal articles and social media
2. Dual-language Programmes Improve Reading Skills Language Magazine (2016)				
3. Portland Dual-Language-Immersion Students Outperform Peers in Reading The language magazine (2015) http://blogs.edweek.org/edweek/learning-the-language/2015/11/dual-language_immersion_studen.html				
4. Study: Students in dual-language programs outperform peers in reading The Seattle times (2015) http://www.seattletimes.com/education-lab/in-portland-dual-language-students-outperform-peers-in-reading/	Middle school students of L2 English learners Longitudinal Standardized Academic achievement tests	Dual language immersion education		peer-reviewed journal article
5. Dual-language Programmes Improve Reading Skills Language Magazine (2016) https://www.languagemagazine.com/2016/05/dual-language-programs-improve-reading-skills/				
6. Dual-language Programmes Improve Reading Skills Language Magazine (2016) https://www.languagemagazine.com/2016/05/dual-language-programs-improve-reading-skills/				

7. Portland Dual-Language-Immersion Students Outperform Peers in Reading The language magazine (2015) http://blogs.edweek.org/edweek/learning-the-language/2015/11/dual-language_immersion_studen.html	12-year-old bilingual students Test: language proficiency tests	Dual language immersion education		No reference
8. Study: Students in dual-language programs outperform peers in reading The Seattle times (2015) http://www.seattletimes.com/education-lab/in-portland-dual-language-students-outperform-peers-in-reading/	School pupils/children Test: GCSEs	Second language learning at school	English as a second/an additional language	No reference
9. Dual-language Programmes Improve Reading Skills Language Magazine (2016) https://www.languagemagazine.com/2016/05/dual-language-programs-improve-reading-skills/	Pupils (primary and secondary school students) with minority and immigration background Task: language proficiency tests in home language and English as an L2	Minority/heritage language speaking in schools and communities	Urdu, Somali, Arabic, Bengali, Panjabi and Romani	Peer-reviewed journal articles
1. CROSS-CURRICULAR BENEFITS: b. Literacy				
10. Portland Dual-Language-Immersion Students Outperform Peers in Reading The language magazine (2015) http://blogs.edweek.org/edweek/learning-the-language/2015/11/dual-language_immersion_student.html	Children starting to learn a second language at school	Early second language learning at school		peer-reviewed journal articles
11. Study: Students in dual-language programs outperform peers in reading The Seattle times (2015) http://www.seattletimes.com/education-lab/in-portland-dual-language-students-outperform-peers-in-reading/	Children with two languages	Early second language learning at school		peer-reviewed journal articles and social media

2. ACQUIRED NEUROLOGICAL IMPAIRMENTS: a. Dementia				
12. Dual-language Programmes Improve Reading Skills Language Magazine (2016) https://www.languagemagazine.com/2016/05/dual-language-programs-improve-reading-skills/	bilingual speakers diagnosed with Alzheimers Task: Brain scan and short-term/long-term memory tasks Outcome: bilinguals have better functional connectivity in frontal brain regions than monolinguals	Not mentioned	German-Italian	1 peer-reviewed journal article
13. Dual-language Programmes Improve Reading Skills Language Magazine (2016) https://www.languagemagazine.com/2016/05/dual-language-programs-improve-reading-skills/	Bilinguals Test: Attention-switching task	Second language learning program	Not mentioned	1 peer-reviewed journal article 1 article from social media
14. Dual-language Programmes Improve Reading Skills Language Magazine (2016) https://www.languagemagazine.com/2016/05/dual-language-programs-improve-reading-skills/	Adult participants diagnosed with probable Alzheimer disease Outcome: AD manifestation for monolingual: 71.5 For bilingual: 76.1 AD diagnosis: 72.5 77.3	Not mentioned	Not mentioned	peer-reviewed journal articles
15. Bilingualism delays Alzheimer manifestation by more than four years Medical Newsletter (2014)				

https://www.medicalnewstoday.com/releases/286270.php				
16. Bilingualism delays Alzheimer manifestation by more than four years Medical X press (2014) https://medicalxpress.com/news/2014-12-bilingualism-alzheimer-manifestation-years.html				
17. Learning another language may help delay dementia CBS NEWS (2013) https://www.cbsnews.com/news/learning-another-language-may-help-delay-dementia/	Indian patients (average age 66) suffering from dementia and Alzheimer disease Outcome: patients speaking more than one language develop the symptoms 4.5 years later than monolinguals	Not mentioned	Not mentioned	9 articles from social media peer-reviewed journal articles and social media
18. Worried About Alzheimer's? Learn a Second Language Rosetta stone blog (2013) http://blog.rosettastone.com/worried-about-alzheimers-learn-a-second-language/				
19. Speaking a Second Language May Delay Different Dementias AAN News (2013) https://www.aan.com/PressRoom/Home/PressRelease/1219				
20. Study: Speaking a second language may delay onset of three types of dementias News Medical (2013) https://www.news-medical.net/news/20131107/Study-Speaking-a-second-language-may-delay-onset-of-three-types-of-dementias.aspx?utm_source=TrendMD&utm_medium=cpc&utm_campaign=AZoNetwork_TrendMD_1				
21. Speaking a second language may delay dementia, study shows Medical X Press (2013) https://medicalxpress.com/news/2013-11-language-dementia.html#nRlv				
22. Dementia delayed by speaking a second language Medical Newsletter (2013)				

http://www.medicalnewstoday.com/articles/268416.php?utm_source=TrendMD&utm_medium=cpc&utm_campaign=Medical_News_Today_TrendMD_0				
23. New Study Shows Brain Benefits Of Bilingualism NPR (2013) http://www.npr.org/sections/13.7/2013/11/14/244813470/new-study-shows-brain-benefits-of-bilingualism				
24. Students should learn second language to prevent dementia in later life The telegraph (2016) http://www.telegraph.co.uk/news/science/science-news/12156709/Students-should-learn-second-language-to-prevent-dementia-in-later-life.html	Retired people (age range: 60-70)	One-week intensive language course (5 hours/day)	Gaelic	2 articles from social media
25. Learning another language could protect against dementia The Telegraph (2012) http://www.telegraph.co.uk/news/health/news/9173552/Learning-another-language-could-protect-against-dementia.html	Adult participants diagnosed with dementia MRI scan Outcome: monolingual:75.4 Bilingual: 78.6	Not mentioned	Not mentioned	peer-reviewed journal articles
26. Dementia, Later-Life Cognition and Bilingualism: what is the impact of bilingualism on dementia and cognition in the early stage? Psychology today (2015) https://www.psychologytoday.com/blog/life-bilingual/201508/dementia-later-life-cognition-and-bilingualism				4 peer-reviewed journal articles
27. Flapping Tongues and Brawny Brains: Does learning a second language prevent dementia? Psychology Today (2015) https://www.psychologytoday.com/blog/talking-apes/201502/flapping-tongues-and-brawny-brains	Patients diagnosed with dementia (mean age 66)	Not mentioned	Not mentioned	peer-reviewed journal articles and social media
28. Being bilingual wards off symptoms of dementia Medical X press (2012) https://medicalxpress.com/news/2012-03-bilingual-wards-symptoms-dementia.html#nRlv		Exposure to two languages after birth		peer-reviewed journal articles and social media

29. Speaking Multiple Languages May Help Delay Dementia Symptoms NPR (2012) http://www.npr.org/blogs/health/2012/04/04/149995850/speaking-multiple-languages-may-help-delay-dementia-symptoms				
30. Bilingual people twice as likely to recover from a stroke (second study in this paper reported the cognitive benefits of language) The Telegraph (2015) http://www.telegraph.co.uk/news/science/science-news/12005837/Bilingual-people-twice-as-likely-to-recover-from-a-stroke.html	participants aged over 50			peer-reviewed journal article
31. Learning another language 'could protect against dementia' The Telegraph (2012) http://www.telegraph.co.uk/news/health/news/9173552/Learning-another-language-could-protect-against-dementia.html	Patients diagnosed with dementia			

2. ACQUIRED NEUROLOGICAL IMPAIRMENTS: b. Recovery from Stroke

32. Speaking multiple languages linked to better cognitive functions after stroke Science Daily (2015) https://www.sciencedaily.com/releases/2015/11/151119211415.htm?utm_medium=cpc&utm_campaign=ScienceDaily_TMD_1&utm_source=TMD	608 patients in the NIMS stroke registry	Not mentioned		peer-reviewed journal articles and social media
33. Bilingual people twice as likely to recover from a stroke The Telegraph (2015) http://www.telegraph.co.uk/news/science/science-news/12005837/Bilingual-people-twice-as-likely-to-recover-from-a-stroke.html				
34. Bilingualism helps aphasia sufferers relearn primary language Medical Newsletter (2013) http://www.medicalnewstoday.com/articles/266743.php?sr				No reference
35. Bilingualism may protect cognitive function following stroke (second half of the study) Medical Newsletter (2015) http://www.medicalnewstoday.com/articles/302787.php?utm_source=TrendMD&utm_medium=cpc&utm_campaign=Medical_News_Today_TrendMD_0				

3. THE BRAIN: a. Size				
36. People Who Learn Foreign Languages Have Bigger Brains, Here's Why: Language Map Login (2012) https://www.lingholic.com/people-learn-foreign-languages-bigger-brains/	Young students MRI scan	13-month intensive language training program		peer-reviewed journal articles and social media
37. Language learning makes the brain grow, Swedish study suggests Science Daily (2012) https://www.sciencedaily.com/releases/2012/10/121008082953.htm				
38. Language learning makes the brain grow Medical X Express (2012) https://medicalxpress.com/news/2012-10-language-brain.html				
39. Bilinguals of two spoken languages have more gray matter than monolinguals Medical X Express (2015) https://medicalxpress.com/news/2015-07-bilinguals-spoken-languages-gray-monolinguals.html			Spanish-English bilinguals ASL-English bilinguals	peer-reviewed journal articles and social media
40. Bilingual brains have higher volume of grey matter, study suggests Science Alert (2015) https://www.sciencealert.com/bilingual-brains-have-higher-volume-of-grey-matter-study-suggests				
41. Bilinguals of two spoken languages have more gray matter than monolinguals Science Daily (2015) https://www.sciencedaily.com/releases/2015/07/150716135054.htm				
3. THE BRAIN: b. Structure				
42. Learning languages is a workout for brains, both young and old Penn State News (2014) http://news.psu.edu/story/334349/2014/11/12/research/learning-languages-workout-brains-both-young-and-old	Adult English native speakers two fMRI scans	Second language learning	English-Chinese	peer-reviewed journal articles

43. Learning a second language remodels our brains https://npjscilearncommunity.nature.com/users/33701-ping-li/posts/15138-learning-a-second-language-remodels-our-brains	Adult language learners	Second language learning		peer-reviewed journal articles and other social media
44. Language juggling rewires bilingual brains Penn State News (2016) http://news.psu.edu/story/392426/2016/02/13/research/language-juggling-rewires-bilingual-brains				
45. Bilingualism Can Change Brain in Positive Ways Psych Central (2015) https://psychcentral.com/news/2016/02/15/bilingualism-can-change-brain-in-positive-ways/99143.html				
46. Being bilingual changes the architecture of your brain. Wired https://www.wired.com/2016/02/being-bilingual-changes-the-architecture-of-your-brain/?mbid=social_fb				
47. What happens in the brain when you learn a language? The Guardian (2014) https://www.theguardian.com/education/2014/sep/04/what-happens-to-the-brain-language-learning	MRI	Intensive language immersion program		2 peer-reviewed journal articles
48. Brain development altered by learning a new language Medical Newsletter (2013) http://www.medicalnewstoday.com/releases/265502.php	Bilingual children	Exposure to two languages in infancy		1 peer-reviewed journal article
49. Keeping actively bilingual makes our brains more efficient at relaying information (+brain structure) The Conversation (2015) https://theconversation.com/keeping-actively-bilingual-makes-our-brains-more-efficient-at-relaying-information-36045				14 peer-reviewed journal articles

3. THE BRAIN: c. Ageing

50. Bilingualism may help brain conserve resources and resist decline Medical Newsletter (2017) http://www.medicalnewstoday.com/articles/315260.php?utm_source=TrendMD&utm_medium=cpc&utm_campaign=Medical_News_Today_TrendMD_0	Adult learners aging from 63-84 years Functional MRI is used to scan the participants' brain activity.	Second language learning		3 peer-reviewed journal articles
51. Bilingual Brains May Be More Efficient, Less Prone to Dementia Psych Central (2017) https://psychcentral.com/news/2017/01/10/bilingual-brains-may-be-more-efficient-less-vulnerable-to-dementia/114921.html				1 peer-reviewed journal article
52. Learning a second language in adulthood can slow brain ageing The Telegraph (2014) http://www.telegraph.co.uk/news/health/news/10869619/Learning-a-second-language-in-adulthood-can-slow-brain-ageing.html	participants in their early 70s Task: intelligence test	Second language learning	Languages other than English	Peer reviewed journal articles+ social media
53. Speaking two languages benefits the aging brain Medical X press (2014) https://medicalxpress.com/news/2014-06-languages-benefits-aging-brain.html				
54. Adult-Acquired Bilingualism Benefits the Aging Brain The language magazine (2014) https://www.languagemagazine.com/2014/06/adult-acquired-bilingualism-benefits-the-aging-brain/				
55. Speaking two languages slows brain ageing The Independent (2014) http://www.independent.co.uk/news/science/speaking-two-languages-slows-brain-ageing-9479423.html				
56. Speaking two languages benefits the aging brain Science daily (2014) https://www.sciencedaily.com/releases/2014/06/140602101204.htm				
57. Speaking a second language could prevent later-life cognitive decline Medical Newsletter (2014) http://www.medicalnewstoday.com/articles/277575.php?sr		Second language learning at school		No reference

58. Learning second language can delay ageing of the brain, say scientists INDEPENDENT (2016) http://www.independent.co.uk/news/science/learning-second-language-can-delay-ageing-of-the-brain-say-scientists-a6873796.html				
59. Bilingualism may save brain resources as you age Medical X Press (2017) https://medicalxpress.com/news/2017-01-bilingualism-brain-resources-age.html#nRlv				

4. COGNITION: a. Executive Function

60. Better attention and cognition in children who grow up in bilingual settings Psychology Today (2012) https://www.psychologytoday.com/blog/radical-teaching/201211/bilingual-brains-smarter-faster		Exposure to two languages after birth		3 peer-reviewed journal articles
61. Study examines role of bilingualism in children's development Medical X press (2012) https://medicalxpress.com/news/2012-02-role-bilingualism-children.html	104 6-year-old children verbal and non-verbal tests	Exposure to two languages after birth	Chinese-English bilinguals, French-English bilinguals, and Spanish-English bilinguals	1 peer-reviewed journal article
62. Bilinguals switch tasks faster than monolinguals, NIH funded study shows NIH (2012) https://www.nih.gov/news-events/news-releases/bilinguals-switch-tasks-faster-monolinguals-nih-funded-study-shows				
63. Singaporean birth cohort study finds benefits for babies exposed to two languages Medical X press (2014) https://medicalxpress.com/news/2014-09-singaporean-birth-cohort-benefits-babies.html	6-month-old bilingual infants	Exposure to two language after birth	Not language-specific	social media
64. Bilingual baby brains show increased activity in executive function regions Medical X press (2016) https://medicalxpress.com/news/2016-04-bilingual-baby-brains-function-regions.html	11-month-old babies MEG while listening to an 18-minute stream of speech	Exposure to two languages after birth	Spanish-English	1 peer-reviewed journal and 6 articles

	sounds			from social media
65. It's never too early for infants to begin learning a second language as it can greatly improve cognitive skills later in life, visiting experts tell South Morning Post (2014) http://www.scmp.com/lifestyle/family-education/article/1499201/its-never-too-early-children-learn-second-language-say	Bilingual infants	Exposure to two languages after birth		Citations from peer-reviewed journal articles
66. Babies of Bilingual Parents Have High Functioning Brains Psych Central (2015) https://psychcentral.com/news/2016/04/05/babies-of-bilingual-parents-have-high-functioning-brains/101356.html	Bilingual infants	Exposure to two languages after birth		Citations from peer-reviewed journal articles
67. Can being bilingual make you smarter? The Telegraph (2013) http://www.telegraph.co.uk/education/expateducation/9267252/Can-being-bilingual-make-you-smarter.html		Exposure to two languages after birth		
68. Bilingual Effects in the Brain NIH News (2012) https://newsinhealth.nih.gov/2012/06/bilingual-effects-brain	High school students Task: babble test	Second language learning at school	Not mentioned	No reference
69. Speaking two languages also benefits low-income children Medical X press (2012) https://medicalxpress.com/news/2012-08-languages-benefits-low-income-children.html	2nd grade children from low-income families Task: vocabulary test	Second language learning at school		sources from social media
70. Researcher studies how language shapes our ability to process information Medical X press (2015) https://medicalxpress.com/news/2015-08-language-ability.html	Infants	Second language learning		sources from social media
71. Bilingualism fine-tunes hearing, enhances attention Science daily (2012) https://www.sciencedaily.com/releases/2012/04/120430152033.htm	Teenagers	Early second language learning	English-Spanish	1 peer-reviewed journal article
72. Bilingual children 'show advantage' in noisy classrooms BBC News (14 October 2014) http://www.bbc.com/news/education-29599177	Primary children aged from 7-10 Task: computer-	Early Second language learning at school	English-Italian/Spanish/Dutch/Ar	peer-reviewed journal

	based reading game+ noise distractor		menian, Bengali, Polish, Russian and Portuguese	articles
73. Bilingual pupils 'outperform their peers in noisy lessons The Telegraph (2014) http://www.telegraph.co.uk/education/educationnews/11159037/Bilingual-pupils-outperform-their-peers-in-noisy-lessons.html				
74. Language learning boosts brain plasticity and ability to code new information Medical Newsletter (2016) http://www.medicalnewstoday.com/articles/312708.php?sr	Native Finnish speakers with normal hearing Listening test with EEG	Second language learning at school		peer-reviewed journal articles and social media
75. Cognitive advantages of second language immersion education (second study) Psychology today (2014) https://www.psychologytoday.com/blog/life-bilingual/201401/cognitive-advantages-second-language-immersion-education	Bilingual children Task: grammaticality judgments and verbal fluency task	Language immersion education		3 peer-reviewed journal articles
76. Why being bilingual works wonders for your brain The Guardian (2016) https://www.theguardian.com/science/2016/aug/07/being-bilingual-good-for-brain-mental-health	Flanker task together with imaging			peer-reviewed journal articles and social media
77. Bilingual brains better equipped to process information Medical X press (2014) https://medicalxpress.com/news/2014-11-bilingual-brains-equipped.html	fMRI to test co-activation and inhibition in bilinguals language comprehension task	Not mentioned	Not mentioned	1 peer-reviewed journal article and other sources from social media

78. Study shows cognitive benefit of lifelong bilingualism Medical X press (2013) https://medicalxpress.com/news/2013-01-cognitive-benefit-lifelong-bilingualism.html	Healthy bilingual seniors (60-68) with language learning experience from childhood fMRI	Not mentioned		peer-reviewed journal articles
79. Bringing Up Bilingual Children - Annika Bourgogne explains the advantages of growing up with more than one language Babel No 6 (February 2014)				peer-reviewed journal articles
80. There are also drawbacks to being bilingual The Conversation (2016) https://theconversation.com/there-are-also-drawbacks-to-being-bilingual-56726				
81. When Does Bilingualism Help or Hurt? The effects of bilingualism on children's cognition Psychology Today (2014) https://www.psychologytoday.com/blog/developing-minds/201404/when-does-bilingualism-help-or-hurt				

4. COGNITION: b. Metalinguistic Awareness

82. Cognitive advantages of second language immersion education (Study 1) Psychology today (2014) https://www.psychologytoday.com/blog/life-bilingual/201401/cognitive-advantages-second-language-immersion-education	Bilingual children Task: grammaticality judgments and verbal fluency task	Language immersion education		3 peer-reviewed journal articles

4. COGNITION: c. Memory

83. Do Bilingual Infants Have Better Memory? Psychology Today (2015) https://www.psychologytoday.com/blog/life-bilingual/201511/do-bilingual-infants-have-better-memory	Bilingual infants	Exposure to two languages after birth		1 peer-reviewed journal article
84. Do Bilingual Infants Have Better Memory? (Study 2 Psychology Today (2015) https://www.psychologytoday.com/blog/life-bilingual/201511/do-bilingual-infants-have-better-memory	Trilingual infants	Exposure to more than two languages after birth		1 peer-reviewed journal article

85. Why learn a foreign language? Benefits of bilingualism The Telegraph (2013) http://www.telegraph.co.uk/education/educationopinion/10126883/Why-learn-a-foreign-language-Benefits-of-bilingualism.html				peer-reviewed journal articles
86. Forgotten? Try Your Other Language Psychology today (2013) https://www.psychologytoday.com/blog/life-bilingual/201307/forgotten-try-your-other-language				

4. COGNITION: d. Problem-Solving Skills

87. Practice makes perfect: switching between languages pays off Medical Newsletter (2016) http://www.medicalnewstoday.com/releases/306061.php	Bilingual toddlers (24/31 month old) Task: vocabulary assessment, tests of cognitive flexibility and memory skills	Exposure to two languages after birth	Not mentioned	1 peer-reviewed journal article
88. Language Switching May Give Bilingual Children Problem-Solving Boost ASHA Leader (2016) http://leader.pubs.asha.org/article.aspx?articleid=2527041				
89. Bilingual children 'better at problem-solving skills BBC News (2012) http://www.bbc.com/news/uk-scotland-glasgow-west-19109883	9-year old children Task: reproduction of colored blocks and oral repetition of numbers	Second language learning at school	Gaelic, Italian or Sardinian	No reference
90. What Languages Do Bilinguals count In? New insights into the relationship between bilingualism and numerical cognition Psychology Today (2015) https://www.psychologytoday.com/blog/life-bilingual/201504/what-languages-do-bilinguals-count-in	College students Tasks to solve the complex mathematical problems	Second language learning at late childhood or adulthood		3 peer-reviewed journal article

4. COGNITION: e. Auditory Perception

91. Bilingual Children May Recognize Voices Better Penn News (2017) https://psychcentral.com/news/2017/06/15/bilingual-children-better-at-recognizing-voices/121971.html	Children below 9 and above 10 years Task: a series of tasks of listening to and identify different voices	Second language learning	English-German	Peer-reviewed journal article
92. Bilingual children are better at recognizing voices Medical X press (2017) https://medicalxpress.com/news/2017-06-bilingual-children-voices.html				
93. Bilingual Children Can Distinguish Voices in Languages They Don't Know Education Week (2017) http://blogs.edweek.org/edweek/learning-the-language/2017/07/bilingual_children_excel_at_voice_recognition.html?qs=benefits+of+language+learning				
94. Bilingual babies are better at detecting musical sounds, research shows Medical X press (2016) https://medicalxpress.com/news/2016-11-bilingual-babies-musical.html	Bilingual infants	Exposure to two languages from infancy	Not mentioned	from peer-reviewed journal articles

4. COGNITION: f. Mental Agility

95. Short-term language learning aids mental agility, study suggests Medical Newsletter (2016) https://www.medicalnewstoday.com/releases/309596.php	University students aged 18-78 Task: listening tests	1-week intensive language course	Scottish Gaelic	1 peer-reviewed journal article
96. Learning languages improves mental agility at any age, study suggests Medical newsletter (2015) http://www.medicalnewstoday.com/releases/288209.php	University students	Second language learning at school	unknown	peer-reviewed journal articles and social media
97. Bilingualism can increase mental agility' Medical X press (2012) https://medicalxpress.com/news/2012-08-bilingualism-mental-agility.html#nRlv	9-year-old primary school children	Second language learning at school	Gaelic (widely taught at school)	Peer-reviewed journal article

			Sardinian (no written form)	
98. Bilingual Speakers Develop Mental Flexibility Psych News (2013) https://psychcentral.com/news/2013/09/11/bilingual-speakers-develop-mental-flexibility/59404.html			Spanish-English	No reference

4. COGNITION: g. Decision-Making

99. Thinking in a foreign language helps economic decision-making U Chicago News (2012) https://news.uchicago.edu/article/2012/04/25/thinking-foreign-language-helps-economic-decision-making	University students	Second language learning starting from junior or high school	English-Japanese English-French English-Korean	peer-reviewed journal articles and social media
100. Here's Why Bilingual People Make Better Financial Choices Business insider (2012) http://www.businessinsider.com/bilingual-people-make-better-financial-choices-2012-4				
101. We think more rationally in a foreign language The Psychologists (2012) https://digest.bps.org.uk/2012/06/25/we-think-more-rationally-in-a-foreign-language/	University students	Second language learning at school		No reference
102. How thinking in a foreign language makes you more rational in some ways but not others The Psychologists (2014) https://digest.bps.org.uk/2014/03/18/how-thinking-in-a-foreign-language-makes-you-more-rational-in-some-ways-but-not-others/	University students Several tests of cognitive reflection	Second language learning at school	Spanish-English English-Hebrew English-Spanish	peer-reviewed journal articles
103. Communicating in a foreign language takes emotion out of decision-making Science Daily (2017) https://www.sciencedaily.com/releases/2017/08/170817141717.htm		Foreign language learning at school		peer-reviewed journal articles
104. Speaking just one language may improve insight and judgement The Telegraph (2016) http://www.telegraph.co.uk/news/science/science-news/12177769/Speaking-just-one-language-may-improve-insight-and-judgement.html	Rapid decision-making task Outcome:	Not mentioned		peer-reviewed journal articles

	monolinguals outperform bilinguals in the accuracy of evaluating one's performance after each decision			and social media

5. SOCIAL COGNITION: a. Empathy/Social Skills

105. Multilingual Exposure Improves Children's Social Skills The language magazine (2015) https://www.languagemagazine.com/2015/05/multilingual-exposure-improves-childrens-social-skills/	Children aged from 4-6 Social communication tasks: the critical test	Exposure to multiple languages after birth	Not mentioned	peer-reviewed journal articles
106. Multilingual Environments Enrich Our Understanding of Others: Exposure to multiple languages improves the ability to see another perspective. Psychology today (2015) https://www.psychologytoday.com/blog/the-athletes-way/201505/multilingual-environments-enrich-our-understanding-others				
107. The Superior Social Skills of Bilinguals The New York Times (2016) https://www.nytimes.com/2016/03/13/opinion/sunday/the-superior-social-skills-of-bilinguals.html?rref=collection%2Fcolumn%2Fgray-matter&action=click&contentCollection=opinion&region=stream&module=stream_unit&version=search&contentPlacement=3&pgtype=collection	Babies aged from 14-16 months	Exposure to two languages after birth	Not mentioned	peer-reviewed journal articles
108. Babies' brains show that social skills linked to second language learning Medical X Press (2015) https://medicalxpress.com/news/2015-07-babies-brains-social-skills-linked.html	10-month-olds EEG while listening to English and Spanish	Foreign language tutorial session	English-Spanish	peer-reviewed journal articles
109. Studies Suggest Multilingual Exposure Boosts Children's Communication Skills National Public Radio http://www.npr.org/2016/03/21/471316384/studies-suggest-multilingual-exposure-boosts-childrens-communication-skills				

110. Teaching Your Baby Sign Language Can Benefit Both of You Psych Central News (2016) https://psychcentral.com/lib/teaching-your-baby-sign-language-can-benefit-both-of-you/	Preverbal infants and toddlers		Sign language learning	social media (7)

5. SOCIAL COGNITION: b. Global Identity

111. Language learning opens new horizons The Telegraph (2014) http://www.telegraph.co.uk/education/educationopinion/11241713/Learning-languages-opens-up-new-horizons.html				No reference
112. Think your world view is fixed? Learn another language and you'll think differently The Guardian (2015) https://www.theguardian.com/commentisfree/2015/apr/27/world-view-learn-another-language				peer-reviewed journal articles

6. MULTIPLE OUTCOMES

113. The Bilingual Advantage: Where Do We Go From Here? What future for an area of research that has become so controversial Psychology Today (2016) https://www.psychologytoday.com/blog/life-bilingual/201601/the-bilingual-advantage-where-do-we-go-here				peer-reviewed journal articles
114. Should parents raise kids bilingually? https://medicalxpress.com/news/2014-03-parents-kids-bilingually.html#nRlv				peer-reviewed journal articles
115. The benefits of being bilingual Wired https://www.wired.com/2012/05/the-benefits-of-being-bilingual				peer-reviewed journal articles
116. 6 potential brain benefits of bilingual education http://www.scpr.org/news/2016/11/29/66617/6-potential-brain-benefits-of-bilingual-education/				peer-reviewed journal articles and social media

117. Why being bilingual helps keep your brain fit Medical X press (2016) https://medicalxpress.com/news/2016-08-bilingual-brain.html				sources from social media
118. Why bilinguals are smarter The New York Times (2012) http://www.nytimes.com/2012/03/18/opinion/sunday/the-benefits-of-bilingualism.html?_r=3&src=me&ref=general				

Appendix 5. On-line questionnaires (Adult and Youth)

Views on Language Learning

Questionnaire Welcome

Thank you for choosing to participate in this online questionnaire. Your feedback is important.

We are interested in learning about your language learning experiences, and your thoughts and attitudes towards language learning. It doesn't matter if you can speak only one language or many.

Please answer all of the questions as fully as possible. There are 50 questions in total, and this will take not more than 15 minutes to complete. Try to put the appropriate time aside to get through these questions fully.

This project is funded by the British Academy, and is researched at University College London (UCL). The Principal Investigators are Professor Bencie Woll (UCL DCAL) and Professor Li Wei (UCL IoE). See the project website for more information.

Data will be held under the guidelines of the Data Protection Act 1998 and the UCL Records Retention Schedule. Research data from this project may be re-used for other research in accordance with the UCL Research Data Policy and UCL Staff IPR Policy. Please contact dcal@ucl.ac.uk for more information.

Views on Language Learning

General Questions

Below is a list of statements about learning a new language. Please indicate how much you agree or disagree with each.

* 1. Learning a new language helps to develop thinking/ analytical skills

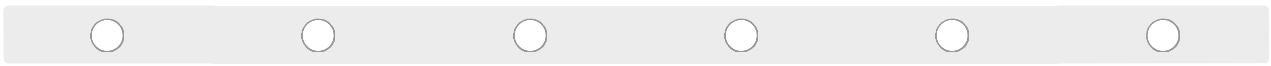
Strongly agree Agree Agree a little Disagree a little Disagree Strongly disagree

* 2. Learning a new language helps to develop multi-tasking skills

Strongly agree Agree Agree a little Disagree a little Disagree Strongly disagree

* 3. Learning a new language helps to improve your memory

Strongly agree Agree Agree a little Disagree a little Disagree Strongly disagree

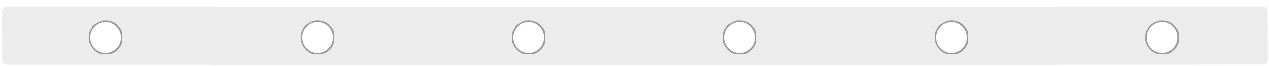


4. Learning a new language helps to focus your attention

Strongly agree Agree Agree a little Disagree a little Disagree Strongly disagree

* 5. Learning a new language helps to prevent memory loss and loss of concentration in older age

Strongly agree Agree Agree a little Disagree a little Disagree Strongly disagree



* 6. Learning a new language has positive benefits for your health

Strongly agree Agree Agree a little Disagree a little Disagree Strongly disagree

* 7. Learning a new language makes you more creative

Strongly agree Agree Agree a little Disagree a little Disagree Strongly disagree

* 8. Learning a new language helps to make you more expressive

Strongly agree Agree Agree a little Disagree a little Disagree Strongly disagree

* 9. Learning a new language helps you to understand other people's emotions

Strongly agree Agree Agree a little Disagree a little Disagree Strongly disagree

* 10. Learning a new language helps to keep your emotions stable

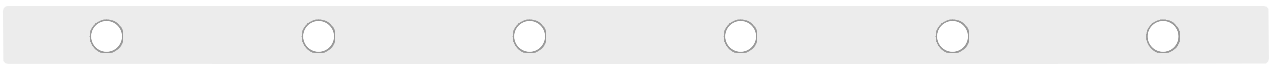
Strongly agree Agree Agree a little Disagree a little Disagree Strongly disagree

* 11. Learning a new language helps you to make more friends

Strongly agree Agree Agree a little Disagree a little Disagree Strongly disagree

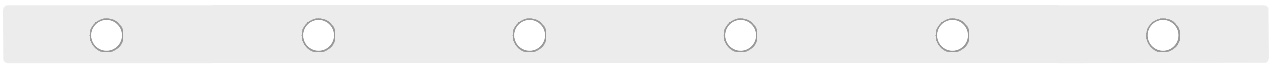
* 12. Learning a new language helps with understanding other cultures

Strongly agree Agree Agree a little Disagree a little Disagree Strongly disagree



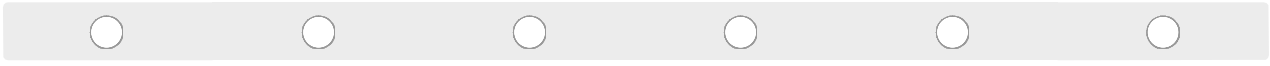
* 13. Learning a new language gives you better employment opportunities

Strongly agree Agree Agree a little Disagree a little Disagree Strongly disagree



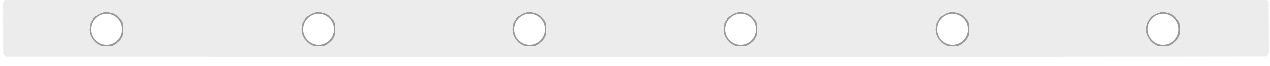
* 14. Learning a new language helps to improve your school/ academic achievements

Strongly agree Agree Agree a little Disagree a little Disagree Strongly disagree



* 15. Learning a new language helps with learning other things

Strongly agree Agree Agree a little Disagree a little Disagree Strongly disagree



* 16. Learning a new language can change your identity

Strongly agree Agree Agree a little Disagree a little Disagree Strongly disagree

* 17. Learning a new language can affect your first language

Strongly agree Agree Agree a little Disagree a little Disagree Strongly disagree

* 18. Learning a new language that is very different from your first language has more benefits than learning a language that is similar to your first language

Strongly agree Agree Agree a little Disagree a little Disagree Strongly disagree

* 19. Learning a new language that has a different writing system to your first language has more benefits than learning a language that has a similar writing system

Strongly agree Agree Agree a little Disagree a little Disagree Strongly disagree

* 20. Learning a new language is only suitable for academically successful children

Strongly agree Agree Agree a little Disagree a little Disagree Strongly disagree

* 21. Learning a new language is not suitable for children with special educational needs

Strongly agree Agree Agree a little Disagree a little Disagree Strongly disagree

* 22. Learning a new language is useful

Strongly agree Agree Agree a little Disagree a little Disagree Strongly disagree

◯	◯	◯	◯	◯	◯

* 23. Learning a new language has no particular benefit

Strongly agree	Agree	Agree a little	Disagree a little	Disagree	Strongly disagree
◯	◯	◯	◯	◯	◯

* 24. Learning a new language can have negative effects

Strongly agree	Agree	Agree a little	Disagree a little	Disagree	Strongly disagree
◯	◯	◯	◯	◯	◯

* 25. Learning a new language takes a lot of time and effort

Strongly agree	Agree	Agree a little	Disagree a little	Disagree	Strongly disagree
◯	◯	◯	◯	◯	◯

Views on Language Learning

Questions About Your Language Learning Experience

* 26. Which is your preferred language?

Views on Language Learning

Questions About Your Language Learning Experience

* 27. Do you mix languages in the same conversation?

◯ Yes ◯ No ◯ N/A (monolingual speaker)

Views on Language Learning

Questions About Your Language Learning Experience

28. Are you fluent in other languages?

◯ Yes ◯ No

Views on Language Learning

Questions About Your Language Learning Experience

29. Please list all the languages you know in order from most to least fluent.

Views on Language Learning

Questions About Your Language Learning Experience

* 30. Are there any languages you can speak/ listen to and understand, but not write or read?

◯ Yes ◯ No

31. If you answered 'Yes' to the previous question, please explain.

* 32. Are there any languages you can read or write, but not speak/ listen to and understand?

◯ Yes ◯ No

33. If you answered 'Yes' to the previous question, please explain.

* 34. What language(s) did you acquire or learn...

At home:

At school:

At work:

By yourself:

Online:

Other (please explain):

Views on Language Learning

Questions About Your Language Learning Experience

* 35. What aspects of language learning do you least enjoy?

* 36. What aspects of language learning do you most enjoy?

Views on Language Learning

Questions About Your Language Learning Experience

* 37. Did or do you have any anxieties about learning languages?

◯ Yes ◯ No

38. If you answered 'Yes' to the previous question, please explain what anxieties you had.

Views on Language Learning

Questions About Your Language Learning Experience

* 39. Would you encourage your own children to learn new languages?

◯ Yes ◯ No

Views on Language Learning

Questions About Your Language Learning Experience

40. Do you think it is better to learn new languages when you are younger?

◯ Yes ◯ No

41. If you answered 'Yes' to the previous question, please explain why

Views on Language Learning

Questions About Your Language Learning Experience

* 42. Does learning new languages when you are older have any particular benefits?

◯ Yes ◯ No

43. If you answered 'Yes' to the previous question, please explain what you think the benefits are

Views on Language Learning

Background Questions

Finally, please complete these background questions.

44. Are you male or female?

◯ Male ◯ Female ◯ Other

45. What is your age?

◯ 17 or younger

◯ 18-20

◯ 21-29

◯ 30-39

◯ 40-49

◯ 50-59

◯ 60 or older

Views on Language Learning

Background Questions

46. What is your postcode?

Views on Language Learning

Background Questions

47. Which of the following categories best describes your employment status?

- ○ Employed, working full-time
- ○ Employed, working part-time
- ○ Student
- ○ Not employed, looking for work
- ○ Not employed, NOT looking for work
- ○ Retired
- ○ Disabled, not able to work

Views on Language Learning

Background Questions

48. Which of the following best describes your current occupation?

- ○ Accounting
- ○ Advertising
- ○ Agriculture/ Fishing
- ○ Architecture
- ○ Automotive
- ○ Banking/ Financial
- ○ Carpentry/ Electrical Installations/ VVS
- ○ Chemicals/ Plastics/ Rubber
- ○ Construction
- ○ Consumer Electronics

- ○ Consumer Packaged Goods
- ○ Education
- ○ Energy/ Utilities/ Oil and Gas
- ○ Engineering
- ○ Environmental Services
- ○ Fashion/ Apparel
- ○ Film/ TV Research PR or Advertising
- ○ Government/ Public Sector
- ○ Healthcare
- ○ Hospitality/ Tourism
- ○ Human Resources
- ○ Information Technology/ IT
- ○ Insurance
- ○ Legal/ Law
- ○ Manufacturing
- ○ Market Research
- ○ Marketing/ Sales
- ○ Media/ Entertainment
- ○ Military
- ○ Non Profit/ Social Services Real Estate/ Property
- ○ Retail/ Wholesale Trade
- ○ Transportation
- ○ I don't work

Other (please specify)

Views on Language Learning

Background Questions

* 49. What is the highest level of school you have completed or the highest degree

you have received?

- ○ Less than high school
- ○ GCSEs
- ○ A Levels
- ○ Undergraduate degree
- ○ Postgraduate degree
- ○ PhD
- ○ Other (please specify)

Views on Language Learning

* 50. What is your country of birth?

Background Questions

Thank you for completing this questionnaire.

If you are willing to be contacted to discuss your language learning experiences, please let us have your email address. You can contact us at dcal@ucl.ac.uk, and can learn more about the project on our website.

The Cognitive Benefits of Language Learning

Copy of Views on Language Learning (Children's Questionnaire)

Questionnaire Welcome

Thank you for participating in this online questionnaire. Your feedback is important.

We are interested in learning about your language learning experiences, and your thoughts and attitudes towards language learning. It doesn't matter if you can speak only one language or many.

Please answer all of the questions as fully as possible. There are 40 questions in total, and will take no more than 15 minutes to complete.

The Cognitive Benefits of Language Learning

Copy of Views on Language Learning (Children's Questionnaire)

General Questions

Below is a list of statements about learning a new language. Please indicate how much you agree or disagree with each.

* 1. Learning a new language is fun

Strongly agree	Agree	Agree a little	Disagree a little	Disagree	Strongly disagree
○	○	○	○	○	○

* 2. Learning a new language helps me to improve my thinking

Strongly agree	Agree	Agree a little	Disagree a little	Disagree	Strongly disagree
○	○	○	○	○	○

* 3. Learning a new language helps me to remember things better

Strongly agree	Agree	Agree a little	Disagree a little	Disagree	Strongly disagree
○	○	○	○	○	○

* 4. Learning a new language helps me to focus better

Strongly agree	Agree	Agree a little	Disagree a little	Disagree	Strongly disagree
○	○	○	○	○	○

* 5. Learning a new language makes me smarter

Strongly agree	Agree	Agree a little	Disagree a little	Disagree	Strongly disagree
○	○	○	○	○	○

* 6. Learning a new language makes me more creative

Strongly agree	Agree	Agree a little	Disagree a little	Disagree	Strongly disagree
○	○	○	○	○	○

* 7. Learning a new language makes me express things better

Strongly agree	Agree	Agree a little	Disagree a little	Disagree	Strongly disagree
○	○	○	○	○	○

* 8. Learning a new language helps me to understand other people's feelings better

Strongly agree	Agree	Agree a little	Disagree a little	Disagree	Strongly disagree
○	○	○	○	○	○

* 9. Learning a new language helps me to make more friends

Strongly agree	Agree	Agree a little	Disagree a little	Disagree	Strongly disagree
○	○	○	○	○	○

* 10. Learning a new language helps when I go on holidays

Strongly agree	Agree	Agree a little	Disagree a little	Disagree	Strongly disagree
○	○	○	○	○	○

* 11. Learning a new language will help me get a good job

Strongly agree	Agree	Agree a little	Disagree a little	Disagree	Strongly disagree
○	○	○	○	○	○

* 12. Learning a new language helps me with my school work

Strongly agree	Agree	Agree a little	Disagree a little	Disagree	Strongly disagree
○	○	○	○	○	○

* 13. Learning a new language helps with learning other things

Strongly agree	Agree	Agree a little	Disagree a little	Disagree	Strongly disagree
○	○	○	○	○	○

* 14. Learning a new language changes my first language

Strongly agree	Agree	Agree a little	Disagree a little	Disagree	Strongly disagree
○	○	○	○	○	○

* 15. Learning a new language requires a lot of time and effort

Strongly agree	Agree	Agree a little	Disagree a little	Disagree	Strongly disagree
○	○	○	○	○	○

* 16. Learning a new language makes me anxious

Strongly agree	Agree	Agree a little	Disagree a little	Disagree	Strongly disagree
○	○	○	○	○	○

* 17. I particularly like learning languages that are very different from my first language

Strongly agree	Agree	Agree a little	Disagree a little	Disagree	Strongly disagree
○	○	○	○	○	○

* 18. I particularly like learning languages with a different writing system from that of my first language

Strongly agree	Agree	Agree a little	Disagree a little	Disagree	Strongly disagree
○	○	○	○	○	○

* 19. Learning a sign language would be fun

Strongly agree	Agree	Agree a little	Disagree a little	Disagree	Strongly disagree
○	○	○	○	○	○

* 20. Learning a sign language would be useful

Strongly agree	Agree	Agree a little	Disagree a little	Disagree	Strongly disagree
○	○	○	○	○	○

* 21. I do not enjoy learning languages

Strongly agree	Agree	Agree a little	Disagree a little	Disagree	Strongly disagree
○	○	○	○	○	○

The Cognitive Benefits of Language Learning

Copy of Views on Language Learning (Children's Questionnaire)

Questions About Your Language Learning Experience

* 22. What language(s) do you speak at home?

The Cognitive Benefits of Language Learning

Copy of Views on Language Learning (Children's Questionnaire)

Questions About Your Language Learning Experience

* 23. What language(s) do you learn at school?

The Cognitive Benefits of Language Learning

Copy of Views on Language Learning (Children's Questionnaire)

Questions About Your Language Learning Experience

* 24. Are there any languages you can speak/ listen to and understand, but not write or read?

- ◯ Yes
- ◯ No

* 25. Are there any languages you can read or write, but not speak/ listen to and understand?

- ◯ Yes
- ◯ No

The Cognitive Benefits of Language Learning

Copy of Views on Language Learning (Children's Questionnaire)

Questions About Your Language Learning Experience

* 26. What do you most enjoy about language learning?

* 27. What do you least enjoy about language learning?

The Cognitive Benefits of Language Learning

Copy of Views on Language Learning (Children's Questionnaire)

Questions About Your Language Learning Experience

* 28. Do you feel worried about learning languages?

- ◯ Yes
- ◯ No

29. If you answered 'Yes' to the previous question, please explain what worries you have.

The Cognitive Benefits of Language Learning

Copy of Views on Language Learning (Children's Questionnaire)

Questions About Your Language Learning Experience

* 30. Do you think it is better to learn new languages when you are younger?

- ◯ Yes
- ◯ No

31. If you answered 'Yes' to the previous question, please explain why.

The Cognitive Benefits of Language Learning

Copy of Views on Language Learning (Children's Questionnaire)

Questions About Your Language Learning Experience

* 32. Does learning new languages when you are older have any particular benefits?

- ◯ Yes
- ◯ No

33. If you answered 'Yes' to the previous question, please explain why.

The Cognitive Benefits of Language Learning

Copy of Views on Language Learning (Children's Questionnaire)

Questions About Your Language Learning Experience

* 34. Do you go online to learn languages?

- ◯ Yes
- ◯ No

35. If you answered 'Yes' to the previous question, please give examples.

The Cognitive Benefits of Language Learning

Copy of Views on Language Learning (Children's Questionnaire)

Background Questions

Finally, please complete these background questions.

* 36. Are you male or female?

- ◯ Male
- ◯ Female

The Cognitive Benefits of Language Learning

Copy of Views on Language Learning (Children's Questionnaire)

Background Questions

* 37. What is your age?

The Cognitive Benefits of Language Learning

Copy of Views on Language Learning (Children's Questionnaire)

Background Questions

* 38. What is your postcode?

The Cognitive Benefits of Language Learning

Copy of Views on Language Learning (Children's Questionnaire)

Background Questions

* 39. What country were you born in?

The Cognitive Benefits of Language Learning

Copy of Views on Language Learning (Children's Questionnaire)

Background Questions

40. Do you get a free school meal?

Thank you for completing this questionnaire!

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Appendix 6. Project Outputs

Li Wei, Yogeswaran C, & Woll B (2016) Cognitive Benefits of Language Learning. Poster presented at British Academy Soiree, June.

Li Wei & Woll B (2016) Presentation of the project at Special Workshop on Strategically Important Languages. Paris, November

Li Wei & Woll B (2017) Presentation of the project to the AHRC OWRI programme teams. Edinburgh, April.

Li Wei & Woll B (2017) Presentation of the project to the Institute of Modern Languages Research, School of Advanced Studies, Senate House, University of London, June.

Li Wei, Yogeswaran C, & Woll B (2017) Reviewing research on the cognitive benefits of language learning. Poster presented at ISB11 conference, Limerick June.

Woll B & Li Wei (2017) Interrogating the evidence on the benefits of multilingual learning. Paper presented at ISB11 conference, Limerick June.

Woll B & Li Wei (2018) Presentation to the All Party Parliamentary Group on Modern Languages, January.

Woll B & Li Wei (in preparation) Cognitive benefits of language learning. *Languages, Society and Policy Journal.*