

Language and Productivity for all Americans

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What are the Benefits of Multilingualism to the Personal and Professional Development of Residents of this Country?

Although most of the world is multilingual, the use of two or more languages in the US has historically been marked as a complicating factor, confounded with attitudes towards immigration and cultural diversity. Those attitudes have created a wealth of mythology surrounding language learning and language use. The assumption of English as the only language or the majority language in the US has led to the belief that acquiring a second language as an adult is an impossible task, accomplished successfully only by the few who possess a special talent for language learning. Likewise, although young children appear to be able to acquire multiple languages easily, there has been an assumption that introducing a second language too early during infancy will produce confusion and irrevocable damage to language and cognitive development. For those who are proficient speakers of two or more languages, and who freely mix the two languages when they speak to others who are similarly proficient, there has been an assumption that language mixing or language switching is a sign of pathology or incomplete language ability.

The attitudes that have shaped the views of multilingualism in the US have not only affected public perceptions, but also those of educators and scientists. It is more difficult to have a classroom of children who speak home languages other than English and it is a challenge to conduct research on language and cognitive development in speakers of more than a single language. In 2016, the assumptions and attitudes that have been prevalent historically have been turned around. We have come to see that the assumptions about the dangers of multilingualism are simply mythology.² Far from being a complication, multilingualism provides benefits to individuals at all points along the lifespan, from the youngest infants and children, to young adults, and to older adults who may be facing cognitive decline.³ Young babies are not confused by hearing two or more languages but develop the ability to discriminate the languages they hear and to be more open to new language learning than their monolingually exposed counterparts.⁴ Adult learners who are well past early childhood have been shown to be able to acquire sensitivity to the grammar of a second language despite their age.⁵ And all of that language mixing? Code switching is a common feature of bilingual discourse, with language switches occurring right in the middle of spoken sentences. We now know that code switching is not only rule governed, but that it reflects a sophisticated cognitive strategy that enables listeners to exploit the features of bilingual speech as speech is produced.⁶ For language scientists, the multilingual speaker is now seen as a model for understanding the way that language experience shapes the mind and the brain.^{7 8}

A set of research discoveries in the last two decades provides compelling evidence to reverse the older false beliefs about multilingualism. We have learned that there is far

greater plasticity throughout the lifespan than previously understood. Life experience at all ages has consequences for cognition and for both the structure and function of the brain. As an important aspect of life experience, language use reveals these consequences.⁹ Contrary to the view that the brain evolved to speak one language only, the evidence suggests that two or more languages co-exist in the same brain networks, each language activating the other even when only one of the languages is in use. We might think that the engagement of all known languages would impose a terrible burden on bilingual and multilingual speakers, but recent studies demonstrate that while there may be some small disadvantages with respect to speed, those disadvantages are far outweighed by what bilinguals and multilinguals learn about how to control potential competition across the two or more languages. Elsewhere, we have described the bilingual as a mental juggler, able to keep both languages in the air, as it were, and to simultaneously be able to use the intended language without making obvious mistakes.¹⁰ The claim in the recent studies is that this ability to juggle all the languages in play creates consequences more generally for bilinguals and multilinguals that enhances the ability to ignore irrelevant information, to switch from one task to another, and to resolve conflict across different alternatives.¹¹ These consequences may be most apparent at the two ends of life, for the youngest babies and children and for the oldest speakers.

The observation that a second or third language engages the same underlying cognitive machinery as the first language also has implications for language itself. The interactivity of the networks that support all of the known languages comes to affect the native language. The native language of a bilingual or multilingual speaker differs from

the native language of a monolingual speaker, reflecting the influence of the second or third language on the first. What is remarkable is that these bidirectional influences can be seen at every level of language use, from the way speech is perceived and spoken, to the way that grammar is processed, and to the way we choose words to describe our perceptual experience.^{12 13} An even more striking finding, in keeping with the claims about the plasticity of life experience, is that changes in the native language have been observed in second language learners at the earliest moments of new learning.^{14 15}

It becomes easy to see from the outside, that these changes to the native language might be seen as a negative consequence of new language learning or as an indication of language attrition. The native language of the bilingual is no longer like the native language of the monolingual speaker. However, that view fails to account for the variation that is normally seen among monolingual speakers themselves. Most Americans accept the idea that people living in the South will speak with a different accent than people living in the Northeast or Midwest, but there is good reason to think that regional differences in dialect may be related to the changes observed in the native language of bilingual or multilingual speakers. Not all monolinguals are the same and recent studies have begun to identify the ways that monolingual speakers of the same native language may differ from one another.¹⁶

In the next part of this paper we consider the implications of this new body of research for those contexts in which the benefits of multilingualism might best be realized. Our goal is to focus on those groups who are most vulnerable and for whom the opportunities

and protections afforded by multilingualism might be greatest. These include young children, for whom the failure to acquire literacy skills may endanger academic outcomes, and older adults, facing normal cognitive decline as they age, or pathology if they are likely to develop dementia. The findings on multilingualism at these two ends of the lifespan have been informed by the basic research on young adults, but we focus here on the very young and very old because the benefits for society at large may be greatest. We then consider more generally the directions that this work suggest for best practices for second language learning and for recommendations about the type of investments that we might make to overcome the biases about multilingualism that prevent the full range of benefits to be observed for all Americans across the diverse contexts in which they find themselves.

Literacy and academic achievement in young school age children

One in five children in the United States lives in a household in which a language other than English is spoken.¹⁷ The 2004 National Center for Education Statistics has reported that about 30% of children who speak English but who are exposed to another a language at home do not complete high school. Many studies have shown a well-established relation between low socio-economic status and low English skill level in children from homes where a language other than English is spoken.^{18 19} Recent work also suggests that speaking a language other than English at home acts as an independent risk factor.²⁰ Poor literacy outcomes among a significant portion of the population constitute a substantial public health concern because low levels of literacy are associated with higher rates of incarceration, unemployment, and mental illness.²¹ These facts are alarming and suggest that unless there is a marked improvement in the literacy skills of today's

minority children, the future labor force will have lower literacy skills than the labor force of today.²² Because mastery of English by immigrant children is a critical aim, one response has been to push aside the development of the home language to encourage the development of English. Often parents, educators, policy makers and pediatricians operate on the basis of a mix of folklore and intuition. Findings that bilingualism affects the rate at which each language is acquired²³ have been misinterpreted by some as evidence that bilingualism provides an inadequate environment for the development of English language skills. Quite to the contrary, the research that has systematically examined early and concurrent acquisition of a home language and a majority language suggests a number of positive linguistic, cognitive, and academic outcomes that have the potential for significant impact for the children and for society. Home language development is related to the quality of relationships within the family and to measures of psychosocial adjustment in adolescence.²⁴ Home language skill is also important because in some linguistic domains (e.g., phonological awareness), skills acquired in one language support the acquisition of skills in the other language.^{25 26 27}. Although the state of scientific knowledge is incomplete, the evidence to date strongly supports the benefits of maintaining the home language. Multilingualism is a significant economic asset for individuals, and a bilingual and biliterate workforce is a national asset.

The value that home language development brings to children via its role on family relations and positive outcomes to society is significantly heightened by recent scientific findings that dispel the belief that children are confused by dual language input,^{28 29} and that demonstrate that bilingualism confers advantages in executive control—the brain's

functions that allows humans to carry out complex tasks such as solve problems, plan a sequence of activities, inhibit information that has already been perceived, direct attention to achieve a goal, or monitoring performance. To illustrate how important executive control is, individuals who show damage in brain areas responsible for coordinating executive function show impaired judgment, have difficulty with decision-making, and have impaired intellectual abilities.

A rapidly growing body literature indicates that bilingual children with similar abilities to monolingual children on psychomotor speed, general cognitive level and socioeconomic status not only perform similarly to monolingual children on language tasks of grammatical knowledge and metalinguistic awareness, but show a significant advantage compared to monolingual children on executive control. Although bilingual children typically have lower receptive vocabulary than monolingual children, they outperform monolingual children in domains of cognitive function skill that require a high degree of attentional control.³⁰ Another significant finding is that the benefits within the domain of executive control have been found across levels of socioeconomic status.³¹ In this respect, bilingual language skill is relevant to academic success in children from dual language homes because bilingualism is associated to an advantage in linguistic and non-linguistic tasks.^{32 33}

The advantages conferred by bilingualism have been reported for bilingual children even in the earliest months of life. When adults speak, bilingual infants look at adults' mouths at an earlier age than monolingual infants and for a longer period of time, providing the

first bit of evidence that bilingual babies ‘figure out’ how to learn two different languages as easily as monolingual infants learn one.³⁴ We also know that six-month old babies growing up in a bilingual environment are better than monolingual babies at rapidly forming internal memory representations of novel visual stimuli.³⁵ One account for this finding is that learning two languages requires enhanced information processing efficiency compared to learning one language only, making it necessary for infants to develop enhanced skills to cope with the task of dual language acquisition. One exciting result from the work exploring the effects of bilingualism in children growing up in poverty is that bilingual children from low-income families are better than monolingual matched controls on a number of verbal and nonverbal tasks.^{See 31} Given that children in the US who are born to the lowest income families have a 43 percent chance of remaining in that income bracket,^{36 37} one way to mitigate the academic risks associated with low socioeconomic status and to maximize school readiness is by promoting the development of bilingual language acquisition in children from language minority homes. Monolingual children will also benefit from bilingual immersion programs similar to the ones offered in Illinois and California because they too will experience the cognitive and linguistic advantages associated with growing up bilingual. Learning a new language and culture will also have transformative effects on their readiness as global citizens.

Speaking two or more languages protects older adults against cognitive decline

Former Speaker of the House of Representatives, Newt Gingrich, published an Op-Ed column in the New York Times on April 22, 2015 in which he urged congress to double the NIH budget. He argued that a breakthrough discovery about Alzheimer’s that might

delay the onset of the disease by five years would create a dramatic reduction in the number of afflicted Americans, with a corresponding reduction in costs and stress to family members. What he failed to mention, is that research on bilingualism has already documented a delay of 4-5 years in the onset of Alzheimer's symptoms for bilinguals relative to age and education matched monolinguals.³⁸ No known pharmaceutical agent has any effect that comes close to bilingualism. The consequence effect of bilingualism is not to affect Alzheimer's directly, but rather the symptoms of the disease. A life as a bilingual seem to provide protection to the cognitive mechanisms that enable the person to negotiate the deleterious consequences of the disease. The protective effects of bilingualism are much like the effects of physical exercise in the face of an injury. A person who is healthy and fit may be better able to deal with the insult to their body than a person who is not. A life of bilingualism may provide precisely this sort of protection when cognitive resources are stressed by the presence of pathology.

Like the research with young children, some have questioned whether the finding that bilingualism delays the onset of dementia symptoms in those who will develop Alzheimer's is seen only in adults who are relatively affluent and well educated. A recent study in India on a very large sample of patients diagnosed with dementia reported that there was a 4.5 year delay in the onset of symptoms for bilinguals relative to monolinguals. Most critically, the observed delay was independent of education, literacy, and other socioeconomic factors.³⁹ Other similar investigations have replicated the 4-5 year delay of dementia symptoms for bilinguals in different language contexts and for different language pairings.⁴⁰

But does bilingualism benefit older adults who are healthy and free of signs of cognitive pathology? It is important to note that cognitive aging is a normal process, with reports of increasing word finding difficulties in spoken language, and increasing disruption to executive control.^{41 42} These declines do not begin abruptly at age 75 or 80 but begin to develop gradually as individuals age. Notably, those aspects of cognition that decline in aging coincide with many of the features of executive function that have been reported to be influenced by bilingualism, including ignoring irrelevant information, resolving competition or conflict across alternative responses, and switching between tasks. Studies that have examined the performance of healthy older adults have shown that bilinguals often outperform monolinguals on these measures of executive function.⁴³ The evidence on behavioral indices of executive control is sometimes mixed, but the findings from studies of structural and functional brain imaging provide compelling support for a difference in the brains of older bilinguals relative to monolinguals.^{44 45} When bilinguals and monolinguals solve a problem, they may recruit the same brain areas, but bilinguals appear to use them more efficiently than monolinguals.

A number of questions have been raised about the findings on bilingualism and aging. One is whether a person needs to be bilingual from birth or whether late bilingualism can confer some of the same advantages as early bilingualism. Studies on young adult bilinguals suggest that many of the same cognitive benefits can be seen for late bilinguals as for early bilinguals.⁴⁶ What is important to recognize is that age of acquisition and language proficiency are confounded because the longer a person has used a language,

the more likely they are to be proficient, and proficiency seems to be more critical to these consequences of bilingualism than age of exposure per se.

Another question and criticism that has been leveled at much of the research on this topic is that it inevitably involves comparisons across different groups of people. As with any comparison across groups of people, we can attempt to control or match as many factors as possible to be sure that the inferences we draw in how these groups differ is really about their language experience and not about some other aspect of their life experience that is correlated with their bilingualism or multilingualism. But it is difficult to do this perfectly. Some individuals acquire a second or third language by choice and others as a consequence of the demands of immigration. Some live in an environment where everyone else speaks two or three languages and others live in an environment that is strongly monolingual, like many locations in the US. Understanding how these different forms of language experience determine the observed consequences for the mind and the brain is a topic of ongoing research.⁴⁷ In theory, a solution to the problem of between-group variability is to conduct longitudinal research with the same individuals tracked over time. However, longitudinal research is both expensive and difficult to conduct, with attrition over time that requires very large samples to come to clear conclusions. A recent study exploited a unique database in Scotland, the Lothian Birth Cohort 1936, in which over a 1000 individuals were given an intelligence test when they were 11 years old in 1947, and then tested again when they were in their 70s. A clear advantage was reported for bilinguals regardless of the age at which they became bilingual, supporting the findings from studies comparing bilingual and monolingual groups.⁴⁸

What are the Lessons from Research on Multilingualism for Developing Best Practices for Universal Access to Language Learning?

The research we have reviewed suggests that multilingualism provides exceptional consequences across the lifespan that reach far beyond the benefits of having two languages available for communicative purposes. Having two languages will of course enhance opportunities for social interaction, for economic advancement, and for increasing intercultural understanding. But being bilingual or multilingual also changes the mind and the brain in ways that create resilience under conditions of stress and that counter some of the deleterious effects of poverty and disease. Here we consider briefly some of the lessons that we might take away from the research on multilingualism to better inform approaches to language learning.

Many years ago, Francois Grosjean published a paper with a title that garnered great attention, noting that the bilingual was not two monolinguals in one.⁴⁹ His comments were addressed to neurolinguists who interpreted mixed language speech in bilingual patients as a sign of pathology. His point, reiterating what we have noted earlier in this paper, was that language mixing and code switching are typical features in bilingual speech and for many bilinguals mixing is neither rare nor pathological. But the claim that bilinguals are not simply the addition of two separate monolingual language systems has implications that go beyond the observation of language mixing. Speaking two or more languages changes all languages that are known and used. There are bidirectional influences that have been demonstrated within a highly interactive language system. The features of the

languages in play are likely to influence one another and the neural plasticity that has been shown to characterize learners at all ages suggests that these changes can sometimes occur quickly during the earliest stages of new language learning.

The bottom line is that the two or more languages that are spoken by a bilingual or multilingual individual are not like the native language spoken by a monolingual speaker. Most of the past research on second language learning is based on a model of the native speaker, with the goal to attain native speaker like abilities in processing the second language. That model assumes, for the most part, that the two languages are independent of one another, an assumption that we now know to be incorrect. If proficient multilinguals are not like monolingual native speakers, then the classic native language model is the wrong model for language learning.

A problem in adopting a multilingual model for new language learning is that for adult learners who are already proficient speakers of their native language, there are some features of the native language and indeed, of their native language skill, that may need to suffer interference, at least briefly, to enable the second language to become established. There is an approach to new learning that has been examined extensively in research on memory and learning that may be useful to the new perspective that we suggest may be necessary. Robert Bjork and Elizabeth Bjork at UCLA have pursued a program of research on what they call “desirable difficulties” in learning.⁵⁰ The idea is that conditions of learning that give rise to difficulties that increase the contextual salience of new material, that produce errors that provide meaningful feedback, and that encourage elaboration, may ultimately produce better learning and better memory for what has been

learned. Desirable difficulties can be imposed externally during learning, e.g., by having learners acquire information under conditions that are costly or slow, or by mentally imposing those condition on themselves, by self-regulation.⁵¹ In the realm of language learning, there have been a few studies that can be understood within this framework, but the implications for language learning more generally have yet to be developed.⁵² Learning new material quickly may produce a level of satisfaction for the learner but may not necessarily produce enduring memory for what has been learned.

The lessons about multilingualism and desirable difficulties come together when we consider what is known about mixing languages. As we noted earlier, code switching, even within a single utterance, is a common occurrence in bilingual speech. Not all bilinguals code switch but those who do appear to move seamlessly from one language to the other with little disruption on the part of either the bilingual speaker or the bilingual listener. Likewise, studies of memory and learning suggest that learning under mixed conditions may produce more stable outcomes than learning under blocked conditions.⁵³ In the field of education, the idea of “translanguaging” proposes a related concept about having learners exploit all known languages within the context of a given lesson.⁵⁴ Mixing information may not simplify learning, but creating learning environments that simultaneously create desirable difficulties and move new language learners in a direction that more closely resembles the experience of proficient bilinguals may be likely to enhance productive outcomes.

The studies we have reported on infant learners suggest tremendous gains that result when babies are exposed to language variation early in life. A recent proposal is that the very conditions that are available naturally during infancy may also give rise to learning strategies that may be applied to adult learners for whom entrenchment in existing knowledge may be an impediment to new learning.^{55 56} A number of investigators are now pursuing a program of research to ask whether new language learning training for older adults will produce benefits to counter age-related cognitive decline.⁵⁷

It is of interest to note that there is a body of work that shows that bilinguals are better language learners than monolinguals. This should not be a surprise, of course, because bilinguals have learned something important about learning itself. One hypothesis about this finding is that the language learning benefit for bilinguals arises from enhancement to self-regulated processes. Bilinguals learn to control the languages not in use, and that control may produce benefits not only to executive function but also to learning mechanisms more generally. It will remain to be seen how effectively the lessons from each of these diverse areas of research will come together to provide concrete proposals for how new language learning might be implemented. The lessons from the field are clear in suggesting a new emphasis on exploiting a model that enables the learner to encounter complexity from the start and to then focus on the strategies that may encourage optimal self-regulation.

How can Future Investments Address the Challenges to Multilingualism in the US to Enhance our Democratic Society and Economic Growth?

In our view, the greatest challenges to multilingualism in the US are characterized by the mythology about multilingualism that we described at the beginning of this essay.

Learning a second or third language is not a cognitively unnatural task, nor does it create deleterious consequences at any point in the lifespan. The new research, especially that work that has been made possible by the revolution in the neurosciences, shows that all the languages that an individual knows and uses are processed in an integrated language system in which there is extensive interaction.⁵⁸ That interaction across languages gives rise to competition across the known languages that requires regulation and although that requirement may impose an initial cost during learning, it appears to be the other side of a process that produces significant benefits to the development of cognitive control. The evidence on multilingualism leads us to think that new approaches to language learning that allow learners to experience the variation across the two or more languages, and that may produce language mixing and initial effortful processing, may be beneficial to long term outcomes.

There is an inspiring message in a film called “Speaking in Tongues” that documents the experiences of children in dual language classrooms but coming from very different backgrounds, including Heritage speakers and monolingual English-speaking learners without other language exposure at home.⁵⁹ The spirit of that documentary meshes well with the scientific evidence we have reviewed here. Encouraging others to embrace this view will require social action that extends beyond our science. But engaging in cross-disciplinary science of the sort we have described provides a first step towards engaging a larger community to work towards that goal.

Endnotes and Acknowledgments

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² See <http://www.bilingualism-matters.ppls.ed.ac.uk/>, the home of “Bilingualism Matters” at the University of Edinburgh, for additional background.

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⁸ We note for the purpose of this discussion that we take a broad view of bilingualism and multilingualism, considering anyone who uses two or more languages actively to be bilingual or multilingual. The form of language experience will differ across individuals and in different language and cultural contexts. Those distinctions, the trajectory of language learning, and the resulting proficiency in each language will be critically important factors but our interpretation of the available research is that bilingualism and multilingualism are more similar than different. The critical distinction will be between individuals who are monolingual and individuals who speak two or more languages.

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