

A Prospectus for Bilingual Early Reading Instruction

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Abstract. In this paper, we describe a framework for bilingual decoding instruction, with a call for collaborators. Decoding is the ability to apply knowledge of letter-sound correspondences to pronounce words. We adopt a standard phonological approach for early instruction that could be expanded to include practice with constructive morphemes, like prefixes and suffixes, and reading for meaning. Decades of research have shown that word decoding is a bottleneck in reading comprehension. Unless children develop sight-word reading capabilities, comprehension of texts is severely hampered. The present approach draws on children's spoken vocabulary knowledge in their native language as a bridge to decoding in a second language. The goal is to develop a tutoring system that draws on current and forthcoming multimedia technologies, and to implement the system in multilingual countries, e.g.: USA, India, Ukraine and across national borders. As a starting point, the authors will use a web platform <https://ethicalengineer.ttu.edu> designed in 2017 by the USA, Indian, and Ukrainian collaborators, several of them being co-authors of this paper, as a model for the new website for reading instruction. The *Ethical Engineer* website demonstrates one mechanism through which instructors can reach out to establish connections within and outside their native country around topics and issues of common interest and support educator cooperation and research development. The new model hopes to achieve success comparable to that of the *Ethical Engineer*. Using computer-based instruction allows for empirical testing of teaching methods, thereby optimizing the educational process. It is important to take advantage of this to ensure the most effective methods are used in early reading instruction for children.

Keywords: *bilingual, decoding, multimedia, technology, tutor, reading, USA, India, Ukraine.*

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Анотація. У цій статті ми описуємо концепцію двомовного навчання декодування і запрошуємо до співпраці. Декодування – це вміння застосовувати знання про відповідності між буквами та звуками для вимови слів. Ми використовуємо стандартний фонологічний підхід для раннього навчання, який можна розширити, включивши в нього практику з конструктивними морфемами, такими як префікси та суфікси, а також читання за змістом. Десятиліття досліджень показали, що декодування слів є вузьким місцем у розумінні

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читання. Якщо діти не розвинуть навички читання зорового сприйняття слів, розуміння текстів буде серйозно ускладнене. Цей підхід спирається на знання дітьми розмовної лексики рідною мовою як на місток до декодування другої мови. Мета полягає в тому, щоб розробити систему навчання, яка спирається на сучасні та майбутні мультимедійні технології, і впровадити цю систему в багатомовних країнах, наприклад, у США, Індії, Україні та інших країнах. За основу автори візьмуть веб-платформу <https://ethicalengineer.ttu.edu>, розроблену у 2017 році спільно американськими, індійськими та українськими колегами, деякі з яких є співавторами цієї статті, як модель нового веб-сайту для навчання читання. Веб-сайт "Ethical Engineer" демонструє один із механізмів, за допомогою якого викладачі можуть налагоджувати зв'язки у своїй країні та за її межами щодо тем і питань, які становлять спільний інтерес, а також підтримувати співпрацю освітян і розвиток наукових досліджень. Нова модель, сподіваємося, матиме популярність, порівнювану з успіхом "Ethical Engineer". Використання комп'ютерного навчання дає змогу здійснювати емпіричну перевірку методів викладання, тим самим оптимізуючи навчальний процес. Важливо скористатися цією можливістю, аби забезпечити використання найефективніших методів раннього навчання дітей читанню.

Ключові слова: двомовний, декодування, мультимедійний, технологія, викладач, читання, США, Індія, Україна.

Learning to read is learning how one's writing system encodes one's language
(Perfetti & Dunlap, 2008)

Introduction

Reading is an essential skill, yet not all children become proficient readers. Two-thirds (64%) of 10-year-olds across low-, middle-, and high-income countries worldwide are unable to read and comprehend a simple story. Christina de Bruin from UNICEF regards these statistics as indicative of a crisis of *learning poverty* (Gidikova, 2022). Prior to the COVID pandemic, 66% of fourth graders in the US were not reading at grade level, however, reading rates for fourth graders from low-income families were even worse, with 88% failing to read at grade level (Snapshot, 2014). In India, despite massive investments in primary education many children fail to acquire basic reading abilities. A study conducted in five Indian States by PRATHAM (A Mumbai-based NGO) revealed that even after four years of schooling nearly 70% children find it difficult to navigate text in Hindi and other vernacular languages that is meant for children two grade level below (Bhattacharjea et al., 2011). In Ukraine, 13.2% of 4th-grade students who completed their primary education in 2018 lack basic reading skills (Ukrainian Center for Educational Quality Assessment, 2019). This category of elementary school graduates faces significant difficulties in reading and comprehending both literary and informational texts. In 2021 the proportion of fourth-grade students who did not reach the basic threshold of reading competence increased over the course of three years to 16.9% (Ukrainian Center for Educational Quality Assessment, 2022).

Remote learning due to COVID resulted in lower rates of reading proficiency at all levels (Barshay et al., 2021). The deficits in basic literacy are widespread and

affect disadvantaged communities the most. According to de Bruin (Gidikova, 2022), vulnerable children are especially affected in systems that perpetuate inequality. This is partly because education systems provide the least resources to children who need them the most. In low-income countries, 11% of public education resources go to the poorest children while 42% goes to the richest (Gidikova, 2023). Overall, there is a worldwide crisis in the acquisition of basic reading skills among children.

Chall (1979) proposed that reading development proceeds in phases. One of those phases occurs around the fourth grade, when students presumably have mastered word decoding and begin reading for content. Current data are consistent with Chall's model, showing that children who are proficient readers by the end of the third grade are more likely to graduate from high school and become economically secure as adults (Snapshot, 2014). In India, the Ministry of Education (2020) has set as its highest priority that children are able to read with meaning by Class 3, because "These are crucial basic skills that help them succeed in life" (p. 3). Worldwide, deficits in basic reading skills fail to prepare children for future occupations and lifelong learning, and there is a need to help children achieve these skills by Grades 3-4.

Decoding, also known as phonological recoding, is the ability to apply knowledge of letter-sound correspondences, and knowledge of letter patterns, to pronounce words. Mastery of these relations is necessary to tackle challenging vocabulary words, like *mitochondria*, and to study complex topics in history and science.

The purpose of this article is to outline what is currently known about early reading acquisition, from empirical and computational perspectives and, further, to propose developing new technologies for teaching children basic word decoding skills across languages (e.g., Hindi-English, Ukrainian-English, Odia-English, Kurukh (Oraon tribe of Odisha use this script)-Hindi, Kurukh-English), based on a highly successful web platform (<https://ethicalengineer.ttu.edu>). The teaching materials will capitalize on a child's native language knowledge in order to develop L2 decoding skills (Culatta et al., 2006). Data from the website will be used to understand how bilingual learning affects the acquisition of decoding skills and to apply research findings in a continuous manner to develop the web platform.

Stages of Reading Development

The goal of skilled decoding is to read all words automatically by sight. The basic units of reading in many languages (e.g., English, Italian, German, Ukrainian, Serbian, Croatian) are graphemes, consisting of a single letter or group of letters (e.g., *th*, *ph*, *igh*), and phonemes, which are the smallest perceptually distinct units of speech. English, for example, has 44 phonemes, based on the 26 letters of the alphabet, and represented by multiple graphemes (Perfetti & Dunlap, 2008). Among Slavic languages, Ukrainian has 38 phonemes (Pivtorak, 2023), based on 33 letters of

its alphabet. Prior to tackling decoding, it is important for pre-readers to develop an ability to auditorily recognize and manipulate the phonemes in words, termed *phonological awareness*. Children must understand that the words they hear are made up of sounds, or phonemes, and, in learning to read, that these phonemes can be represented by letters, or graphemes.

Languages differ in how children develop phonological awareness. In English, rhyme patterns can help children to segment the *onset* (the initial consonant or consonant cluster) in a syllable from the *rime* (the vowel and consonants that complete the syllable), e.g., *b + at* in *bat* (Goswami, 1999; MacLean et al., 1987). Alliteration, the repetition of the same consonant sound across adjacent or closely occurring words, can also help children to analyze the phonemes composing words. In Spanish, though, rhyme is not salient (Culatta et al., 2006) and thus rhyme may not be pertinent in developing decoding ability across all languages. Despite differences in methods and manner of acquisition, phonological awareness has been shown to be important and to transfer from one language to another (Durgunoglu et al., 1993).

Linnea Ehri (2005) described developmental phases in learning how to read words by sight. These phases apply to opaque writing systems, like English, and transparent systems, like Italian, Spanish, and Ukrainian. Young children begin this developmental process by learning the letters of the alphabet and typical sounds associated with those letters. Early on, they identify how graphemes match up with phonemes in a word, forming connections between graphemes and phonemes for the word. By reading those words multiple times, the connections are securely encoded in memory. Letter-sound connections are supplemented by larger units, like *onset + rime* units that repeat across words and which children can apply in learning pronunciations of new words. This is related to a process of learning to read new words by analogy to known words (Goswami et al., 2003). The process of securely binding grapheme-to-phoneme connections into memory for sight words can occur, in part, through instruction, and in part through implicit learning and practice.

English Spelling Is a Mess

Decoding is a fundamental process of reading ability. Some languages have consistent and transparent relationships between spelling and sound, like Italian, Spanish, and Finnish, some languages have semi-transparent orthographies, like Polish and Hindi, while others, like English and Urdu are opaque. Characteristic of opaque orthographies, spelling-sound relationships in English are, as Calfee (2005) declared, a mess. In English, the same letter can be associated with more than one phoneme, and a phoneme can be represented by more than one letter.

Building on Venezky's seminal analysis of English orthographic structure (Venezky, 1970), Calfee (2005) proposed a two-prong tactic for teaching reading: one involving the phonetic structure of words and one involving the morphemic structure. Venezky derived an analysis of English consisting of approximately 100

productive grapheme-phoneme correspondences. These included single consonants, consonant blends, short and long vowels, vowel digraphs, and *r* and *l* controlled vowels. Calfee et al. (2013) describe a decade-long series of educational experiments putting Venezky's ideas into practice.

Later elementary grade levels benefit from a focus on the morphemes – i.e., the basic units of meaning – especially in word constructions. These include prefixes like *pre-*, *post-*, *uni-*, *bi-*, *anti-*, *tele-*, and *multi-*, and suffixes like *-graph*, *-man*, *-ive*, *-al*, and *-ology*. Recognizing that words are composed of productive morphemes aids both decoding and, importantly, comprehension. It provides children with the ability to develop skills in content area reading and writing. Henry (2012) provides examples of how to bring a morphophonemic approach into classroom instruction.

The Reading Bottleneck

According to the *verbal efficiency* theory proposed by Perfetti (1985), skilled reading comprehension depends in large part on rapid and efficient retrieval of a word's pronunciation and meaning. Learning to efficiently access a word's pronunciation from its spelling is a major task of early reading development (Castles et al., 2018). Efficient single-word decoding is a consistent predictor of later reading success (Steady et al., 2022). Fast and accurate word decoding is essential to long-term reading success and knowledge acquisition. Simply, "Comprehension skill depends on word reading skill" (Perfetti & Hart, 2002, p. 67).

According to Perfetti (1992), "Phonological knowledge is clearly critical to skilled reading. The heart of lexical access is the activation of a phonologically referenced name code. Although this assumption does not appear to be universally shared, it should be without contention" (pp. 164-165). For Perfetti, the central theoretical component in reading acquisition is the development of lexical representations, that is bound grapheme-phoneme codes linked to a word's pronunciation and meaning. High-quality representations become highly specific and autonomous, function much like sight words in Ehri (2005), and can become part of a child's lexicon early in reading development.

The goal of reading is to access meaning and ideas; however, this is not necessarily the primary goal of learning to read. For Perfetti and Duncan (2008), "learning to read is learning how one's writing system encodes one's language" (p. 25). This means converting symbols, like letters or characters, to words and their meanings. This highlights the fact that readers around the globe are presented with different writing systems, and in each instance, readers are presented with the same fundamental problem, namely, how to link the graphic representations to the person's spoken language. In tandem with the instructional challenges, there remains the need to develop sufficient processing models to address the central theoretical questions of how the associated lexical representations develop and become automatic (Perfetti, 2017).

Early Reading Challenges in the United States: A Need for Bilingual Reading Models

According to the Migration Policy Institute, “Worldwide, the United States is home to more international migrants than any other country,” with large immigrant population coming from Mexico, India, and China (Ward & Batalova, 2023). About 27% (87.7 million people) of the United States’ population is comprised of immigrants and their U.S. born children (Ward & Batalova, 2023), the majority of whom do not speak English as a second language or are dual language learners (DLLs). “Children who are DLLs in the U.S., on average, lag behind their monolingual English-speaking peers in academic achievement” (U.S. Department of Health and Human Sciences & U.S. Department of Education, 2016, p. 1). In efforts to support children who are DLLs, in-school programs have been created (such as *Head Start*) to promote bilingualism in language development, instead of full English immersion. Many studies support the benefits of bi-/multilingual instruction (Culatta et al., 2006; López, 2012) yet children may still struggle to perform at the same level as their monolingual peers. The development of a remote tutoring program that utilizes a bilingual reading model can potentially begin to close the gap between the academic achievements of DLLs and their monolingual peers.

Early Reading Challenges in India: A Need for Bilingual Reading Models

The Annual Status of Education Report (ASER) survey found that only fifty percent of Grade 5 children could read a passage of Grade 2 level (ASER Centre, 2019). Given the striking imbalance in reading abilities among primary school children in India, current National Educational Policy (NEP, 2020) seeks to ensure that all girls and boys have access to quality early childhood development, care, and pre-primary education so that they are ready for primary education, in a linguistically diverse country like India. The current national policy on education by the Government of India emphasizes the inclusion of the mother tongue or native language as a medium of instruction for second language (L2) learning. It promises to raise the reading level among primary and secondary government school children struggling with reading and writing in their first or spoken language.

A multilingual country like India poses unique challenges and opportunities to teach kids in the pre-primary and primary grades that is contextual as well as relevant for future learning outcomes. Especially, when it comes to teaching the tribal children in their mother-tongue, lack of trained teachers in the local languages becomes the major impediment. Further, due to lack of a script in many tribal spoken languages, children are forced to learn in the official language of the particular state. Such a practice leads to comprehension difficulties and lack of interest in addition to other challenges resulting in high dropout rates in the primary grades.

Reading Challenges and Bilingual Preference Changes in Ukraine

In the academic years 2008-2009, the proportion of students enrolled in full-time secondary schools with Ukrainian as the medium of instruction amounted to 81.1%, compared to 47.5% in 1989-1990. Similarly, the proportion of students enrolled in Russian-language schools was 17.6% in 2008-2009, compared to 51.8% twenty years earlier (Pavlenko, 2011). In 2016-2017, 355,955 students in schools in Ukraine learned in Russian. This was about 9% of the total number of students. The most significant proportion of secondary schools offering Russian language instruction was located in the eastern and southern oblasts of Kharkiv, Odesa, Dnipro, Zaporizhzhia, Donetsk, Luhansk, and Kherson. These oblasts also had a significantly higher number of people considering Russian their native language than other parts of Ukraine (Kudriavtseva, 2020). The percentage of the population claiming Russian as their native language in the eastern regions of Dnipropetrovsk, Kharkiv, Luhansk, and Donetsk ranged in 2001 from 32% to 74.9%, and from 24.9% to 48.2% in the southern regions of Kherson, Odesa, and Zaporizhzhia, compared to an average of 5.5% in the rest of the country (Ukrainian Census 2001).

In 2013, the proportion of students enrolled in Ukrainian-language secondary schools surged to 82 percent, a proportion higher than the demographic weight of Ukrainians (78 percent in the 2001 census) and much higher than those claiming Ukrainian as a language of origin (67 percent in the 2001 Census) let alone using Ukrainian as their language of preference (around 50 per cent in surveys) (Kulyk, 2017). In 2020, 73% of Ukrainians considered Ukrainian their native language. They predominantly communicated at home in Ukrainian, with 53% using it as the primary language, while 29% of Ukrainian citizens use Russian.

Since the Russia's invasion of Ukraine in 2022, there have been considerable changes in language preferences among Ukrainians. Russian language is dramatically becoming less popular due to objective reasons, i.e. killing of Russian- and Ukrainian-speaking citizens resulting in their disgust to everything connected with Russia including the language. As recently as 2019, only 8% of Ukrainians believed that it was not worth studying Russian in schools at all, while now 52% consider Russian unnecessary (KIIS, 2023a). English as a second language is rapidly gaining popularity. In March 2023, 51% of Ukrainians indicated that they have some knowledge of the English language (KIIS, 2023b). However, a more detailed analysis showed that only 23% could read, write, and communicate in English at everyday and professional levels. Almost one-third of adult residents of Ukraine, or 31.8%, do not possess any foreign language skills at any level. In this context, the Russian language was not considered, only English, Polish, Turkish, Hungarian, Spanish, French, and German. Knowledge of foreign languages is higher among younger, educated, and wealthier individuals. There is a relatively higher prevalence of foreign language proficiency in cities with a population of 500,000 or more (77%) and in the capital city, where it reaches 84%. Since the beginning of 2023, 61% of the respondents had

experience using English daily, primarily related to leisure activities and communication with acquaintances. English was used in professional activities by 19% of respondents and in education by 18%. Half of the children (51%) study English within educational institutions, while 27% study it outside, and 22% do not. For the entire adult population of Ukraine, the overall indicator of English proficiency stands at 2.86 out of 10 points on the scale. 93% of parents, regardless of gender, level of English knowledge, time spent learning English, or a personal desire to learn it, want their children to study and improve their English language skills. Among this 93% of parents, 37% are confident it will significantly improve their child's life. In comparison, another 55% believe that increasing English language proficiency will positively impact their child's future.

The top motivating factors for learning English include increased travel opportunities (43%), interest in learning foreign languages (36%), more diverse leisure activities such as books, movies, and music (33%), and the possibility of working in international companies (31%). (KIIS, 2023b).

On June 28, 2023, the President of Ukraine submitted to the Verkhovna Rada a draft law *On the Use of the English Language in Ukraine*. The bill proposes officially recognizing English as one of Ukraine's languages for international communication.

In summary, there is a pressing need to develop English reading, writing, and speaking skills by Ukrainians today as bilingualism is shifting towards Ukrainian–English and the tendency seems to keep.

A Multimodal Bilingual Model

The present initiative and call for collaboration is for the exploration and development of a multimodal and bilingual model that is theoretically coherent and that could function successfully as an instructional paradigm within and across national borders. The prospects of this initiative are partly supported by the highly successful web platform for students' reactions to engineering ethics, the *Ethical Engineer*: <https://EthicalEngineer.ttu.edu> (Taraban et al., 2019, 2023). The *Ethical Engineer* website is a virtual context for ethical reflection and shared discourse that provides an interactive platform for college students to present their comments and reactions to ethical dilemmas. Although unrelated in content to decoding instruction, the *Ethical Engineer* website demonstrates one mechanism through which instructors can reach out to establish connections within and outside their native country around topics and issues of common interest.

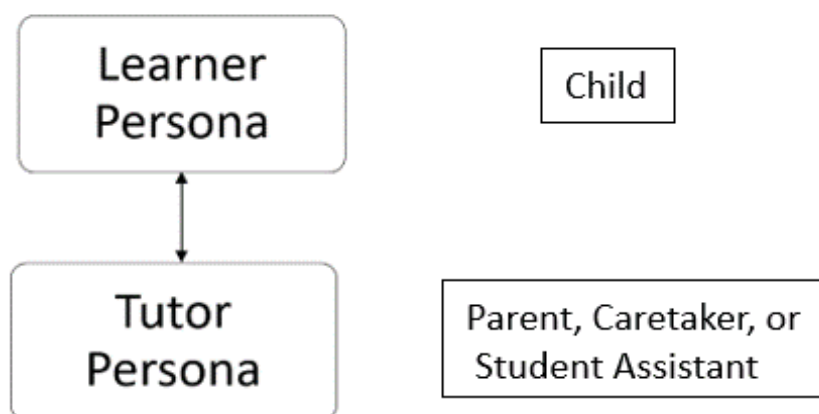
To develop and launch the *Ethical Engineer* website, several of the present authors worked collaboratively across several academic disciplines and with international contacts to promote participation on the website. After mutual discussion and agreement, the website was incorporated into course curricula at partner institutions in somewhat different manners, depending on instructional objectives and content and specific instructor goals. Since its inception in 2017, the

website has been viewed by individuals from at least 50 different countries, and the website has accumulated nearly 3,000 registered participants, with a large proportion of registered members from non-US countries. Similar goals of mutual development and cooperation in the development and implementation of current technological tools are envisioned for the present project.

Below we present several possible variations of child-tutor interactions (see Figure 1) within a more general interactive model (see Figure 2). The basic child-tutor interaction is presented in Figure 1.

Figure 1

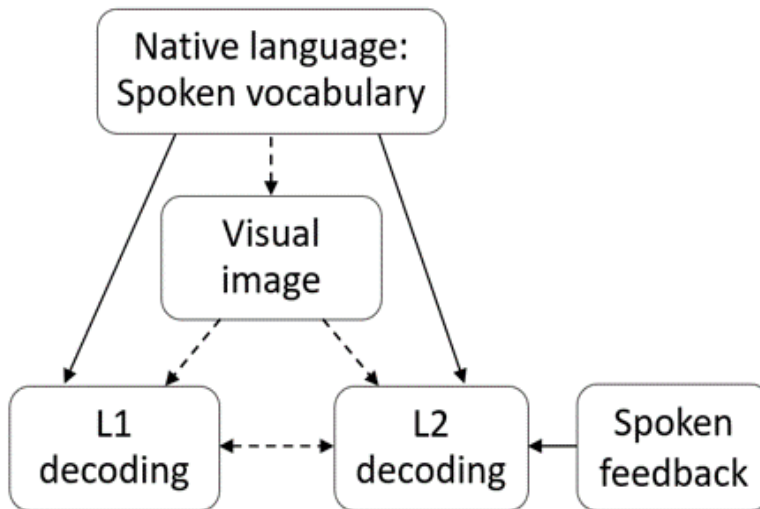
Basic Model for Child-Tutor Interactions



In order to protect privacy and assure confidentiality, interactions between the child and tutor are through character personas. These are essentially pseudonyms, but can be implemented as interactive agents using present technologies, comparable to the Microsoft® Agent character Peedy the parrot¹. The interactions between child and tutor can be in-person and direct, or between children and tutors in remote locations, like trained university research assistants tutoring children in rural locations. Child-tutor interactions can also take place across national borders.

The more general model is shown in Figure 2. The primary link in this model is between Native Language and L2 decoding. The goal is to draw on children's oral vocabulary in order to build meaningful connections to words in the second language (L2). Spoken feedback for children's decoding attempts in L2 can be automated, as well as other elements of feedback, like encouragement. Links associated with a visual image are shown with dashed lines to indicate optionality. Images could be used for scaffolding mental connections between the native language and L2, but can be withdrawn as the child is able to independently decode in L2. There is also an option to separately or simultaneously connect into decoding in the child's native language, as indicated by the link between Native Language and L1 vocabulary. Figure 2 presents the first pass at a robust model for bilingual decoding instruction that can be modified and improved as variations of the model are implemented and tested.

¹ <https://learn.microsoft.com/en-us/windows/win32/lwef/microsoft-agent-animations-for-peedy-character>

Figure 2*Model for Bilingual Decoding Instruction*

Over several decades, many good instructional programs have appeared for second-language (L2) learners. Lukatska (2022), for example, reviews a number of programs to teach Ukrainian to English speakers, with examples like Palinska and Turkevych (2010). Another project, *Yabluko*, launched by the Ukrainian Catholic University published a series of textbooks for Elementary, Intermediate, and Advanced level learners of Ukrainian (Bartkiv & Borodin, 2015; Burak, 2015; Synchak, 2015). Others are *Крок-1* for beginning Ukrainian readers and Dzhura (2007) *Let's Learn Ukrainian*. Existing materials for Ukrainian and other languages provide rich sources of ideas and examples for development within a globally-accessible and technology-rich interactive learning system.

A benefit of computer-based implementations for decoding instruction is the ability to empirically test questions related to teaching and learning methodologies. In our most recent work (Meza, 2023), we have implemented a rudimentary computer-based method for researching the benefits of organizing practice sets of words by rhyme endings. In one method children practiced sets of rhyming words: e.g., *sun*, *bun*, *run*. In the other method, children practiced sets of mixed words: e.g., *sun*, *get*, *fan*. Children in both conditions are exposed to the same overall set of practice words, which allows us to address whether organizing reading practice using rhyme benefits learning and retention of grapheme-phoneme correspondences and the development of sight words (Ehri, 2005).

Conclusions and Call for Collaborators

The method of developing and implementing a digital instructional platform for the *Ethical Engineer* has been quite successful. Since its inception in 2017, the website has been viewed by individuals from at least 50 different countries, and the website has accumulated nearly 3,000 registered participants, with a large proportion

of registered members from non-US countries. The website demonstrates the capacity of current technology to support educator cooperation and research development within and across national boundaries. The present model hopes to achieve comparable success in early reading instruction for children. Chrabaszcz et al. (2022) provide a recent example of teaching language skills over the internet, involving more than 1,000 volunteer teacher applicants and about 3,700 student applicants. The teachers engaged students in learning a foreign language, most commonly English, French, German, or Spanish, using vocabulary exercises, role playing, and discussions of everyday topics. Students made significant gains in language proficiency and motivation to learn a new language, through participation in the program. The researchers concluded that “harnessing digital technologies for online language learning through volunteer-based communities [of practice] seems like a viable option” (p. 25).

Reading research in the US since the 1960s has been characterized by phonics wars, with some researchers arguing for reading phases similar to those proposed in Ehri (2005), described in the National Reading Panel Report (National Reading Panel, 2001), and other researchers arguing for immersion programs (Bond & Dykstra, 1967) that depend on a natural acquisition of print to sound relationships through an immersion in children’s literature. There is merit in both positions. In spite of the centrality of a sight word vocabulary to skilled reading, more is required for the development of literacy. This includes attention to comprehension, writing skills, inferential ability, critical thinking, and an appreciation for text and literature (Calfee, 2005). These elements are part of a comprehensive model of reading skill (Shanahan, 2003), and will ultimately need to be incorporated into the present model.

Perfetti and Dunlap (2008) ask whether there are universals in reading and suggest that there are. The most basic universal, the Language Constraint, holds that “writing systems encode spoken language, not meaning” (p. 26). Meaning is derived from the associated language. The signs in the written form do not communicate meaning independently of the language. This universal applies to alphabetic, syllabary, and logographic representations. The second universal is the Phonological Principle: word reading activates phonology at the phoneme, syllable, morpheme, and word levels. These universals prompt one to ask about reading skill in terms of mental representations and learning. Perfetti and Hart (2002) define high-quality mental representations for reading words in this way:

A lexical representation has high quality to the extent that it has a fully specified orthographic representation (a spelling) and redundant phonological representations (one from spoken language and one recoverable from orthographic-to-phonological mappings). If a lexical representation is specific and redundant, its retrieval is more likely to be coherent and reliable. (p. 68)

The present project seeks to apply current digital technologies and research on reading to aid children in developing high-quality word representations for reading. A key idea is to link these to children’s knowledge of their native language. The tools and methods of this project will be tested in local settings to develop L1 reading skill, as well as more broadly to develop L2 reading skills.

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