

White Paper



Thinking holistically about creating better readers and writers in the context of the Amplify ELA Lexica game world

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This paper describes the research behind the design and development of The World of Lexica™, an English Language Arts (ELA) digital game world released by Touch Press Games (formerly known as Amplify Games). Touch Press Games is a suite of innovative learning games that can be purchased by schools, districts and other educational programs via Amplify.

Lexica is a tablet-based game ecosystem for middle school students which focuses on the cognitive and non-cognitive foundational skills that research shows make better readers and writers. It includes 16 embedded, skill-based literacy games and a virtual library with more than 300 books. Players browse and read books; meet characters from literature; practice syntax, vocabulary, morphology and spelling skills; and create their own interactive stories. Lexica has enough hours of play to span the entire school year, and also motivates students to persist in these literacy activities even after they are finished with it. Lexica's design principles are based on years of research and study by psychologists and literacy specialists, and aligns with current educational standards that emphasize more reading and writing, greater rigor in those experiences, and more time on task with ELA skills.

Engagement and persistence

Lexica is built to encourage and enable students to read books over a prolonged period, both in school and out. As such, it must be sufficiently engaging for students to voluntarily play and persist. The research on how to engage and how to encourage persistence is essential to the design of games that students actually want to play. In "Self Determination Theory," psychologists Deci and Ryan identify activities that satisfy individual needs for autonomy, competence and connectedness (Deci & Ryan 1985). By meeting these needs, these activities promote persistent engagement. When engaged in a favorite activity, students may enter a state of flow, the unselfconscious involvement in an activity during which nothing else seems to matter and a sense of time is lost (Csikszentmihalyi 1997). Research shows that teenagers experience flow 44 percent of the time they are involved in sports or games, and that people experience more flow when they are reading books than when they are watching television (Csikszentmihalyi 1997). Games contribute to a state of flow by encouraging the use of a set of skills to overcome a challenge. Players then move onto learning new skills and facing new challenges. Combining conditions that contribute to flow and self-determination promotes persistence, a critical skill for learning.

Important to understanding why games that foster persistence contribute to learning is the work of psychologists studying skills associated with intelligence. The studies reveal that there

is a distinction between “being smart” and “getting smart” (Resnick 1999) and that intelligence is not fixed. Many people believe that one is smart or not and that performance simply reflects intelligence. In fact, intelligence is something that grows with time and effort. In her “Mindset” work, Carol Dweck, a Stanford psychologist, explains how people with a growth mindset develop their basic talents and abilities through dedication and hard work (2006). Dweck’s research examines how teachers and other facilitators of learning can focus on improving skills and abilities rather than examining if an individual is “smart.” Dweck’s research findings show that the key to improving abilities is persistence. The Lexica game world is designed to make competency with words and reading the vehicle of success and proficiency the reward of persistence.

More reading makes better readers

“Practice makes perfect” is a truism preached by parents, coaches and teachers. Elite athletes and musicians demonstrate its value in creating top performers (Ericsson & Lehmann 1996). In fields as diverse as medicine, writing and computer software design, researchers repeatedly document the necessity of deliberate practice for mastery and excellence (Norman et al. 2006; Kellogg 2006; Sonnentag, Niessen & Volmer 2006).

Research on reading also indicates that practice is key to reading success. Defined here as the ability to understand written text, reading comprehension is dependent on other skills such as depth of vocabulary (Kuhn & Stahl 2003; Biemiller 2009) and fluency (the ability to automatically identify words, accurate decoding of words and rapid reading), a skill that even in high school can limit reading comprehension (Rasinski et al. 2005). In an effort to gauge growth in student reading ability, researchers use these factors to measure reading success. Over and over, they document that more reading leads to better reading comprehension, increased vocabulary and greater fluency (Anderson, Wilson & Fielding 1988; Therrien 2004; Alber-Morgan et al. 2007; O’Connor, White & Swanson 2007; Shany & Biemiller 2010). In fact, for decades educators have been advocating for more time reading to achieve reading success (Allington 1977; Levine 1984; Moser & Morrison 1998; Cunningham 2005). Students who read a wide range of texts increase reading comprehension, fluency and vocabulary (O’Connor et al. 2007; Shany & Biemiller 2010; Ari 2009; Kuhn 2005; Homan et al. 1993). Furthermore, simply making a wide range of texts easily available to students during school time is an effective way to improve reading comprehension (Guthrie & Humenick 2004). Taken together with research that documents a strong relationship between the amount of time students read outside of school and growth in reading ability over time (Anderson et al. 1988) and research that shows

improved reading achievement from home summer reading programs (Kim & Quinn 2013), the value in developing an approach to motivate students to read on their own time is clear.

Lexica is Amplify's approach for motivating kids to voluntarily read more, both in school and out. Situated in a virtual library with hundreds of age-appropriate titles, Lexica aims to drive players to browse and read narrative and informational texts. It seeks to engage players through stories and by providing opportunities to interact with characters from great works of literature. Players are encouraged to continue the story by reading the source books in the virtual library. Specific texts are linked directly to the game, making it easy for players to jump immediately into reading after a play session. Players also create content to shape the Lexica world, further encouraging deep engagement with texts. A major goal of Lexica is to make reading fun and relevant in order for kids to read more. More reading should lead to better readers with greater reading comprehension and vocabulary skills.

Skill building through a virtual world

Reading texts of age-appropriate complexity is central to the ELA Common Core State Standards. In order to engage students in challenging reading and build fluency, it is essential to broaden vocabulary, understand how words are constructed, and study syntax. The following sections explore the research behind developing ELA games focused on these skills, because practice with these skills leads to greater reading comprehension and enhances the fluency necessary to prevent persistent reading comprehension problems (Hirsh 2003; Liben & Liben 2012). Most significantly, practice with vocabulary in the context of reading combined with understanding sentence formation and word structure make better readers.

Vocabulary, morphology and spelling

Understanding the meaning of words is a necessity for becoming a good reader (Biemiller 2009). Students with small vocabularies tend to avoid reading and, hence, in the long run remain poor readers (Cunningham & Stanovich 1997; Storch & Whitehurst 2002). Therefore, enhancing vocabulary is a requirement for reading success. Activities designed to promote this vocabulary acquisition have been shown to improve reading ability (Mezynski 1983; Stahl & Fairbanks 1986). To better understand the types of words students need to know when reading, Beck, McKeown, and Kucan (2013) classify words into three categories: Tier 1

words are used in everyday spoken language that are also found in written text. Tier 2 words are commonly found in written text, but are not generally spoken. Tier 3 words are important for understanding specific informational content, but are not found in a broad range of texts. All of these word categories are important for reading comprehension, for if students do not understand any of these words, they will not be able to understand the reading passages that contain them (Hirsch 1987). Yet, Tier 2 words are the most important targets for learning, since these are the words students are most likely to encounter and with which, simultaneously, they may be unfamiliar (Beck et al. 2013). Importantly, to truly learn these new words, students must experience them in context and multiple times (Stahl 2005; Butler et al. 2010).

Lexica uses research-based strategies to support vocabulary development. For example, embedded in its word-meaning game, The Tomes, are words identified as high-priority Tier 2 words. These words are unfamiliar to approximately 20 to 60 percent of sixth-graders, but are also considered to be important to reading comprehension (Biemiller 2009). The Tomes also includes an additional set of more difficult words that are important for text comprehension in middle school and high school (Biemiller 2009). Meanings of these words are then explored multiple times in context, and importantly, students perform activities that require them to think about word meaning (Liben 2005). These activities, taken together with morphology and spelling games, aim to build student understanding of words. This, in turn, should contribute to greater student reading comprehension.

Morphology refers to the study of the structure of words, particularly the smallest units of meaning in words called “morphemes.” Research shows that understanding the structure of words is a very powerful tool for learning vocabulary in the context of a text (Keiffer & Leseaux 2007; Verhoeven & Perfetti 2011). Understanding of morphology is correlated with rich vocabulary inventories, which can grow by increasing spelling awareness. Spelling is what allows students to see morpheme patterns, since the patterns are only apparent when words are properly spelled. Understanding these morpheme patterns allows students to build meaning from new words, a critical component to expanding their vocabulary (Prince 2014).

In teaching about word morphology, the suggested instructional tasks are distinct components of explicit vocabulary instruction. Instruction should emphasize the relationships among words based on their shared roots, prefixes, or suffixes (Beck et al. 2013). This is referred to as “word consciousness” (Graves 2006). Determining the meaning of words in context by examining their parts enhances comprehension.

Lexica and its suite of embedded games provide many opportunities for the development of vocabulary and spelling skills. For example, in The Tomes, users tap on unfamiliar words

to learn their definitions in the context of the story. Spell Tracer invites students to create words by connecting their various parts, which contributes to vocabulary building, reading comprehension and accurate spelling. In W.E.L.D.E.R. Edu, players, assisted by a game dictionary, build spelling and vocabulary skills by moving letters around a virtual game board. Morphology games like Ink Blott: Underground aim for students to recognize morphemes that aid in the development of new vocabulary.

Grammar and syntax

A meta-analysis of determinants of text complexity found that syntax along with vocabulary are the most important features in determining the difficulty of a complex text (Nelson et al. 2011). This finding is significant since both vocabulary and syntax skills are not regularly taught in routine reading instruction. Syntax refers to the arrangement of words in a sentence and the study of the rules that govern the formation of a proper sentence. It includes the study of forming phrases from words and organizing these phrases into grammatically correct sentences. Scott's 2009 study shows that sentence comprehension is pivotal to successful reading. Understanding what makes sentences complex, for example, the extent to which they contain more than one clause helps students make meaning of expository texts in content subjects. Informational sentences written by adults are on average longer and more complex than narrative sentences. Because the syntax of complex sentences poses challenges to reading comprehension, practice with sentence construction and deconstruction — simpler to complex and vice versa — is an important skill for both reading text and writing about it (Scott 2009).

Researchers recognize the association between understanding syntax and reading comprehension; however, syntax-as-knowledge is hard to isolate from syntax-as-process (Scott 2004). For this reason, there are many types of syntax exercises that challenge readers to explore the grammatical construction of simple and more complex sentences and/or the agreement of subject and verb in a sentence. The goal is to develop syntactic knowledge and awareness and no single type of syntax ability is shown to contribute to reading comprehension (Scott 2009). It is a “both and” scenario that requires different sentence tasks to develop a wide range of syntactic abilities.

Doing these syntax exercises as isolated drills, devoid of a content context, is less useful than embedding the study of sentence structure into the study of the text (Scott 2009). Teaching sentence construction skills contributes to better writing as it contributes to reading

comprehension. *Writing to Read*, a Carnegie Corporation Study (Graham & Hebert 2010), provides evidence that writing is a powerful vehicle for improving reading, specifically asking students to write about a text they are reading.

Lexica addresses syntax exercises in multiple ways, using the game world as the overarching context and embedding micro games that address specific skills. Mukashi Mukashi is a syntax game in which players create their own stories by choosing words that syntactically and semantically fit together to make meaningful sentences. Page Invaders invites students to race against time to form more and more complex sentences before cute but menacing “worms” invade the page. Sentence Sensibility encourages students to use a variety of complex sentence structures. Students are rewarded for correct grammar as they construct funny, sometimes silly, sentences. These games have the potential to nurture the development of an intuitive sense of syntax, or syntax-as-process (Scott 2009).

The World of Lexica

Lexica’s attention to reading, vocabulary, syntax, spelling, word morphology and meaning in context aims to make better readers, ones that are capable of understanding both nonfiction and fictional texts, key competencies of the Common Core goals for college and career readiness (Liben & Liben 2012; Hirsch 2003; Stahl 2005). Importantly, Lexica is intended to extend learning in and out of school. Built to engage, it promotes a state of flow by addressing students’ needs for autonomy, competence and connectedness. The goal is for the user to experience the joy of advancing through the game world, gaining greater status and mastery

within the game. Hence Lexica's game design seeks to make working hard on these skills inviting and intrinsically rewarding.

References

- Alber-Morgan, S. R., Ramp, E. M., Anderson, L. L., & Martin, C. M. (2007). Effects of repeated readings, error correction, and performance feedback on the fluency and comprehension of middle school students with behavior problems. *The Journal of Special Education, 41*(1), 17-30.
- Allington, R. L. (1977). If they don't read much, how they ever gonna get good. *Journal of Reading, 21*(1), 57-61. Anderson, R.C., Wilson, P.T. & Fielding, L. (1988). Growth in reading and how children spend their time outside of school. *Reading Research Quarterly 23*, 285–303.
- Ari, O. (2009). Effects of wide reading vs. repeated readings on struggling college readers' comprehension monitoring skills. Middle-Secondary Education and Instructional Technology Dissertations, Georgia State University.
- Beck, I. L., McKeown, M. G., & Kucan, L. (2013). *Bringing words to life: Robust vocabulary instruction*. New York: Guilford Press.
- Biemiller, A. (2009). *Words worth teaching: Closing the vocabulary gap*. Columbus, OH: McGraw-Hill SRA.
- Butler, S., Urrutia, K., Buenger, A., Gonzalez, N., Hunt, M., & Eisenhart, C. (2010). A Research Synthesis: A review of the current research on vocabulary instruction national reading technical assistance center, RMC Research Corporation Available from: <http://www2.ed.gov/programs/readingfirst/support/rmcfinal1.pdf>
- Csikszentmihalyi, M. (1997). Finding flow. Psychology Today. Available from: <http://www.psychologytoday.com/articles/199707/finding-flow>
- Cunningham, P. (2005). If they don't read much, how they ever gonna get good? *The Reading Teacher, 59*(1), 88-90.
- Cunningham, A. E., & Stanovich, K. E. (1997). Early reading acquisition and its relation to reading experience and ability 10 years later. *Developmental Psychology, 33*, 934-945.
- Deci, E. & Ryan, R. (1985). *Intrinsic motivation and self-determination in human behavior*. New York: Plenum Dweck, C. (2006). *Mindset: The new psychology of success*. New York: Random House LLC.
- Ericsson, K.A., & Lehmann, A.C. (1996). Expert and exceptional performance: Evidence of maximal adaptation to task constraints. *Annu. Rev. Psychol. 47*, 273–305
- Graham, S., & Hebert, M. (2010). *Writing to read: Evidence for how writing can improve reading: A report from Carnegie Corporation of New York*. Carnegie Corporation of New York.

- Graves, M. F. (2006). *The vocabulary book: Learning & instruction*. New York: Teachers College Press.
- Guthrie, J. T., & Humenick, N. M. (2004). Motivating students to read: Evidence for classroom practices that increase motivation and achievement. In P. McCardle and V. Chabra (Eds.), *The voice of evidence in reading research*. Baltimore, MD: Paul Brookes.
- Hirsch, E. D. (1987). *Cultural literacy: What every American should know*. Boston, MA: Houghton Mifflin.
- Hirsch Jr, E. D. (2003). Reading comprehension requires knowledge—of words and the world. *American Educator*, 27(1), 10-13.
- Homan, S. P., Klesius, J. P., & Hite, C. (1993). Effects of repeated readings and nonrepetitive strategies on students' fluency and comprehension. *The Journal of Educational Research*, 87(2), 94-99.
- Kellogg, R. T. (2006). Professional writing expertise. In K.A. Ericsson, N. Charness, P.J. Feltovich & R.R. Hoffmann (Eds.), *The Cambridge handbook of expertise and expert performance*, (pp. 389-402). Cambridge: Cambridge University Press.
- Kieffer, M. J., & Lesaux, N. K. (2007). Breaking down words to build meaning: Morphology, vocabulary, and reading comprehension in the urban classroom. *The reading teacher*, 61(2), 134-144.
- Kim, J. S., & Quinn, D. M. (2013). The effects of summer reading on low-income children's literacy achievement from kindergarten to grade 8 a metaanalysis of classroom and home interventions. *Review of Educational Research*, 83(3), 386-431.
- Kuhn, M., & Stahl, S. (2003). Fluency: A review of developmental and remedial practices. *Educational Psychology*, 95, 3–21.
- Liben, D. M., & Liben, M. (2004). Our journey to reading success. *Educational Leadership*, 61(6), 58-61.
- Liben, D. (2005). Learning to read in order to learn: Building a program for upper-elementary students. *Phi Delta Kappan*, 86(5), 401-406.
- Liben, D. & Liben, M. (2012). The Common Core Standards: Starting now. *Educational Leadership* 70 (4). Retrieved from <http://www.ascd.org/publications/educationalleadership/dec12/vol70/num04/The-Common-Core-Standards@-Starting-Now.aspx>
- Mezynski, K. (1983). Issues concerning the acquisition of knowledge: Effects of 9 vocabulary training on reading comprehension. *Review of Educational Research*, 53, 253-279.
- Moser, G. P., & Morrison, T. G. (1998). Increasing students' achievement and interest in reading. *Reading Horizons*, 38(4), 1.

- Nelson, J., Perfetti, C., Liben, D., & Liben, M. (2011). Measures of text difficulty: Testing their predictive value for grade levels and student performance. Technical Report to the Gates Foundation. Retrieved from http://www.achievethecore.org/downloads/E0201_Measures_of_Text_Difficulty.pdf
- Norman, G., Eva, K., Brooks, L., & Hamstra, S. (2006). Expertise in medicine and surgery In K.A. Ericsson, N. Charness, P.J. Feltovich & R.R. Hoffmann (Eds.), *The Cambridge handbook of expertise and expert performance*, (pp. 339-353). Cambridge: Cambridge University Press.
- O'Connor, O. E., White, A., & Swanson, H.L. (2007). Repeated reading versus continuous reading: Influences on reading fluency and comprehension. *Exceptional Children*, 74(1), 31-46.
- Prince, R.E. (2014) Morphological analysis: New light on a vital reading skill. Retrieved from: <http://www.uknow.gse.harvard.edu/teaching/TC102-407.html>
- Rasinski, T. V., Padak, N. D., McKeon, C. A., Wilfong, L. G., Friedauer, J. A., & Heim, P. (2005). Is reading fluency a key for successful high school reading? *Journal of Adolescent & Adult Literacy*, 49(1), 22-27.
- Resnick, L. B. (1999). Making America smarter. *Education Week Century Series*, 18(40), 38-40.
- Ryan, R. & Deci, E. (2000). Intrinsic and extrinsic motivations: Classic definitions and new directions. *Contemporary Educational Psychology*, 25(1), 54-67.
- Scott, C.M. (2004). Syntactic contributions to literacy. In A. Stone, K. Apel, & E. Silliman (Eds.), *Handbook of language and literacy: Development and disorders* (pp. 340–362). Guilford Press.
- Scott, C. M. (2009). A case for the sentence in reading comprehension. *Language, Speech, and Hearing Services in Schools*, 40(2), 184-191.
- Shany, M., & Biemiller, A. (2010). Individual differences in reading comprehension gains from assisted reading practice: pre existing conditions, vocabulary acquisition, and amounts of practice. *Reading and Writing*, 23(9), 1071-1083.
- Sonnentag, S., Niessen, C., & Volmer, J. (2006). Expertise in Software Design. In K.A. Ericsson, N. Charness, P.J. Feltovich & R.R. Hoffmann (Eds.), *Cambridge handbook of expertise and expert performance*, (pp. 373- 387). Cambridge: Cambridge University Press.
- Stahl, S., & Fairbanks, M. (1986). The effects of vocabulary instruction: A modelbased meta-analysis. *Review of Educational Research*, 56, 72-110.
- Stahl, S. (2005). Four problems with teaching word meanings (and what to do to make vocabulary an integral part of instruction). In E. H. Hiebert & M. L. Kamil (Eds.), *Teaching and learning vocabulary: Bringing research to practice* (pp. 95–114). Mahwah, NJ: Lawrence Erlbaum.

- Storch, S. A. & Whitehurst, G. J. (2002). Oral language and code-related precursors to reading: Evidence from a longitudinal structural model. *Developmental Psychology*, 38, 934-947.
- Therrien, W. J. (2004). Fluency and comprehension gains as a result of repeated reading a meta-analysis. *Remedial and special education*, 25(4), 252-261.
- Verhoeven, L., & Perfetti, C. A. (2011). Morphological processing in reading acquisition: A cross-linguistic perspective. *Applied Psycholinguistics*, 32(03), 457-466.



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