RESEARCH WHITE PAPERS

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By Jonathan A. Bower

Family Learning

Human beings are social learners. In a meta-analysis of studies investigating instructional practices that enhanced motivation for, and engagement in, reading, Guthrie and Humenick identified "opportunities to collaborate with other students in discussion and assignment groups to achieve their learning goals.[1]" In her seminal three-year study of learning in families, Denny Taylor concluded that children are motivated to learn to read to participate in their family unit, not to access knowledge in the wider world.[2]

Family learning is an approach to intergenerational learning. It acknowledges the family and its culture as the foundation of learning for the child. Family literacy recognizes the parent as the child's first teacher. According to Ruth Nickse's early descriptions of family literacy programs, intergenerational and family programs retain adult students longer, enhancing adult outcomes.[3] And of course, parental literacy predicts the literacy achievement of their children.

Family learning is powerful. For example, children who participated in the High/Scope family learning program at ages 4 – 8 grew up to have fewer criminal arrests, higher earnings, more accumulated wealth and stronger marriages than those who didn't.[4]

The motivation to attend family literacy programs is high, as participants come to these programs to improve life for their families, not solely themselves. Adult participants want to increase their educational levels and learn job skills, but they also want to be more effective parents.[5] There is also a synergy that exists in family literacy programs that is not found in programs that work with children or adults separately.[6]

The research shows a wide range of measured benefits for children participating in family learning programs[7]:
- Achievement in school improves
- General knowledge, including that measured by intelligence tests, improves
- Oral language development accelerates
- Phonemic awareness and decoding ability improves
- Reading vocabulary improves
- Comprehension improves.
- Writing improves
- Math and science achievement improve
- Social skills, self-esteem, and attitudes toward school improve
- Children are healthier
- Motivation to read increases

Measured benefits for parents in family learning programs:
- Persist in family literacy programs longer than in other adult literacy programs
- Attitudes about education improve
- Reading achievement increases.
- Writing ability improves
- Math and science knowledge increases.
- Knowledge about parenting options and child development increases
- Social awareness and self-advocacy increases
- Parents enhance their employment status or job satisfaction
- Parents and other family members become more involved in schools.

Measured benefits for families from family learning programs:
- Families become emotionally closer which creates a more supportive home environment
- Families read more and engage in more literate behaviors at home

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[1] Guthrie, JT, Motivating students to read: Evidence for classroom practices that increase reading motivation and achievement. NM Humenick, *The voice of evidence in reading research*, 2004

[2] Taylor, D., Family literacy : young children learning to read and write. Heinemann, Portsmouth, NH ©1998.

[3] Nickse, Ruth S., Family Literacy Programs: Ideas for Action. *Adult Literacy*, Volume: 1 issue: 5, page(s): 9-28, February 1, 1990.

[4] William Raspberry, *The Denver Post*, July 25, 1993

[5] Anderson, Jean E., Families Learning Together in Colorado: A Report on Family Literacy. Colorado State Office of Adult Education, 1994.

[6] Ibid.

[7] Padak, N & Rasinski, T, Family Literacy Programs: Who Benefits? Ohio Literacy Resource Center, Kent State Univ., 2003.

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Developing the 6 Components of Literacy

Twenty-five years ago, the U.S. government commissioned a project to definitively recommend the best approach to teaching literacy. Only one third of the students in American schools were learning to read proficiently, and their lack of literacy was preventing their further education. In 1998, the U.S. National Research Council released *Preventing Reading Difficulties in Young Children*[8] defining instructional solutions to the problem. In 2000, the *Report of the National Reading Panel*[9] was published describing which methods of teaching reading are proven to work by rigorous scientific studies. Both reports concluded that while reading as much as possible, students should be explicitly taught skills in six areas:

1. **Phonemic Awareness** – an understanding of the sounds in their language and how they form words,
2. **Decoding** – the ability to figure out unfamiliar words, and to learn to read them automatically,
3. **Vocabulary** – knowledge of an adequate number of words to understand text passages,
4. **Fluency** – the ability to read quickly and without conscious attention,
5. **Comprehension** – the ability to understand the direct meaning of text, and also its implications and intention, and finally the ability to perform analysis on text and
6. **Writing** – the ability to express their feelings, thoughts and understanding in various forms of written expression.

Ideally, learners should master phonemic awareness by the end of Kindergarten and decoding by the end of 3rd grade[10] while actually reading for pleasure and for knowledge. Then, learners read material of interest to them[11] while being taught to improve their vocabulary, fluency and comprehension abilities until they can easily read, understand and analyze any text. From the time they can hold a pencil, students also learn to share their perspectives, understanding and ideas in writing.

This approach stands in contrast with "whole language" approaches to reading instruction which exclusively emphasize the reading of important content and focus on using context clues to discern the meaning of text. This approach has been thoroughly debunked by data showing that explicit instruction in phonics combined with text-based language activities (reading) generates significantly faster progress in reading than the whole language approach[12].

Unfortunately today, it is still true that only 36% of students in American schools ever become proficient readers by the time they enter high school[13]. The vast majority lack adequate phonemic awareness and decoding skills, which prevents them from mastering higher level reading skills[14]. Few continue to build their reading vocabularies so that they can take on more complex, interesting text. They do not become fluent readers, and they do not learn to fully comprehend text so that they can write about it.

The solution is clear: provide developing readers of all ages with explicit instruction and plenty of practice in the six components of literacy while providing access to interesting content, until they have become proficient readers and writers. High quality literacy software provides the practice to complement teacher instruction so that students learn to mastery.

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[8] Snow, C.E., Burns, M.S., and Griffin, P. (Eds.). (1998). *Preventing reading difficulties in young children*. Washington, D.C.: National Academy Press.

[9] National Institute of Child Health and Human Development. (2000), Washington, D.C.

[10] Joseph K. Torgesen. (2005) *Preventing Early Reading Failure*.

[11] Torgesen, J. K., Houston, D. D., Rissman, L. M., Decker, S. M., Roberts, G., Vaughn, S., Wexler, J. Francis, D. J, Rivera, M. O., Lesaux, N. (2007). Academic literacy instruction for adolescents: A guidance document from the Center on Instruction. Portsmouth, NH: RMC Research Corporation, Center on Instruction.

[12] Camilli, G., Vargas, S., and Yurecko, M. (May 8, 2003). *Teaching Children to Read*: The fragile link between science and federal education policy. *Education Policy Analysis Archives, 11*(15).

[13] National Center for Education Statistics. (2013). *2013 Reading Assessment Report Card*.

[14] Joseph K. Torgesen. (2005) *Preventing Early Reading Failure*.

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Personalizing Learning with Student Choice vs. Algorithms

In general, the large amount of research on the subject of student agency shows that "the degree to which students learn how to control their own learning … is highly related to outcomes. "[15] Furthermore, for computer-aided instruction, "when the student is in 'control' over his or her learning … then the effects were greater than when the teacher was in 'control' over these dimensions of learning. "[16] Students who feel that they are in control of their learning are more highly motivated to do the often difficult work of acquiring a new skill like reading. Studies by Kanevsky & Keighley about student engagement show that, "five interdependent features … distinguished boring from [engaging] learning experiences: control, choice, challenge, complexity and caring teachers. The extent to which these five C's were present determined the extent of students' engagement and productivity. "[17]

Student-controlled software gives students control through choice. Students choose their own challenges across a range of complexity; for example, in reading, evolving from simple alphabet activities to the application of complex analysis to text. The key item that software cannot provide is a caring teacher. That's where peer learning comes in[18]: students can share a screen with peers, who usually care about their co-learners, and with caring parents who certainly do. In this way, student-controlled software provides truly engaging and effective learning experiences.

And what about algorithms? Computer-assisted instruction is one of the many interventions studied by researcher John Hattie who found that:
- normal mental development and exposure to a teacher for a year generates an average learning gain of 0.37[19], while
- the use of computer-assisted instruction also shows a gain of exactly 0.37 per year.

Students who use algorithmically-controlled software see no benefit above students who don't!

We shouldn't be surprised. The algorithms used are rarely sophisticated enough to account for the different learning pathways of real students. As Richard Culatta says, "a model where a student is simply clicking through digital content at their own pace does not meet the criteria for personalized learning."[20] Even "Individualized Instruction" programs based on student-response algorithms do not provide a truly personalized learning experience, and as shown by Hattie's analysis if the research, do not contribute in a meaningful way to learning.

The Family Learning Company implements all of this best practice research by giving students choice over their own learning in order to maximize learning outcomes. Our products are student-controlled. This means that students choose not only when and where they use them, but also, what learning activities they perform – without limitations. They are free to choose any level, any activity, and to repeat activities as they wish/need. They use information about their performance on each activity, and about what they need to accomplish to decide whether to repeat it, to move on to a more difficult one, or to do something else entirely. The result is both long-term engagement and accelerated learning.

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[15] Hattie, John. *Visible Learning: a Synthesis of Meta-Analyses Relating to Achievement*, 2009, P. 48.

[16] Ibid. P. 225.

[17] Lannie Kanevsky & Tacey Keighley. *To produce or not to produce? Understanding boredom and the honor in underachievement*, Roeper Review, Volume 26, 2003 - Issue 1, P. 20-28

[18] *See Peer Learning is Better than 1-1 Computing* by Jonathan Bower

[19] That is, an effect size of 0.37 from the school experience over one year. Effect sizes ranged from -0.3 to 1.44.

[20] Tweet: Richard Culatta,CEO, International Society for Technology in Education

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Promoting English Learners' Literacy Development in English

English Learners (ELs) each bring their own, varied cultural and linguistic literacy development experiences to literacy acquisition in English. As explained in the 2006 report *Developing Literacy in Second-Language Learners*[21], ELs take a more unique route than their English-speaking peers to developing literacy in English, even though their reading instruction comprises the same research-based components: phonemic awareness, phonics/decoding, fluency, vocabulary, and text comprehension along with writing skills development. Successful literacy instruction for ELs results when ELs build upon their prior knowledge, capitalize on opportunities for cross-linguistic transfer, and receive academic language and literacy instruction that is comprehensible.

Building on ELs' existing phonological awareness to develop phonemic awareness is equally important to their literacy development as it is for native English-speaking students. It is essential, however, to recognize that the ELs' development of phonemic awareness is largely influenced by their native language proficiency and their phonemic awareness of the sounds in their native language.[22] Given the interactive nature of the components of literacy, ELs benefit most when all six skills are taken into consideration simultaneously, rather than learning them in isolation. For example, Helman discussed the importance of phonics in learning to read and also recommended eight instructional guidelines to support ELs' acquisition of the written code: 1) work with students at their developmental level; 2) build on students' home language and literacy skills; 3) follow a systematic sequence of literacy instruction; 4) make phonics instruction clear and explicit; 5) use active learning strategies to teach and practice skills; 6) integrate vocabulary study into phonics instruction; 7) connect phonics instruction to meaningful texts; 8) check for understanding and use frequent informal assessments.[23]

The Family Learning Company implements these recommendations to offer ELs appropriate second language literacy learning opportunities in English with meaningful practice in all six skill areas by providing:
- Explicit phonics practice in Spanish and English using a language-specific scope and sequence for each language to ensure complete mastery of phonemic awareness and decoding skills,
- Explicit vocabulary development built on a curated list of over 1,200 high frequency vocabulary words essential for developing social and academic literacy, and on eBook-connected word lists.
- 100-350 (depending on age) grade-leveled eBooks in both Spanish and English with audio support for guided reading practice, tools to measure fluency, and activities supporting the development of reading comprehension via the framework *Strategies That Work*[24]: making connections, visualizing, inferring, determining importance, and synthesizing, and
- Structured opportunities to write that provide a scaffold from mechanics activities to free writing.

Daniel and Cowan[25] discussed the many language learning benefits of technology as an instructional tool for ELs. Among those benefits, the Family Learning Company offers ELs software-based practice that includes: the opportunity for ELs to interact with their second language numerous times while developing control over a text through the processing of auditory and visual input; and, regular opportunities for oral language development in the form of collaboration with peers on interactive tasks that are meaningful and result in language learning. In these many ways, The Family learning Company promotes both reading comprehension and writing skills for ELs.

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[21] August, D., & Shanahan, T. (Eds.). (2006). *Developing literacy in second-language learners: Report of the national literacy panel on language-minority children and youth*. Mahwah, NJ: Lawrence Erlbaum.

[22] Herrera, S.G., Perez, D.R., & Escamilla, K. (2010). *Teaching reading to English language learners: Differentiated literacies.* Boston: Allyn & Bacon.

[23] Helman, L. (2016). *Literacy development with English learners: Research-based instruction in grades K-6* (2nd ed.) p.179. New York: The Guildford Press.

[24] Harvey, S., & Goudvis, A. (2000). *Strategies that work: Teaching comprehension to enhance understanding.* York, ME: Stenhouse.

[25] Daniel, M. C., & Cowan, J. E. (2012). Exploring teachers' use of technology in classrooms of bilingual students. *GIST Education and Learning Research Journal, 6,* 97-110.

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Accelerating Vocabulary Development with Software

According to Baumann, Kame'enui, & Ash, students' vocabulary knowledge correlates strongly to their reading comprehension and overall academic success[26]. Robert Marzano's research has shown that direct vocabulary instruction on words related to content that will be on a test increases performance on that test from the 50th percentile to the 83rd.[27] However, Horst, Cobb & Meara found that a minimum of 8-12 exposures must occur for retention with normal students of any new concept or word[28]. Although teaching can make a real difference in vocabulary learning, the explicit teaching of vocabulary is not enough: a dedicated teacher can only teach 300-400 words per year[29]. The solution to providing enough exposures to new words to master a complete academic vocabulary is comprehensive, well-designed software.

Content Sources

The vocabulary content for Family Learning Company software for Grades K-2 is based on high frequency words for those grade levels. The vocabulary list includes all of the words in three standard lists of high frequency words: Dolch, Fry 1,000 and EDL. Vocabulary content for Grade 3 and above is drawn from standard spelling and vocabulary approaches for each grade range, focusing more on vocabulary in provided eBooks as we move to middle, high school and adult learners.

Pedagogy

Oral vocabulary words for Pre-K and K are organized by subject to support content knowledge development. From Kindergarten up, reading vocabulary words are organized into wordlists containing from six words (for Kindergarten students) to 10-20 words (for third grade students and above). Since high frequency words do not follow any content-related pattern, we organize them alphabetically and do the same with Grade 3 words for the sake of consistency. In higher grade levels, eBook-based lists are linked to each reading, introducing vocabulary just when it will be used.

For each wordlist, students are provided with a choice of 5-12 different learning activities starting with simple image matching at the Kindergarten level, and increasing in sophistication and difficulty as the levels rise. Each activity provides students with different practice with the words in the lists. The goal is for learners to select the activities that work best for them, until they have demonstrated mastery.

Family Learning Company software therefore delivers all of Robert Marzano's six steps for vocabulary development[30]:

1. On the computer, students see and hear words in context and with definitions,
2. Students select the definitions for words and use them in context,
3. Students identify pictures of words when that is possible,
4. Students extend their knowledge of the word through spelling activities,
5. Students are constantly encouraged to discuss word meaning during the activities, and
6. Students play multiple games using the words they are learning for additional exposures.

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[26] Baumann, J., Kame'enui, E., & Ash, G. (2003). Research on vocabulary instruction: Voltaire redux. J. Flood, D. Lapp, J. Squire, & J. Jensen (Eds.), *Handbook of research on teaching the English language arts* (2nd ed., pp. 752-785). Mahwah, NJ: Erlbaum.
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[28] Horst, M., Cobb, T., & Meara, P. (1998). Beyond A Clockwork Orange: Acquiring second language vocabulary through reading. *Reading in a Foreign Language*, *11*, 207–223.
[29] Beck, I. L., & McKeown, M. G. (2007). Different ways for different goals, but keep your eye on the higher verbal goals. In R. K. Wagner, A. E. Muse, & K. R. Tannenbaum (Eds.), *Vocabulary acquisition: Implications for reading comprehension* (pp. 182–204). New York: Guilford.
[30] Op. Cit. Marzano (2004)

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Entertainment vs. Education

Americans, and many others around the world, live in a highly stimulating entertainment environment. Television, video games, phone apps and a myriad of web sites offer highly engaging entertainment experiences at any time, in just about any place. In order to compete for attention, many educators and education software developers argue that learning experiences need to be given the style, pace and scoring systems of games, to be "gamified," in order to engage learners and provide effective learning experiences. Yet, research contradicts their assumption.

Humans are natural learners. The brain secretes Dopamine in its reward centers in response to a successful learning experience demonstrated by performance[31]. First graders successfully reading new words and golfers who learn to hit straighter down the fairway both experience real pleasure from their achievements. They do not need animated figures to congratulate them, rapid-fire editing to keep them involved or good scores to tell them they succeeded. Performing a learned skill generates the pleasure by itself.

Even more important to learning, the gamification of learning activities actually reduces learning; reducing the value and the pleasure that learners receive from their use. Research by Michelle Donnelly in 2006[32] found that students who heard stories read out loud were 2.5 times more likely to remember their content than students who experienced them in animated interactive applications. Writing about the study, Iain Thomson noted that "pupils who use interactive software cannot remember the stories they have just experienced because they are distracted by cartoons and sound effects."[33] Similarly, Hongpaisanwiwat and Lewis reported in 2003 that animated characters had zero or negative impact on recall depending on whether a human or animatronic voice was used[34]. Many other studies[35] have shown the same: the more multimedia effects are included in learning activities; the less learning takes place due to both time wasted and distraction from the learning task.

Effective instructional software implements this research by limiting animation to answers moving into position for selection by learners, and by limiting sound effects to direct positive and neutral (for errors) feedback. Students choose the backgrounds they prefer from complex themes or simple colors depending on their ability to concentrate and their propensity for boredom. Learners focus on the content; tracking their progress through reports. Teachers can also access these reports to provide additional feedback and direction to learners, but the primary value is in informing students directly[36]. That is probably the only area where gamification is appropriate for learning: more learning takes place when students receive direct feedback on their performance than if they receive it from a third party.

In sum, well designed educational software activities provide engagement through learning rather than through entertainment, effectively motivating students to succeed.

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[31] *The Compass of Pleasure: How Our Brains Make Fatty Foods, Orgasm, Exercise, Marijuana, Generosity, Vodka, Learning, and Gambling Feel So Good*. David J. Linden Penguin, Apr 14, 2011

[32] Education 3 to 13

[33] Iain Thomson, vnunet.com 10 Jan 2006

[34] *Attentional Effect of Animated Character. Human-computer Interaction*, INTERACT '03: IFIP TC13 International Conference. Cholyeun Hongpaisanwiwat & Michael Lewis (2003)

[35] Christensen & Gerber (1990), Boyce & Assad (1990), Tversky, Morrison & Betrancourt (2002), Rieber, Baylor, Ryu & Shen (2003), Large, Beheshti, Breuleux & Renaud (2003), De Jong & Bus (2004), Lowe, R.K. (2004), Sung-il Kim (2007)

[36] Hattie, John. *Visible Learning: a Synthesis of Meta-Analyses Relating to Achievement*, 2009, Pgs. 48 & 225

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# The Value of Family Engagement in Early Childhood Education

Family engagement is the apple pie of early childhood education: everybody is for it, but not many people experience it every day. If they did, it would light up their children's lives, and their own. It would deepen family relationships, deepen children's commitment to learning, increase adult's interest in improving their own literacy, and increase children's academic outcomes.

Unfortunately, family engagement in early childhood education is often confused with parental engagement in their children's education programs. Parents are invited to back-to-school night to meet their children's teachers, they may be given access to their children's gradebook, they are encouraged to communicate with their children's teachers, but they are not given a clear role in their children's learning.

Family engagement in education requires direct parental (grandparent, aunt, uncle, adult friend, etc.) involvement in the learning process itself. Young children are extremely sensitive to where their parents spend their time. If Mom invites her daughter or son to play catch or kick a soccer ball, then that sport rises in importance for her child. If Dad invites his son or daughter to play cards, then card shuffling and math skills rise in importance for his child. So, when it comes time to learn to read, should parents put their children in front of the TV to watch Sesame Street while they prepare dinner? Sure, if they need an electronic babysitter, but they shouldn't expect the experience to engage children in reading.

Learning to read is one of the hardest things that children ever do. In fact, only 1/3 of school children ever becomes proficient in reading (NAEP 2019). Unlike walking and talking, the brain is not pre-wired for reading. Areas of the brain optimized for other purposes have to be repurposed and connected through direct instruction and practice. While 10-20% of children do not need much instruction or structured practice, over 80% do, especially the 2/3 who are not becoming proficient today.
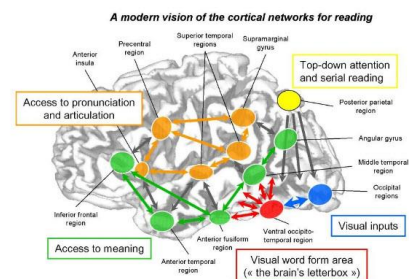
That's where parental engagement can have the biggest impact: in providing motivational support for the instruction and direct involvement in the practice that children need to master their early reading skills. It takes years to learn to read and write properly. Most children simply do not have the self-motivation to stick with the task in the face of attractive alternatives like TV and video games. When parents get involved, children follow.

Some family support is obvious. Parents should read to their children as often as possible, and then ask their children to read to them once they are able. Unfortunately, this is not easy for too many parents. **Approximately 75% of children who are behind in reading have functionally illiterate parents. These parents need early reading instruction tools to help them help their children.** Reading performance upon kindergarten entry is among the strongest predictors of long-term reading success. Providing tools to parents that they can use with their children is the most likely avenue to preparing kids to succeed.

There is a new category of tools to help parents help their children – **Family Learning Software**. This software is explicitly designed to bring children together with their parents for learning. Key features to look for include:

➢ Joint logins,

➢ Shared goal setting,

➢ Context-sensitive parent advice,

➢ Opportunities for children to make supervised decisions about their learning pathways,

➢ Appropriate learning tasks for both children and adults addressing the same skills,

➢ Plenty of time to discuss learning tasks, and

➢ Lots of formative feedback to children and their parents about their progress.

These elements provide scaffolding to build:

➢ Improved parent-child relationships,

➢ Learner agency,

➢ Better oral communications skills, and perhaps most important,

➢ Data-based decision-making skills, the top skills highlighted—along with reading and writing—by employers seeking qualified employees.

The same elements provide substantial benefits for parents:

➢ Improved confidence in their parenting,

➢ Information about their children's progress against benchmarks,

➢ Language to share their perspectives with their children's teachers, and

➢ Specific behaviors like open-ended question asking to help their children learn.

Parent participation in the use of family learning software is particularly important during the early childhood years. Not only do children see the importance that their parents place on learning to read and write, most four- and five-year-olds are simply not ready to manage interactive learning software on their own. While they may be able to watch a video or play a simple game, engaging in an interactive learning experience requires their parent's (grandparent's …) involvement.

However, the time commitment need not be burdensome. Family learning software can be effective in sessions of as little as five to ten minutes at a time. Furthermore, once children have used a given learning activity a few times with a parent, they will learn to use it on their own. Then, parents can encourage their child to try out new activities with their help as needed.

Finally, it is vitally important to distinguish between the shared use of family learning software and the excessive screen time that many young children experience. Psychologists at the Harvard Family Research Project found that the emerging research tell us that[37],

• Effective uses of technology and media are active, hands-on, engaging, and empowering for children;

• Carefully monitored screen time experience with quality content can benefit children over age 3, but excessive screen time harms healthy growth and development, regardless of content;

• Young children may benefit from computer use if appropriate software is selected;

• Children can learn through joint media engagement with parents, grandparents, siblings, and peers;

• Parents are more likely to consider the educational benefits of technology for their children than to consider the downsides.

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[37] Harvard Family Research Project, **Research Spotlight: Families and Digital Media in Young Children's Learning**, February 2014.

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Formative vs. Summative Assessment

When most people think about assessment, they think about tests: medium stakes tests that measure learning at the end of a course module or the end of a course, or high stakes tests at the end of a schooling experience. While these tests provide valuable information about whether learning has taken place, they do not provide much information to students or teachers about why, and none about how to achieve mastery of the target skill or content.

Formative assessment provides the data that learners and teachers need. Formative assessment is a not a test; rather, it is a conversation between learners and teachers (including peers) about learning goals and what it will take to achieve them. It comes in the form of formative feedback from learners to each other, from teachers to learners and from learners to their teachers as they go through the learning process together. According to John Hattie, "the most powerful single moderator that enhances achievement is feedback."[38] In their review of 196 studies describing nearly 7,000 effects on learning, Hattie and Timperley reported that formative feedback had an average effect size of 0.79 – an effect greater than student prior cognitive ability, socioeconomic background, and reduced class size[39].

Note that learners and teachers are grouped together when we discuss formative assessment. Rather than having teachers test students, in formative assessment they work together to achieve an understanding of where they are in the learning process, where they need to go to achieve their mutual goal, and what needs to be done next to move forward. For larger goals, students present evidence of their mastery to their teachers, accumulating small points of data into a complete story.

While it is possible to use test results as the basis of formative feedback, there are plenty of other forms of data that can be used such as: written feedback on papers, audience feedback about presentations and performances, and, the feedback provided by software to learners. In fact, instructional support software is the ultimate source of formative feedback because it provides endless real-time feedback at exactly the moment of learning. As Hattie says, "The simplest prescription for improving education must be 'dollops of feedback' -- providing information how and why the child understands and misunderstands, and what directions the student must take to improve."[40] "Feedback designed to improve learning is more effective when it is focused on the task, and provides the learner with suggestions, hints, or cues, rather than offered in the form of praise or comments about performance."[41] Well-designed educational software provides just such hints and cues, while leaving it up to the learner to complete every task.

As we have discussed in the paper, *Entertainment vs. Education*, frequently viewing formal reports about their progress toward learning goals is also highly motivating to students. They receive acknowledgement of their achievements of mastery, feedback on their progress toward their goals, and an understanding of the scope of the task they are engaged in. So long as they can measure their progress, and experience control over the learning process, students will continue to make the effort to learn.

In summary, the direct feedback provided by well-designed software learning activities, and the reports it provides to students, provide valuable formative feedback; enhancing summative test results.

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[38] John Hattie, *Influences on student learning*, 1999

[39] Hattie & Timperley, 2007, p. 83

[40] Op.Cit. Hattie, 1999

[41] Bangert-Drowns, Kulik, Kulik, & Morgan, 1991; Kluger & DeNisi, 1996

By Jonathan A. Bower

Executive Function and Reading

Along with core reading and mathematics skills, the development of executive function skills is the hallmark of an educated person. Armed with the ability to organize and process information, people are ready for both school and job success.

	What is Executive Function?	Successful Readers…	Family Learning Approach
Organizing	The ability to impose order on information and objects, create systems for managing information or objects, and recognize that one can use order and systems to successfully complete tasks.	Use the structure inherent in language and texts Create their own organizing structure (schema) to gather and manage information from text, and integrate text information with their existing knowledge Are able to learn different structures for different kinds/genres of text	Writing assignments that identify structure and ask learners to use it themselves Practice telling and writing stories using existing images as a cue for existing knowledge Practice reading different text genres for meaning with feedback on understanding
Goal Setting	The ability to formulate actions in advance and to approach a task in an organized, strategic, and efficient manner (Central to Executive Functions, very related to skills of inhibition, wording memory, and cognitive flexibility)	Set a purpose for reading with particular goals Are good at keeping goals in mind as they read Preview text to make links to background knowledge Choose the behaviors and actions they need to take, in the appropriate order, to achieve the goal of understanding the text	Learners set their own learning goals with support from family members Adult readings include preview questions to focus readers on key concepts Explicit writing tasks asking readers to take specific actions while they write about text
Cognitive Flexibility	The ability to consider multiple bits of information or ideas at one time and actively switch/shift between them when engaging in a task. Involves changing focus from one aspect of a task to another, requires attentional control	Adjust flexibly their reading behaviors to ensure that their reading goals are met Handle multiple features of text and comprehension strategies simultaneously Are able to switch from decoding to comprehension skills	Comprehension questions switch between 6 objectives to help learners consider multiple issues and angles in one text Varied writing tasks require assorted comprehension strategies Explicit decoding texts and story texts to help learners switch focus
Working Memory	The ability to hold and link ideas in mind while reading	Gather ideas from text, link text ideas together in ways that make sense, connect those ideas to their own thinking, and update their ever-changing mental model as they encounter new information	Audio and written text to provide varied perspectives on meaning Varied writing assignments require varied focus during reading

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Working Memory (cont.)	Capability to store information while processing it	Use working memory to combine multiple clues from text to make inferences Can hold and combine verbal information from text with visual information from pictures	Inference questions in every comprehension activity offer effective practice Concentration games build working memory across text, audio and images
Self-Monitoring	The ability to reflect on one's learning and to recognize when and how to use strategies to improve performance. (Refers to the ways students edit and correct their behavior and school work.)	Are meta-cognitive (thinking about their thinking) Recognize when they do not understand, and do something about it Determine when and how to use comprehension strategies (e.g., question generation, summarizing, graphic organizers)	Videos offer strategies for learning Star colors show mastery, or the lack of – providing a focus on areas needing attention Practice with comprehension approaches, and with analytical approaches while writing about text

Source: Joan Sedita, www.keystoliteracy.com, 2017