Using Technology to Enhance Literacy Through Deliberate Practice

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Need. Research suggests students may not maintain or attain a sufficient degree of reading expertise to achieve college and career readiness in literacy (Achieve, 2005; ACT, 2005, 2006; Alliance for Excellent Education, 2006). The new-found focus on college and career readiness provides an opportunity to further develop the instructional ingredients critical to promoting expertise such that each reader is placed on a growth trajectory predictive of college and career readiness.

Instructional Elements Contributing to Development of Expertise in Literacy. It's easy to think of a field of endeavor and arrive at criteria and consensus for at least one person considered a master in his or her discipline. We could easily agree that Mia Hamm was one of the world's most innovative soccer players, Sir Lawrence Olivier mastered the craft of acting better than any who came before or since, Maya Angelou was the most articulate poetess, and Bobby Fischer was a sublime grandmaster in chess.

A more difficult question to answer is how did each of these individuals develop expertise in their field? Emerging research from a wide array of fields suggests that novices are not born but rather develop expertise by engaging in deliberate practice over a long period of time (Ericsson, Charness, Feltovich, & Hoffman, 2006. Empirical results specifically suggest that deliberate practice is needed to advance each student from novice to expert (Glaser, 1996; Kellogg, 2006; Wagner & Stanovich, 1996): (1) ***targeted practice*** in which each person is engaged in activities targeted to their ability; (2) ***real-time corrective feedback*** that is based on each person's performance; (3) ***intensive practice*** to increase the volume of activity each day; (4) ***distributed practice*** to increase the volume of developmentally appropriate activities over a long period of time (e.g., 10 years, 10,000 hours); (5) ***self-directed practice*** in an activity so that volume is not restricted by availability of a coach, mentor or teacher; and (6) ***progress measured on an objective developmental scale*** which allows educators to monitor growth from novice to expert.

Increasing Time and Volume of Literacy Activities. The idea of increasing the volume of deliberate practice in literacy by growing the time each student devotes to individualized reading and writing activities targeted to a each student's ability may overwhelm educators who teach in already-busy classrooms. A solution with potential to prepare students for college and career is to use technology that integrates key elements of deliberate practice (Biancorsa & Snow, 2006; Graham & Perin, 2007; U.S. Department of Education, 2010). This technology would help teachers overcome both the time-consuming demands of finding or developing activities targeted to the reading and writing ability of each student and, subsequently, scoring the activities for purposes of formative assessment. Instead, it would allow teachers to do what they do best—teach.

A Technology-Based Solution. Oasis is a Web-based research platform that applies principles of deliberate practice to support growth from novice to expertise in reading and writing. Oasis uses the Lexile Framework for Reading to target developing readers with text of high interest or content relevance to what is being taught in the classroom (targeting at each reader's ability $\pm$100L assures 69%–80% success rate). Currently, Oasis contains digitized text comprised of approximately 25,000 articles from periodicals such as *Ranger Rick* and *Scholastic News* to *The*

Economist, Science, and *Scientific American* provided by EBSCO, over 1,100 articles from on-line English newspapers from 25 countries around the world, and approximately 1,200 articles from the *Featured Articles* section of Wikipedia. Students may also elect to read classic texts such as *Kidnapped, Call of the Wild, Bunny Brown and His Sister Sue on Grandpa's Farm*. Students may use the reading component of Oasis to read for pleasure or as a class assignment. One of the most important features of this application is that each student's reading comprehension is constantly monitored using his or her answers to auto-generated cloze items. Cloze is a type of reading assessment item in which the reader is asked to supply words that have been systematically deleted from a text. Each student receives immediate feedback about the words chosen to complete the cloze. The count correct is converted to a Lexile® reader measure.

Oasis also uses the Lexile Framework for Writing to monitor each student's growth in writing and convention ability through individualized writing activities. The practice activities are designed to enhance (1) writer ability (use of words and how they are combined), (2) convention ability (use of grammar, spelling, capitalization and punctuation rules), and (3) device fluency (use of a keyboard). Growth in writer ability is monitored by students writing 1-2 essays per week to the more than 250 prompts in Oasis. Convention ability is enhanced and monitored through students correcting grammar, spelling, punctuation, and capitalization errors in high interest passages targeted to their writing ability. Student fluency (words typed-per-minute, accuracy) is enhanced through targeted keyboard activities.

Making a Difference Through Technology. Oasis has been used by students in grades 2-12 in a diverse school district in north central Mississippi for four years (2006-2010; Euro-American=56%, African-American=38%, Hispanic=6%; Free-Reduced Lunch=60%. Students in grades 2-12 have read more than 195 million words from approximately 290,000 articles; each targeted to their ability (see Table 1). They have also taken almost 2.5 million auto-generated cloze items. These students have also written almost 7.2 million words in 38,000 essays. They have also corrected over 180,000 errors in the paragraph edit task (see Table 2).

Data from a longitudinal study (2006-2009) of students (n=146) who used Oasis in upper elementary and middle school starting Fall 2006 and ending in middle school Spring 2009 were analyzed to test differences in reading ability and location on a growth trajectory predictive of college and career readiness compared to a control group of students (n=7,000). The treatment group had a significantly higher reading ability compared to the control group (1125L vs. 1033L, $p<0.01$) and were 25L higher than the point on the growth trajectory predictive of college and career readiness (1125L vs. 1100L) compared to the control group who were 67L lower (1033L vs. 1100L).

Summary. Developing expertise in any field of endeavor requires immersing people in activities targeted to their abilities with opportunities to receive feedback and independent practice over long periods of time. Applying these principles in the classroom, so that each student has an opportunity to develop expertise in literacy, will require using technology that supports the teacher. Oasis is one such technology.

Table 1: Oasis - Reading Data by Cohort - Corinth (MS)

Data From 2007-06-01 to 2010-04-26

	Student Count	Mean Reader Measure	sd	Encounters	Words	Time Spent	WPM	WPM sd	Items	Observed Correct	Expected Correct	Observed Performance	Expected Performance
Overall	1,743	1071L	344	289,345	194,968,617	2y 157d 23h 16m	150	82	3,051,341	2,245,741	2,291,787	73.90%	75.11%
Grade 1	4	739L	105	47	16,203	2h 36m	103	44	477	306	308	60.54%	64.53%
Grade 2	217	586L	295	14,449	3,127,596	29d 21h 17m	72	43	119,037	81,523	85,242	69.02%	71.61%
Grade 3	174	810L	284	22,286	5,644,421	47d 18m	89	51	193,840	130,819	135,400	68.29%	69.85%
Grade 4	186	946L	295	32,936	10,932,254	74d 19h 24m	108	58	302,708	202,905	210,746	68.26%	69.62%
Grade 5	164	1074L	221	34,864	15,026,873	92d 10h 12m	121	59	340,605	243,056	251,237	72.35%	73.76%
Grade 6	175	1130L	180	33,650	16,335,039	80d 20h 48m	144	66	338,226	245,232	252,667	73.68%	74.70%
Grade 7	171	1171L	229	19,485	9,352,170	43d 1h 36m	153	70	173,593	127,235	131,027	74.36%	75.48%
Grade 8	164	1281L	252	17,083	8,725,553	39d 19h 37m	158	75	150,612	112,762	114,806	76.09%	76.23%
Grade 9	149	1285L	254	22,815	19,490,193	81d 19h 21m	167	80	264,169	203,037	206,715	77.26%	78.25%
Grade 10	130	1268L	229	23,225	21,477,331	89d 11h 49m	182	80	264,252	199,222	201,473	75.44%	76.24%
Grade 11	102	1324L	151	23,906	26,811,304	104d 19h 16m	191	82	312,976	240,951	246,715	77.38%	78.83%
Grade 12	107	1353L	157	28,394	35,844,222	128d 3h 13m	206	84	384,070	298,797	306,723	78.56%	79.86%
Graduated				16,205	22,185,458	75d 17h 49m	219	86	206,776	159,896	163,092	78.18%	78.87%

Table 2: Oasis - Writing Data by Cohort - Corinth (MS)

Data From 2006-06-01 to 2010-04-26

	Student Count (Essays)	Mean Writer Measure	sd	Essays Written	Words	Time Spent	WPM	WPM sd	Student Count (Edits)	Edit Count	Edit Items	Percent Correct	Time Spent
Overall	1,581	558W	356	37,864	7,185,670	1y 126d 7h 51m	10	9	1,576	180,129	2,352,010	69%	1y 314d 19h 29m
Grade 1													
Grade 2	132	96W	103	489	16,760	4d 55m	4	2	63	557	7,174	39%	4d 4h 8m
Grade 3	169	253W	131	1,636	134,854	26d 6h 39m	4	2	166	4,451	57,181	45%	24d 14h 38m
Grade 4	184	395W	195	3,335	380,640	53d 8h 36m	5	3	184	12,684	163,274	50%	64d 1h 23m
Grade 5	153	419W	162	4,220	493,758	67d 5h 49m	5	4	164	18,126	232,868	57%	103d 19h 50m
Grade 6	161	482W	177	3,508	508,958	55d 14h 20m	6	4	174	23,167	298,631	63%	102d 8h 10m
Grade 7	170	584W	239	4,815	738,200	49d 18h 38m	10	6	170	16,118	209,358	65%	64d 17h 24m
Grade 8	160	581W	200	3,704	571,296	39d 12h 16m	10	6	162	9,696	126,268	70%	36d 21h 55m
Grade 9	135	617W	213	3,482	603,616	33d 7h 32m	12	7	150	15,647	204,394	73%	42d 21h 24m
Grade 10	109	901W	272	4,344	1,014,403	45d 22h 42m	15	7	132	20,081	263,896	76%	61d 10h 3m
Grade 11	101	1126W	227	3,012	918,547	41d 21h 58m	14	11	102	20,387	269,480	79%	64d 8h 55m
Grade 12	107	1165W	246	3,273	1,098,969	46d 6h 53m	16	7	107	25,498	337,915	79%	68d 6h 50m
Graduated				2,046	705,669	28d 1h 33m	15	22	0	13,715	181,545	78%	42d 4h 36m

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