WHITE PAPER

Relation between MVRC and ELA Standards: Exploration of One-Year Data from a High-Poverty Urban School District

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Relation between MVRC and ELA Standards: Exploration of One-Year Data from a High-Poverty Urban School District

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Objectives:

1. Norming the MindPlay Universal Screener using ELA Standards in Grades 3-9
2. Assessing the Impact of MVRC Exposure on ELA Outcomes in Grades 3-9
3. Exploring Factors that Modulate the Extent to which Students Benefit from MVRC

Abstract:

A data set from an urban Midwestern school district was mined to explore how the technology-based reading enrichment known as Mindplay Virtual Reading Coach (MVRC) affects children's performance on the English Language Arts (ELA) Standards state-wide assessment (N = 6098 students from Grades 3 to 9). ELA data from two times points were available, approximately one year apart. ELA data were correlated with various data points obtained from MVRC, including the benchmark assessment administered at the beginning and at the end of the year. Results revealed large correlations across grade levels for the MVRC Composite score obtained from the MVRC Universal Screener, $0.40 < r < 0.74$. Results also revealed that the amount of MVRC exposure was linearly related to an increase in ELA performance at the end of the year, largely independent of grade level and students' initial reading competence. Girls and boys benefited equally from MVRC exposure, as did children from different ethnicities. The most prevalent factor in predicting the ELA-MVRC relation was the type of school, with MVRC exposure having the highest benefits in non-failing elementary schools, compared to high schools.

Highlights:

- The outcome of the MVRC assessment battery closely tracked the outcome of the ELA state-wide standardized test, despite notable differences in the emphasis of the two types of assessments.
- Students benefited from MVRC exposure, independent of their grade level, initial reading competence, gender, or identified ethnicity.
- Schools differed considerably in the degree to which their students benefited from MVRC exposure (across grade level), hinting at structural barriers to learning.

Introduction:

MindPlay Virtual Reading Coach is a commercially available educational software geared towards improving reading fluency in an individualized learning environment. Lessons are provided by virtual reading specialists and speech pathologists, followed by online practice that includes immediate and specific feedback. Depending on the needs of the student, emphasis

is placed on phonological awareness, phonics skills, vocabulary, grammar, silent reading fluency and comprehension. An underlying flow-chart structure defines the order in which lessons and practice activities are presented. Lessons are continuously adapted to fit the needs and emerging skills of individual students.

Several empirical studies have demonstrated the positive effect of MVRC exposure on reading skills (e.g., Bauer-Kealey & Mather, 2018; Chambers, Mather, & Stoll, 2013; Kloos, Sliemers, Cartwright, Mano, & Stage, 2019; Schneider et al., 2016; Vaughan, Crews, Sisk, & Garcia, 2004). For example, 2nd-graders who logged in for an average of 44 MVRC hours improved in reading fluency more than students who did not take part in the intervention (Schneider et al., 2016). In addition, students who were exposed to MVRC for 9 weeks in 2nd and 4th grade improved in reading fluency more so than students who used an alternative reading technology (Kloos et al., 2019). The current report was designed to further substantiate these findings, looking specifically at the link between MVRC and performance on the state-mandated ELA assessment.

Approach:

As part of a larger partnership, data were analyzed from an urban school district that serves a large group of students from economically disadvantaged communities. Table 1 provides demographic details of the available data set. For ease of description, we have categorized students in terms of the number of hours they were exposed to MVRC during the year of the study (in increments of 10 hours).

Table 1: *Number of Students, Separated by Demographics*

	MVRC Exposure (in Hours)						
	<10	10-20	20-30	30-40	40-50	50-60	60+
Grade Level							
Grade 3	42	76	109	201	209	203	190
Grade 4	30	68	94	111	147	145	316
Grade 5	36	70	141	181	215	149	90
Grade 6	100	64	114	169	184	119	91
Grade 7	234	132	136	148	108	47	19
Grade 8	216	141	139	93	68	39	47
Grade 9	576	103	129	37	9	4	2
Gender							
Female	662	277	385	468	492	379	389
Male	571	377	477	472	450	329	367
Race/Ethnicity							
African American	810	473	612	617	578	391	431
White	298	106	159	225	256	228	244
Other	126	75	91	98	108	89	81
Special Ed Status							
No	990	501	680	768	811	611	659
Yes	214	150	180	168	125	94	96
N/A	30	3	2	4	6	3	1

Objective 1: *Norming the MVRC Universal Screener using ELA Standards in Grades 3-9*

The MVRC contained a comprehensive diagnostic tool, known as the Universal Screener (MindPlay Universal Screener™ Resource Guide, 2018). For Grades 2 and above, it consisted of an assessment of reading fluency (which returns a Composite score of grade-equivalent reading fluency), a visual-scanning test, a listening-vocabulary test, a phonics test, and a letter-

discrimination test. Students also completed the mandatory ELA state assessment at two time points: in the Spring prior to the use of MVRC, and in the Spring after MVRC exposure. Figure 1 shows the findings, expressed as correlation coefficients. Note that *r* =.30 represents moderate a correlation, while *r* = .50 represents a strong correlation.

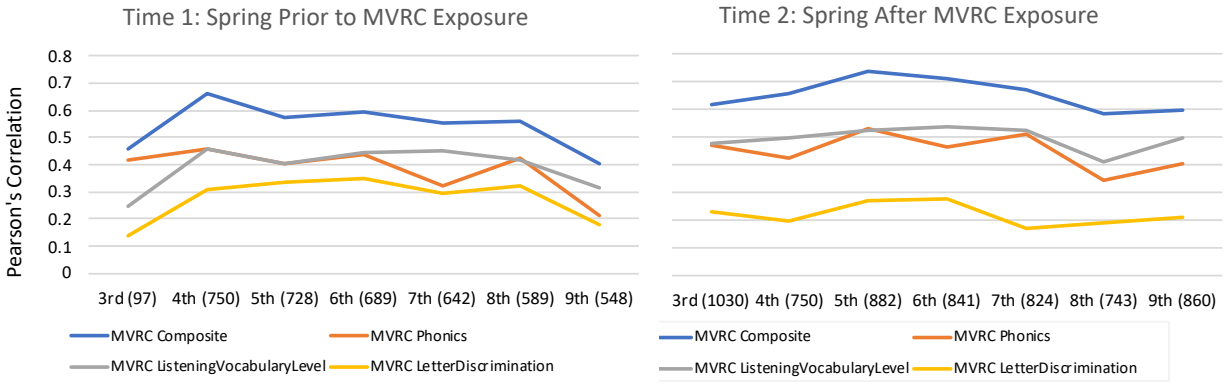

Figure 1. Correlations were carried out for each grade level separately. Number of students is provided in parenthesis.

Findings. For most grade levels, the composite measure of the MVRC Universal Screener correlated strongly with the ELA measure. These findings were impressive, given that both MVRC and ELA return categorical outcomes (MVRC Composite score: grade equivalence score; ELA: 5-item scale; 1 = limited; 2 = basic; 3 = proficient; 4 = accelerated; 5 = advanced). It is also important to note that MVRC reading fluency is correlated with ELA more strongly than the MVRC measures of phonics, listening vocabulary, and letter discrimination, *p*s < .01. The differences between Time 1 and Time 2 correlations are likely due to the difference in the number of participants (ELA data at Time 1 were only available for 4043 students).

Conclusion. MVRC's composite score correlated highly with a state-wide assessment of reading skills. This speaks to the construct validity of the MVRC diagnostic tool.

Objective 2: *Assessing the Impact of MVRC Exposure on ELA Standards in Grades 3-9*

To what extent did students' exposure to MVRC during the school year impact end-of-the-year ELA performance? To answer this question, students with access to MVRC were categorized based on the amount of time they spent on MVRC lessons and practice. Figure 2 provides the results.

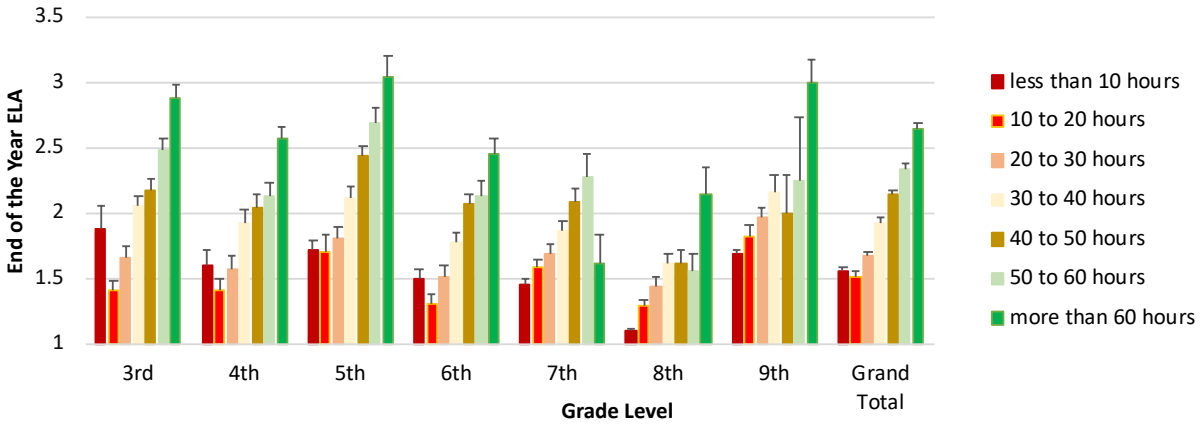

Figure 2. Average ELA performance at the end of the year, after exposure to MVRC for different lengths of time.

Findings. There was a linear trend between the amount of MVRC exposure and performance on the ELA assessment at the end of the year. This trend is best visible when scores are added across grade levels (Grand Total). Exceptions to this trend are seen when students used MVRC for less than 20 hours (shown in dark and light red in Figure 2): For most grade levels, students with less than 10 hours exposure to MVRC performed as good or better than students with 10 to 20 hours of MVRC exposure. Surprisingly, the linear trend between MVRC exposure and ELA outcome did not hold up for 7th graders: Students who completed more than 60 MVRC hours nevertheless performed as poorly on the ELA assessment as students who completed very few MVRC hours. This is likely due to the fact that only 3% of the 7th graders completed 60 or more MVRC hours.

Conclusion. In the aggregate, the time spent on MVRC activities had a positive effect on the outcome of the high-stake state assessment. Given that MVRC is geared towards improving reading fluency, this finding highlights the importance of reading fluency in achieving general reading proficiency.

Objective 3: *Exploring Factors that Modulate the Extent to which Students Benefit from MVRC*

Despite promising results of MVRC exposure, students differed in the extent to which they benefitted from MVRC. For example, in the current data set, 206 students were critically behind in reading proficiency at the beginning of the year but did not make any progress by the end of the year, despite completing over 60 MVRC hours. While this is only a small proportion of students, it raises the question about factors outside of MVRC exposure that affect learning. One way to address this question is to calculate the size of the slope in an MVRC-ELA regression model (i.e., predictor variable = amount of MVRC exposure; predicted variable = ELA outcome). A small slope indicates little predictive value, while a large slope indicates high predictive value.

Findings. A comparison of slopes predicting ELA proficiency from MVRC exposure revealed no effect of gender (B_{Female} = .16; B_{Male} = .18): Both girls and boys benefited from MVRC exposure to a similar extent. Similarly, ethnicity did not affect the size of the slope ($B_{\text{Black/African American}}$ = 0.16; $B_{\text{White/Caucasian}}$ = .22; B_{Other} = .17). However, there was a slope difference between typically developing students (B = .19) and students eligible for special

education services (B = .11). There was also a slope difference between grades: the 7th-grade slope was lower than the slopes of the other grades (B_3 = .20; B_4 = .17; B_5= .24; B_6 = .18; B_7 = .08; B_8 = .14; B_9 = .17). Perhaps most striking was the difference among schools. While students in non-failing elementary schools benefited the most from MVRC exposure (B = .19), students in failing elementary schools benefited to a lesser extent (B = .14), and high school students benefited even less (B = .06).

Conclusion. MVRC findings were robust across various demographics, including students' gender and ethnicity. Students' grade level was largely inconsequential as well: Students benefited from MVRC exposure in similar ways, whether in early or later grades. The largest modulating factor was the type of school: Students attending non-failing elementary schools benefited almost twice as much from MVRC exposure as students attending high schools. Further work is needed to determine how to address the structural barriers to MVRC learning.

For questions or comments, or to obtain more detailed information about the analyses presented here, please send an email to heidi.kloos@uc.edu.

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