SER SCHOOL EFFECTIVENESS REPORT

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Anoka-Hennepin School District

Anoka, Minnesota

Summer 2012 Odyssey Implementation Report

CompassLearning®

Executive Summary

During the summer of 2012, Anoka-Hennepin School District offered students the opportunity to use CompassLearning's Odyssey system to continue skill development in mathematics and reading/language arts and to combat the summer learning loss that occurs for many students across summer vacations. Odyssey was implemented in two settings during the summer — a school-based intervention and a home-based intervention.

The school-based intervention was offered to students entering 6th through 8th grade enrolled in traditional summer school classes at the district's six middle schools: Anoka Middle School for the Arts, Coon Rapids Middle School, Jackson Middle School, Northdale Middle School, and Roosevelt Middle School, and Oak View Middle School.

The home-based Odyssey intervention was offered online to exiting 6th grade students who enrolled in the Summer Virtual Learning (SVL) program. A random sample of students who did not participate in either of the Odyssey interventions during summer 2012 and did not attend summer school was selected as a comparison group for the Summer Virtual Learning sample. Student achievement in mathematics and reading was assessed for all district students prior to the summer interventions when students completed the two relevant subtests of NWEA's Measures of Academic Progress (MAP) during the spring 2012. After the Odyssey implementations, students again participated in MAP testing during October 2012 to determine mathematics and reading achievement levels.

Highlights of the summer 2012 Anoka-Hennepin Odyssey implementation showed the following results:

- For all Anoka-Hennepin students who used Odyssey during summer 2012, an increase in the number of hours spent using Odyssey resulted in statistically significantly higher posttest (fall 2012) scores on MAP mathematics and reading assessments, after controlling for students' prior (spring 2012) levels of achievement.
- Students who participated in Anoka-Hennepin's Summer Virtual Learning program scored significantly higher than comparison students on fall 2012 mathematics achievement, after controlling for prior mathematics achievement.
- Students who participated in Anoka-Hennepin's Summer Virtual Learning program showed small increases in mathematics achievement compared to NWEA's national MAP norm group across the summer vacation and did not significantly change in reading achievement; in contrast, students in the comparison group lost ground over the summer — possibly indicating summer learning loss.
- Summer Virtual Learning (SVL) students' academic successes followed moderate fidelity of implementation. More than one-third of SVL students exceeded the targeted goal of using Odyssey 45 minutes a day/five days a week over the six week summer intervention, and the entire group's median time using Odyssey per week was approximately two hours and 40 minutes (159.8 minutes/week). If all SVL students had met or exceeded the targeted goal, it is likely that their gains would have been even larger.

Background of the Study

Education Secretary Arne Duncan (USDE, 2012) cited summer learning opportunities as a priority to increase the competitiveness of America's youth in the world economy. Students' loss of academic knowledge and skills over the summer vacation has been well-documented (Cooper, Nye, Charlton, Lindsay, & Greathouse, 1996), especially for students with lower achievement levels (Rambo-Hernandez, 2011) and those from low socioeconomic backgrounds (Alexander, Entwisle & Olson, 2007). The length of the summer vacation, coupled with the non-academic nature of many children's activities outside the school calendar, makes summer a prime window for achievement-enhancing interventions. Anoka-Hennepin School District provided multiple interventions during the summer of 2012 to prevent summer learning loss and to keep its students' achievement moving along a steady upward trajectory.

Anoka-Hennepin School District 11 is the largest school district in Minnesota, serving "approximately 39,000 students and 248,000 residents in 13 suburban communities spread out over 172 square miles north of the Twin Cities." (Anoka-Hennepin website, 2012). In response to an increasingly diverse student population, Anoka-Hennepin's 2011–2012 District Level Improvement Plan identified "culturally responsive teaching" as a priority to meet the challenges of attaining academic proficiency for all students (MDE, 2012). This need for flexibility and personalization supports the use of differentiated instruction (Tomlinson, 2001) approaches that can accommodate each child's unique learning needs.

CompassLearning's Odyssey provides a computer-assisted instructional system that tailors learning activities to identified student readiness levels. In addition, CompassLearning's professional development services support teachers in making the most effective use of Odyssey's features. Although research has documented positive effects of Odyssey on student achievement during the regular school year (Clariana, 2009; DiLeo, 2007; Martin, 2005), Odyssey's effectiveness at promoting student learning during summer vacation has not previously been investigated. The present study seeks to determine the effect of using Odyssey on mathematics and reading achievement across the 2012 summer months for middle school students at Anoka-Hennepin School District.

Research Design

Quantitative research designs to investigate the effects of educational interventions can be classified as experimental, quasi-experimental, or correlational based upon how participants are assigned to treatment condition. In a true experiment, participants are assigned randomly to a treatment or control group in order to create groups that are theoretically equivalent on any underlying characteristics that would influence the outcomes of the study. Another design for strong causal inference is a regression discontinuity design, in which participants are strictly assigned to treatment or control condition based on falling above or below a cutoff score on some pretest measure.

When it is not possible to assign participants to condition either through random assignment or pretest cutoff scores, a quasi-experimental design (or non-equivalent groups design) using an untreated comparison group can also eliminate threats to the validity of the study's inferences by providing an estimate of what might have happened to the treated students if they had not received the treatment. Although a comparison group strengthens causal claims, if the treatment group and the comparison group differ substantially on relevant factors, then the ability to make useful counterfactual inferences is reduced. In a correlational study, students are not assigned to a research condition to create comparable treatment and comparison groups prior to the intervention. Rather, attempts are made after data collection to statistically control for pre-intervention differences in student characteristics that might have influenced the outcomes of the study, such as prior levels of achievement.

Study Design and Sample Demographics

The original study design for Anoka-Hennepin's summer 2012 Odyssey implementation anticipated two treatment and two matched comparison groups to study Odyssey's impact both in the traditional summer school setting and in the home setting (the Summer Virtual Learning program). Four of the district's middle schools intended to offer traditional summer school students access to the Odyssey system while the other two schools would refrain from offering Odyssey to summer school students, who would serve as the summer school comparison group. In the home setting, the achievement outcomes for students who used Odyssey for Summer Virtual Learning could be compared with a randomly selected sample of other middle school students who neither attended summer school nor participated in the Summer Virtual Learning program.

Table 1. Demographic Information for Anoka-Hennepin Students Participating in Odyssey in School Settings — Summer 2012 (N = 808)

Student Characteristic	Number of Students	Percentage of School-Based Group
School Enrolled		
Anoka Middle School for the Arts	114	14.1
Coon Rapids Middle School	137	17.0
Jackson Middle School	135	16.7
Northdale Middle School	153	18.9
Oak View Middle School	67	8.3
Roosevelt Middle School	160	19.8
School Not Indicated	42	5.2
Grade Level (2012-2013)		
Six	247	30.6
Seven	315	39.0
Eight	204	25.2
Gender		
Female	360	44.6
Male	405	50.1
Gender Not Indicated	43	5.3
Ethnicity		
American Indian	20	2.2
Asian/Pacific Islander	68	7.4
African American	148	16.1
Hispanic	56	6.1
White	583	63.4
Ethnicity Not Indicated	44	4.8
Free/Reduced Meal Eligibility	418	51.7
Limited English Proficiency	136	16.8
Receiving Special Education Services	238	29.5

As the summer programs proceeded, nearly all of Anoka-Hennepin middle school students enrolled in summer school (398 out of 423 enrollees) logged time on the Odyssey server during the summer regardless of which middle school they attended, eliminating the ability to create the anticipated comparison group. Also, an additional large number (approximately 400 students) of Anoka-Hennepin middle school students who were neither enrolled in summer school nor the Summer Virtual Learning program showed summer usage data on the Odyssey server. These complications may be considered as treatment diffusion, which occur when "participants in one condition receive some or all of the treatment in the other condition" (Shadish, Cook, & Campbell, 2001, p. 81).

Although many of the summer school students showed low amounts of usage time on Odyssey and may have only used the system to complete pretests rather than accessing the Odyssey learning modules, it was not possible to cleanly define a treatment and comparison group for the traditional summer school attendees. Because of this, a correlational analysis linking the outcomes of increased Odyssey use with fall 2012 math and reading achievement was deemed more consistent with the school-based summer implementation than the originally planned treatment/comparison group analysis. Including students on the 2012 summer school roster and other students who accessed Odyssey from school during summer 2012, a total of 808 Anoka-Hennepin middle school students used Odyssey in a school setting. Demographic data for the school-based Odyssey group of students (also referred to later as the Traditional Summer School Group) is contained in Table 1.

In addition to students who used Odyssey from a school setting during summer 2012, Anoka-Hennepin students exiting 6th grade were eligible to enroll in a Summer Virtual Learning program that allowed them to access the Odyssey system at home from June 18th to July 26th. Of the 469 students who signed up to participate in the Summer Virtual Learning program, 364 had valid Odyssey usage time during the summer and were still in the district as of fall 2012. These 364 students were considered the Summer Virtual Learning Group, while the sample of students who did not use Odyssey at all over the summer was considered the Comparison Group. This group contained 1,045 students. Demographic data for students in the home-based (SVL) Odyssey treatment group and comparison group is shown in Table 2. As can be seen, the comparison group contained a higher percentage of students from ethnically diverse groups, as well as a higher percentage of students with Limited English Proficiency, free or reduced priced meal eligibility, and student receiving special education services.

Table 2. Demographic Information for Anoka-Hennepin Students in Home Settings — Summer 2012 (N = 364 for treatment group; N = 1045 for comparison group)

	Number of Students		Percentage of Group	
Student Characteristic	**Treatment**	**Comparison**	**Treatment**	**Comparison**
School Enrolled				
Anoka Middle School for the Arts	110	226	30.2	21.6
Coon Rapids Middle School	36	131	9.9	12.5
Jackson Middle School	55	227	15.4	21.7
Northdale Middle School	42	136	11.5	13.0
Oak View Middle School	80	169	22.0	16.2
Roosevelt Middle School	40	156	11.0	14.9
Grade Level (2012-2013)				
Six	N/A	350	N/A	33.5
Seven	364	278	100.0	27.5
Eight	N/A	408	N/A	39.0
Gender				
Female	194	507	53.3	48.5
Male	168	538	46.2	51.5
Gender Not Indicated	2	0	0.5	0.0
Ethnicity				
American Indian	4	18	1.1	1.7
Asian/Pacific Islander	17	74	4.7	7.1
African American	14	93	3.8	8.9
Hispanic	7	37	1.9	3.5
White	322	823	88.5	78.8
Free/Reduced Priced Meal Eligibility	50	278	13.7	26.6
Limited English Proficiency	2	44	0.5	4.2
Receiving Special Education Services	29	121	8.0	11.6

Measures and Scaling

Students' scores on the spring 2011 and fall 2012 administrations of the reading and mathematics sections of the Measures of Academic Progress (MAP) were used as outcomes measures in this study. MAP tests are computer adaptive assessments that present items based on students' prior response patterns. MAP RIT scores are estimated using a Rasch (one parameter) item response theory model to estimate student achievement levels. As students progress through the assessment, the estimate of their achievement level is used to determine the difficulty level of the next items presented. By allowing students at different places on the achievement spectrum to take individualized sets of items, the standard error of measurement

in each student's score is reduced. This is useful for causal inferences because it reduces the internal validity threat of regression toward the mean for students initially scoring either very high or very low in the achievement distribution.

Another feature of the Measures of Academic Progress (MAP) assessments is that they are vertically scaled so that students' academic growth across grade levels can be determined. However, this means that a 6th grader with a RIT score of 210 has a different achievement level relative to his norm group than an 8th grader with the same RIT score. For this reason, when analyzing MAP data from students in multiple grade levels, the RIT scores should not be compared directly to determine treatment effects. If RIT scores were used in such analyses, the results would be biased due to differences in grade distributions between treatment and comparison groups. For example, if a comparison group happened to have a higher proportion of older students, then their mean outcomes could be higher as an artifact of the sampling, not actually due to a treatment impact from the intervention. These effects are not problematic for correlational analyses, which do not require the use of sample means to determine statistical significance.

To put students' scores on a comparable scale across grades for the analyses involving sample means, the study performed an equipercentile equating. This equating involved taking each student's national percentile rank relative to the national norm group and finding the corresponding z-score based on the probability of obtaining that rank within a cumulative normal distribution. A z-score is the score within a normal distribution that reflects a student's normative performance within a group with a mean set to zero and a standard deviation set to 1. After this equating has been performed, a given z-score would mean the same thing for a sixth grader relative to other 6th graders as it would to a 7th or 8th grader relative to grade peers. For the MAP data used here, the range of possible z-scores was from -2.33 for a student scoring at the first percentile compared with the national norm group to a maximum of 2.33 for a student scoring at the 99th percentile compared with the national norm group.

Once RIT scores are equated into z-scores, they can also be rescaled to commonly used means and standard deviations to aid in interpretation while retaining the across-grade comparability of the z-scores. These rescaled scores are simply linear transformations of the z-score that is calculated by multiplying the z-score by the desired standard deviation and then adding the desired mean. For the relevant sections of this study's analyses, the z-scores were rescaled to reflect a mean score of 216.5 for reading and 225.5 for math, which were the scores associated with students at the 50th percentile of Northwest Education Associates' (NWEA) national norm group. The standard deviation for the rescaled score, 14.5 for both reading and mathematics, was derived from the norming data as well.

Analyses

Descriptive Statistics and Paired-Sample T-Tests

Descriptive statistics for the spring and fall administrations of the MAP mathematics and reading assessments are presented in Table 3 for Traditional Summer School students, Summer Virtual Learning students, and Comparison students. For small numbers of students in each group, data were available for either the fall or spring MAP administration but not both, or for one subject area but not the other within a testing administration. The statistics reported are for students who had valid data for each measure, and the sample size for each will be slightly smaller than the total sample size of the group.

As shown in the table, traditional summer school students had substantially lower performance on pre-intervention (spring 2012) measures of mathematics and reading achievement than the other two Anoka-Hennepin groups, as well as compared to the national norm group. This is unsurprising based on the typical selection of students for summer school based on the need for academic remediation in one or more subject areas. Although each of the groups contained a range of student achievement across the entire achievement distribution, the density of scores was closer to the lower end for the traditional summer school students and closer to the upper end of the distribution for the

Table 3. Descriptive Statistics for Anoka-Hennepin Summer School Students, Summer Virtual Learning Students, and Comparison Group Students

Measure	Group Mean (Standard Deviation)		
	Summer School (N = 808)	Summer Virtual Learning (N = 364)	Comparison (N = 1045)
Spring 2012 Mathematics			
RIT Scale Score	219.9 (14.3)	236.0 (12.9)	236.3 (15.1)
National Percentile Rank	41.1 (25.4)	69.7 (22.7)	69.9 (25.0)
Z-Score	-0.32 (0.87)	0.65 (0.79)	0.65 (0.91)
Rescaled Score	220.9 (12.6)	234.9 (11.5)	235.0 (13.2)
Spring 2012 Reading			
RIT Scale Score	209.8 (13.1)	222.6 (10.8)	222.5 (12.5)
National Percentile Rank	38.2 (24.2)	64.0 (22.9)	64.8 (23.8)
Z-Score	-0.41 (0.84)	0.42 (0.73)	0.44 (0.81)
Rescaled Score	210.6 (12.1)	222.6 (10.7)	222.8 (11.7)
Fall 2012 Mathematics			
RIT Scale Score	219.2 (14.5)	236.7 (13.8)	235.0 (15.5)
National Percentile Rank	40.8 (24.8)	69.8 (22.6)	68.7 (24.6)
Z-Score	-0.33 (0.84)	0.66 (0.80)	0.60 (0.88)
Rescaled Score	220.7 (12.2)	235.0 (11.7)	234.1 (12.8)
Fall 2012 Reading			
RIT Scale Score	208.8 (14.0)	222.4 (10.9)	221.8 (13.3)
National Percentile Rank	37.0 (24.3)	63.8 (23.6)	63.4 (24.1)
Z-Score	-0.46 (0.86)	0.43 (0.76)	0.40 (0.82)
Rescaled Score	209.8 (12.5)	222.7 (11.0)	222.3 (11.9)

Summer Virtual Learning and Comparison students. These pre-intervention achievement distributions are seen in **Figures 1 and 2** for reading and mathematics achievement, respectively. However, the Summer Virtual Learning and Comparison students did have remarkably similar levels of pre-intervention achievement, making it appropriate to make inferences about post-intervention outcomes being directly attributable to the use of Odyssey rather than to pre-existing student differences.

Figure 3 shows all three groups' national percentile ranks (NPRs) in reading before and after the Odyssey intervention. While the Summer Virtual Learning users' ranking compared to the national norm group remained essentially constant over the summer vacation, the other groups lost a small amount of ground.

Figure 4 shows the same three groups' national percentile ranks (NPRs) in mathematics before and after the Odyssey intervention. The same pattern as for reading achievement can be seen, with the Summer Virtual Learning group remaining steady while the Summer School and Comparison group's NPR also dropping slightly over the summer. While these changes in both subject areas are relatively small in magnitude, they occurred over a fairly short period of time given the intervention only lasted six weeks.

To quantify these changes statistically, a paired samples t-test revealed that the change in reading RIT scores over the summer was non-significant ($t = -0.74$, $p = 0.46$) for the Summer Virtual Learning students, but the decreases for the other two groups were statistically significant ($t = -3.5$, $p < 0.001$ for the Summer School Group; $t = -3.0$, $p = 0.002$ for the Comparison Group). In mathematics achievement, the paired samples t-test indicated a statistically significant gain for the Summer Virtual Learning students ($t = 2.17$, $p = 0.03$) while the other groups had statistically significant losses in mathematics achievement ($t = -2.5$, $p = 0.01$ for the Summer School students; $t = -5.5$, $p < 0.001$ for the Comparison Group).

Figures 5 and 6 show rescaled MAP scores in reading and mathematics to illustrate differences in summer learning changes between the Summer Virtual Learning students and Comparison students. This information reiterates the results shown in the prior National Percentile Ranking figures but using a more interpretable scale (based on the actual scale of the MAP assessments) to demonstrate how Summer Virtual Learning students remained constant or gained achievement over the summer, while their matched Comparison peers did experience small rates of summer learning loss.

Figure 1. Frequency distribution of national percentile ranks for students in different groups for spring 2012 MAP Reading results

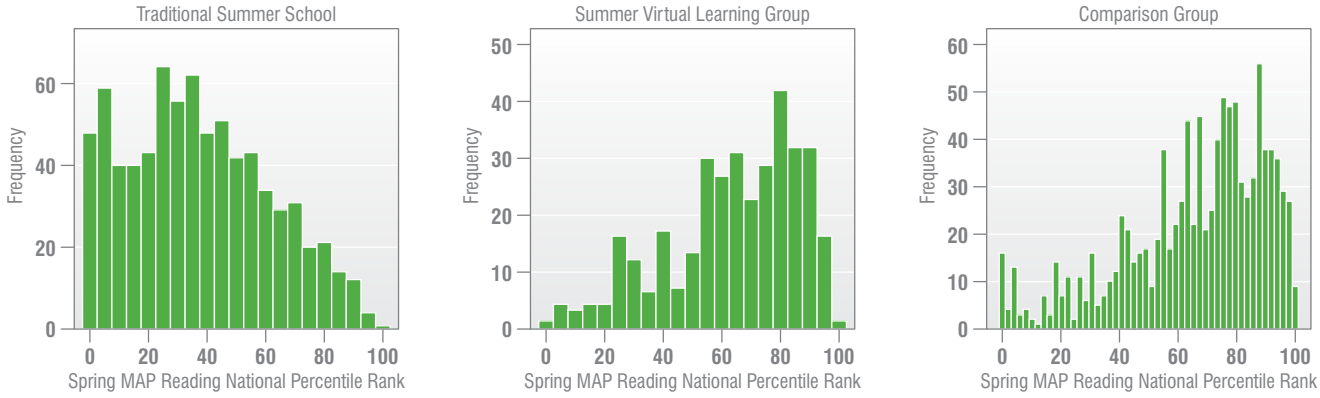


Figure 2. Frequency distribution of national percentile ranks for students in different groups for spring 2012 MAP Mathematics results

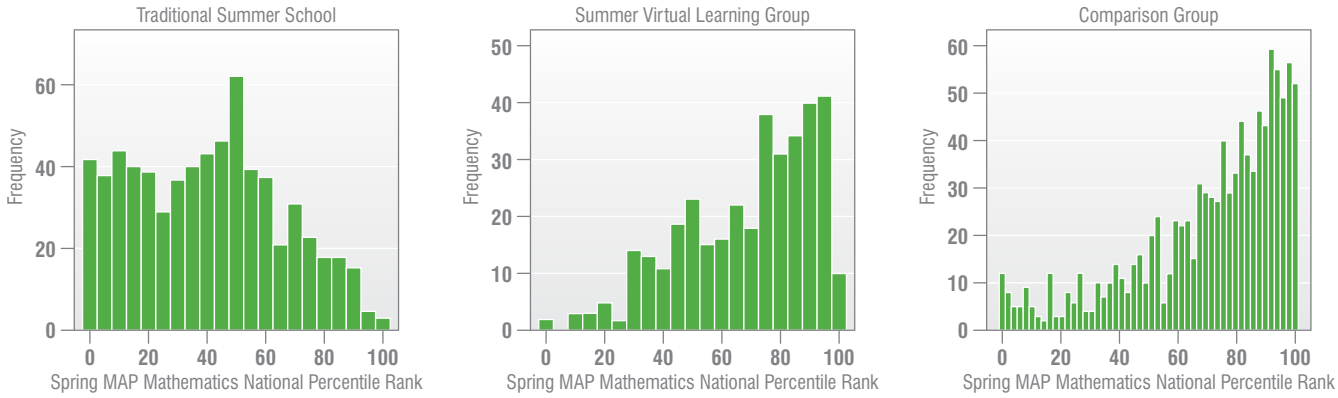


Figure 3. Reading achievement relative to NWEA's national norm group before and after the Odyssey implementation for three groups of Anoka-Hennepin middle school students

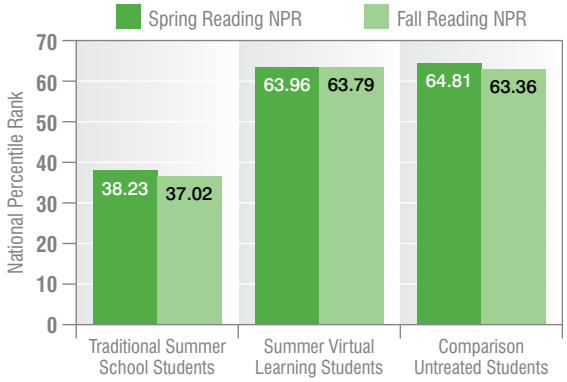


Figure 4. Mathematics achievement relative to NWEA's national norm group before and after the Odyssey implementation for three groups of Anoka-Hennepin middle school students

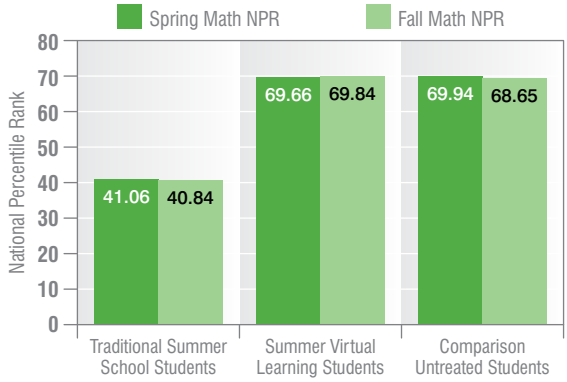


Figure 5. Changes in grade-adjusted MAP RIT reading achievement for Anoka-Hennepin middle school students using Odyssey from home (Summer Virtual Learning Group) and students not using Odyssey (Comparison Group)

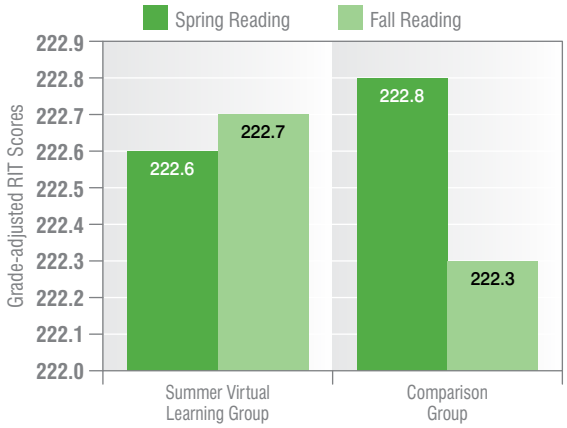


Figure 6. Changes in grade-adjusted MAP RIT mathematics achievement for Anoka-Hennepin middle school students using Odyssey from home (Summer Virtual Learning Group) and students not using Odyssey (Comparison Group)

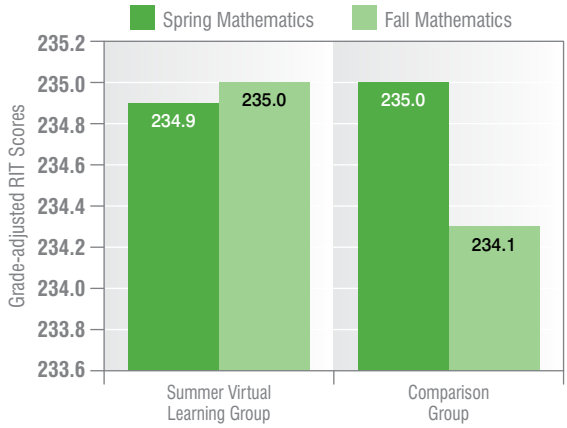


Figure 7. Scatterplot showing the positive relationship between more hours using Odyssey during summer 2012 and fall reading achievement for all Anoka-Hennepin middle school students who used Odyssey

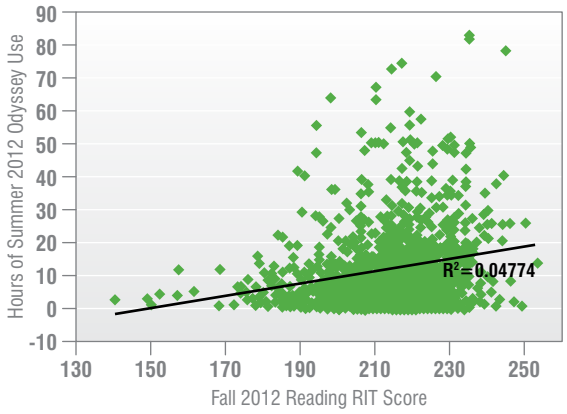
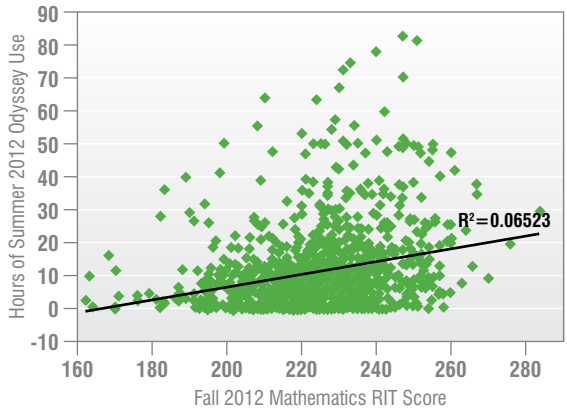


Figure 8. Scatterplot showing the positive relationship between more hours using Odyssey during summer 2012 and fall mathematics achievement for all Anoka-Hennepin middle school students who used Odyssey



Regression Analyses

Two types of regression analyses were performed to illustrate the effect of Odyssey on student achievement at Anoka-Hennepin School District. The first compares the achievement of students in the Summer Virtual Learning Group with their Comparison Group after controlling for pre-intervention levels of achievement. This analysis provides the strongest causal inferences for the overall effect of Odyssey because both a pretest and a matched comparison group are used. The second type of regression analysis uses data from treatment students only to predict post-intervention achievement from levels of Odyssey use. These analyses can also control for treatment students' prior levels of achievement, but do not contain a comparison group (since these students would not have any usage data) to aid causal inference.

A multiple linear regression model with fall 2012 MAP mathematics outcomes found that Anoka-Hennepin's Summer Virtual Learning students performed statistically significantly higher ($t = 4.6$, $p < 0.001$) than Comparison Group students after controlling for pre-intervention achievement levels. The magnitude of this higher achievement was approximately 2 points ($\beta = 1.88$) on the MAP mathematics RIT scale. This is notable due to the relatively short length of the Summer Virtual Learning intervention. A similar model did not show a statistically significant difference in fall 2012 MAP reading achievement between the Summer Virtual Learning students and Comparison students ($t = 1.04$, $p = .30$).

For all Anoka-Hennepin middle school students who used Odyssey during summer 2012, an increased amount of time using the Odyssey system correlated significantly with increased fall 2012 reading and mathematics achievement scores. For reading, the bivariate correlation was 0.22 ($p < 0.001$), and for mathematics, the bivariate correlation was 0.25 ($p < 0.001$). **Figures 7 and 8** show scatterplots for data from all Odyssey users at Anoka-Hennepin during summer 2012. The upward sloping lines represent the positive relationship between increasing summer Odyssey use and achievement in the fall.

Although the simple bivariate correlations create a good visual image of the impact of increased Odyssey use on achievement for Anoka-Hennepin students, a stronger causal claim is found in linear regression analyses that determine whether higher Odyssey use leads to higher achievement even after controlling for student initial levels of achievement.

For all Odyssey users, more total time using Odyssey during summer 2012 resulted in statistically significantly higher fall reading achievement after controlling for students' springtime levels of reading ($t = 3.2$, $p = 0.002$). A significant result was also present for mathematics achievement after controlling for students' pretest levels of achievement ($t = 4.2$, $p < 0.001$).

These linear regression analysis results strongly indicate the positive impact of using Odyssey longer amounts of time, regardless of students' incoming levels of achievement. In fact, the duration of usage may have been at least partially responsible for the fact that Anoka-Hennepin's Summer Virtual Learning students demonstrated more favorable summer achievement changes than traditional summer school students who also used Odyssey. On average, the Summer Virtual Learning students used Odyssey more than twice as many total hours (an average of 20 hours versus an average of just under eight hours) during the six-week program than traditional summer school students did. **Figure 9** illustrates the differences in total hours of Odyssey use between Anoka-Hennepin middle school students enrolled in traditional summer school and students enrolled in the Summer Virtual Learning program.

Even the relatively high rates of Odyssey use by students in the Summer Virtual Learning program only reflected moderate fidelity of implementation. The program targeted 45 minutes of Odyssey use five days a week over the course of the six-week program. Although approximately one-third of the students enrolled in the program reached this usage target, the majority did not. Therefore it is likely that their achievement gains may have been greater still if the targeted usage levels had been consistently reached. For the traditional summer school students, Odyssey usage rates were generally fairly low, although it is unknown whether any usage goals were set for this sample of students.

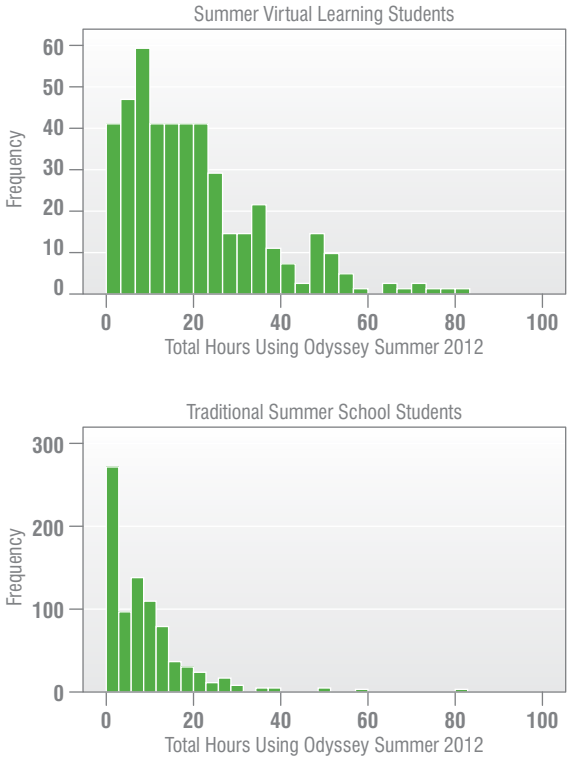
Discussion and Conclusions

Using Odyssey over the summer helped many Anoka-Hennepin students reduce or eliminate the effects of summer learning loss. This result was especially strong for mathematics, which mirrors previous research indicating that mathematics summer learning loss is often more pronounced than summer learning loss in other content areas (Cooper, et al., 1996). Anoka-Hennepin's middle school students who participated in the Summer Virtual Learning program received a statistically significant treatment effect for mathematics achievement as measured by the results of the fall 2012 MAP assessment. While other groups of Anoka-Hennepin middle school students had small achievement and national percentile rank losses across the summer vacation in reading and mathematics, the students who used Odyssey from home either stayed the same or increased on these measures. Because this successful program was offered only to exiting 6th grade students in the summer of 2012, Anoka-Hennepin could anticipate additional benefits if the program is extended to students at other grade levels in subsequent summers.

Anoka-Hennepin's commitment to fidelity of implementation using Odyssey will continue to result in even greater levels of student academic growth. More time on task using Odyssey in the summer translated into higher fall mathematics and reading achievement for all middle school students who used Odyssey during this time period at Anoka-Hennepin, even when students' prior levels of achievement were controlled for. This increased level of achievement associated with more time on task was statistically significant for both subject areas. Clearly, for all students, productivity and motivation to learn while using Odyssey are not fully captured in usage data that only reflect time spent logged onto the Odyssey server. However, even this imperfect measure of fidelity to the implementation showed unambiguous positive results of increased time with Odyssey.

For Anoka-Hennepin's summer school students, an emphasis on more traditional instructional methods rather than more time using Odyssey may have failed to produce the desired achievement growth over the summer. For students in need of remediation in core academic areas, innovative methods embracing technology may offer more motivating alternatives to lecture or text-based resources. The high levels of personalization made possible through differentiated instruction with technology like the Odyssey system can accommodate students who may have become turned off to learning in other ways. Knowing how such interventions function most effectively, however, should continue to be researched with rigorous methods that account for students' varying levels of incoming achievement.

Figure 9. Comparison of total hours logged onto the Odyssey server during summer 2012 for Anoka-Hennepin traditional summer school students and students enrolled in the Summer Virtual Learning program



References

Alexander, K. L., Entwisle, D. R., & Olson, L. S. (2007). Lasting consequences of the summer learning gap. American Sociological Review, 72, 167–180.

Anoka-Hennepin School District. (2012). Enrollment report. Retrieved from http://www.anoka.k12.mn.us/education/dept/dept.php?sectionid=29357

Clariana, R. (2009). Ubiquitous wireless laptops in upper elementary mathematics. Journal of Computers in Mathematics and Science, 28, 5–21.

Cooper, H., Nye, B., Charlton, K., Lindsay, J., & Greathouse, S. (1996). The effects of summer vacation on achievement test scores: A narrative and meta-analytic review. Review of Educational Research, 66, 227–268.

DiLeo, J. T. G. (2007). A study of a specific language arts and mathematics software program: Is there a correlation between usage levels and achievement? Unpublished doctoral disseratation. Retrieved from ProQuest.

Martin, R. L. (2005). Effects of cooperative and individual integrated learning system on attitudes and achievement in mathematics. Unpublished doctoral dissertation. Retrieved from ProQuest.

Minnesota Department of Education. (2012). District Level Improvement Plan (Anoka-Hennepin). Retrieved from https://education.state.mn.us/MDEAnalytics/Data.jsp

Rambo-Hernandez, K. E. (2011). How much do schools matter? Using summer growth patterns to assess the impact of schools on high achieving and gifted students. Unpublished doctoral dissertation. Retrieved from ProQuest.

Shadish, W. R., Cook, T. D., & Campbell, D. T. (2001). Experimental and quasi-experimental designs for generalized causal inference. Wadsworth Publishing.

Tomlinson, C. A. (2001). How to differentiate instruction in mixed ability classrooms (2nd ed.). Alexandria, VA: ASCD.

United State Department of Eduation. (2012). Arne Duncan on summer learning. Accessed from http://www2.ed.gov/news/av/video/2009/06/interview.html