Effectiveness of WorkKeys Curriculum for Improving Foundational Workplace Skills: Nevada State High School Case Study

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Introduction

This study sought to estimate the potential benefits of using ACT® WorkKeys® Curriculum to improve foundational workplace skills and subsequent performance on the ACT® WorkKeys® Applied Math, Workplace Documents, and Graphic Literacy assessments. Students at Nevada State High School (NSHS) took the WorkKeys Assessments before and after using ACT WorkKeys Curriculum. Using data from the supervisor dashboard, students were classified as engaged or unengaged in lessons, practice questions, and quizzes included in WorkKeys Curriculum. Overall, students who engaged meaningfully with WorkKeys Curriculum were expected to have greater score gains and were more likely to increase their WorkKeys level scores. In particular, students who engaged in Applied Math practice questions had significantly greater scale score gains than unengaged students, and students who exhibited overall engagement in the Applied Math and Workplace Documents modules were more likely to increase their corresponding level scores. Engagement in WorkKeys Curriculum was related to performance improvements for Graphic Literacy but not to a statistically significant degree.

Additional analyses detected significant relationships between WorkKeys scores and grade point average at NSHS. In all, results suggest that engagement with WorkKeys Curriculum helps improve WorkKeys scores and that WorkKeys is a useful predictor of academic success in a dual-enrollment, college-into-workforce program.

Nevada State High School

NSHS is a dual-enrollment system of schools in Nevada for 11th and 12th graders that has been operating since 2004. The students at NSHS attend college classes with college professors for a real college experience. NSHS provides classes to help monitor and support students in their early college experience. The curriculum focuses on readiness for the transition from college to careers with real world applications. This involves working with students to help develop workplace skills and career direction for their post-high school college planning. NSHS has been using WorkKeys Assessments since the 2008–2009 school year as a way to compare student performance with the foundational workplace skill levels required for jobs nationwide. Moreover, WorkKeys results are meaningful for students after

high school because prospective employers may use WorkKeys for hiring purposes, and most students earn a nationally recognized certification—the ACT National Career Readiness Certificate.

Background

ACT WorkKeys is an assessment of foundational workplace skills used by employers and workforce developers to select job candidates and trainees. WorkKeys Curriculum is designed to help users improve the skills measured by the WorkKeys Applied Math, Workplace Documents, and Graphic Literacy assessments. For each skillset, the curriculum materials are divided by levels (3, 4, 5, 6, and 7) corresponding to levels of knowledge and skills that are required for different jobs or training programs.[1] Curriculum users have the option of taking a placement test to estimate their initial skill level. For each WorkKeys level, the curriculum provides instruction, practice items, and a summative quiz to evaluate mastery.

All first-year students at NSHS (11th or 12th grade) take the WorkKeys Applied Math, Workplace Documents, and Graphic Literacy assessments. Students who do not achieve a level score of 5 or higher on a given assessment are assigned to the corresponding modules of WorkKeys Curriculum. Students subsequently take certain WorkKeys assessments again to attempt earning a higher score. This pre-test/post-test design provides a unique opportunity to examine the effectiveness of WorkKeys Curriculum for improving WorkKeys scores.

A preliminary analysis of 2017–2018 data from NSHS indicated that students who engaged with the Applied Math and Workplace Documents modules of WorkKeys Curriculum increased their scores approximately 1 point more, on average, than students who did not engage with the curriculum.[2] Unfortunately, students in 2017–2018 were not assigned to the practice questions, which might be expected to contribute significantly to the effectiveness of WorkKeys Curriculum. In 2018–2019, NSHS students were assigned all components of WorkKeys Curriculum, which made it possible to evaluate the full implementation of the curriculum. This report presents results from analyses of the 2018–2019 data.

Data

Data from several standardized assessments were analyzed for this study. WorkKeys scores are reported on a 65–90 scale, and those scale scores are transformed to level scores with a maximum of 7. Level scores are commonly used to support hiring decisions and admissions to workforce training programs. Examinees who achieve certain level scores on the Applied Math, Workplace Documents, and Graphic Literacy assessments are awarded an ACT® National Career Readiness Certificate® (NCRC®).[3] Specifically, examinees earn a Bronze NCRC by scoring level 3 or higher on all assessments, Silver by scoring level 4 or higher, Gold by scoring level 5 or higher, and Platinum by scoring level 6 or higher.

The data also included scores from the ACT® assessment, which is primarily used for college admissions. For the ACT, each examinee completes four subject-area tests (English, reading, math, and science), and scores are reported on a 1–36 scale. The average of the subject-area scores is the

ACT Composite score. Students at NSHS also took ACT Engage®, a measure of social and emotional learning competencies associated with academic success. The full instrument includes 108 items divided between 10 subscales. ACT Engage school and district score reports include two indices: an academic success index reflecting the probability of earning a 2.0 or higher GPA, and a retention index reflecting the probability of completing high school; both were analyzed in this study.

NSHS provided ACT a de-identified data file including records for students in 2018–2019. This file included demographics, grade point average, math courses taken, WorkKeys scores, and ACT Engage scores. Using a unique identification number, the NSHS data were merged with records exported from WorkKeys Curriculum. This included percentage of instructional lessons viewed, total time spent on lessons, number of practice questions completed, average practice question response time, percentage correct on practice questions, number of quizzes completed, average quiz question response time, and percentage correct on quizzes (overall and for each level).

Sample

The overall sample included 248 NSHS students, 70.2% of which were female. In terms of race/ethnicity, the sample was 6.0% Asian, 11.7% Black, 40.7% Hispanic, 1.6% Pacific Islander, 29.0% White, and 10.9% multi-racial/ethnic. Four percent of students were classified as English language learners during 2018–2019; an additional 17.3% had been classified as English language learners in prior years. As an indicator of socioeconomic status, 47.6% of the sample was eligible for free or reduced-price lunch. Analyses were conducted on smaller groups of students who retested on Applied Math (186), Workplace Documents (159), or Graphic Literacy (63). The distributions of demographic variables were similar in each analysis, so only overall sample demographics are reported here.

Results

Descriptive Statistics

Table 1 provides descriptive statistics for WorkKeys, the ACT, Engage, and GPA for the different (but overlapping) samples analyzed for this study. Pre-test WorkKeys scores reflect the earliest test date during the 2018–2019 school year, and post-test scores reflect that latest test date. The average maximum WorkKeys scores were slightly higher than the average post-test scores because students did not always achieve their highest scores on the last test date. Comparing ACT Composite score, the Engage indices, and GPA between samples indicates that the Graphic Literacy sample had relatively low average academic achievement and social-emotional learning competencies.

Table 2 shows the correlations between variables analyzed in this study. ACT Composite score had moderate and statistically significant correlations with all three maximum WorkKeys scores. That is, students who earned higher ACT Composite scores tended to earn higher WorkKeys scores. Of the WorkKeys Assessments, social-emotional learning competencies were most strongly related to Graphic Literacy scores. Nearly all WorkKeys, ACT, and Engage scores correlated significantly with GPA.

Table 1. Average Assessment Scores and Grade Point Averages

	Applied Math (n = 186)	Workplace Documents (n = 159)	Graphic Literacy (n = 63)
WorkKeys Pre-Test	76.2	77.9	75.6
WorkKeys Post-Test	78.1	79.8	78.0
WorkKeys Maximum	78.6	80.2	78.2
ACT Composite	17.8	17.8	16.6
Engage Academic Success	.45	.45	.39
Engage Retention	.41	.41	.36
Incoming GPA	3.13	3.19	2.94
Outgoing GPA	3.20	3.28	3.02
WorkKeys Pre-Test	76.2	77.9	75.6
WorkKeys Post-Test	78.1	79.8	78.0
WorkKeys Maximum	78.6	80.2	78.2
ACT Composite	17.8	17.8	16.6

Table 2. Correlations with Outcome Variables

	Applied Math Maximum	Workplace Documents Maximum	Graphic Literacy Maximum	Cumulative GPA
Applied Math Pre-Test	.65***	.28**	.09	.29***
Applied Math Post-Test	.93***	.43***	.28*	.29***
Applied Math Maximum		.43***	.22	.32***
Workplace Documents Pre-Test	.23*	.46***	.15	.37***
Workplace Documents Post-Test	.46***	.92***	.25	.27***
Workplace Documents Maximum	.43***		.22	.32***
Graphic Literacy Pre-Test	.30*	.14	.19	.19
Graphic Literacy Post-Test	.24	.23	.96***	.36**
Graphic Literacy Maximum	.22	.22		.27*
ACT Composite	.56***	.53***	.40**	.46***
Engage Academic Success	.16*	.07	.37**	.52***
Engage Retention	.16*	.05	.35**	.46***

* $p < .05$, ** $p < .01$, *** $p < .001$

WorkKeys Curriculum Engagement

Usage data from WorkKeys Curriculum made it apparent that some students engaged meaningfully with the curriculum and some did not. For example, numerous students had average response times for practice and quiz questions of two seconds or less. On one hand, this observation is disappointing because students missed chances to improve their foundational workplace skills. For research purposes, however, this provided an opportunity to examine the effectiveness of WorkKeys

Curriculum by comparing students who did and did not engage.

Engagement was inferred using data from the WorkKeys Curriculum dashboard including number of lessons, practice questions, and quizzes; time spent on lessons, practice questions, and quizzes; and percentage correct scores on practice questions and quizzes. Cut points were established through a combination of empirical and rational means. This generally involved examining the distribution of a variable, identifying a value that would isolate the group of apparently disengaged students, and comparing that value with expectations considering the amount of curricular materials and the amount of time it would take to read or respond conscientiously. For example, there was a sizeable group of students who spent less than 40 minutes reviewing the lessons. Considering that there were between 21 and 30 lessons per module, and each lesson entailed several pages of text and example questions, students who spent less than 40 minutes on the lessons could not have reviewed many of them thoroughly. The cut point for question response time (15 seconds) was based on the distribution of response times and prior research on responding behavior indicative of rapid guessing. The percentage correct cut point (55%) was chosen to be higher than the percentage expected from random guessing (25%) and indicative of effort to answer questions correctly, yet well below full mastery, which was not necessarily expected of students. Cut points for percentage of completed practice questions (30%) and number of quizzes (three out of five) were selected based on distributions and what would be considered low to moderate effort.

The goal was to identify students who were likely not engaged. Setting the cut points higher might have identified students who were more engaged, but exploratory analyses indicated that results were not sensitive to higher cut points. In most analysis, variables were combined because individual variables were unreliable indicators of engagement. For example, some students completed every practice question but got only 30% correct—an indication of random guessing.

As described above, engagement was first inferred by classifying students as engaged in the lessons (i.e., reading instructional text and reviewing example questions) according to the amount of time spent on the lessons (40+ minutes). The percentage of lessons viewed was not considered because students could easily demonstrate substantial “progress” through the lessons in a very short time. As shown in Table 3, 90% of students engaged in the Applied Math lessons, 77% in the Workplace Documents lessons, and 76% in the Graphic Literacy lessons.

Students were classified as engaging in the practice questions if they spent an average of 15 or more seconds responding to each practice question, completed at least 30% of the available practice questions, and got at least 55% correct on the practice questions. The percentage engaging on the Applied Math practice questions (61%) was greater than the percentage on the Workplace Documents (36%) or Graphic Literacy (35%) practice questions (Table 3). The main drivers of lack of engagement were short response times and low percentages correct.

WorkKeys Curriculum is divided into units based on WorkKeys levels 3 through 7, and

each unit concludes with a quiz to assess mastery of associated skills. Students were classified as engaged on the quizzes if they spent an average of 15 or more seconds responding to quiz questions, completed three or more quizzes (out of five), and got at least 55% correct on the quiz questions. The percentage of student engaged in quizzes was particularly low for Graphic Literacy (14%; Table 3). As with the practice questions, students were most likely to be flagged for disengagement due to short response times and low percentages correct.

Table 3. Average Assessment Scores and Grade Point Averages

	Applied Math		Workplace Documents		Graphic Literacy	
	Mean	Median	Mean	Median	Mean	Median
Average Progress	84%	100%	82%	100%	81%	100%
Total Time (min.)	229	208	117	101	122	93
% Practice Questions Completed	85%	31%	78%	100%	100%	0%
Mean Practice Response Time (sec.)	71	41	205	27	79	18
Practice % Correct	72%	74%	66%	68%	67%	71%
Quizzes Completed	4.2	5.0	4.0	5.0	4.0	5.0
Mean Quiz Response Time (sec.)	79	35	86	36	1527	20
Quiz % Correct	70%	78%	67%	75%	67%	77%
Engaged in Lessons	90%		77%		76%	
Engaged in Practice	61%		36%		35%	
Engaged in Quizzes	48%		40%		14%	
Engaged in All	38%		22%		10%	

Pre-Test/Post-Test Differences

On average, students increased their WorkKeys scores from the initial administration (pre-test) to the final administration (post-test) by an average of 1.9 to 2.4 points on the 65–90 WorkKeys scale (Table 4). Average pre-test to maximum score differences ranged from 2.3 to 2.6 points. All differences were statistically significant according to paired-sample *t*-tests. The average differences were transformed to effect sizes, which are reported in standard deviation units (using standard deviations from population distributions[4]). The average differences corresponded to moderate effect sizes.

Figures 1, 2, and 3 illustrate changes in the distributions of WorkKeys level scores over time for Applied Math, Workplace Documents, and Graphic Literacy, respectively. In all cases, retesting resulted in reductions in the percentages of level 3 and level 4 scores and increases in the percentages of level 5 and level 6 scores. Correspondingly, the percentages of students with a Bronze or Silver NCRC decreased and the percentage with a Gold NCRC increased (Figure 4; NCRC levels are based on maximum scores).

Table 4. Comparison of Mean WorkKeys Scale Scores

Assessment	N	Mean			Mean Difference		Effect Size	
		Pre-Test	Post-Test	Max.	Pre-Post	Pre-Max.	Pre-Post	Pre-Max.
Applied Math	186	76.2	78.1	78.6	1.9***	2.4***	0.35	0.44
Workplace Documents	159	77.9	79.8	80.2	1.9***	2.3***	0.37	0.45
Graphic Literacy	63	75.6	78.0	78.2	2.4***	2.6***	0.47	0.50

* $p < .05$, ** $p < .01$, *** $p < .001$

Figure 1. Applied Math Level Score Distributions

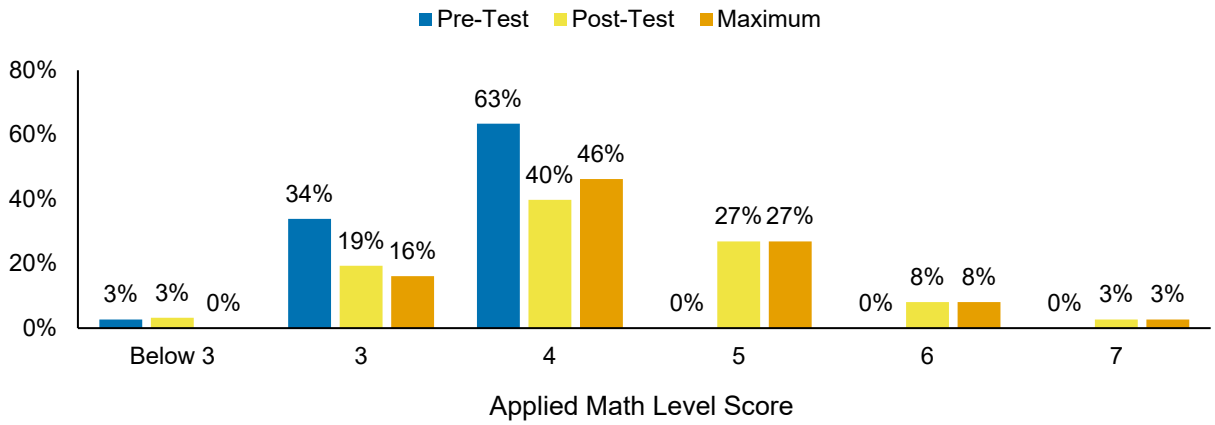


Figure 2. Workplace Documents Level Score Distributions

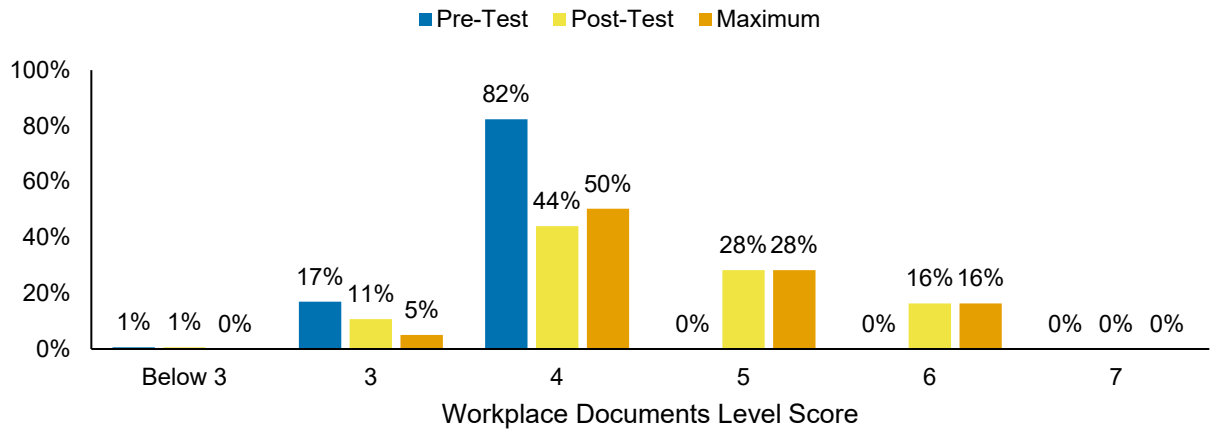


Figure 3. Graphic Literacy Level Score Distributions

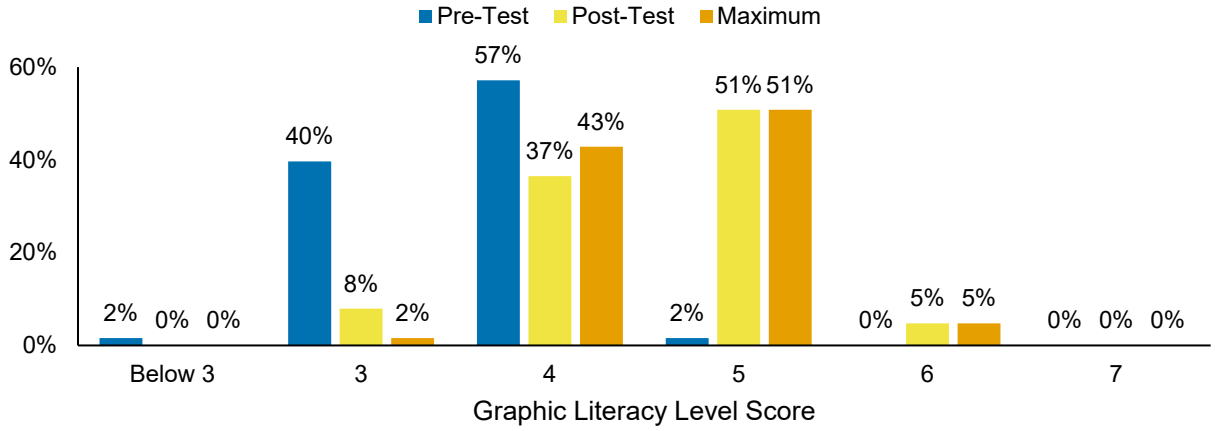
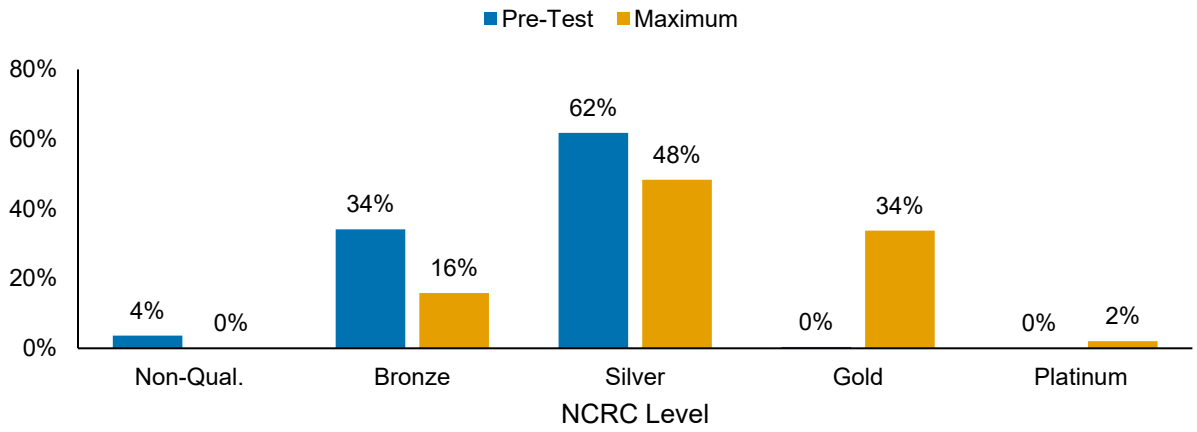


Figure 4. National Career Readiness Certificate Level Distributions



WorkKeys Curriculum Effect

The observed increases in WorkKeys scale scores and level scores are possibly attributable to use of WorkKeys Curriculum. However, students took the post-test an average of six months after the pre-test, and learning may have occurred through other means, such as classroom instruction. The following analyses help address this limitation by controlling for engagement with WorkKeys Curriculum. Assuming that students experienced similar learning outside of WorkKeys Curriculum (regardless of engagement with the curriculum), the analysis attempted to disentangle learning within and outside WorkKeys Curriculum.

The first analysis employed linear regression—specifically, analysis of covariance—to examine the relationship between engagement with WorkKeys Curriculum and post-test scores while controlling for pre-test scores. Results indicated whether students who engaged with WorkKeys Curriculum earned higher post-test scores than unengaged students with similar pre-test scores. A total of five

models were fit to the data for each WorkKeys Assessment (see Appendix Table A1). The models included various combinations of engagement indicators (engaged in lessons, engaged in practice, engaged in quizzes, and engaged in all three) and the ACT Engage Academic Success index.

Of the engagement variables, engagement in practice appeared to have the strongest association with post-test scores (Appendix Table A1). For Applied Math, students who engaged in the practice questions earned post-test scores that were 1.9 points higher than students with similar pre-test scores who did not engage (Model 3). The left panel of Figure 5 illustrates this relationship. This statistically significant difference corresponded to an effect size of 0.35 standard deviations (a moderate effect). The expected effect of engagement in practice questions was approximately 0.5 points for Workplace Documents, but this coefficient was not significantly different from zero. The models including only an overall engagement indicator each suggested a positive effect associated with engagement (Model 4), but only the coefficient for Applied Math (1.1) was statistically significant (see Model 3 in Appendix Table A1). Smaller sample sizes for Workplace Documents and Graphic Literacy made it more difficult to detect statistically significant effects.

The last model included engagement in practice questions and the ACT Engage Academic Success index. The Academic Success and Retention indices were highly correlated (r = .91); therefore, the Retention index was left out of analyses to avoid multicollinearity. Consistent with the correlations reported in Table 2, the coefficient for Academic Success was statistically significant only for the Graphic Literacy model (see Model 5 in Appendix Table A1). Note that the Academic Success index reflects a combination of academic discipline, social activity, and a self-reported ACT Composite score. In general, harder working and more conscientious students tend to have better educational outcomes. Thus, Academic Success was expected to predict WorkKeys scores.

Next, logistic regression was used to examine the relationship between engagement in WorkKeys Curriculum and the probability of increasing by one level score or more (based on maximum WorkKeys scores). In this analysis, a significant effect indicated that students who engaged with WorkKeys Curriculum had higher odds of increasing their level scores through retesting than unengaged students with similar pre-test scores. The general patterns in logistic regression results (Appendix Table A2) were similar to the linear regression results. That is, students who engaged in the Applied Math practice questions had significantly greater odds of increasing their level scores. The right panel of Figure 5 reveals that engaged students' chances of increasing their level scores were approximately 25% higher than unengaged students. The negative slope indicates that that students with higher pre-test scores were somewhat less likely to increase their level scores.[5]

Figure 6 illustrates how overall engagement in the Workplace Documents curriculum materials related to expected post-test scores and the probability of increasing one's level score. The effect of overall engagement (0.73) was not significantly different from zero in the linear regression, but the overall engagement coefficient in logistic regression was nearly so (p = .07).

Throughout the range of Workplace Documents pre-test scores, students who engaged in WorkKeys Curriculum had greater chances of improving their level scores (by up to 19%). The estimated effects of overall engagement in the Graphic Literacy curriculum were positive and similar in magnitude to those for Workplace Documents, but neither was statistically significant (Table A2).

Figure 5. Applied Math Linear and Logistic Regression Plots for Engagement in Practice

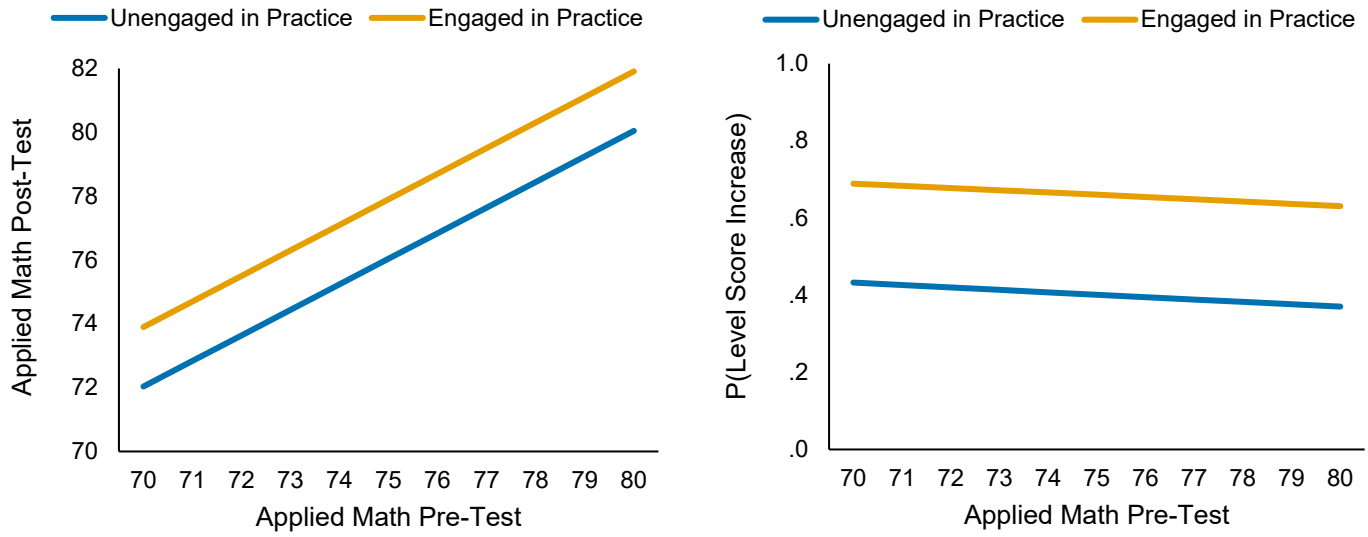
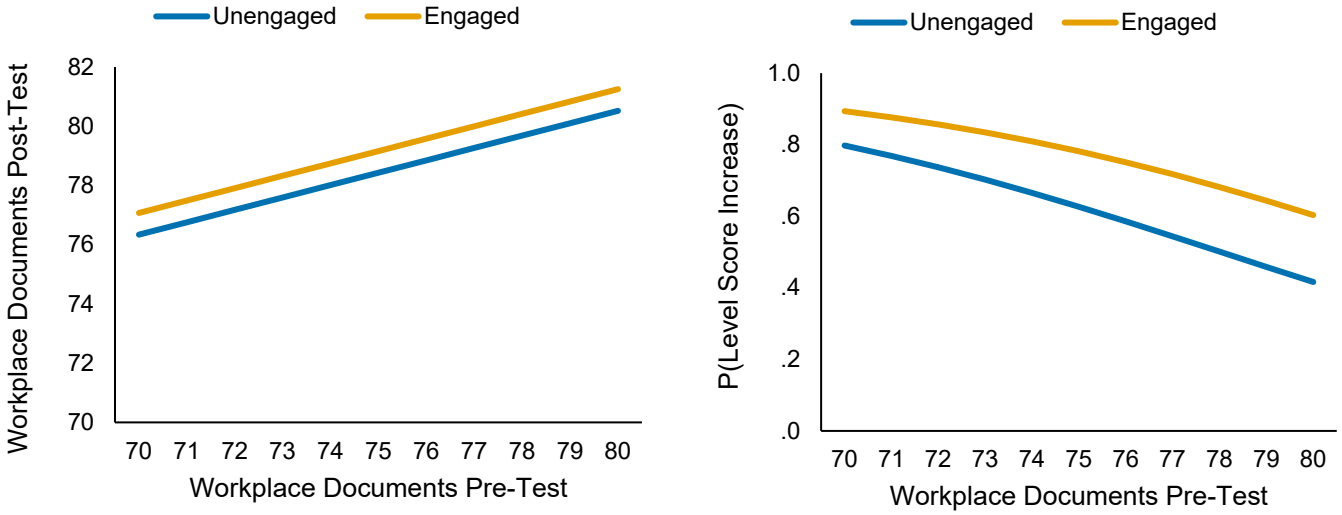


Figure 6. Workplace Documents Linear and Logistic Regression Plots for Overall Engagement



Predicting Outgoing GPA

The main objective of this study was to examine the effectiveness of WorkKeys Curriculum for improving foundational workplace skills as measured by WorkKeys. However, data provided by NSHS allowed for additional analyses relevant to the validity of WorkKeys as a predictor of success in dual-enrollment programs like NSHS. Data were analyzed from a total of 217 students who took WorkKeys during the 2018–2019 academic year. For this analysis, it was not necessary to restrict the sample to students who used WorkKeys Curriculum. Included students had complete records including GPA, WorkKeys, ACT, and Engage. This analysis used the earliest WorkKeys scores (pre-test) as predictors of cumulative GPA. As indicated by the correlations in Table 2, the single best predictor of cumulative GPA was incoming GPA, which should be expected since both are calculated using grades from many of the same courses. Indeed, incoming GPA accounted for 84.5% of the variance in cumulative GPA, and no other variables added incrementally to the prediction of cumulative GPA. For that reason, incoming GPA was held out of predictive models for cumulative GPA.

As shown in Table 5, scores from all three WorkKeys Assessments were statistically significant predictors of cumulative GPA (Model 1). However, their coefficients were no longer significant when ACT Composite score was added to the model (Model 2). This finding is possibly explained by the correlations among the WorkKeys scores (i.e., multicollinearity resulted in imprecise model parameter estimates). Indeed, in subsequent analyses, Graphic Literacy (alone) provided significant incremental improvement to the prediction of cumulative GPA, but Applied Math and Workplace Documents did not. One possible explanation is that Graphic Literacy measures unique skills that are not fully captured by other predictors. ACT Composite includes math and reading performance, so it may provide information that overlaps with Applied Math and Workplace Documents.

Model 3 included Graphic Literacy, ACT Composite, and the Engage Academic Success index. The Academic Success index incorporates self-reported ACT Composite score, so it overlaps with ACT Composite to some extent. Yet, including the Academic Success index as a predictor nearly doubled the variance in cumulative GPA accounted for by the model (Graphic Literacy accounted for only a small percentage of the variance in Model 3). Thus, the combination of standardized achievement tests and a measure of social-emotional learning competencies provided useful prediction of cumulative GPA for NSHS students, but they did not improve upon the predictive accuracy provided by incoming GPA.

Table 5. Linear Regression Model Coefficients for Predicting Outgoing GPA

	Model 1	Model 2	Model 3
Intercept	-5.513***	-2.499	-1.115
Applied Math	0.032*	0.014	
Workplace Documents	0.040*	0.021	
Graphic Literacy	0.040*	0.020	0.034*
ACT Composite		0.078***	0.065***
Academic Success			0.011***
R^2	.146	.217	.405

*p < .05, ** p < .01, *** p < .001

Summary

This study estimated how engaging with WorkKeys Curriculum related to changes in performance on the WorkKeys Applied Math, Workplace Documents, and Graphic Literacy assessments for students at NSHS. Students were identified as "engaged" according to the time spent on lessons, number of practice questions and quizzes completed, time spent answering practice and quiz questions, and percentage correct on practice and quiz questions. In statistical analyses, the strongest evidence that engagement in WorkKeys Curriculum translates to higher WorkKeys scores was observed for Applied Math. Specifically, students who engaged in Applied Math practice questions were expected to increase their scores by approximately 2 points more than unengaged students, and they were significantly more likely to improve their level scores. There was also statistical evidence that students who engaged in all aspects of the Workplace Documents curriculum were more likely to improve their level scores. Thus, fairly brief engagement with WorkKeys Curriculum (a few hours) was associated with greater improvements in WorkKeys performance.

A substantial percentage of students did not apparently engage with WorkKeys Curriculum as intended—in particular for the Workplace Documents and Graphic Literacy modules. The engagement cutoff values were selected to reflect minimal engagement. In future research, different cutoff values could be applied for different WorkKeys Curriculum modules, or multiple cutoffs might differentiate between levels of engagement. For that to work, however, more students would have to engage at higher levels. The ability to monitor student activity in WorkKeys Curriculum was recently improved, so NSHS instructors may be able to ensure that students complete their assignments conscientiously in the future. Supplementary analyses compared the relative value of predictors of cumulative GPA at NSHS. The WorkKeys Assessments all correlated significantly with cumulative GPA, though regression analyses revealed ACT Composite and ACT Engage scores to be relatively strong predictors of cumulative GPA. In all, this study provided evidence supporting the use of WorkKeys Curriculum for improving WorkKeys scores and the value of the skills measured by Applied Math, Workplace Documents, and Graphic Literacy for success in dual-enrollment, college-into-workforce programs like Nevada State High School.

Notes

1. ACT. (2019). *ACT WorkKeys Assessments*. Retrieved from *https://www.act.org/content/act/en/products-and-services/workkeys-for-educators/assessments.html*
2. Steedle, J. T. (2019). *A preliminary study of ACT WorkKeys Curriculum efficacy at Nevada State High School.* Iowa City, IA: ACT. Retrieved from *http://www.act.org/content/dam/act/unsecured/documents/R1737-nshs-workkeys-study-2019-02.pdf*
3. ACT. (2019). The *National Career Readiness Certificate*. Retrieved from *http://www.act.org/content/act/en/products-and-services/workkeys-for-educators/ncrc.html*
4. 5.46 for Applied Math, 5.10 for Workplace Documents, and 5.14 for Graphic Literacy; ACT. (2019). *Technical documentation*. Retrieved from *https://www.act.org/content/act/en/research/reports/technical-manuals-and-fairness-reports.html*.
5. A negative relationship between pre-test and gain is generally expected in longitudinal data analyses because of test score unreliability and regression to the mean. That is, students who perform particularly well initially (relative to their “true” abilities) are expected to exhibit smaller gains, and students who perform particularly poorly initially (relative to their “true” abilities) are expected to exhibit greater gains.

Appendix

Table A1. Linear Regression Model Coefficients for Predicting WorkKeys Post-Test Score

	Variable	Model 1	Model 2 (All Three)	Model 3 (Practice Only)	Model 4 (Overall)	Model 5 (Practice & Academic Success)
Applied Math	Intercept	15.099	17.009*	15.965*	18.344*	16.226*
	Pre-Test	0.827***	0.794***	0.801***	0.779***	0.787***
	Engaged in Lessons		-0.732			
	Engaged in Practice		1.939***	1.863***		2.405***
	Engaged in Quizzes		0.233			
	Engaged in All				1.061*	
	Academic Success					0.010
	R^2	.268	.334	.330	.287	.380
Workplace Documents	Intercept	44.824***	46.690***	46.710***	47.080***	44.951***
	Pre-Test	0.449***	0.426***	0.423***	0.418***	0.445***
	Engaged in Lessons		-0.360			
	Engaged in Practice		0.519	0.450		0.418
	Engaged in Quizzes		-0.011			
	Engaged in All				0.732	
	Academic Success					0.002
	R^2	.105	.114	.111	.117	.114
Graphic Literacy	Intercept	66.727***	68.142***	66.654***	70.632***	74.976***
	Pre-Test	0.149	0.137	0.150	0.096	0.021
	Engaged in Lessons		-0.845			
	Engaged in Practice		0.388	0.083		0.389
	Engaged in Quizzes		0.015			
	Engaged in All				0.921	
	Academic Success					0.036**
	R^2	.014	.039	.015	.029	.176

* $p < .05$, ** $p < .01$, *** $p < .001$

Table A2. Logistic Regression Model Coefficients for Predicting Probability of Increasing WorkKeys Level Score

	Variable	Model 1	Model 2 (All Three)	Model 3 (Practice Only)	Model 4 (Overall)	Model 5 (Practice & Academic Success)
Applied Math	Intercept	0.943	1.648	1.549	2.871	2.849
	Pre-Test	-0.010	-0.030	-0.026	-0.038	-0.051
	Engaged in Lessons		0.293			
	Engaged in Practice		0.982**	1.066***	0.000	1.472***
	Engaged in Quizzes		0.070			
	Engaged in All				0.626*	
	Academic Success					0.009
	McFadden's R^2	.000	.049	.047	.015	.213
Workplace Documents	Intercept	10.891	13.512	13.029	13.342*	9.633
	Pre-Test	-0.137	-0.169	-0.167	-0.171*	-0.121
	Engaged in Lessons		-0.447			
	Engaged in Practice		0.518	0.482		0.440
	Engaged in Quizzes		0.116			
	Engaged in All				0.757	
	Academic Success					-0.001
	McFadden's R^2	.013	.027	.022	.029	.130
Graphic Literacy	Intercept	26.368	21.468	26.289	28.825	37.423*
	Pre-Test	-0.336	-0.273	-0.335	-0.369	-0.497*
	Engaged in Lessons		0.289			
	Engaged in Practice		0.127	0.075		0.447
	Engaged in Quizzes		-0.604			
	Engaged in All				0.404	
	Academic Success					0.029*
	McFadden's R^2	.042	.049	.042	.044	.215

* $p < .05$, ** $p < .01$, *** $p < .001$

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