The ACT WorkKeys NCRC as an Indicator of Skills Needed for Success in Work-Based Learning

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GPS Education Partners (GPSEd) is a community-based nonprofit organization and work-based learning intermediary offering a statewide manufacturing youth apprenticeship in Wisconsin. During their one to two years in the program, students meet high school graduation requirements, receive industry-specific and job-specific training, technical certifications, and Department of Workforce Development Youth Apprenticeship Certification. This report describes a research collaboration between GPSEd and ACT that examined the relationships between ACT® WorkKeys® performance and outcomes for GPSEd students. Analyses revealed that WorkKeys scores correlated with academic outcomes like reading ability level and math course-taking patterns. WorkKeys scores and WorkKeys® National Career Readiness Certificate® (NCRC®)[1] Levels were also related to Manufacturing Skill Standards Council (MSSC) Certified Production Technician (CPT) certificate attainment as well as attendance in GPSEd classes and apprenticeships. In all, the results suggest that WorkKeys provides useful signals of the foundational workplace skills required for success in a work-based learning program. Moreover, average WorkKeys scores increased significantly from junior to senior year, which is consistent with the notion that students can improve their foundational workplace skills in a work-based learning program.

GPS Education Partners

The GPSEd program leverages a competency-based curriculum focused on both application and foundational knowledge for successful matriculation to a community college, technical college, or directly into the workplace. This includes career interest exploration and technical skills development, which offer students a full range of career pathways in manufacturing. The program leverages the ACT WorkKeys NCRC, the MSSC CPT certificate, and opportunities for dual enrollment. Program elements incorporate opportunities to develop social-emotional competencies related to employer-valued skills and attitudes needed for success in manufacturing careers. Because students learn apprentice skills, they should be better prepared for work or further training after high school. Between 2015 and 2018, the program had 273 graduates, with 80% of these students pursuing technical careers through immediate employment or post-secondary education programs.

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Students apply to the GPSEd program at the end of their sophomore or junior years. Students who attend GPSEd for one year are on track to graduate on time and have an identified career interest upon entrance. Students attending GPSEd for two years are often recommended to the program by high school counselors, in part, because they are disengaged, credit deficient, and at-risk of not graduating. GPSEd students also tend to prefer hands-on learning, have an affinity for technical skills, and find a non-traditional school setting appealing.

Sample and Descriptive Statistics

The sample analyzed in this study consisted of 94 GPSEd students who graduated in spring 2018 and 97 who graduated in spring 2019. The sample was predominantly male (90.1%), White (78.5%), and spent two years studying at GPSEd (68.6%). In terms of other race/ethnicity groups, the sample was 9.9% Black, 4.7% Hispanic, and 1.6% Asian or Pacific Islander. Twenty-two percent of the sample had an individualized education plan to help address special learning or attention needs.

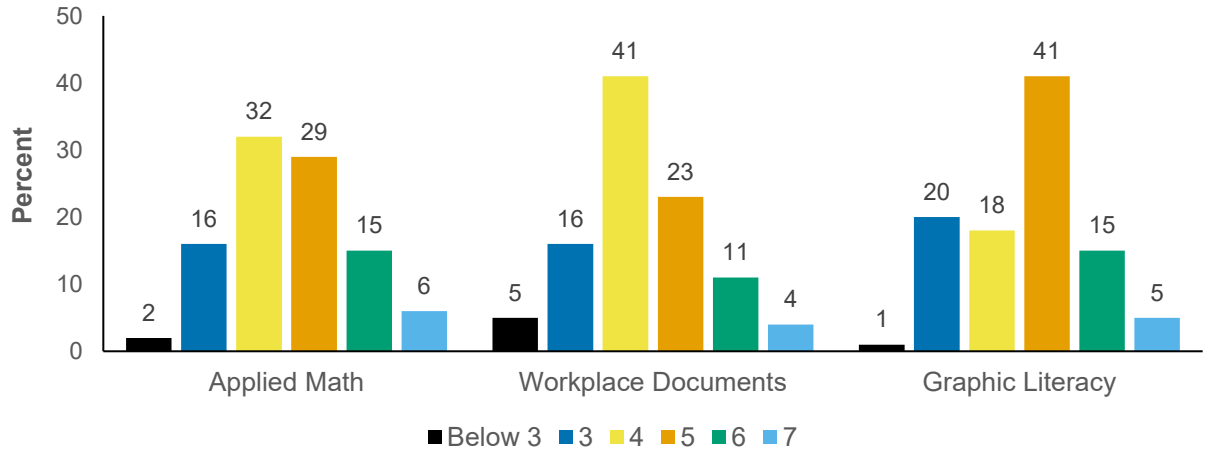
Table 1 provides descriptive statistics for several achievement variables including ACT WorkKeys—an assessment of foundational workplace skills. The Wisconsin Department of Public Instruction administers WorkKeys to all public high school students in the spring of junior year. GPSEd re-administers WorkKeys to their senior students as they approach graduation. The results in this report reflect maximum WorkKeys performance, regardless of when the test was administered, because maximum performance is what prospective employers or training programs would consider when evaluating applicants. WorkKeys scale scores, which range from 65–90, are transformed to level scores with a maximum of 7. The average Applied Math score of 79.3 falls in the level 4 range (76–79), the average Workplace Documents score of 78.9 falls in the level 4 range (77–80), and average Graphic Literacy score of 78.5 falls in the level 5 range (78–81).

Table 1. Descriptive Statistics

Variable	N	Mean	SD	25th Percentile	Median	75th Percentile
WorkKeys Applied Math	191	79.3	4.0	76.0	80.0	82.0
WorkKeys Workplace Documents	191	78.9	4.0	77.0	79.0	81.0
WorkKeys Graphic Literacy	191	78.5	3.5	76.0	78.0	81.0
CPT Safety	186	85.6	5.3	82.0	86.0	90.0
CPT Quality Practices & Measurement	175	83.3	5.4	79.0	83.0	87.8
CPT Manufacturing Processes & Production	124	81.6	5.5	77.0	81.0	86.0
CPT Maintenance Awareness	110	80.0	5.6	75.0	79.4	84.2
Lexile Level	189	1167	233	1005	1170	1340
Class Absences	165	7.7	8.4	2.0	5.0	10.0
Work Absences	142	4.8	4.6	2.0	3.0	6.0

Students who achieve certain levels of performance on ACT WorkKeys Applied Math, Workplace Documents, and Graphic Literacy are awarded an NCRC. Specifically, examinees must attain level 3 or higher on the three WorkKeys Assessments to earn Bronze, 4 or higher to earn Silver, 5 or higher to earn Gold, and 6 or higher to earn Platinum. Figure 1 shows the distribution of level scores for GPSEd students on the three WorkKeys Assessments. In the study sample, NCRC levels were distributed as follows: 5.2% non-qualifier, 33.0% Bronze, 31.9% Silver, 20.9% Gold, and 8.9% Platinum.

Figure 1. Distributions of WorkKeys Level Scores



The average MSSC CPT exam scores in Table 1 all exceed the corresponding passing scores, which range from 73–76. Sample sizes were smaller for CPT Manufacturing Processes & Production and CPT Maintenance Awareness because most students who attend GPSEd for one year attempt only the CPT Safety and CPT Quality Practices & Measurement certifications. However, students move through the GPSEd academic curriculum at their own pace, so some one-year students complete all four components and earn their MSSC CPT certificate. In addition, GPSEd students had an average Lexile® reading ability level of 1167, which was assessed through the Achieve3000 learning platform (www.achieve3000.com).[2] For reference, the typical Lexile range for 11th and 12th graders is 1130–1440.[3] During their senior year, GPSEd students were absent from class an average of 7.7 days and absent from their apprenticeships an average of 4.8 days.

Academic Achievement

Achievement on WorkKeys should correlate positively with other indicators of achievement in similar content areas. For example, GPSEd students who earned higher Workplace Documents level scores tended to have higher Lexile reading ability levels. Indeed, the correlation between Workplace Document scale scores and Lexile levels was .553 ($p < .001$), indicating a moderately strong, positive relationship. In the past, GPSEd has observed that Lexile reading scores correlated with NCRC levels, earning the CPT, and overall program success. In this study, average Lexile levels were consistently higher for GPSEd students with higher Workplace Documents level scores (972 for Level 3, 1120 for Level 4, 1284 for Level 5, 1369 for Level 6, and 1426 for Level 7).

GPSEd students with higher Applied Math level scores were more likely to have taken higher-level math courses during their senior year. Specifically, the percentage whose highest course was Technical Math (level 1A or 2), rather than Math for the Trades (level 1 or 2), increased from 0% to 18.0% to 39.3% to 48.3% to 66.7% as Applied Math level score increased from 3 to 7. Students whose highest course was Technical Math scored an average of 3.6 points higher on Applied Math than students whose highest course was Math for the Trades. This statistically significant difference ($p < .001$) corresponded to 1.0 standard deviation on the Applied Math score scale, which would be considered a large effect.

MSSC Certified Production Technician Attainment

Numerous organizations across the US administer WorkKeys as an indicator of readiness for MSSC CPT success. GPSEd does not use WorkKeys for this purpose. Rather, GPSEd considers the NCRC and CPT as complementary certifications. Thus, results described below may not generalize to other uses of WorkKeys and MSSC CPT. Nevertheless, GPSEd data provide an opportunity to study associations between WorkKeys and CPT exam performance.

As shown in Table 2, WorkKeys had weak positive correlations with the CPT exams, which indicated that students with higher WorkKeys scores tended to earn higher CPT exam scores, but the correlations were not always statistically significant. Applied Math correlated significantly with CPT Safety ($r = .24$, $p < .01$) and with CPT Manufacturing Processes & Production ($r = .19$, $p < .05$). Workplace Documents correlated significantly with CPT Quality Practices & Measurement ($r = .17$, $p < .05$) and CPT Manufacturing Processes & Production ($r = .25$, $p < .01$). Graphic Literacy correlated significantly only with CPT Safety ($r = .19$, $p < .01$). None of the WorkKeys Assessments correlated significantly with CPT Maintenance Awareness. Note that higher correlations between WorkKeys and CPT exams have been observed in other studies.[4]

Table 2. Correlations Between WorkKeys and CPT Exams

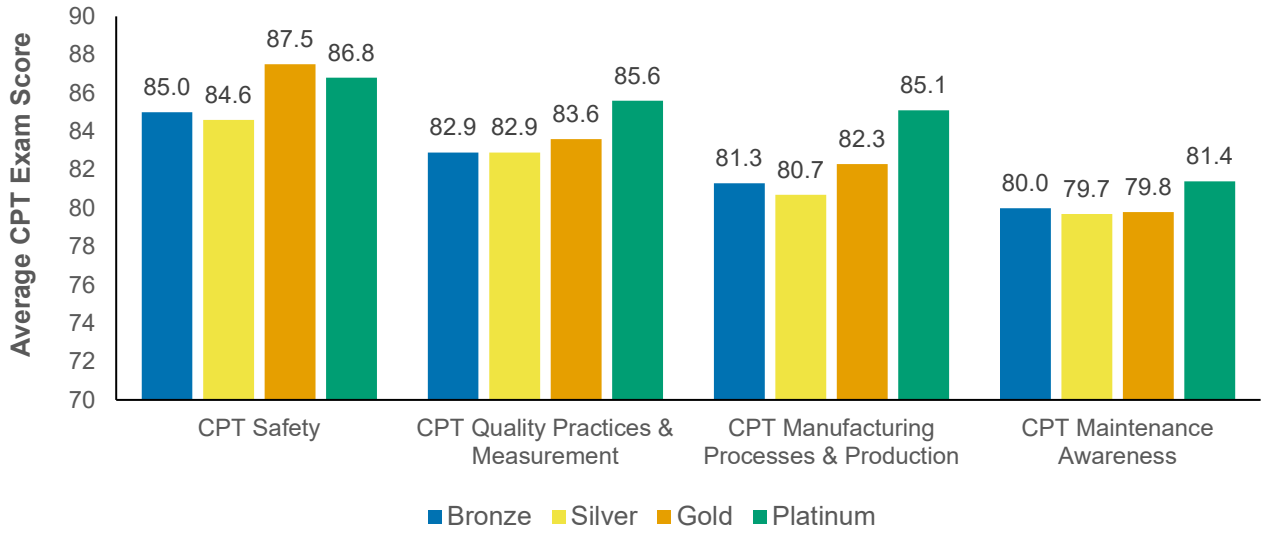
	Applied Math	Workplace Documents	Graphic Literacy
CPT Safety	.24**	.12	.19**
CPT Quality Practices & Measurement	.12	.17*	.14
CPT Manufacturing Processes & Production	.19*	.25**	.17
CPT Maintenance Awareness	.13	.06	.13

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

High, positive correlations between WorkKeys and CPT exams were not necessarily expected, mainly because the assessments measure different constructs. Yet, some degree of association was expected since CPT curriculum analyses identified numerous objectives requiring skills measured by WorkKeys.[5] For example, Workplace Documents skills are required for CPT Manufacturing Processes & Production (e.g., when reviewing standard operating procedures or identifying product specifications), and Graphic Literacy skills are required for CPT Safety (e.g., when interpreting diagrams or locating information on a material safety data sheet).

Considering the small magnitude of the correlations in Table 2, strong associations between NCRC level and average CPT exam score were not expected. Indeed, the average CPT exam score tended to increase as NCRC level increased from Bronze to Platinum, but it did not increase consistently from one level to the next (Figure 2). Note that results for non-qualifiers are not shown in Figures 2 and 3 due to the small sample size (fewer than 10 students).

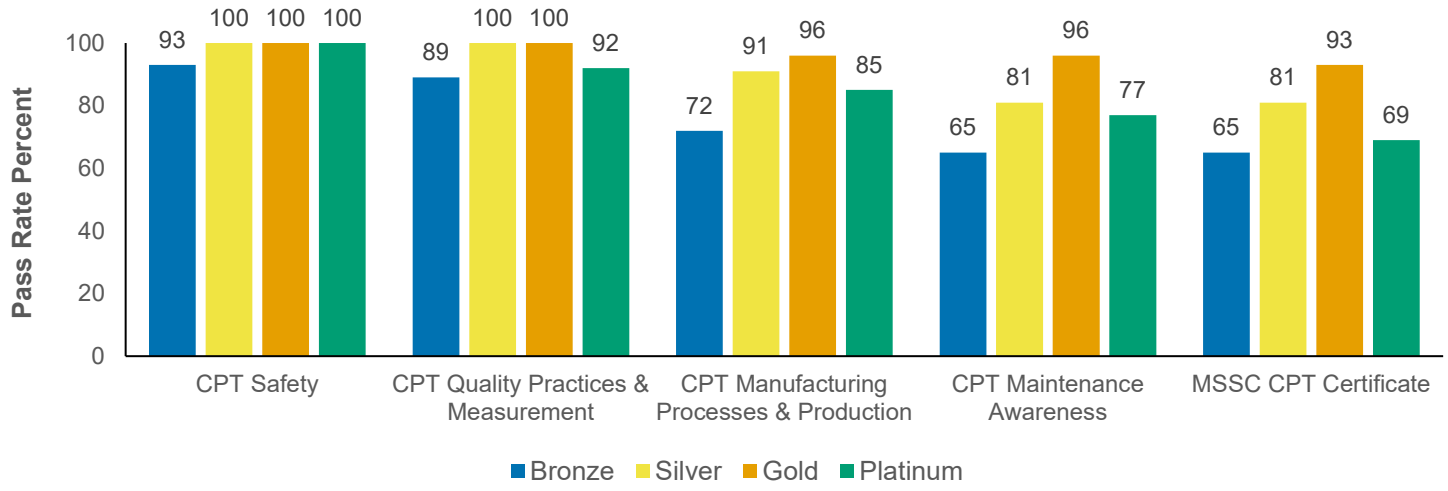
Figure 2. Average CPT Exam Score by NCRC Level



Further analyses focused on the relationship between NCRC levels and CPT pass rates for two groups of students: those who attended GPSEd for two years (131) and those who attended for one year but attempted all four CPT exams (10). GPSEd puts great emphasis on CPT Safety and CPT Quality Practices & Measurement as foundations to support success in the work-based learning activities that employers provide the students. Because the pass rates for those exams were both very high (97.9% for CPT Safety and 95.0% for CPT Quality Practices & Measurement), there could not have been strong relationships between NCRC level and pass rate. Nevertheless, Figure 3 reveals that Bronze NCRC earners were least likely to pass those exams.

The overall pass rates for CPT Manufacturing Processes & Production and CPT Maintenance Awareness were 85.1% and 78.0%, respectively. In both cases, those earning higher NCRCs tended to have higher CPT pass rates, though the relatively small group of 13 Platinum NCRC earners included a few students who did not pass, which reduced their pass rates below those of the Gold and Silver NCRC earners (Figure 3).

Figure 3. CPT Exam Pass Rate by NCRC Level



Of the students in this analysis, 76.6% earned the MSSC CPT certification, and students earning higher NCRC levels were generally more likely to earn the certificate. Though GPSEd does not use the NCRC as a prerequisite for the MSSC CPT, results from this analysis are consistent with the notion that WorkKeys measures foundational skills that are important for success in an industry-specific certification program.

WorkKeys Growth

Recall that all public high school students in Wisconsin take Applied Math, Workplace Documents, and Graphic Literacy in the spring of junior year, which allowed for estimating growth in WorkKeys performance between spring of junior year and the time at which GPSEd students took the tests again as seniors. Examining increases in WorkKeys performance was possible only for 2019 graduates because they took the same version of WorkKeys in 2018 and 2019 (2018 graduates took an earlier version of WorkKeys in spring 2017). Observing improved WorkKeys scores is a positive finding, and it is consistent with the notion that engaging in a work-based, applied-learning environment can increase WorkKeys scores. However, the design of this study precludes ruling out other causes such as learning outside of school or work and changes in motivation to perform well on the tests.

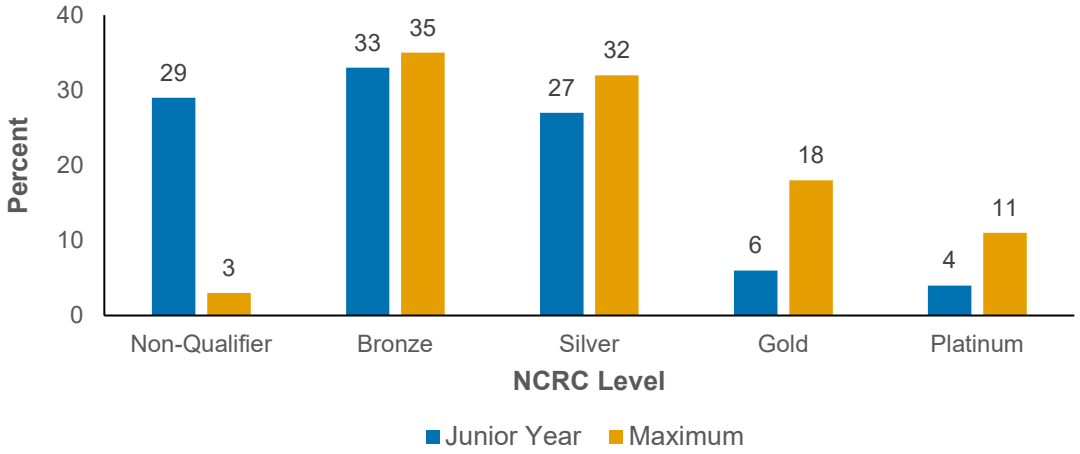
As shown in Table 3, the average differences between junior year and maximum WorkKeys scores ranged from 2.1 points for Workplace Documents to 3.0 points for Graphic Literacy. In all cases, the differences were statistically significant. Those differences corresponded to effect sizes ranging from 0.48 to 0.69 standard deviations, which would be considered medium effects. The increases in scale scores translated to increases in level scores. Specifically, 30.8% increased by one level and 19.1% increased by two or more levels on Applied Math, 36.2% increased by one level and 8.5% increased by two or more levels on Workplace Documents, and 22.6% increased by one level and 33.3% increased by two or more levels on Graphic Literacy. As for NCRC levels, 45.2% increased by one level and 14.0% increased by two or more levels. Figure 4 illustrates differences in the NCRC level distributions from junior year to students' maximum performance. Changes in the distribution are most apparent from the decreasing percentage of non-qualifiers and the increasing percentages of Gold and Platinum NCRCs.

Table 3. Mean Difference in WorkKeys Performance between Junior and Senior Year

Assessment	N	Mean (Junior)	Mean (Maximum)	Mean Difference	Effect Size
Applied Math	94	76.5	79.4	2.9***	0.69
Workplace Documents	94	76.9	79.0	2.1***	0.48
Graphic Literacy	93	75.8	78.8	3.0***	0.67

*** $p < .001$

Figure 4. NCRC Level Distributions over Time



Additional Analyses

Results from several additional analyses are summarized here.

- WorkKeys performance had a small positive association with apprenticeship pay rate. However, apprenticeship pay rate was directly tied to passing CPT exams, so this relationship was expected considering the positive association between WorkKeys and CPT exam scores.
- Other analyses indicated that the typical student who did not qualify for an NCRC at any time had 10 more class absences during senior year compared to the typical student who earned an NCRC (median of 15.5 vs. 5 days). Moreover, there was a weak negative relationship between NCRC level and apprenticeship absences. That is, students with higher NCRC levels had fewer average apprenticeship absences (5.4 for non-qualifiers, 5.1 for Bronze, 4.7 for Silver, 4.5 for Gold, and 4.5 for Platinum).
- A final analysis compared WorkKeys scores for students with different plans after graduation (e.g., manufacturing, military, etc.). The only notable trend was that the 26 students who entered full-time postsecondary studies had slightly higher average WorkKeys scores (by 1–2 points).

Conclusions

Through collaboration with GPS Education Partners, ACT Research analyzed GPSEd student data to examine the relationship between ACT WorkKeys and work-based learning outcomes. Overall, GPSEd students exhibited positive program outcomes. Indeed, students exhibited significant improvement on WorkKeys from junior to senior year, which is consistent with the notion that students improve their foundational workplace skills while at GPSEd. Still, some students might benefit from further skills development to support better outcomes by engaging with the WorkKeys Curriculum. Students who took higher level math courses at GPSEd tended to perform better on WorkKeys Applied Math, and Workplace Document scores had a moderately strong association with Lexile reading ability levels. Students who performed better on WorkKeys tended to score higher on their MSSC CPT exams, and they were more likely to earn the MSSC CPT certification. In all, GPSEd students who performed well on WorkKeys were more likely to have positive academic and certification-related outcomes. Thus, results from the study suggest that WorkKeys measures foundational workplace skills required for success in programs like GPS Education Partners, which offer work-based learning through apprenticeships.

Notes

1. ACT. (2014). *ACT National Career Readiness Certificate*. Iowa City, IA: ACT. Retrieved from http://forms.act.org/certificate/pdf/NCRC-InformationFlyer.pdf.

3. MetaMetrics. (2019). How do Lexile measures relate to grade levels? Durham, NC: MetaMetrics, Inc. Retrieved from https://lexile.com/parents-students/measuring-growth-lexile-measures/evaluating-performance-by-grade/.

4. Steedle, J. (2019). *The ACT WorkKeys National Career Readiness Certificate: A foundation for stackable credentials in manufacturing*. Iowa City, IA: ACT. Retrieved from https://www.act.org/content/dam/act/unsecured/documents/R1738-ncrc-sworwib-2019-01.pdf.

5. ACT. (2016). *ACT WorkKeys Curriculum Analysis Report: Manufacturing Skill Standards Council's Certified Production Technician (CPT) Curriculum*. Iowa City, IA: ACT. Retrieved from https://www.act.org/content/dam/act/unsecured/documents/pdfs/Curriculum-Report-Manufacturing-Skill-Standards-Council-CPT.pdf.