



PowerPrepping for ACT

Assessing the Efficacy of an in-class + at-home Intervention

A Pilot Study at Bearden High School

Study conducted by BHS
Data Analysis by BHS & eKnowledge

Abstract

Nationally, ACT scores have declined steadily for a decade, despite efforts to reverse the trend. The ACT/SAT prep tool produced by eKnowledge takes a novel approach to college entrance exam preparation. Bearden High School in Knoxville, TN evaluated the effectiveness of this tool during the 2020-2021 school year. When used as an intervention for both in-class instruction and homework, the tool increased student ACT scores by an average of 3.8 ACT points. For students who increased their scores, the average increase was 4.7 ACT points.

Introduction

Data from ACT, Inc. indicate that the national average ACT composite score trended downward from 2012 through 2021, and stands at 20.3 as of 2021—an all-time low (See Appendix A).ⁱ In Tennessee, as in many other states, high schools are “graded” according to students’ average ACT scores.ⁱⁱ Thus, administrators are challenged to reverse the downward trend in the interests of students as well as the interests of their schools, districts, & states.

During the 2020-2021 school year, BHS adopted and evaluated the eKnowledge ACT/SAT Prep program (“the tool”) within their existing ACT prep class. The program is an online tool that provides video instruction, as well as score prediction, assessment, and individualized student study plans. All of the curriculum and teaching happens inside the tool, so teachers can support larger groups of students—a single

teacher can manage the progress of several hundred students simultaneously.

This study assesses the tool’s efficacy when used as an intervention both in-classroom and at-home, to improve 11th grade students’ performance on the ACT exam.

Methods

To assess the effectiveness of the tool, BHS staff conducted an experiment in one section of its ACT prep class. 62 students participated in the study. All participants were 11th-grade students whom BHS believed were likely to under-perform on the ACT. The study was one semester in length and took place January – April of 2021. Results were de-personalized before analysis.

1. In January 2021, BHS staff proctored a “practice” ACT exam to establish each student’s baseline score. An officially-released ACT test from a prior year was used.
2. The online tool was introduced. It evaluated each student’s strengths and weaknesses and then auto-generated individualized/custom study plans.
3. Working with the online tool at school and from home, students studied according to their individual study plans and at their own pace using the program’s multi-media resources and tools.
4. Because the tool provided all the academic instruction, BHS teachers did not create lesson plans or curriculum. Their primary role was to encourage,

motivate, and intervene 1-on-1 where needed among all students.

5. Students took their scheduled ACT exams in March 2021, and ACT officials reported

the students' scores back to BHS. Some students continued using the tool and took the ACT again during the spring/summer of 2021. Their highest scores were used.

Data

Overall

The average change in score for all 62 participants was **+3.8 ACT** points.

Score changes break down as follows:

- 86% of students' scores increased (53 of 62). Of scores that increased, the average change was **+4.7 ACT** points, and the maximum change was +11 ACT points.
- 5% of students' scores did not change (3 of 62).
- 10% of students' scores decreased (6 of 62). Of scores that decreased, the average change was **-1.5 ACT** points, and the maximum change was -3 ACT points.

The class's average initial ACT score was **17.85**. After the intervention, the class's average ACT score was **21.69** (a 3.84-point increase).

Comparison to National & State Averages

2021 Composite ACT average (All)	2021 Composite ACT average (Tennessee)	Study cohort average (Pre-Intervention, Composite)	Study cohort average (Post-Intervention, Official ACT Composite)
20.3	19.1	17.9	21.7

Prior to the intervention, the cohort scored an average of **2.45 ACT points below** the 2020 national average of 20.3. After the intervention, the cohort scored an average of **1.35 ACT points above** the national average.

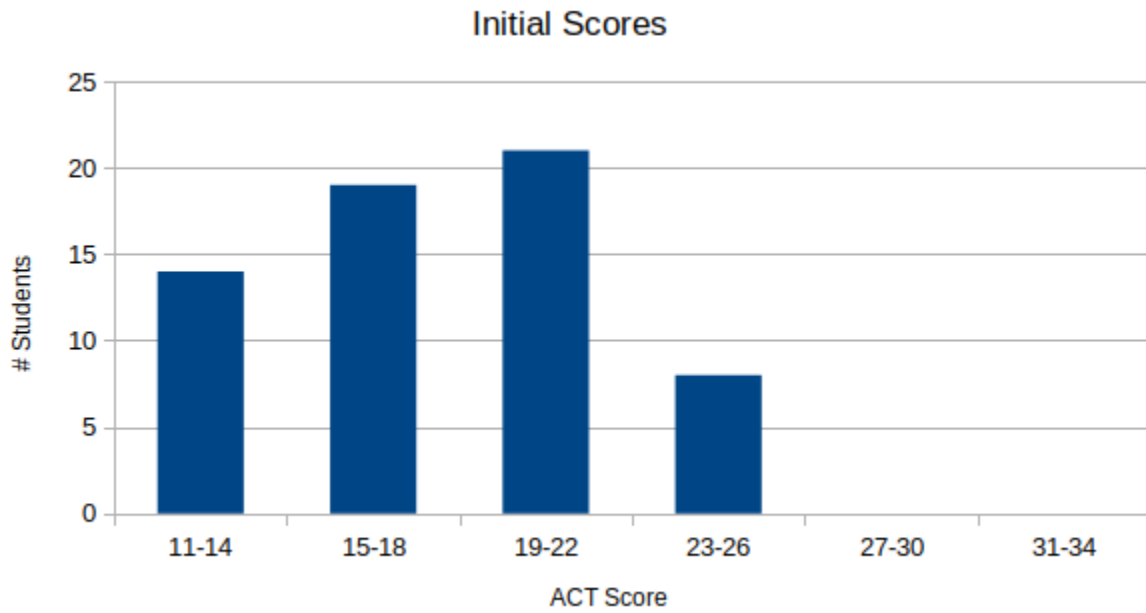


Figure 1: Histogram: Initial Scores

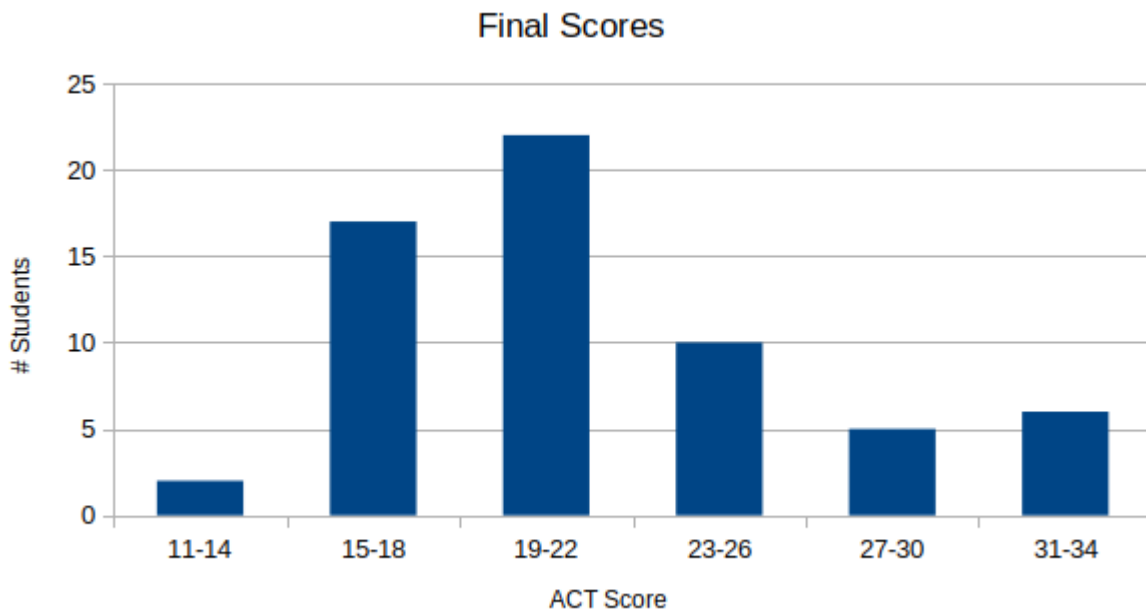


Figure 2: Histogram: Final Scores (Official)

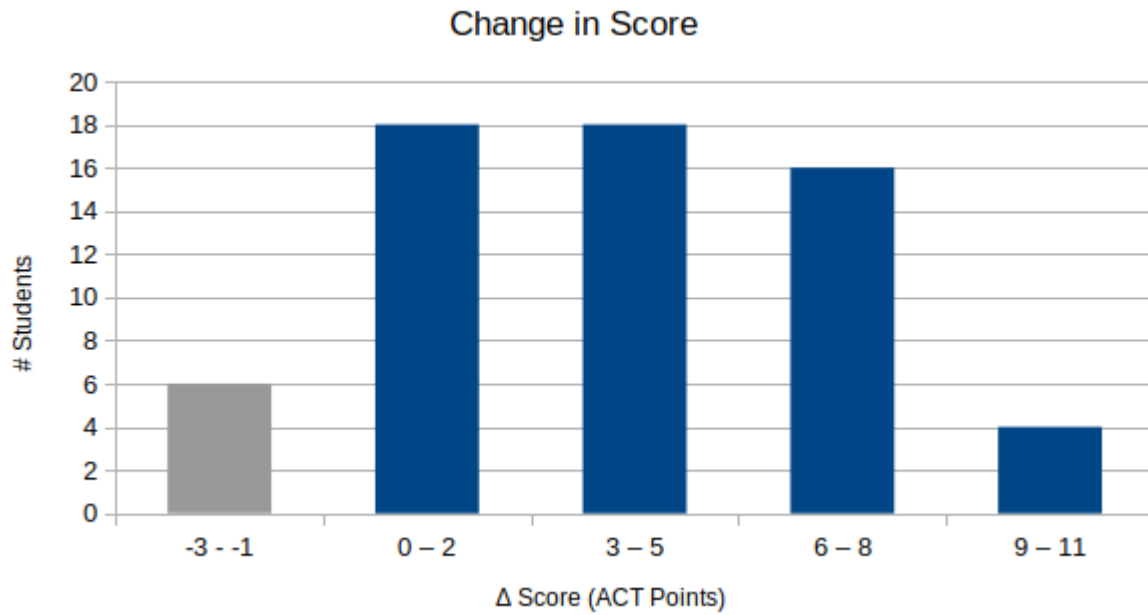


Figure 3: Histogram: Change in ACT Scores

Initial Score

The following chart shows outcomes according to initial score.

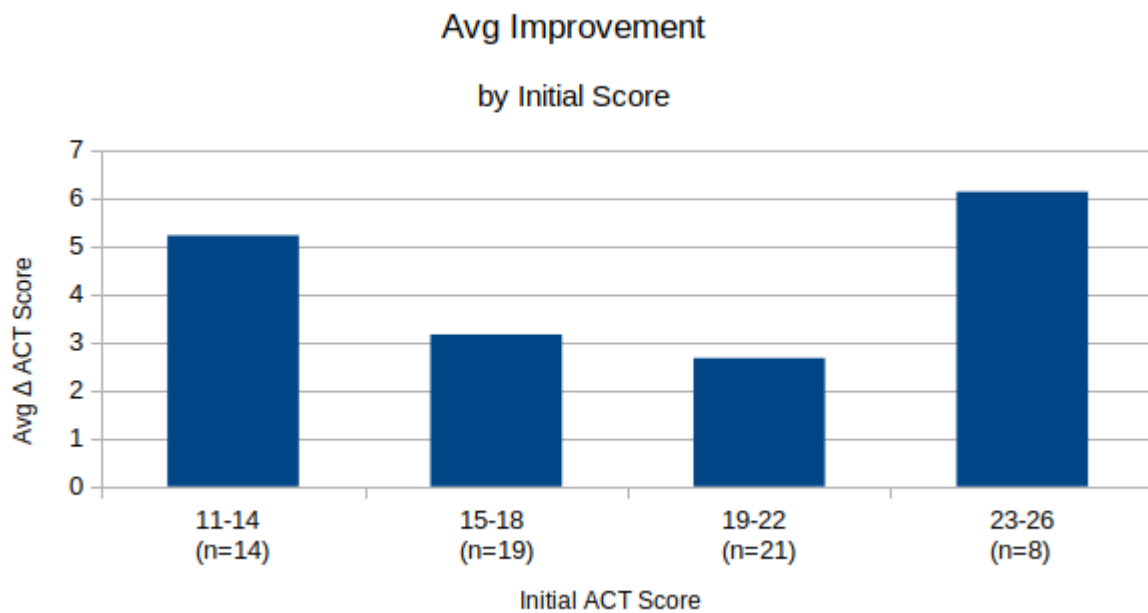


Figure 4: Average Δ ACT Score

Time In Program

Students spent an average of 20 hours studying using the tool (in-class + homework). “Time in program” was reported by the tool, and includes only time spent actively engaged with the learning materials. The following charts show outcomes according to time spent studying.

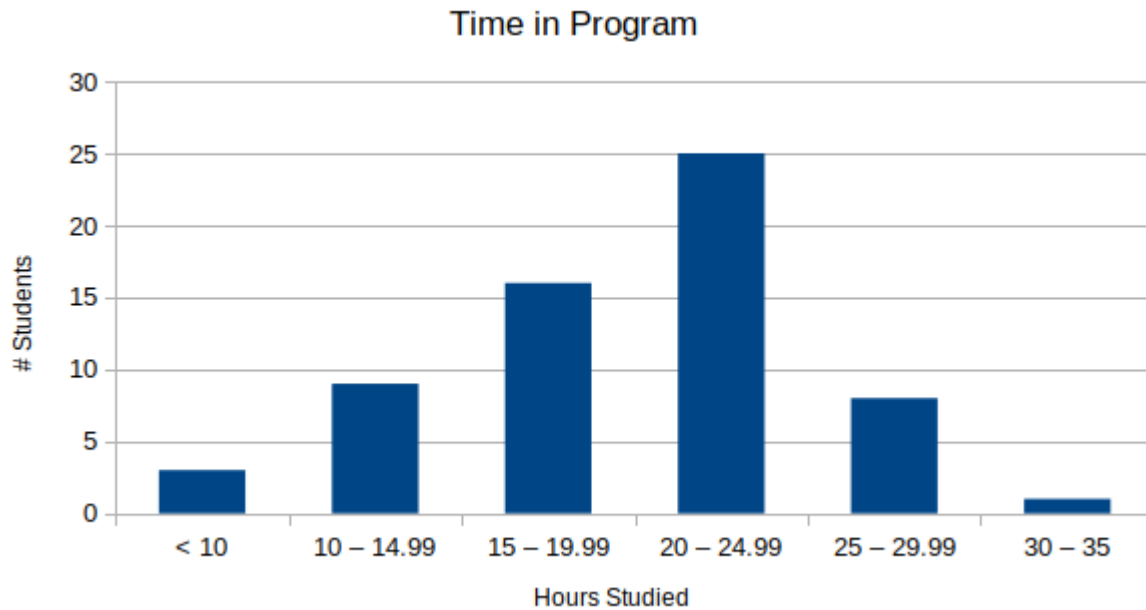


Figure 5: Histogram: Time in Program

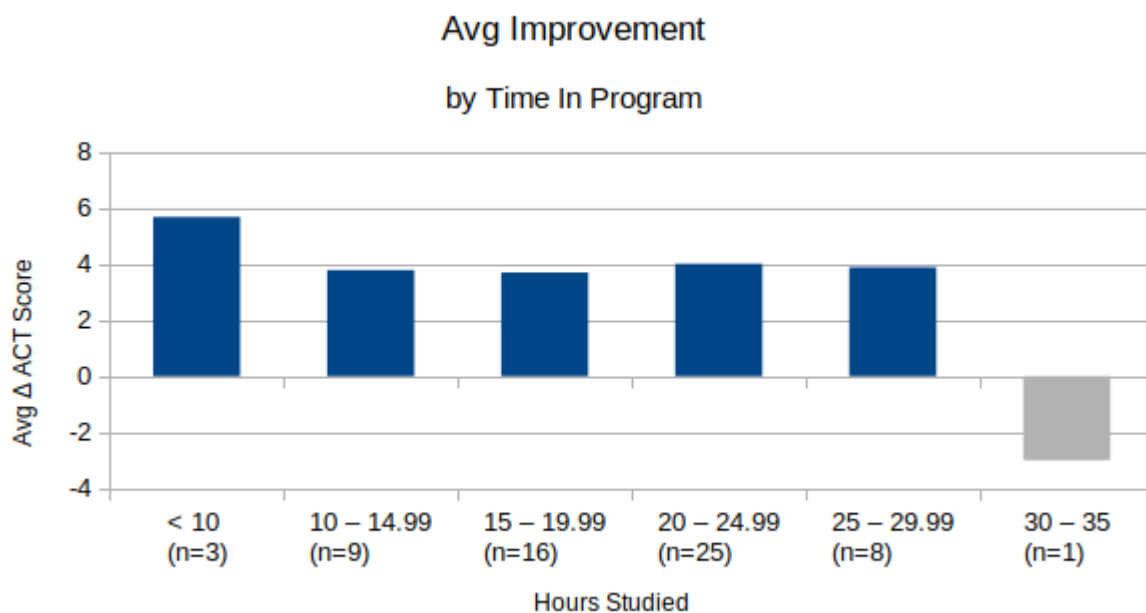


Figure 6: Change in ACT Score, by Hours Studied

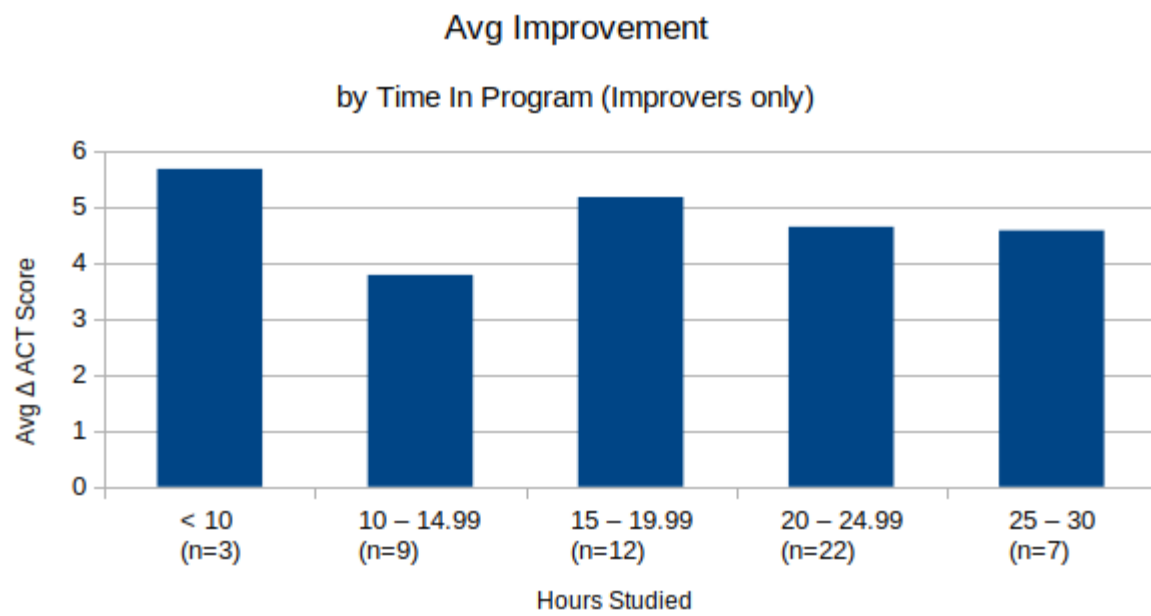


Figure 7: ACT Score Improvement, by Hours Studied

Results

The average change in score for all 62 participants was **+3.8 ACT** points. 86% of participants increased their scores. For those who increased their scores, the average increase was **4.7 ACT** points.

The average score of the cohort moved from 17.9 (**2.4 points below** the national average) in January, to 21.7 (**1.4 points above** the national average) in March. The ramifications of such a change vary from state to state and district to district—school administrators will immediately

recognize the significance of moving their particular school's average scores above benchmarks such as national and state averages.

According to ACT, Inc's official public data, a 3.8-pt year-over-year increase in average ACT score places the study's cohort in the 99th percentile for YoY ACT score improvement among "comparison schools testing 50 to 99 graduates." ⁱⁱⁱ

The tool, used in the context of Bearden High School's ACT prep program (in-class + at-home) is efficacious.

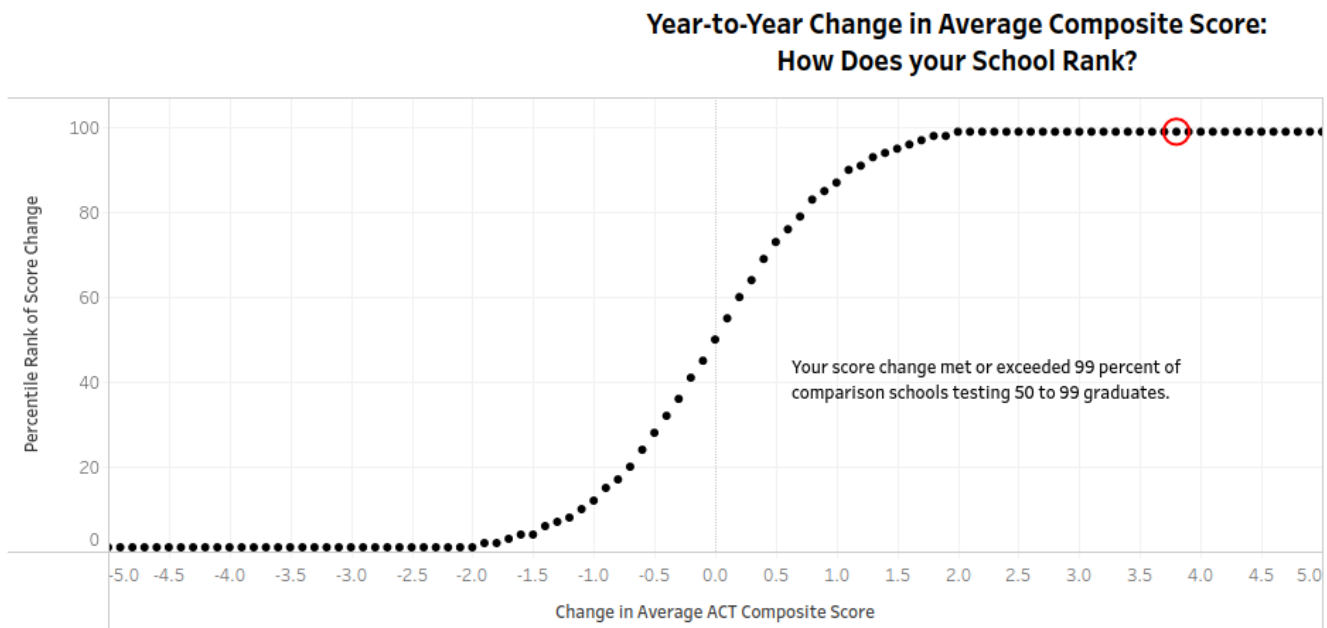


Figure 8: YoY ACT Score Change, Percentile Rankings For Schools (ACT, Inc)

Discussion

While the results of this pilot study are promising, further research is needed to increase the statistical power of the results. Future studies are planned at Bearden High School and elsewhere.

Feasibility

The properties of this intervention made it extremely feasible to implement.

For this study, the teacher was Bearden High School's Varsity baseball coach—a dynamic and experienced educator and coach. Instruction took place within the online tool, and the in-classroom teacher applied his expertise as a coach by encouraging and motivating students towards their individual goals. The teacher did not design curriculum, prepare lesson plans, or grade assignments, which greatly reduced the burden on the teacher. The teacher was able to manage a large number of students without detracting from other teaching and coaching responsibilities.

The comparatively light load of implementing this intervention freed administrators to select their most motivating and student-centric teacher or coach—with much-reduced risk of overburdening him. Therefore, in many schools, this intervention may be dramatically more feasible and more scalable than traditional approaches.

Limitations

This study's sample size is 62 participants. Therefore, some of the sub-group averages in the

Data section are low-precision. For example, the left-most and right-most groupings in figure 6 lack precision (sample sizes of 3 and 1, respectively).

The tool was studied in the context of a complete academic program designed by professional educators—including structured classroom time, encouragement, motivation, and 1-on-1 intervention from a teacher. This study cannot predict outcomes for students who use the tool without similar structured time, encouragement, and 1-on-1 attention.

In any study, there are ethical concerns about withholding a believed-effective intervention from a control group. In this case, it was decided that all students should receive the intervention. Therefore, the data should be interpreted with the understanding that confounds likely exist. However, because the outcomes were unusually positive relative to previous semesters, we believe confounds likely temper, rather than exaggerate, the results of the study. Future studies are planned to address this limitation.

The study's participants, although racially, ethnically and economically diverse, attended the same high school, were in the same grade, and were administered the program by a single teacher. Therefore, the influence of the teacher is a confounding variable. To increase the power of the results, similar studies should be conducted at other schools and with students in different grade levels.

Because the data were anonymized by Bearden High School prior to analysis, it was not possible to control for race, gender, socioeconomic background or other factors. The cohort included

male and female students from various backgrounds, speaking multiple different first-languages, and immigrants originating from multiple countries outside of the United States. Because of the diverse makeup of the cohort, we believe the data indicate efficacy of the intervention across gender, racial, socioeconomic, and cultural lines. However, more research is needed to determine the existence and severity of any disparate outcomes across groups.

Future Research

15% of students did not improve. Follow-up interviews should be conducted with these students to determine causal factors, and findings should be used to improve the intervention.

To further validate this study's findings, similar studies should be repeated at multiple high schools in different areas of the United States. Questions remain to be answered by future research:

- This study measures results for ACT preparation. An equivalent study should be deployed to verify the efficacy of the SAT version of the tool.
- Why did some students not improve? Why did some scores decrease? Can the

underlying causes be addressed by the intervention under study, or are entirely different interventions needed? What other intervention(s) would effectively improve outcomes for these students?

- What is the relative importance of the teacher/coach in motivating and directing students? We suspect that the teacher or coach (motivator) is indispensable in achieving the outcomes observed in this study.
- Are there disparate outcomes for various racial, ethnic, gender, cultural, or other groups? Is the program equally efficacious for marginalized or disadvantaged students? How can the program be improved to increase efficacy for these group(s)?

Acknowledgments

The study was conducted at Bearden High School in Knoxville, TN. Data were collected, verified and anonymized by Bearden staff prior to analysis.

Appendix: Supplemental Data

The following two figures were obtained from ACT.org's public data visualization tool. ^{iv}

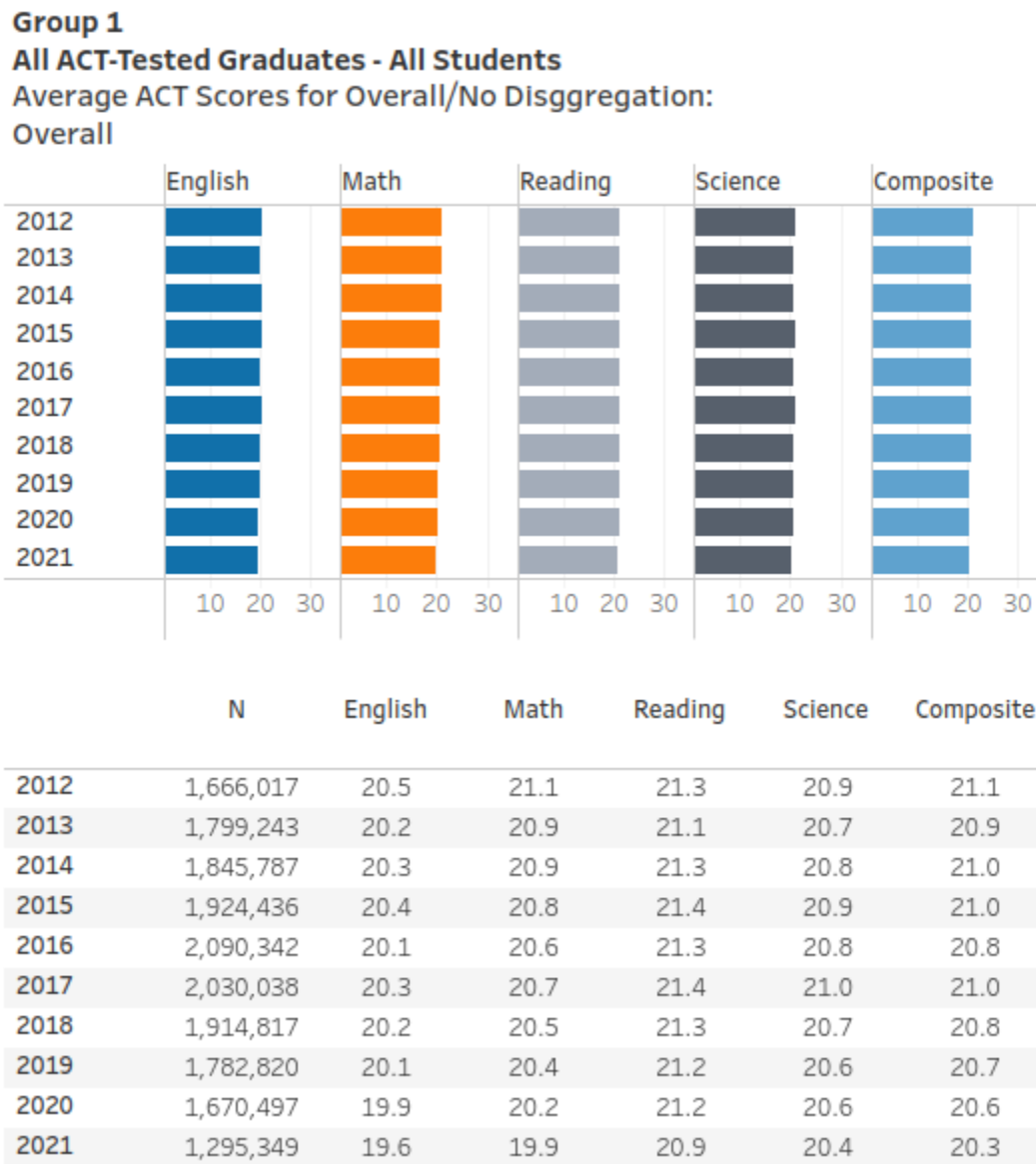


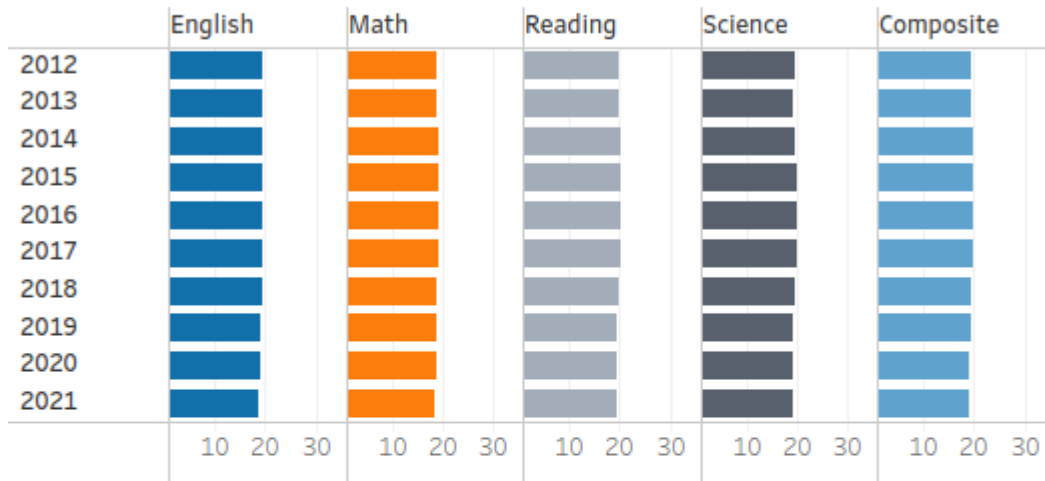
Figure 9: Average ACT Scores 2012-2021 (Source: ACT.org)

Group 2

Tennessee ACT-Tested Graduates - All Students

Average ACT Scores for Overall/No Disaggregation:

Overall



	N	English	Math	Reading	Science	Composite
2012	68,095	19.6	19.1	19.9	19.6	19.7
2013	69,641	19.3	19.1	19.8	19.4	19.5
2014	69,505	19.6	19.2	20.1	19.6	19.8
2015	68,737	19.5	19.3	20.1	19.9	19.8
2016	71,880	19.6	19.2	20.3	19.9	19.9
2017	75,808	19.5	19.2	20.1	19.9	19.8
2018	79,170	19.4	19.1	19.9	19.6	19.6
2019	85,436	19.1	18.9	19.7	19.2	19.4
2020	80,372	19.1	18.7	19.6	19.1	19.3
2021	73,295	18.7	18.5	19.7	19.1	19.1

Figure 10: Average Tennessee ACT Scores 2012-2021 (Source: ACT.org)

Table 157. ACT score averages and standard deviations, by sex and race/ethnicity, and percentage of ACT test takers, by selected composite score ranges and planned fields of study: Selected years, 1995 through 2011

Score type and test-taker characteristic	1995	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
1	2	3	4	5	6	7	8	9	10	11	12	13	14
Total test takers													
Number (in thousands)	945	1,065	1,070	1,116	1,175	1,171	1,186	1,206	1,301	1,422	1,480	1,569	1,623
Percent of graduates	37.5	37.6	37.6	38.4	39.0	38.4	38.2	38.6	40.6	42.9	44.6	47.2	49.5
	Average test score ¹												
Composite score, total	20.8	21.0	21.0	20.8	20.8	20.9	20.9	21.1	21.2	21.1	21.1	21.0	21.1
Sex													
Male	21.0	21.2	21.1	20.9	21.0	21.0	21.1	21.2	21.2	21.2	21.3	21.2	21.2
Female	20.7	20.9	20.9	20.7	20.8	20.9	20.9	21.0	21.0	21.0	20.9	20.9	21.0
Race/ethnicity													
White	—	22.7	21.8	21.7	21.7	21.8	21.9	22.0	22.1	22.1	22.2	22.3	22.4
Black	—	17.8	16.9	16.8	16.9	17.1	17.0	17.1	17.0	16.9	16.9	16.9	17.0
Hispanic	—	—	—	18.4	18.5	18.5	18.6	18.6	18.7	18.7	18.7	18.6	18.7
Asian/Pacific Islander	—	22.4	21.7	21.6	21.8	21.9	22.1	22.3	22.6	22.9	23.2	23.4	—
Asian	—	—	—	—	—	—	—	—	—	—	—	—	23.6
Native Hawaiian/Pacific Islander	—	—	—	—	—	—	—	—	—	—	—	—	19.5
American Indian/Alaska Native	—	20.4	18.8	18.6	18.7	18.8	18.7	18.8	18.9	19.0	18.9	19.0	18.6
Two or more races	—	—	—	—	—	—	—	—	—	—	—	—	21.1
Subject-area scores													
English	20.2	20.5	20.5	20.2	20.3	20.4	20.4	20.6	20.7	20.6	20.6	20.5	20.6
Male	19.8	20.0	20.0	19.7	19.8	19.9	20.0	20.1	20.2	20.1	20.2	20.1	20.2
Female	20.6	20.9	20.8	20.6	20.7	20.8	20.8	21.0	21.0	21.0	20.9	20.8	20.9
Mathematics	20.2	20.7	20.7	20.6	20.6	20.7	20.7	20.8	21.0	21.0	21.0	21.0	21.1
Male	20.9	21.4	21.4	21.2	21.2	21.3	21.3	21.5	21.6	21.6	21.6	21.6	21.6
Female	19.7	20.2	20.2	20.1	20.1	20.2	20.2	20.3	20.4	20.4	20.4	20.5	20.6
Reading	21.3	21.4	21.3	21.1	21.2	21.3	21.3	21.4	21.5	21.4	21.4	21.3	21.3
Male	21.1	21.2	21.1	20.9	21.0	21.1	21.0	21.1	21.2	21.2	21.3	21.1	21.1
Female	21.4	21.5	21.5	21.3	21.4	21.5	21.5	21.6	21.6	21.5	21.4	21.4	21.4
Science reasoning	21.0	21.0	21.0	20.8	20.8	20.9	20.9	20.9	21.0	20.8	20.9	20.9	20.9
Male	21.6	21.6	21.6	21.3	21.3	21.3	21.4	21.4	21.4	21.3	21.4	21.4	21.4
Female	20.5	20.6	20.6	20.4	20.4	20.5	20.5	20.5	20.5	20.4	20.4	20.5	20.5
	Standard deviation ²												
Composite score, total	—	4.7	4.7	4.8	4.8	4.8	—	4.8	5.0	5.0	5.1	5.2	5.2

Figure 11: ACT Score averages 1995 - 2011

Source: National Center for Education Statistics

https://nces.ed.gov/programs/digest/d11/tables/dt11_157.asp

Table 137. American College Testing (ACT) score\1\ averages, by sex: 1970 to 2000

Type of test	1970	1975	1980	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Participants:\2\																			
Total (in thousands)	714	822	836	739	730	777	842	855	817	796	832	876	892	945	924	959	995	1,019	1,065
Test scores\3\																			
Composite, total	18.6	18.5	18.5	18.6	18.8	18.7	18.8	18.6	20.6	20.6	20.6	20.7	20.8	20.8	20.9	21.0	21.0	21.0	21.0
Male	19.5	19.3	19.3	19.4	19.6	19.5	19.6	19.3	21.0	20.9	20.9	21.0	21.0	21.0	21.0	21.1	21.1	21.1	21.2
Female	17.8	17.9	17.8	17.9	18.1	18.1	18.1	18.0	20.3	20.4	20.5	20.5	20.7	20.7	20.8	20.8	20.9	20.9	20.9
English, total	17.7	17.9	17.8	18.1	18.5	18.4	18.5	18.4	20.5	20.3	20.2	20.3	20.3	20.2	20.3	20.3	20.4	20.5	20.5
Male	17.1	17.3	17.3	17.6	17.9	17.9	18.0	17.8	20.1	19.8	19.8	19.8	19.8	19.8	19.8	19.9	19.9	20.0	20.0
Female	18.3	18.3	18.2	18.6	18.9	18.9	19.0	18.9	20.9	20.7	20.6	20.6	20.7	20.6	20.7	20.7	20.8	20.9	20.9
Math, total	17.6	17.4	17.3	17.2	17.3	17.2	17.2	17.1	19.9	20.0	20.0	20.1	20.2	20.2	20.2	20.6	20.8	20.7	20.7
Male	19.3	18.9	18.9	18.6	18.8	18.6	18.4	18.3	20.7	20.6	20.7	20.8	20.8	20.9	20.9	21.3	21.5	21.4	21.4
Female	16.2	16.2	16.0	16.0	16.0	16.1	16.1	16.1	19.3	19.4	19.5	19.6	19.6	19.7	19.7	20.1	20.2	20.2	20.2
Reading, total\4\	17.4	17.2	17.2	17.4	17.6	17.5	17.4	17.2	---	21.2	21.1	21.2	21.2	21.3	21.3	21.3	21.4	21.4	21.4
Male	18.7	18.2	18.3	18.3	18.6	18.4	18.4	18.1	---	21.3	21.1	21.2	21.1	21.1	21.0	21.2	21.1	21.1	21.2
Female	16.4	16.4	16.4	16.6	16.9	16.7	16.6	16.4	---	21.1	21.1	21.2	21.4	21.4	21.6	21.5	21.6	21.6	21.5
Science reasoning, total\5\	21.1	21.1	21.0	21.2	21.4	21.4	21.4	21.2	---	20.7	20.7	20.8	20.9	21.0	21.1	21.1	21.1	21.0	21.0
Male	22.4	22.4	22.3	22.6	22.7	22.8	22.8	22.6	---	21.3	21.4	21.5	21.6	21.6	21.7	21.7	21.8	21.5	21.6
Female	20.0	20.0	20.0	20.0	20.2	20.1	20.2	20.0	---	20.1	20.1	20.3	20.4	20.5	20.5	20.6	20.6	20.6	20.6
Percent																			
Obtaining composite scores of--	---	---	---	---	---	---	---	---	12	12	11	12	12	12	13	10	10	10	10
27 or above \6\.....	---	---	---	---	---	---	---	---	35	35	35	35	35	35	34	26	25	25	25
18 or below \7\.....	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Planned major field of study																			
Business\8\	18	14	20	21	22	23	23	22	20	18	16	14	13	13	12	12	12	12	11
Engineering\9\	8	6	8	9	9	9	9	9	9	10	10	9	9	8	8	8	8	8	8
Social science\10\	10	7	6	7	8	9	10	11	10	10	10	9	9	9	9	9	9	9	9
Education\11\	16	11	9	6	7	8	8	8	8	8	8	8	8	8	9	9	9	9	9

Figure 12: ACT score averages 1970-2000

Source: National Center for Education Statistics

<https://nces.ed.gov/programs/digest/d00/dt137.asp>

- i <https://nces.ed.gov/programs/digest/d00/dt137.asp>
https://nces.ed.gov/programs/digest/d11/tables/dt11_157.asp
- ii The Tennessee Value-Added Assessment System (TVAAS) assesses high schools based upon both ACT performance and “ACT growth” (year-over-year change in performance). See <https://tvaas.sas.com/welcome.html>
- iii <https://public.tableau.com/app/profile/act2044/viz/AverageScoreChangeHowDoesYourSchoolRank/Dashboard1>
- iv <https://www.act.org/content/act/en/research/services-and-resources/data-and-visualization/grad-class-database-2021.html>