
Turnitin Revision Assistant

Results from the Classroom: Pilot Study Review

Table of Contents

Abstract	2
1.0 Introduction	2
2.0 Key Findings for Middle School Students	4
3.0 Key Findings for High School Students	5
4.0 Discussion of Results and Limitations	7
5.0 Conclusion	8
References	8
About Turnitin	9

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Abstract

Turnitin Revision Assistant is a web-based writing tool that provides instant, actionable, and targeted feedback to students while they write. In 2015, Turnitin conducted a pilot study of Revision Assistant with eighteen middle and high schools, 164 educators and 3,439 students. An analysis of student writing composed with the help of Revision Assistant revealed three key areas of writing growth among participating students: revision of student work, length of student compositions, and performance on standards-aligned rubrics. Ninety-four percent of pilot students revised their work at least once when writing with Turnitin Revision Assistant; middle school students revised, on average, ten times, while high school students revised six times. Middle schoolers doubled the length of their essays across revisions when using the system, while high school papers increased by 70%. Finally, the data reveal that Revision Assistant helped students improve their writing performance as measured by standards-aligned rubrics. On average, middle school students saw their scores increase by nearly one full point (on a four-point scale), while high schoolers' scores grew by three-quarters of a point. These findings suggest that Revision Assistant effectively supports growth in student writing.

1.0 Introduction

1.1 Revision Assistant Overview

Revision Assistant is a web-based writing tool that provides immediate, specific feedback to students *while they are engaged in the writing process*. Revision Assistant emphasizes the revision process, encouraging students to take ownership over their own writing and the writing process. For teachers, Revision Assistant provides the opportunity to view student progress over time, across their drafts.

Revision Assistant is used in a variety of settings, including timed performance tasks, writing practice, or homework assignments. Its library of writing prompts contains both document-based and open-ended tasks, which are suitable for both middle and high school students. The prompts cover a wide range of genres and essay types and are standards-aligned.

At any point during the writing process, students may have Revision Assistant call a "Signal Check," which instantly provides both qualitative and visual feedback on their work. First, the Signal Check provides a student-friendly visualization of trait-level scores on standards-aligned rubrics, which cover areas such as focus, evidence, ideas, and genre. Second, actionable, direct comments appear in the margins of students' compositions and are tied to specific sentences highlighted in the text. The Signal Check feedback emphasizes areas of strength and offers constructive suggestions for sentence-level improvements. The combination of prioritized positive and constructive comments encourages students to continue to revise and progress.

Revision Assistant also offers students the ability to use a pre-writing tool so they have a space for collecting and organizing their thoughts. Additionally, a set of automated validators will prevent students from gaming the system and inform them if they are writing off-topic; making invalid attempts that are not appropriate; or are relying too heavily on source quotes, so that they can make sure to emphasize original writing in their work.

1.2 Brief Literature Review on Student-Driven Revision

Revision Assistant facilitates students' improvement in writing by helping them to increase their sense of self-efficacy. Self-efficacy is how a student perceives his or her own ability to effect change (Bandura, 1997) and is the only psychosocial construct known to consistently account for the variance in student performance after taking that student's prior ability into consideration (Pajares, 2003). Seeking help aids students in improving their ability (Newman, 1994), which thereby improves their self-efficacy (Karabenick, 2003). However, the act of seeking help can sometimes present disadvantages since students may treat it as a threat to their autonomy (Huet, Escribe, Dupeyrat & Sakdavong, 2011). Research has shown, however, that these potential detriments are mitigated when students seek help online (Walther & Boyd, 2002), particularly with intelligent tutoring systems (Matsuda, Yarzebinski, Keiser, Reisada, Stylianides, Cohen & Koedinger, 2011), and especially so in the latter case when students socially align themselves with those systems (Ogan, Finkelstein, Mayfield, D'Adamo, Matsuda & Cassell, 2011).

Revision Assistant's design incorporates evidence-based practices on how students effectively learn how to write with the aforementioned findings on self-efficacy. Students who learn how to treat writing as an iterative process show significant improvement in skills that transfer to other tasks (Tillema, van den Bergh, Rijlaarsdam & Sanders, 2011). However, learning to think of writing as a process is extremely challenging (Graham & Harris, 2005), and teaching this lesson is no less complex (Scardamalia & Bereiter, 1996). Formative writing instruction with systems that use automated assessment technologies has shown strong gains in learning (Crossley, Varner, Roscoe & McNamara, 2013), especially if it emphasizes writing strategies (Graham & Perin, 2007) and treats writing as a process that relies upon revision (Deane, Odendahl, Quinlan, Welsh & Bivens-Tatum, 2008). Revision Assistant builds upon this research with new features that promise to increase student engagement and self-efficacy even more: actionable feedback delivered in-line with the student's own writing and a timeline view that shows progress over time within a composition.

1.3 Pilot Study Background and Methods

Turnitin conducted a pilot study of Revision Assistant that ran from January to April of 2015. Eighteen schools from Pennsylvania, Arizona, Minnesota, California, North Carolina, New Jersey, New York, Florida, and Maryland participated in the pilot. Participants included 164 educators, who were primarily English Language Arts and AP[®] English teachers, and 3,439 students from both middle and high school. Turnitin provided teachers with non-mandatory training on Revision Assistant that took place either remotely or in person, and the study's expectations were that educators would use Revision Assistant within their classes for at least one writing assignment.

The primary goals of this pilot study were to:

- Gain insights into the user experience in order to determine what improvements to make on the system.
- Gather data to determine the efficacy of Revision Assistant in regards to encouraging students to write more and to help them improve upon their writing skills.

This white paper presents the preliminary findings related to the second goal, as determined by an analysis of the writing students submitted to Revision Assistant during the pilot. As primary indicators, we measure the number of drafts that students wrote, the number of words contained within each draft, and the rubric evaluation that Revision Assistant applied to each draft through Signal Checks.

Middle schools within the pilot simultaneously took part in another formal study on efficacy administered by SRI International[®] for the Bill and Melinda Gates Foundation[®]. That study is currently under review and will be released separately and independently. For specific details about the implementation and testing of Revision Assistant in early classroom pilots, see "Talking with Teachers: Reflective Design of Automated Formative Writing Assessment" (Mayfield, 2014) and "Automated Essay Scoring Done Right: Using LightSide for Feedback in Classroom Writing" (Mayfield & Butler, 2014).

2.0 Key Findings for Middle School Students

2.1 Summary of Results

As the pilot study did not control for external factors that may also have had an impact on student outcomes (such as classroom environments, curricula, and particular pedagogies used during instruction), this paper serves only as a precursor to more rigorous investigations that will take place in the near future. However, our results consistently show that students in both middle school and high school revised more, wrote more, and showed improvement in writing quality when using Revision Assistant. The most positively striking result: 94% of all students revised their essay at least once within Turnitin Revision Assistant, compared to a baseline of 29% in prior research using existing software (Attali, 2004). Students' scores improved significantly, as well. Middle school students' essay scores, on average, increased nearly one full point from their first draft to their final paper. The scores for high school students increased, on average, nearly three-quarters of a point.

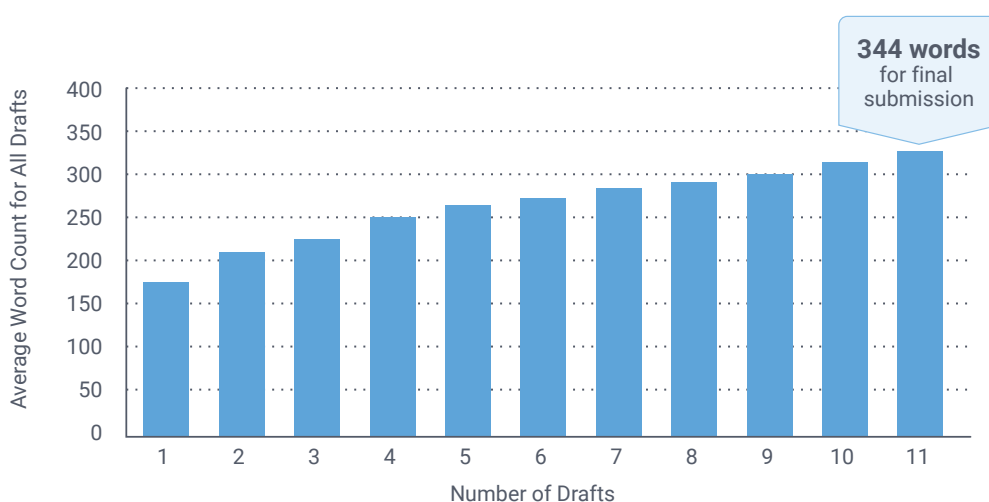
2.2 Middle School Students Revised More

Students participating in the pilot in the 6th through 8th grades, on average, wrote eleven drafts of their essays before they made a final submission of their work for their teachers to review. Out of approximately 1,700 middle school students, 93% revised at least once; nearly 1,100 wrote five drafts or more; and almost 540 wrote ten drafts or more. Comparing these numbers to those in Attali's study (2004), where only 29% of students revised at least once and less than 1% revised ten times, these data demonstrate that middle school students revised more using Revision Assistant.

2.3 Middle School Students Wrote More

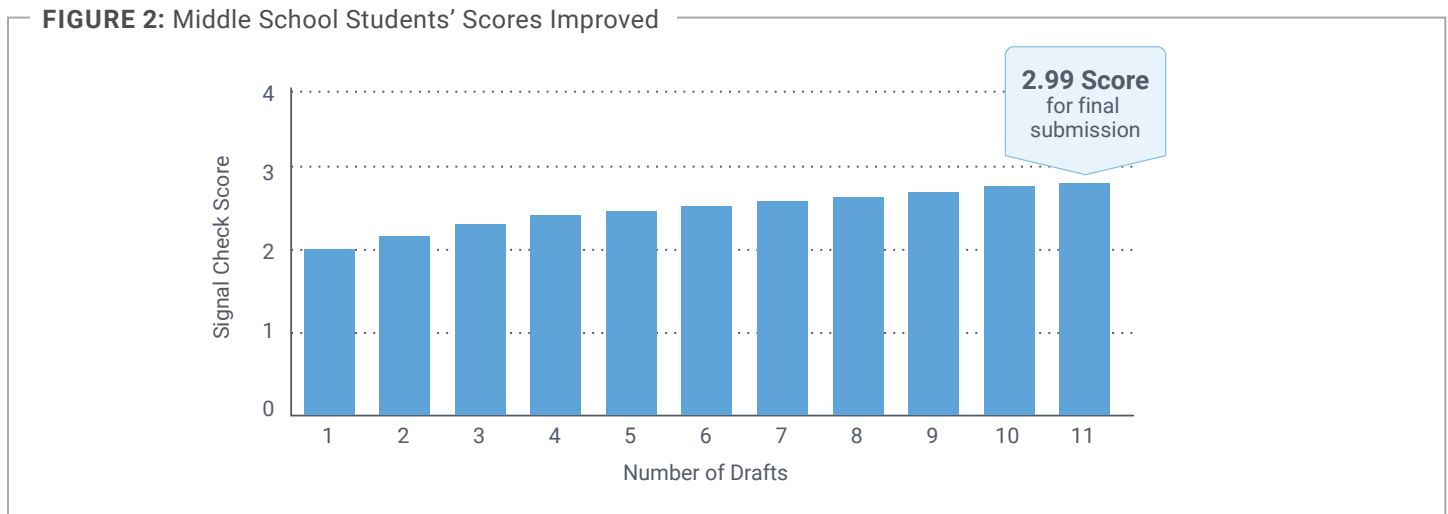
The average word counts of the students' papers steadily increased with each revision. Figure 1 represents the average number of words for all essay drafts, up to the eleventh-draft mark, since students wrote, on average, eleven drafts before they submitted their final papers for review. The counts in this chart include essays from students who continued to revise, as well as the papers that were submitted to their teachers. Looking at all drafts, the average number of words in students' initial essays was 178; by the fifth draft, the number of words had increased to 262, and for those papers that had ten versions, the average word count reached an average of 312. Since students wrote, on average, eleven drafts before submitting a final version to their teachers, Figure 1 indicates the average word count of the final submissions that took eleven drafts: 344. The typical student essay written with Turnitin Revision Assistant nearly doubled in length over the course of using the software.

FIGURE 1: Middle School Students Wrote More



2.4 Middle School Students' Writing Improved

Not only did students revise more and write more, but their performances improved, on average, for each additional draft they wrote. Figure 2 shows the average Signal Check score received by students for all drafts. Signal Checks are based on a trait-based, 1- to 4-point rubric scale, with four genre-specific traits per rubric. The average Signal Check score for middle school students' first attempts was 2.02; by the fifth draft, this increased to 2.48, and by draft number ten to 2.79. Final submissions in Turnitin Revision Assistant received an average Signal Check score of approximately 3.0, demonstrating a full point increase from the initial essay.



3.0 Key Findings for High School Students

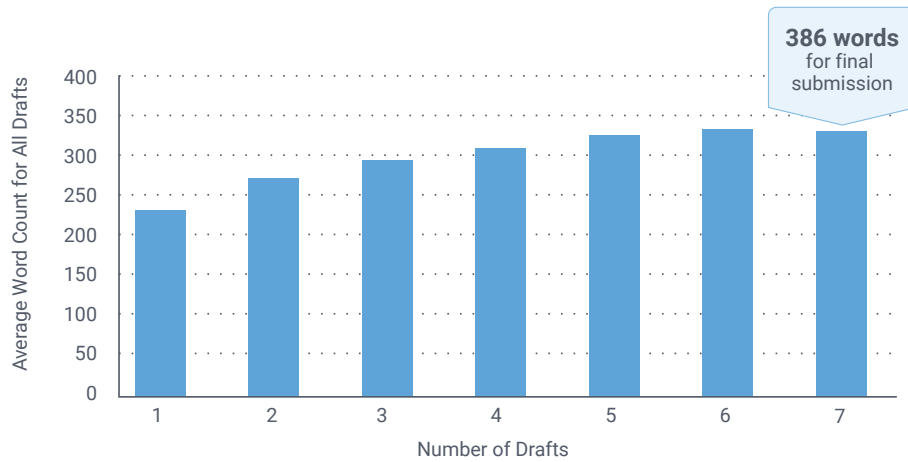
3.1 High School Students Revised More

High school students wrote seven drafts, on average, before submitting their final essay versions for their teachers to grade. Approximately 2,013 students wrote one or more drafts; 937 wrote five drafts or more and 359 students wrote ten or more drafts. In Turnitin Revision Assistant, 94.4% revised their essays at least once and the highest number of drafts written was 36. Again, the strong discrepancies in the number of revisions that students wrote using Revision Assistant and the drafting behaviors of students documented by Attali (2004) show how much more high school students revised with Revision Assistant.

3.2 High School Students Wrote More

High school students increased the average word counts of their essays on each succeeding draft, particularly in the first six revisions (Figure 3). High school students, on average, wrote seven drafts before submitting their papers for final review. The initial first drafts contained, on average, 226 words; which increased rapidly to 294 words by the third draft; and then to 329 by the seventh draft. Looking specifically at the essays that were submitted for final review, we find that the average word count was 386. In other words, the average student's essay increased in length by over 70% between the first and final drafts with the support of Turnitin Revision Assistant.

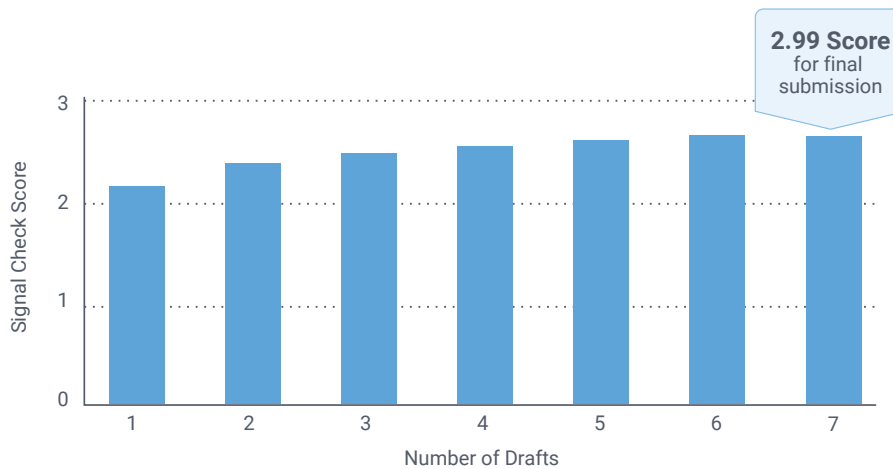
FIGURE 3: High School Students Wrote More



3.3 High School Students' Scores Improved

Results for high school students also increased, on average, for each subsequent version of their essays. The average Signal Check score for their first drafts was 2.26; which increased to 2.6 by the third version; which then went on to reach 2.77 by their sixth revision. High school students who submitted their papers for final review in the seventh iteration demonstrated an even higher average score of 2.99.

FIGURE 4: High School Students' Scores Improved



4.0 Discussion of Results and Limitations

The results presented above give a strong directional indicator of efficacy, but there are limitations to the claims that can be made based on the data. First and foremost, this paper presents several results based on average word count across revisions. One problem here is that word count does not necessarily correlate directly with an improvement in essay quality. A growth in word count does indicate, however, that students wrote more, and therefore practiced more. Among students in early grade levels in particular, an increase in writing practice is a positive result in and of itself which increases the likelihood that students' skills progressed.

Second, there are few to no formal studies in the current literature that present baseline metrics against which this analysis can measure some of its results. We neither know the average word count nor the typical rubric score increase across revisions on traditional writing assignments for students. However, Attali's research on ETS's Criterion system (2004) does provide us with a strong baseline indicator for the third metric, that is, how many revisions students typically make. In that study of 23,567 students, Attali found that only 29% submitted more than one drafts of their papers. Only 13% submitted four or more drafts, and less than 1% submitted 10 drafts of their papers. As this paper shows, students using Revision Assistant revised many more times.

In regards to the number of revisions that students wrote and the observed performance increases across these revisions, one may argue that the data within this study are affected by "survivor bias" (Feldstein, 2013). We have investigated this, and there are strong indications that this did not occur. The survivor bias argument would claim that it is possible that the students who wrote more drafts were the ones who were more likely to write more drafts in the first place, and Revision Assistant did not facilitate any behavioral change. Additionally, one could argue that the students who revised more may have had stronger skills, and therefore, it was not the case that essays improved through revision, but simply that the students with weaker skills stopped revising earlier.

First, the fact that 94% of students in the Revision Assistant pilot revised at least once, compared to the 29% in Attali's study (2004), serves as one sign that survivor bias did not affect the number of revisions. Second, of those high school students who wrote 8 or more drafts (above the average number of revisions), the average Signal Check score increased from 1.81 on their first drafts to 3.17 on their final submissions. Of middle school students who wrote 11 or more drafts (above the average), the average Signal Check score increased from 2.13 on their first drafts to 3.13 on their final submissions. These numbers would contradict an assertion of survivor bias—among "high revising" students, performance dramatically increases from a low initial baseline to a final submission that receives high Signal Check scores and positive feedback. This suggests that students who revised a substantial number of times likely came from a variety of initial skill levels, rather than high use merely predicting that a student is already high-performing.

As a final caveat, the results for Signal Check score averages in this paper are intrinsic to the system. We did not conduct a measure of transfer from performance within system to performance on the high-stakes standardized tests that many schools base their technology adoption around. In the future, we do expect that these extrinsic measures will be available, but as Revision Assistant is designed for student learning rather than test preparation, correlation to these factors was not a priority for preliminary results.

In future studies, Turnitin will continue to investigate baseline metrics to account for the potential of survivor bias in our results and to validate learning outcomes in independent, causal measures that would demonstrate transfer, placing special emphasis on results that are not correlated to word count. To account for the many areas of inquiry that are open in the field of automated feedback for student writing, Turnitin supports 3rd-party evaluations of Revision Assistant. For additional information, please see Appendix A.

5.0 Conclusion

This paper shows that Revision Assistant encourages both middle school and high school students to revise more, write more, and improve upon their writing skills. An average of eleven drafts prior to final submission for middle school students, and seven drafts for high school students, indicates that Revision Assistant facilitates a better grasp of the writing process for students. The data reveal robust performance increases. Middle school students' papers showed an increase of 0.97 points on a 4-point rubric, from first draft to final submission; in high school, the average improvement was 0.73 points. These findings indicate that Revision Assistant helps students practice more and improve their essays along the way, empowering students and acting as a support for existing teaching practices.

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Appendix A

Regarding Interest in Third Party Evaluations and Research on Revision Assistant

On request and after confirming that the intent of the work is to publish results in peer-reviewed academic venues, we provide free licenses to researchers, including unlimited access to the product for use by both students in schools or in lab settings and to research staff for testing. Under some circumstances, Turnitin may make additional funding available to support research studies, provided that the study is wholly independent of our internal research, has a high likelihood of resulting in peer-reviewed publication, and can be funded through direct grants to affiliated universities or academic departments.

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