

# Product Efficacy Argument (PEAr) for ETS's *Criterion*® Online Writing Service: Information for Institutions of Higher Education

ETS invests substantial resources in designing products and in evaluating their impact to improve student learning. One such product — ETS's *Criterion*® Online Writing Service — was designed to do just that. The *Criterion* Service is a web-based application that helps students to improve their writing skills by providing instructional tools that help students to plan, write, and revise essays. It immediately provides instant scoring and annotated feedback. This allows faculty to focus instruction on the areas of student writing that need improvement.

While we don't yet have results from randomized controlled trials that demonstrate the *Criterion* Service's ability to improve student writing, this document sets out our thoughts on how the *Criterion* Service might improve student writing, if used regularly and appropriately. In the diagram below, each numbered arrow refers to specific supporting evidence that is detailed in the research section that accompanies this discussion. The colors in the diagram correspond to a particular outcome (e.g., blue represents outcomes resulting in improved writing skills).

### Criterion Components

**Tools for Students**

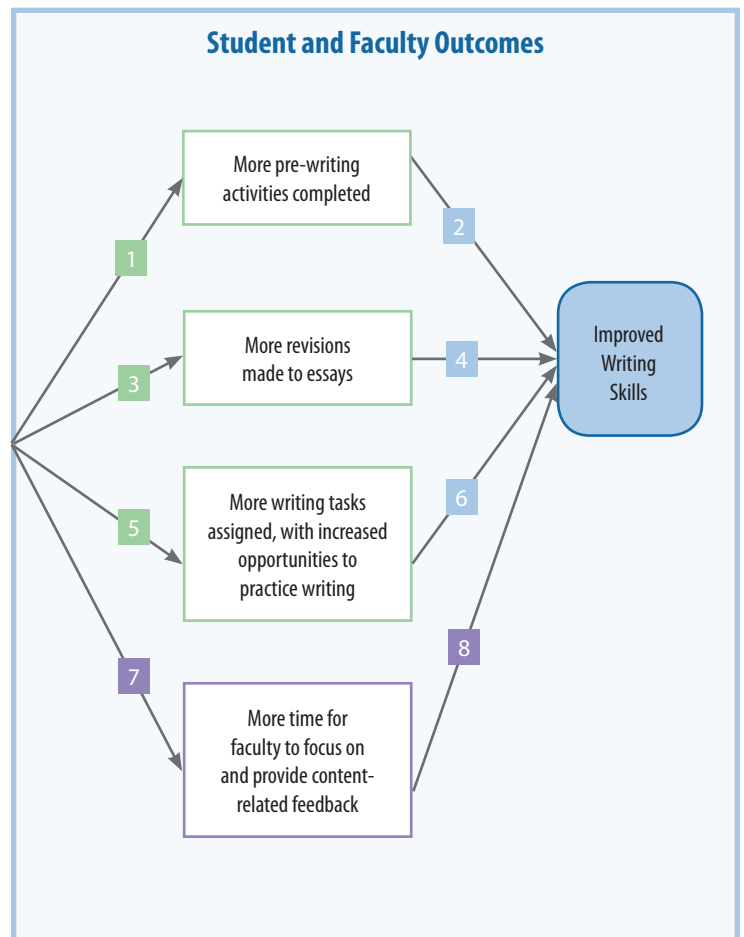
For each assigned prompt, the *Criterion* Service provides:

- Planning tools with space to enter notes and print, save, or paste into the writing screen
- The option to have professors view their plan from their portfolio
- Trait feedback analysis on grammar, usage, mechanics, style, and organization and development
- A summary of errors and advice on how to correct them
- A quick, reliable holistic score (on a 1–6 scale) with guidance on how their essays compare to others written at the same level
- Multiple opportunities for revision and resubmission
- The development of an online portfolio
- Access to the program from school, home, and other locations (e.g., library)
- An online writer's handbook

**Tools for Faculty**

The *Criterion* Service offers time-saving tools for faculty through:

- A library of over 180 essay topics at various levels of difficulty and in various fields and the ability to create customized topics
- Personalized feedback options (e.g., writing in the margins, comments library)
- Tools for tracking which students have written and revised their essays
- Class-level reports to gauge student progress, including error reports, holistic score summaries, class roster reports, and feedback analysis
- Access from school, home, and other locations





## Research Summary

**Research** shows that students have found pre-writing tools to be useful for writing (Sun, 2007). When students are provided with pre-writing activities or pre-writing tools, students engage in more planning and pre-writing (Goldstein & Carr, 1996; Kozma, 1991). Thus, when students engage in pre-writing, this leads to improved writing (Chai, 2006; Goldstein & Carr, 1996; Graham & Perin, 2007; Kellogg, 1988).

In addition to pre-writing activities, feedback (immediate and automated) has also been shown to have an effect on student writing. Immediate feedback encourages students to make more revisions to their writing (Beach, 1979; Foltz, Gilliam, & Kendall, 2000; Goe & Martinez, in press; Grimes & Warschauer, 2010; Kluger & DeNisi, 1996; Warschauer & Grimes, 2008), which in turn leads to improved writing skills (Attali, 2004; Gentile, 1992; Greenwald, Persky, Campbell, & Mazzeo [with Jenkins & Kaplan], 1999; Riedel, Dexter, Scharber, & Doering, 2006). Automated feedback also allows the teacher to focus on providing the student with content-related feedback (Covill, 1997; Warschauer & Grimes, 2008). Content-related feedback can become a key aspect of teacher-student discussions about writing. Research has shown that when teachers and students are able to have a discussion about the writing, students focus more on writing quality, pay more attention to comments, and understand feedback better (Bardine, Bardine, & Deegan, 2000). Receiving meaningful, good-quality feedback helps students to make changes and improvements (Azevedo & Bernard, 1995; Bangert-Downs, Kulik, Kulik, & Morgan, 1991; Narciss & Huth, 2002; Nicol & Macfarlane-Dick, 2006). Automated feedback provides students with opportunities to submit multiple revisions for each assignment (Riedel, Dexter, Scharber, & Doering, 2006) and helps the teacher assign more writing tasks (Wade-Stein & Kintsch, 2004; Warschauer & Grimes, 2008). The end result is that assigning more writing tasks can help students improve their writing skills (Gau, Hermanson, Logar, & Smerek, 2003; NCES, 1999).

**For more details of this summary,  
see the Full Description of the Research Foundation**

# ETS's *Criterion*<sup>®</sup> Online Writing Service

## Information for Institutions of Higher Education:

### Full Description of the Research Foundation

Within each component box, there are three pieces of information: (1) specific research for how the product leads to the identified outcome; (2) a generalization about the associated challenges in today's classrooms; and (3) how the product addresses both the research and the challenges.

1

#### When students are provided with online planning templates, they complete pre-writing activities.

**Research** found that, when students were provided with a blank page and basic instructions to use the page for planning and pre-writing, 29% of fourth-grade students, 35% of eighth-grade students, and 46% of twelfth-grade students made use of the blank page for planning and pre-writing activities (Goldstein & Carr, 1996). This data was collected in the context of the 1992 administration of the National Assessment of Educational Progress (NAEP), which was administered to 7,000 fourth-grade students, 11,000 eighth-grade students, and 11,500 twelfth-grade students. The results indicate that when provided with something as simple as a blank page and basic instructions, some students will engage in pre-writing.

Kozma (1991) found that the use of computer-based tools (i.e., an outliner and graphic idea organizer) and embedded prompts (i.e., a series of questions about the topic) increased planning for undergraduate writers. Forty-one undergraduate students participated in the study and were randomly assigned to the following treatments: basic word processor, outliner, or idea organizer. Advanced writers ( $n = 20$ ) had taken at least two writing courses, one being argumentative writing, and novice writers ( $n = 21$ ) were enrolled in an introductory English composition class. When using the idea organizer with prompts, both advanced and novice writers demonstrated more conceptual planning compared to subjects who used only a word processor or those who used the outliner tool. There is, however, considerable variability in the results presented.

Finally, Sun (2007) looked at graduate students using an online scholarly writing template (SWT) in Taiwan for English academic writing. SWT scaffolds academic writing (e.g., writing for publication) and includes an information (guidance) template and a language template. In the default mode, the information template provides a suggested sections-and-stages outline template. This information template matches the outline for the paper-writing zone in the tool, which aids the student's writing and pre-writing. SWT was used in an academic-writing course by 20 participants. Participants' survey responses indicated that they found the tool to be beneficial and would use it again.

In general, students need guidance, time, and tools to help them effectively plan their essays. Providing a template encourages students to plan before they write and helps them to organize their planning.

The *Criterion* Service features pre-writing tools to help students write more clearly. Eight planning templates are provided, and teachers can assign a template or allow students to choose. In addition, students can copy the text from their pre-writing directly into their essay when they are ready to begin writing.



2

## When students are presented with increased pre-writing opportunities, it results in improved student writing.

**Research** has demonstrated that pre-writing leads to better-quality written essays. One meta-analysis investigated aspects of writing instruction and the impact on writing quality. Based on the effect sizes found for various elements of writing instruction, pre-writing was identified as one of the 11 most effective elements, with an average effect size of 0.32 (Graham & Perin, 2007). The authors found that pre-writing activities had a positive impact on writing. The five studies reviewed in this meta-analysis were conducted on students in grades 4 through 9 and selected based upon nine quality indicators. The five studies dealt with pre-writing activities that included planning before writing, group and individual planning before writing, reading topic-pertinent material and planning in advance, using a semantic web, and planning after a demonstration of how to plan. Although the studies had differences in control conditions, the effect sizes ranged from .06 to .95.

Writing on assessments has also been shown to improve with pre-writing (Chai, 2006; Goldstein & Carr, 1996). Although the design of NAEP studies does not allow us to infer causality, Goldstein and Carr (1996) in their study of the 1992 administration of the NAEP found that students (7,000 fourth-grade students, 11,000 eighth-grade students, and 11,500 twelfth-grade students) in all three grades who used a blank page for planning and pre-writing had higher average scores than students who did not use the blank page. Additionally, students' pre-writing was categorized into one of five categories: unrelated notes or drawings, lists or outlines, diagrams, different versions, and first drafts. They found that students in all three grades who used lists, outlines, or diagrams during pre-writing had higher average scores than students who used notes or drawings, different versions, or first drafts during pre-writing. In a similar study, Chai (2006) examined the writing assessment score and writing plans from the planning sheets on the 1998 administration of the Provincial Learning Assessment Program (PLAP). The PLAP contains pre-writing sheets that are optional, but that encourage students to pre-write prior to completing the writing section of the assessment. The authors found that students who planned their writing earned better writing scores.

Kellogg (1988) found that college students who created an outline compared with those who did not had writing that was rated as of higher quality. Eighteen college students were randomly assigned to four conditions (no outline, outline, polished draft, and rough draft). Each participant was asked to write a business letter that was rated by two judges using five dimensions and a 7-point scale.

While most of the studies cited above focus on students in K–12, we would assume that the same results would apply at the higher education level. Providing students with increased pre-writing opportunities can help students to improve their writing.

In general, when students are provided with effective planning tools they are more likely to organize their thoughts, and their essays, ahead of time.

The *Criterion* Service provides pre-writing tools that include templates for free writing, which allows students to jot down random ideas; lists, which allows students to list specific ideas for their essay; the traditional outline template with main and supporting ideas; more sophisticated templates such as the idea tree and idea web; and the three templates for different modes of writing, including compare-and-contrast, cause-and-effect, or persuasive writing. These templates provide the diverse tools needed to cater to individual student approaches to planning and writing.



## When students receive immediate feedback and have access to supporting resources, they are more likely to make revisions to their essays.

**Research** suggests that giving students feedback on their writing results in more revisions (Beach, 1979). Beach (1979) investigated the effects of three conditions (between-draft teacher evaluation, guided self-evaluation, and no evaluation) on student revision of rough drafts for 103 students (three 10th-grade classes and two 11th/12th-grade classes). Students were randomly assigned to one of the three conditions as well as one of the three writing topics. The author found that teacher evaluation subjects showed significantly higher degree-of-change scores, fluency scores, and final draft support ratings than guided self-evaluation or no-evaluation subjects. Furthermore, a summary of past research by Kluger and DeNisi (1996) suggested that feedback that supports learning at the task level is likely to yield impressive gains in performance.

Warschauer and Grimes (2008) discuss the use of two automated writing evaluation (AWE) software systems as a way to evaluate and provide feedback on essays. The mixed-methods exploratory case study used one middle school, two junior high schools (majority of the data from these two schools), and one high school. The authors found that both systems encouraged more revision. Interviews from teachers and administrators showed that both systems promoted student revision, although without careful teacher monitoring students tended to focus on quick-fix errors (i.e., mechanics) to raise their scores rather than focusing on feedback about content and organization. Grimes and Warschauer (2010) conducted a three-year study in which eight middle schools from two districts used an online writing tool that provides immediate feedback. Results indicate evidence of more revising of essays using automated essay evaluation. In one district for which data were available, the percent of essays having more than one draft rose from 12% in year 1 to 53% in year 3. In the other districts the year 3 results showed 61% of essays having more than one draft. A survey given to the teachers revealed that 30 out of the 40 teachers agreed or strongly agreed that students revised more when using the tool.

Wade-Stein and Kintsch (2004) describe educational software that provides automatic feedback about essay content. One of the goals of the tool is to provide extended, guided practice without increasing teacher demands. The software was used by two sixth-grade classes ( $n = 52$ ). The authors used a counterbalanced design where students who used the software on the first occasion did not do so on the second occasion. Three teachers scored the summaries from time 1 and time 2. The authors found that students spent twice as long writing/revising and wrote better summaries when using the software. Students kept revising their summaries until the tool indicated that the content was covered. Thus, the tool provided students with the opportunity for practice without increasing teacher workload. Foltz, Gilliam, and Kendall (2000) found that undergraduate students revised their essays after receiving immediate feedback from an automated essay grader and critic. The students liked the immediate feedback and found it useful in helping them to identify problems in their writing. The automated essay grader and critic provided holistic scores and an analytic measure. The componential measure provided feedback on missing components in the essay. Forty students in two undergraduate psycholinguistics courses were asked to write an essay at home using the webpage and submit it. The students were given the option to revise their essays as many times as they wished using the automated essay grader and critic. All of the students revised their essay at least one time and the mean number of revisions for the students was three. Thirty students said they would use the system if it were available, nine said probably, and only one student said no. However, caution should be used when interpreting the results of this study due to the lack of controls.

In Goe and Martinez's (in press) paper, 11 middle school teachers were interviewed and had their classes observed. Nine of the teachers felt that the feedback provided by *Criterion* motivated students to make more revisions. The teachers mentioned that this is due to *Criterion* highlighting their mistakes. "Six teachers specified that in essays students write using *Criterion*, they are developing their paragraphs more, adding more supporting details, and using quotes" (p. 24).

In general, teachers do not assign as many writing tasks as they would like because of the time it takes to provide feedback to students. Due to the amount of time between when a student hands in an assignment and when he/she receives feedback, the student might have already made revisions or might not read the comments and just look at the final grade.

The *Criterion* Service provides students with individualized, instant diagnostic feedback on each essay and each revision that they submit, specifically in the areas of organization and development; style; and grammar, usage, and mechanics.

## When students make more revisions to their essays, their writing skills improve.

**Research** in 1992 showed that of papers with evidence of revision, only 1% (at each grade level — 4th and 8th grade) had revisions that were beyond surface-level features. The papers were from students from a nationally representative subgroup of students who participated in the 1990 NAEP writing trend assessment; students were asked to submit a sample of their best piece of writing (Gentile, 1992). Although the design of NAEP studies does not allow us to infer causality, Greenwald et al. (1999) found that students in grades 8 and 12 “who were always asked to write more than one draft of a paper had higher average scale scores than did their peers who were sometimes or never asked to do so” (p. 92).

In a study conducted specifically with the *Criterion* Service online essay evaluation application, Attali (2004) examined improvement in student essays after resubmission. The *Criterion* Service provides immediate feedback related to grammar, usage, mechanics, style, and organization and development. Only the first and last submissions for each essay were analyzed. Over 9,000 essays (written to 6th- through 12th-grade essay prompts) were submitted on more than one occasion. Overall, the essay scores increased by almost half of a standard deviation from the first to the last essay submission. Students reduced their error rates by about one quarter (median effect size of .22) and increased their rates of background and conclusion elements as well as the number of main points and supporting ideas and elements. Students improved their development scores by .31 of a standard deviation. Grammar, usage, mechanics, and style scores also increased, but to a lesser extent. Even though there was no external evaluation of the essays in this study, *e-rater*<sup>®</sup>, the system used by the *Criterion* Service, has been found to be comparable to human rater agreement rates (Shermis, Burstein, & Leacock, 2006). Burstein, Chodorow and Leacock (2004) state that the exact plus adjacent agreement rate between human and *e-rater* is approximately 97%.

At the higher education level, Riedel, Dexter, Scharber, and Doering (2006) examined the impact of automated essay scoring (AES) used by pre-service teachers for short essay responses to teacher education cases, which asked them to make instructional decisions about technology integration in the classroom. Seventy pre-service teachers were randomly assigned to the control or experimental condition and asked to respond to two cases. Individuals assigned to the experimental condition had the choice of whether to use AES, but the control teachers did not have access to AES. AES provided scores on the essay response as well as recommendations for specific information to access that may improve their scores. Individuals could make as many submissions as they wished prior to submitting the essay to the instructor. Statistically significant differences in essay quality were found by condition. Results showed that individuals who had the opportunity to submit multiple versions of an essay through AES had higher scores (on the second education case) than individuals in the control conditional as well as individuals in the experimental condition who chose not to use AES.

In general, the more revisions students make, the better their writing. In today’s classroom it is often unrealistic for teachers to provide feedback on multiple drafts for every assignment, which may limit the number of revisions that students make. In addition, providing individualized feedback is time-intensive for teachers and, therefore, the number of revisions that students can submit is limited if revisions are restricted to those for which external feedback has been received.

The *Criterion* Service provides individualized feedback to help students reflect on their own writing and gives students the opportunity to revise and resubmit their writing for further evaluation, thus improving their work.

## When students are provided with automated feedback from a computer program, faculty can assign more writing tasks.

Warschauer and Grimes (2008) investigated the use of automated writing evaluation (AWE) software as a way to evaluate and provide feedback on essays. The mixed-methods exploratory case study used middle and high school students. Participating teachers reported and observations confirmed that teacher time was freed up. Thus, this allowed teachers to be selective about what they chose to grade and provide feedback on. Grimes and Warschauer (2010) also found that AWE saved teachers time. The authors conducted a three-year study in which eight middle schools from two districts used an online writing tool that provides immediate feedback. The results of the survey given to 41 teachers indicated that teachers felt that the tool saved them time.

Wade-Stein and Kintsch (2004) describe educational software that provides automatic feedback about essay content. One of the goals of the tool is to provide extended, guided practice without increasing teacher demands. The software was used by two sixth-grade classes ( $n = 52$ ). The authors found that students wrote better summaries and revised their summaries until the tool indicated that the content was covered. Thus, the tool provides students with feedback and does not increase the teacher's workload.

While both of the studies cited above focus on students in K–12, we would assume that the same results would apply at the higher education level. If faculty members do not have to evaluate and provide feedback on every writing task, they should be able to assign more opportunities for students to write.

In general, when students receive automated feedback, teacher time is freed up and more writing assignments can be given to help students improve their writing. In today's classrooms, it is often unrealistic for teachers to provide individualized feedback on every writing assignment, due to the amount of time teachers have. Thus, the use of automated feedback programs can increase the number of writing assignments that can be assigned to help students improve their writing skills.

The *Criterion* Service provides individualized feedback and scores to help students reflect on their own writing and gives students the opportunity to revise and resubmit their writing for further evaluation. Instructors can view multiple reports (e.g., submitted essays, student reports, class reports, etc.). With the quick turnaround time provided by *Criterion* for feedback, more writing assignments can be given to students.



## When students complete more writing tasks, more often, writing skills improve.

**Research** shows that increased evaluation and feedback can improve student learning. Although the design of NAEP studies does not allow us to infer causality, NCES (1999) asked students questions about reading and writing and found that “students who said they wrote long answers on a weekly or monthly basis had higher reading scores than those who said they did twice a year or less” (p. 10). The relationship between reading and writing in today’s classrooms is important.

A survey administered by Gau, Hermanson, Logar, and Smerek (2003) to second through fifth graders (N = 21, 22, 23, and 23, respectively) before and after beginning a 14-week writing intervention showed that as students progress in school more writing occurs when it is assigned. After the intervention, which included a daily 10-minute time period for journal writing, weekly sharing of writing with peers, weekly response journaling in other subjects, as well as brainstorming, modeling, and reviewing writing expectations, a curriculum-based measurement was administered that revealed an increase in the number of words written compared with the week 1 administration.

While the studies cited above deal with students at the K–12 level, it is logical to assume that more opportunities to write and receive feedback would help students to improve their writing skills at all educational levels.

In general, when students are assigned more tasks and given more opportunities to practice, their writing improves. However, students are unlikely to practice their writing unless a formal assignment is given. In today’s classrooms, teachers are unlikely to assign more writing tasks than are currently in their syllabus because of the time-intensive nature of the grading. Therefore, the number of assignments given to students is limited.

The *Criterion* Service provides students with increased opportunity for writing practice and evaluation. The *Criterion* Service also gives students individualized feedback and many opportunities to revise their work.

## When students are provided with automated feedback from a computer program, faculty can focus on and provide content-related feedback.

While there is limited empirical support for this claim, the theory of action assumes that when faculty are burdened with the provision of surface-level feedback, they will have less time to focus on the content of the writing or assignment. This is supported by Warschauer and Grimes (2008), who discuss the use of AWE as a way to evaluate and provide feedback on essays. The mixed-methods exploratory case study used middle, junior, and high school students. The authors found that AWE saved teachers time and encouraged more revision, which allowed teachers to be selective about what they chose to grade and provide feedback on (Warschauer & Grimes, 2008).

Interestingly, Covill (1997) administered a survey to 48 students (two sophomore English classes and two junior English classes in high school) and found that students' attitudes towards revising were more positive when teacher feedback focused on content instead of surface-level features. The *Criterion* Service can help teachers and students by providing automated feedback on grammar, usage, mechanics, style, and organization and development. Teachers can then focus on providing content-related feedback to students.

Goe and Martinez's (in press) research also showed that the *Criterion* Service helps reduce teacher workloads and allows teachers to focus on content. Eleven middle school teachers were interviewed and had their classes observed. Eight of the teachers stated that *Criterion* reduced their workload. Teachers also mentioned that they were able to focus on other aspects of writing because *Criterion* attends to the mechanical problems.

In general, writing can be improved with feedback. In today's classrooms, teachers usually do not have the time to focus on the content of the student's writing. Therefore, content-related feedback may be limited.

The *Criterion* Service provides students with individualized feedback, which then allows the teacher the time to focus on providing content-related feedback.

## When students receive meaningful, content-related feedback on their assignments, writing skills improve.

**Research** has shown that when teachers create opportunities for dialogue about student writing, those same teachers report that students focus less on grades and more on overall writing quality, pay more attention to comments, and understand feedback better (Bardine, Bardine, & Deegan, 2000). Bardine et al. (2000) asked two high school teachers to grade and mark student essays as he/she would normally. The essays were returned to the students along with a questionnaire to be completed by the student and a peer who also read the essay. After reviewing student responses and interviewing students, the authors concluded that creating a dialogue helps students pay attention to and understand teacher comments. In another study, Greenwald et al. (1999) analyzed student responses and writing scores on NAEP and found that students who were consistently afforded the opportunity to discuss their writing with teachers outperformed peers on NAEP who participated in this dialogue only occasionally. While this study reports on the relationship between teacher-student dialogue and writing quality, it does not allow us to determine whether it was the dialogue that increased the writing quality.

Research on feedback in a variety of subject areas and contexts has shown that feedback helps students to make changes and improve. Narciss and Huth (2002) provide general principles for designing informative feedback. The authors reviewed research and examined how the principles can be included within learning experiments (specifically, a multimedia learning environment for written subtraction tasks). The authors found that “systematically designed formative feedback has positive effects on achievement and motivation” (p. 10). Nicol and Macfarlane-Dick (2006) in their review of research on formative assessment and feedback identify seven principles for good quality feedback. The authors support each principle with research. The authors support the view that students who learn about their performance make positive changes to improve.

Bangert-Downs, Kulik, Kulik, and Morgan’s (1991) meta-analysis reviewed 58 effect sizes where 42 of the effect sizes were for college level. The authors found that feedback did have a small, positive impact on achievement even though there was a large range in effect sizes. Pridemore and Klein (1995) developed six computer programs to provide 210 junior high school students taking part in a science lesson different types of feedback (i.e., no feedback, correct-answer feedback, and elaboration feedback). The level of feedback had a significant effect on achievement, in that elaboration and no feedback had significantly better performance than correct-answer feedback. The authors explain that this may be due to the fact that participants in the no-feedback condition were looking for information in the text because they did not receive a feedback message that would provide this information (Pridemore & Klein, 1995).

Finally, several meta-analyses have also found that feedback improves learning (Azevedo & Bernard, 1995; Kluger & DeNisi, 1996). Azevedo and Bernard’s (1995) meta-analysis on the effects of feedback when using computer-based instruction ( $n = 22$ ) revealed that achievement was greater for feedback versus the control group when immediate posttest results were examined with a weighted mean effect of .80. Kluger and DeNisi’s (1996) meta-analysis of 607 effect sizes shows that feedback improves performance overall with an effect size of .41. However, the authors do state that there is wide variability of effect sizes.

In general, when students are given opportunities to interact with teachers regarding their writing, the overall quality of their writing improves. In today’s classrooms, teachers are often unable to create these interactions due to large class sizes, packed curriculum, and other factors.

The *Criterion* Service provides scores and feedback on surface-level errors, thereby allowing the teacher to focus on providing feedback about content, discuss writing in depth with students, and provide direct guidance in the critical stages of the writing and revising processes.

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# Notes



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