

# Product Efficacy Argument for the *Criterion*<sup>®</sup> Online Writing Evaluation Service

## Product Efficacy Argument (PEAr)

ETS, a nonprofit organization, invests substantial resources to ensure that the products and services offered are of the highest technical quality. The development of a Product Efficacy Argument (PEAr) is an important step in this process. The PEAR helps product developers make informed decisions about the structure and scope of the product and helps educators and clients make informed decisions about the product's use.

A PEAR begins with a description of the product's underlying theory of action, which indicates how a product is intended to work when implemented appropriately. The theory of action is illustrated through a diagram that connects the product to both student and instructor outcomes, as appropriate. The theory of action is then followed by summaries of relevant research that supports the theory.

To understand the PEAR for this product, a brief product description and research summary are provided. The description and summary are followed by the theory of action diagram and supporting research.

## Product Description

The *Criterion*<sup>®</sup> Online Writing Evaluation Service supports classroom instruction and assessment by giving students an overall score, as well as immediate, individualized, constructive, and specific diagnostic feedback on their essays. These components improve the writing process (planning, drafting, reviewing feedback, revising, and sharing work) by providing a mechanism for students to draft essays, receive immediate feedback, and revise work in the same or consecutive class periods.

## The Theory of Action

The diagram on page 2 displays the theory of action for the *Criterion* service. The diagram begins with a list of the product components. A series of numbered arrows then connects the product to intermediate outcomes and a final outcome.

Each arrow represents a specific hypothesis for what is expected to happen when the product is implemented. A summary of salient, relevant research for each hypothesis is then detailed in the following sections. The research evidence presented is from studies that may or may not have used the product but that generally support the theory of action. The arrows and research summaries are numbered and color-coded for easy identification (green represents student outcomes; purple, teacher outcomes; and blue, outcomes resulting in improved student writing).



### Criterion Components

#### Tools for Students

The *Criterion* service provides tools for:

#### Planning and Writing

- 8 planning templates, with the ability for students to edit their plan during assignments
- Writer Samples, examples of well-written essays by grade level

#### Revising and Editing

- Opportunities for revision and resubmission
- Diagnostic feedback on grammar, usage, mechanics, style, and organization and development
- A score with an associated rubric and a Trait Score Level (Basic, Proficient, or Advanced)
- An online writer's handbook
- An online thesaurus

#### Communication and Access

- Tools to facilitate dialogue
- Opportunities to develop online portfolios
- Ability to access from school, home, and other locations (e.g., library)

#### Tools for Teachers

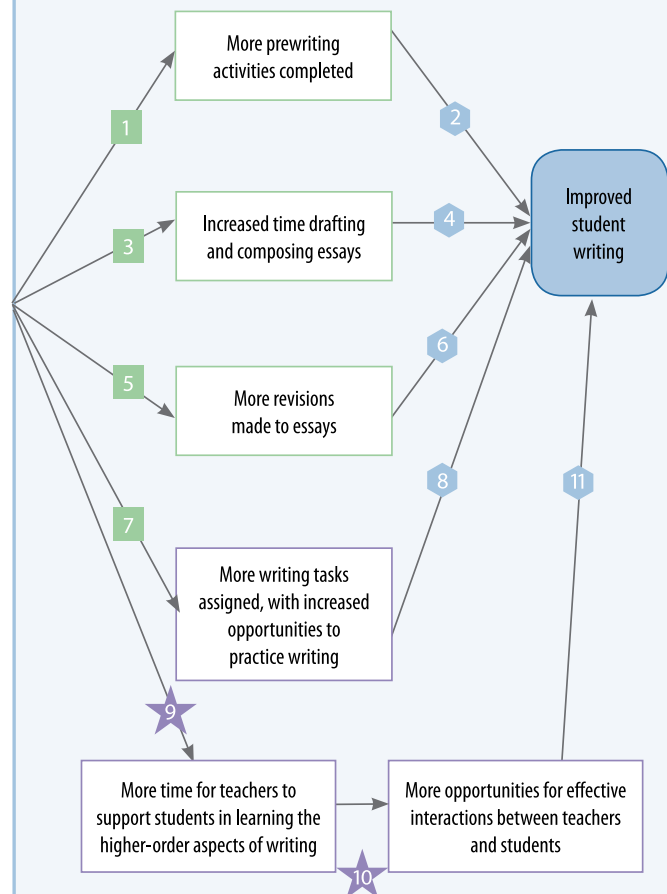
The *Criterion* service offers time-saving tools:

- A large library of essay topics aligned to Common Core State Standards
- Options within assignments
- Instant diagnostic feedback and score reports
- Online tracking of student portfolios
- Access from school, home, and other locations

#### Teachers can further customize instruction by:

- Enabling prewriting tools for student planning, with the ability to designate a specific planning template
- Selecting level-appropriate writing resources and feedback
- Tailoring assignments to target specific skills
- Creating their own essay topics
- Using summary class reports to analyze progress and patterns of errors
- Commenting on student work through different modalities, including Peer Review
- Offering bilingual resources and writer's handbook

### Student and Teacher Outcomes



## Outcomes/claims that align to the numbers in the chart on page 2:

1. Providing online planning templates may result in the completion of prewriting activities
2. Increased prewriting often results in improved student writing
3. Using computers when learning to write engages students and results in increased time spent drafting and composing essays
4. Increased time drafting and composing essays helps to support improved student writing skills and overall writing quality
5. Giving students task-specific feedback results in more revisions made to essays
6. More revisions made to essays leads to improved student writing skills and overall writing quality
7. Use of technology by teachers and students leads to more writing tasks assigned and increased opportunities to practice writing
8. More writing tasks assigned and increased opportunities to practice writing help to support improved student writing skills and overall writing quality
9. Assigning writing tasks on a computer gives teachers more time to support students in learning higher-order aspects of writing
10. More time to support students in learning the higher-order aspects of writing leads to more effective interactions between teachers and students
11. More effective interactions between teachers and students lead to improved student writing skills and overall writing quality

## Research Summary

Research tells us that students are more likely to engage in planning and prewriting activities if they are provided with tools to facilitate those processes (Goldstein & Carr, 1996; Graham & Perin, 2007). Furthermore, when students engage in these activities, their writing improves (Chai, 2006; Goldstein & Carr, 1996; Graham & Perin, 2007; Wong, Butler, Ficzero, & Kuperis, 1997). Additionally, providing immediate, individualized, and specific feedback encourages students to write more extensively and to revise their work more intensively, and using computer technology in the classroom increases the time students spend on writing (Attali, 2004; Beach, 1979; Covill, 1997; Etchison, 1989; Fitzgerald, 1987; Goldberg, Russell, & Cook, 2003; Grimes & Warschauer, 2006; Kluger & DeNisi, 1996; Lipnevich & Smith, 2008; Russell & Plati, 2002; Solomon, Lutkus, Kaplan, & Skolnik, 2004; Warschauer, Arada, & Zheng, 2010). Using technology for classroom assignments also gives teachers more time to support students in learning the higher-order aspects of writing and to interact with individuals and with the whole class at a higher level (Greenwald, Persky, Campbell, & Mazzeo, 1999; Grimes & Warschauer, 2006; Grimes & Warschauer, 2010; Solomon et al., 2004; Tiene & Luft, 2001). Finally, when students increase their writing and revising activities and teachers have time to interact with students on a deeper level, students see significant improvements in the quality of their writing (Bardine, Bardine, & Deegan, 2000; Butterfield, Hacker, & Plumb, 1994; Cochran-Smith, 1991; Fitzgerald, 1987; Foltz, Lochbaum, & Rosenstein, 2011; Gentile, 1992; Goldberg et al., 2003; Greenwald et al., 1999; Grimes & Warschauer, 2010; Lehr, 1995; O'Dwyer, Russell, Bebell, & Tucker-Seeley, 2005; Solomon et al., 2004; Tiene & Luft, 2001; National Center for Education Statistics [NCES], 1999).

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

# The *Criterion* Service: Full Description of the Research Foundation

For each hypothesis, three pieces of information are presented: (a) specific research that supports how the product may lead to the identified outcome, (b) a generalization about the current educational environment and/or the associated issues or challenges, and (c) how the product addresses both the research and the challenges.

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## Providing online planning templates may result in the completion of prewriting activities

Students are found to engage in the prewriting process more effectively when given more direct assistance. For example, based on a meta-analysis of a series of recommended writing instructions across grades 4–12, it was found that an effective means of support involves the use of think sheets or graphic organizers that structure what students do as they plan, draft, revise, or edit (Graham & Perin, 2007); these prewriting techniques had an effect size of 0.32. A think sheet for planning a paper, for example, might direct students to identify their audience and purpose for writing the paper, generate possible content, decide which basic ideas to use, and order the ideas for writing. Furthermore, research found that students were more likely to engage in prewriting when provided with a blank page and basic instructions to use the page for planning and prewriting. For the 1992 administration of the National Assessment of Educational Progress (NAEP), Goldstein and Carr (1996) examined the responses from approximately 7,000 fourth-grade students; 11,000 eighth-grade students; and 11,500 12th-grade students. Twenty-nine percent of fourth-grade students, 35% of eighth-grade students, and 46% of 12th-grade students made use of the blank page for planning and prewriting activities.

**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 prewriting tools to help students write more clearly. Eight planning templates are provided, and teachers can assign a template or allow students to choose. Students can also edit their plan during the writing assignment window, and teachers can easily verify if students used a plan when submitting a piece of writing. In addition, students can copy the text from their prewriting directly into their essay when they are ready to begin writing.



## Increased prewriting often results in improved student writing

**Research** in grade levels K–12 has demonstrated that prewriting leads to better-written essays (Graham & Perin, 2007; Wong et al., 1997). One meta-analysis investigated aspects of writing instruction and their impact on writing quality. Based on the effect sizes found for various elements of writing instruction, prewriting was identified as one of the 11 most effective elements, with an effect size of 0.32 in grades 4–12 (Graham & Perin, 2007). Writing on assessments has also been shown to improve with prewriting (Chai, 2006; Goldstein & Carr, 1996). The National Assessment of Educational Progress (NAEP) and the Provincial Learning Assessment Program (PLAP) assessments both contain prewriting sheets that are optional but that encourage students to prewrite prior to completing the writing section of the assessment. Goldstein and Carr (1996) categorized students' prewriting on the 1992 administration of the NAEP into five categories: unrelated notes or drawings, lists or outlines, diagrams, different versions, and first drafts. The students who used the prewriting sheet — specifically, those who used lists or outlines or diagrams — were found to have higher proficiency scores on the writing assessment. Chai (2006) examined the writing assessment scores and writing plans from the planning sheets on the 1998 administration of the PLAP and found that students who planned their writing earned better writing scores.

**In general**, when students are provided with effective planning tools, they are more likely to organize their thoughts, and their essays, ahead of time. This work can lead students to write a higher-quality final essay.

The *Criterion* service provides prewriting tools that include templates for free writing, which allow students to jot down random ideas; lists, which allow 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, which will lead to improved writing.



## Using computers when learning to write engages students and results in increased time spent drafting and composing essays

A **research** summary (Goldberg et al., 2003) found that, on average, K–12 students who use computers when learning to write are more engaged and motivated in their writing. In earlier research, Etchison (1989) found that students who used computers for composition classes spent more time producing text than students who used traditional paper-and-pencil methods. Greenwald et al. (1999) showed that nearly 75% of students in grades 4, 8, and 12 used computers for writing drafts or final versions at least once or twice a month (more than a third of all students did so at least once a week). Additionally, “in 70% of fourth-grade and 68% of eighth-grade classrooms, teachers believed that computer use had changed student writing” (p. 27). Specifically, when students used computers, teachers reported “an increase in students’ motivation and an increase in students’ time spent on writing and revising their work” (Solomon et al., 2004, p. 27).

**In general**, students enjoy working with computers, are generally competent users, and tend to write more when using computers.

The *Criterion* service is an online writing service that gives students access to writing assignments at any location where a computer and an Internet connection are available. Before students start writing their essays, teachers can also provide electronic links to resources that are available as additional support for their writing.



## Increased time drafting and composing essays helps to support improved student writing skills and overall writing quality

**Research** reviewed by Cochran-Smith (1991) showed that elementary students spend a greater amount of time writing and produce slightly longer, neater, and more error-free texts when they use computers than when they handwrite. In a more recent research summary on the effects of computers on student writing, Goldberg et al. (2003) found that K–12 students are more engaged and motivated when using a computer and, therefore, they produce higher-quality and longer written work. Through a series of randomized experiments, Russell and Plati (2002) provide empirical evidence that suggests middle school students who are accustomed to writing with computers in the classroom perform between 0.4 and 1.1 standard deviations higher when they are allowed to use a computer for tests that require them to compose written responses compared to performance on paper. Additionally, O’Dwyer et al. (2005) found that middle school students who report higher frequencies of computer use for editing papers during school time tended to have higher writing scores on the writing component of a state standardized test, even after controlling for poor achievement and socioeconomic status. Finally, Warschauer et al. (2010) found that when K–12 students use laptops, they generally revise more, write more, and produce higher-quality writing than compared to performance on paper. In this study, students voiced the opinion that writing with a keyboard allowed them to avoid fatigue and not worry about handwriting.

**In general**, when students spend more time writing, their writing improves. It can be difficult to engage students in multiple or extended writing tasks, and students might be more motivated to write when using a computer.

The *Criterion* service is a computer application that allows students to compose, edit, and revise essays either in school or at home. This increased access to writing assignments outside the classroom and increased motivation within the classroom can lead to improvements in writing skills and overall writing quality.



## Giving students task-specific feedback results in more revisions made to essays

**Research** suggests that giving students feedback on their writing results in significantly more revisions (Beach, 1979; Fitzgerald, 1987). Interestingly, Covill (1997) found in her high school design that participating 10th- and 11th-grade students were looking for feedback to improve their work. Furthermore, a research summary by Kluger and DeNisi (1996) suggested feedback that supports learning at the task level is likely to yield impressive gains in performance. In 1998, a high percentage of classrooms (87% fourth-grade and 91% eighth-grade) had teachers mentioning the importance of giving feedback to students (Solomon et al., 2004).

“Whether feedback took the form of a one-on-one conference, comments based on a rubric or list of requirements, written comments on submitted work or more generalized comments to the whole class, teachers reported that students do make changes in their writing as a result of feedback” (p. 12).

In a study by Grimes and Warschauer (2006), on average, 7th- to 12th-grade students responded favorably to a statement about revising their writing more often when using automated feedback technology. Further research on the use of descriptive feedback and its effect on learning was investigated by Lipnevich and Smith (2008). They found that detailed comments specific to individual work directed students’ attention toward relevant and specific information and, in turn, improved performance. Finally, Grimes and Warschauer (2010) found, when studying classroom observations and conducting teacher interviews, middle school students were more motivated to write and revise when using automated feedback technology; the advantage of receiving a quick score, rather than waiting days or weeks for feedback, motivated students to focus.

**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, as well as a trait level (Developing, Proficient, or Advanced).





## More revisions made to essays leads to improved student writing skills and overall writing quality

**Research** in 1992 showed that less than 1% of students in American K–12 classrooms made major revisions to their writing (Gentile, 1992), even though a positive correlation between writing quality and revisions had been found (Butterfield et al., 1994; Fitzgerald, 1987). 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). And Solomon et al. (2004) reported that “eighth graders who wrote drafts on the computer one or two times a month performed better than students who never used computers to write drafts” (p. 27). Foltz et al. (2011) found that, on average, 4th- to 12th-grade students would revise an assignment five times while using automated feedback technology, which is more revisions than would occur compared to a more traditional approach to teaching and grading writing. Students’ scores increased an average of 1 point on a 6-point scale between the first and last revision. A study by Attali (2004) compared the first and last submissions of essays that had been revised by students in grades 6–12 using automated feedback technology. There was significant improvement in the total score, as well as improvements in essay development, grammar, usage, mechanics, and style. Furthermore, there was a general linear increase in the improvement of essay quality with increasing revisions and submissions. Overall, students were able to reduce their error rates by about one quarter.

**In general**, the more revisions students make, the better their writing. However, students are unlikely to make revisions without feedback. In today’s classrooms, it is often unrealistic for teachers to expect multiple drafts for every assignment. In addition, providing individualized feedback is time intensive for teachers and, therefore, the number of revisions that students can submit is limited.

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. Also, as additional feedback, after students submit their essays, teachers can create groups for the class to engage in peer assessment.



## Use of technology by teachers and students leads to more writing tasks assigned and increased opportunities to practice writing

**Research** from Tiene and Luft (2001) stated that one significant challenge for public schools is to provide meaningful assignments at an appropriate level of difficulty for all students. Teachers who participated in this study felt that individualized instruction was fostered by a technology-rich environment. Grimes and Warschauer (2010) showed that when students use automated feedback technology, student writing frequency increases. In this study, middle school teachers were asked, “How much has using automated feedback technology increased or decreased the amount of writing your students do overall?” Teacher responses varied, but the mean estimated change was 33% increase.

**In general**, the majority of teachers and students are comfortable using computer programs such as Microsoft® Word. Computer programs that help students with their writing are regarded by teachers as supplements to in-class writing instructional strategies.

The *Criterion* service provides a library of grade-level, genre-specific prompts aligned to the Common Core State Standards that teachers can select to create individual or class writing assignments. The *Criterion* service also provides the opportunity for teachers to create their own essay topics for which students receive feedback and an overall score. Teacher-designed writing prompts can give students additional writing tasks and practice that are specific to their curriculum and/or state standards.



## More writing tasks assigned and increased opportunities to practice writing help to support improved student writing skills and overall writing quality

**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) showed that “students who said they wrote long answers on a weekly or monthly basis had higher scores than those who said they did twice a year or less” (p. 10). In addition, Greenwald et al. (1999) showed that “... at grades 8 and 12, students who used computers for writing drafts or final versions at least once a week or once or twice a month had higher scores than their peers who reported never or hardly ever using computers for this purpose” (p. 90).

Research by Grimes and Warschauer (2010) reported on usage levels of automated feedback technology and the number of essays written by middle school students who use automated feedback technology over a three-year period. Overall, the number of essays per student nearly doubled from year one to year three. Additionally, the percentage of essays that were revised also increased, from 12% to 53% in the same period.

**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 syllabi 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, and gives students individualized feedback and many opportunities to revise their work.



## Assigning writing tasks on a computer gives teachers more time to support students in learning higher-order aspects of writing

**Research** from Tiene and Luft (2001) described results of a study examining classroom dynamics in a technology-rich learning environment. Overall, K–12 teachers felt that using technology gave them more opportunities to interact individually with students. The teachers also felt that higher-order thinking skills were developed, thereby leading to higher student achievement. In addition, observation of middle school teachers and their attitudes on automated feedback technology was done by Grimes and Warschauer (2010). Researchers found this software helped teachers attend to other aspects of student writing rather than solely on mechanics. Teacher survey responses to the item “automated feedback technology lets me focus on higher concerns of writing instead of mechanics” had a mean score of 3.51 on a 5-point scale (where 5 is “strongly agree”). Teachers also reported that “automated feedback technology saves me time,” which had a 4.10 mean score and suggests that automated feedback technology helps with mechanical errors and opens up the teacher’s time for higher-order concerns like ideas and style. At the conclusion of this study, which examined a variety of impacts tied to teacher and student attitudes and the use of automated feedback technology in classrooms, researchers found “that mindful use of automated feedback technology ... allow[s] teachers to focus on higher-level concerns instead of writing mechanics” (Grimes & Warschauer, 2010, p. 34).

**In general**, it is difficult to differentiate instruction and time spent with individual students. Class size, a broad curriculum, and large ranges in ability can force teachers to teach to the middle of the class. Typically, teachers can spend more time working with individual students and assign individualized tasks when their class is engaged with computer-based assignments.

The *Criterion* service provides students and teachers with computer access to writing assignments, diagnostic feedback, and scores. These features allow additional time for teachers to help individual students with their specific instructional needs and to choose individualized essay prompts for each student or class.



## More time to support students in learning the higher-order aspects of writing leads to more effective interactions between teachers and students

**Research** from Tiene and Luft (2001) showed that when K–12 teachers had more time to work individually with students (because they were using technology), they had more opportunities to motivate, guide, inform, clarify, explain, and encourage students. In addition, they found that when teachers had more time, their teaching was more effective, and they worked in more flexible ways to meet the individual needs of their students. Solomon et al. (2004) reported that “39% of both fourth-grade and eighth-grade classrooms indicate they would like more time in general for writing instruction” (p. 36). Additionally, Grimes and Warschauer (2006) investigated how automated feedback technology was implemented in 20 English language arts classes of 7th- to 12th-graders. This mixed-methods exploratory case study examined implementation in five schools. One benefit, in particular, was noteworthy: easier classroom management for teachers. For example, a teacher in the study scheduled one day per week of writing using the *Criterion* service. By doing this, she was able to save several hours of cursory grading, thus allowing the opportunity to attend to other student needs. Overall, teachers’ views were favorable when asked about whether automated feedback technology makes writing instruction easier, saves time, and makes teaching more enjoyable. When observed, teachers were found to appear more relaxed when students used this software instead of pencil and paper.

**In general**, many teachers report they would like to spend more time on writing instruction. A few hours a week does not allow them sufficient time to interact with students regarding the writing loop: planning, drafting, receiving feedback, revising, and sharing work. Teachers need help finding ways to use classroom time more effectively.

The *Criterion* service allows teachers the time to support students in the higher-order features of writing, either individually or as a whole class, by changing the teachers’ role in writing instruction. The *Criterion* service identifies student errors, allows students to work at their own pace, and provides an overall score to students, allowing the teacher to create more opportunities to interact with their students regarding other aspects of writing.

## More effective interactions between teachers and students lead to improved student writing skills and overall writing quality

**Research** has shown that when high school teachers create opportunities for dialogue about student writing, they report that students focus less on grades and more on overall writing quality, pay more attention to comments, and understand feedback better (Bardine et al., 2000). Although the design of NAEP studies does not allow us to infer causality, Greenwald et al. (1999) and Solomon et al. (2004) found that K–12 students who were consistently afforded the opportunity to discuss their writing with teachers outperformed peers who participated in this dialogue only occasionally. In addition, Lehr (1995) found positive results when there was direct teacher intervention related to student writing.

**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 curricula, 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, to discuss writing in depth with students, and to provide direct guidance in the critical stages of the writing and revising processes. Teachers also have the ability to customize score report information to the specific needs of students.

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