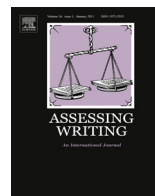




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## Assessing Writing



# The effects of computer-generated feedback on the quality of writing



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### ABSTRACT

This study provides a critical review of research into the effects of computer-generated feedback, known as automated writing evaluation (AWE), on the quality of students' writing. An initial research survey revealed that only a relatively small number of studies have been carried out and that most of these studies have examined the effects of AWE feedback on measures of written production such as scores and error frequencies. The critical review of the findings for written production measures suggested that there is modest evidence that AWE feedback has a positive effect on the quality of the texts that students produce using AWE, and that as yet there is little evidence that the effects of AWE transfer to more general improvements in writing proficiency. Paucity of research, the mixed nature of research findings, heterogeneity of participants, contexts and designs, and methodological issues in some of the existing research were identified as factors that limit our ability to draw firm conclusions concerning the effectiveness of AWE feedback. The study provides recommendations for further AWE research, and in particular calls for more research that places emphasis on how AWE can be integrated effectively in the classroom to support writing instruction.

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## 1. Introduction

This study provides a critical review of literature on the pedagogical effectiveness of computer-based educational technology for providing students with feedback on their writing that is commonly

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known as Automated Writing Evaluation (AWE).<sup>1</sup> AWE software provides computer-generated feedback on the quality of written texts. A central component of AWE software is a scoring engine that generates automated scores based on techniques such as artificial intelligence, natural language processing and latent semantic analysis (See [Dikli, 2006](#); [Philips, 2007](#); [Shermis & Burstein, 2003](#); [Yang, Buckendahl, Juszkiewicz, & Bholra, 2002](#)). AWE software that is used for pedagogical purposes also provides written feedback in the form of general comments, specific comments and/or corrections.

Originally, AWE was primarily used in high-stakes testing situations to generate summative scores to be used for assessment purposes. Widely used, commercially available scoring engines are Project Essay Grader™ (PEG), e-rater®, Intelligent Essay Assessor™ (IEA), and IntelliMetric™. In recent years, the use of AWE for the provision of formative feedback in the writing classroom has steadily increased, particularly in classrooms in the United States. AWE programs are currently being used in many elementary, high school, college and university classrooms with a range of writers from diverse backgrounds. Examples of commercially available AWE programs designed for classroom use are: Criterion (Educational Testing Service: MY Access! (Vantage Learning): Write to Learn and Summary Street (Pearson Knowledge Technologies); and Writing Roadmap (McGraw Hill). These programs sometimes incorporate the same scoring engine as used in summative programs. For example, Criterion incorporates the e-rater scoring engine and MY Access! incorporates the Intellimetric™ scoring engine.

Common to all AWE programs designed for classroom use is that they provide writers with multiple drafting opportunities, and upon receiving feedback writers can choose whether or not to use this feedback to revise their texts. AWE programs vary in the kinds of feedback they provide writers. Some provide feedback on both global writing skills and language use (e.g., Criterion, MY Access!), whereas others focus on language use (e.g., QBL) and some claim to focus primarily on content knowledge (e.g., Write to Learn and Summary Street). Some programs incorporate other tools such as model essays, scoring rubrics, graphic organizers, and dictionaries and thesauri.

Like many other forms of educational technology, the use of AWE in the classroom has been the subject of controversy, with scholars taking divergent stances. On the one hand, AWE has been hailed as a means of liberating instructors, freeing them up to devote valuable time to aspects of writing instruction other than marking assignments (e.g., [Burstein, Chodorow, & Leacock, 2004](#); [Herrington & Moran, 2001](#); [Hyland & Hyland, 2006](#); [Philips, 2007](#)). It has been seen as impacting positively on the quality of students' writing, due to the immediacy of its 'on-line' feedback ([Dikli, 2006](#)), and the multiple practice and revision opportunities it provides ([Warschauer & Ware, 2006](#)). It has also been claimed to have positive effects on student autonomy ([Chen & Cheng, 2008](#)).

On the other hand, the notion that computers are capable of providing effective writing feedback has aroused considerable suspicion, perhaps fueled by the fearful specter of a world in which humans are replaced by machines. Criticisms have been made concerning the capacity of AWE to provide accurate and meaningful scores (e.g., [Anson, 2006](#); [Freitag Ericsson, 2006](#)). There is a common perception that computers are not capable of scoring human texts, as they do not possess human inferencing skills and background knowledge ([Anson, 2006](#)). Other criticisms relate to the effects that AWE has on students' writing. AWE has been accused of reflecting and promoting a primarily formalist approach to writing, in which writing is viewed as simply being "mastery of a set of subskills" ([Hyland & Hyland, 2006, p. 95](#)). Comments generated by AWE have been said to place too much emphasis on surface features of writing, such as grammatical correctness ([Hyland & Hyland, 2006](#)) and the effects of writing for a non-human audience have been decried. There is also fear that using AWE feedback may be more of an exercise in developing test-taking strategies than in developing writing skills, with students writing to the test by consciously or unconsciously adjusting their writing to meet the criteria of the software ([Patterson, 2005](#)).

Positive and negative claims regarding the effects of AWE on students' writing are not always based on empirical evidence, and at times appear to reflect authors' own 'techno-positivistic' or 'technophobic' stances toward technology in the writing classroom. Moreover, quite a lot of the research that has

<sup>1</sup> Other terms found in the literature are automated essay evaluation (AEE) (See [Shermis & Burstein, 2013](#)) and writing evaluation technology.

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