

## The Importance of Assessing Student Writing and Improving Writing Instruction

Paul Deane



Writing is a critical 21st century skill. Today's knowledge economy places a premium upon collaboration and written communication, which means that the skilled writer enters the job market at a significant advantage (Aschliman, 2016; Brandt, 2005). And yet students typically enter the job market with weak writing skills. Only 27% of 12th-grade students demonstrated proficiency in writing on the National Assessment of Educational Progress (The Nation's Report Card, 2022). Similarly, according to one recent study, only 27% of employers classified recent college graduates as "well-prepared" for written communication in the workplace (Stewart et al., 2016).

Disparities in writing skills both reflect and contribute to inequities in our society. Certain groups, (e.g., people who identify as White and female) typically display stronger writing achievement, at least on the kinds of writing tasks that are highly valued in academic institutions and the professions (Roberts et al., 2017), with evidence that this leads to further inequities (Warren, 2013). Writing matters, and thus it is important to understand why so many students experience writing as deeply challenging and how they can be encouraged to develop their writing skills.

For decades, writing has been a major focus of research for the ETS Research and Development (R&D) division. The results of our efforts include substantial contributions to the measurement and development of student writing skills, with important implications for teacher professional development and the improvement of teaching practice.

## Writing is hard to evaluate

It is hard to teach writing without having mutually agreed upon standards of writing quality. To support this goal, ETS pioneered methods for getting human raters to evaluate writing quality accurately (Diederich et al., 1961). In this early research, we found that different raters tend to pay attention to different things. Some raters care most about mechanics and grammar; others focus on the ideas or effectiveness of expression. It takes a great deal of work using carefully developed rubrics, examples, and practice to get raters to evaluate writing consistently, in part because raters have to pay attention to many different dimensions of the text (Deane, 2011) and because different aspects of the text may matter more in some contexts and for some audiences than for others. More recent studies of rater cognition (e.g., Finn et al., 2020; Finn & Arslan, in press) showed that evaluating the quality of an essay is a difficult task even for professional, trained raters and that their performance can be strongly affected by the kind of training and feedback they receive.

What is hard for professional raters is, obviously, even more challenging for teachers and students. But to a very large extent, learning to write is learning how to evaluate writing. Effective writing instruction is all about supporting the provisioning and use of feedback. Effective writing teachers know how to evaluate student writing and provide effective feedback. Students become better writers when they learn how to evaluate their own writing and provide feedback to their peers (Graham et al., 2013).

---

***Writing isn't easy. . . . Few things are more important than providing teachers with the knowledge, tools, and support that will enable them to teach writing effectively.***

---

## Automated tools can help

ETS pioneered the use of natural language processing to evaluate student writing (Burstein, 2003; Burstein et al., 1998). This led to the development of the *CRITERION*<sup>®</sup> online writing service, one of the first classroom writing tools to offer automated feedback on student writing (Burstein et al., 2004). Later studies indicated that grade-level increases in writing performance can be measured using automated writing evaluation tools (Attali & Powers, 2008). As part of this work, ETS has developed measures for a wide variety of features that affect student writing quality, including organization and development, discourse cohesion, argument language, syntactic diversity, word choice, and conventions. This, in turn, makes it possible to examine in detail exactly how student writing changes as a result of instruction (Deane et al., 2021). Automated tools like these are no substitute for human judgment. However, they can provide feedback quickly and accurately for many aspects of student writing, which can make it easier for teachers to assign more writing tasks and to focus on more substantive writing skills. This combination, in turn, can lead to improvements in student performance (Potter & Wilson, 2021).

Automated writing evaluation can be particularly effective if it encourages students to develop their understanding of what makes writing effective. Much recent work at ETS has focused on developing feedback and visualizations designed to help students make more effective revisions, including the *WRITING MENTOR*<sup>®</sup> online writing practice tool that functions as a Google Docs plug-in (Madnani et al., 2018; Burstein et al., 2020). *WRITING MENTOR* makes it possible for students to visualize specific elements of their own or other people's writing, like the use of transition words or the vocabulary they have deployed to develop specific

---

***Automated tools . . . are no substitute for human judgment.***

***However, they can . . . make it easier for teachers to assign more writing tasks and to focus on more substantive writing skills.***

---

topics. People learn faster when they are provided models of good writing, especially if their attention is directed to specific features of those models that make them stronger and more effective (Graham et al., 2013).

## The writing process matters

Writing can be challenging, in part, because writers have to juggle so many tasks:

- developing ideas,
- organizing those ideas for presentation,
- finding the right words to express what one wants to say,
- transcribing words onto the page (either physically with a pen, or by typing on a keyboard),
- and monitoring the whole process to detect and fix problems and make revisions, as necessary.

Juggling all of these writing processes is hard work and takes time and attention. Problems with one task (say, handwriting or typing) can reduce the working memory available to take on other tasks, such as idea generation (Kellogg, 1996; McCutchen, 1996). The way

---

## ***People learn to write well when the writing activities they are asked to complete matter to them and their community and help accomplish meaningful goals.***

---

students go about completing these tasks can provide a lot of information about where students are writing fluently and where they are struggling (Baaijen et al., 2012; Leijten & Van Waes, 2013).

As a result, learning to write well is, in large part, learning effective strategies for managing the writing process (Deane, 2018). Effective planning and revision strategies require more work up front, but they make the cognitive load of writing manageable (Graham et al., 2013).

In recent work at ETS, we examined the use of writing process logs to better understand students' writing (Almond et al., 2012; Cao et al., 2020; Deane, 2014; Deane & Zhang, 2015; Guo et al., 2018; Zhang & Deane, 2015; Zhang, Zhu, et al., 2019). Such logs record writing behavior in fine detail, including the keys a student pressed during the writing process and how long they paused between paragraphs, sentences, words, and letters. These features derived from writing process logs are predictive of writing quality, and some, especially those related to typing speed, account for variance not accounted for by automated measures of the final submitted essay (Deane & Zhang, 2015; Sinharay et al., 2019; Zhang & Deane, 2015). Typing speed, in particular, is an important gateway skill: students who struggle to keep up with the demands of typing are likely to produce weaker essays (Gong et al., 2022).

Multiple factors affect people's ability to compose text fluently. In addition to typing speed, people write

more fluently when they know more about the subject (Deane, O'Reilly, et al., 2018). They write more slowly when they are having to evaluate what they write or if they have to remember text they are quoting (Deane, Roth, et al., 2018). Students write more efficiently when they have already read and thought in depth about a subject (Deane & Zhang, 2015; Sinharay et al., 2019; Zhang & Deane, 2015; Zhang, van Rijn, et al., 2019; Zhang et al., 2017), which means that ancillary activities, such as internet searches or reading and note-taking activities, can play a critical role (Deane & Zhang, 2020). Because individuals vary quite a bit in their typing habits, what they know, and the writing strategies they employ, people may have very different characteristic writing profiles (Choi et al., 2021). This results in very different patterns of pauses for stronger and weaker writers (Bennett et al., 2020; Bennett, Zhang, & Sinharay, 2021; Zhang et al., 2021; Zhu et al., 2019), in both native and English Learner populations (Choi & Deane, 2021).

One consequence of these differences is that we observe group differences in keystroke log patterns, with low socioeconomic status, minority, and male student groups typically being less fluent and engaging in fewer editing behaviors (Guo et al., 2019; Zhang, Bennett, et al., 2016; Zhang, Bennett, et al., 2019). These differences are particularly apparent across gender, consistent with the advantages shown for females on writing assessments like National Assessment of Educational Progress (Zhang, Bennett, et al., 2019). We are therefore exploring ways to profile students using writing process patterns, with the goal of identifying

students with distinctive instructional needs (Bennett, Zhang, Sinharay, et al., 2021; Zhang, Hao, et al., 2016).

## Reading matters for writing

### So do context and purpose

One of the fundamental results of educational research is that learning and assessment go together. Students need to know what they are learning, why they are learning it, and how well they have learned what they have learned so far. Assessment functions most effectively not only when it documents what students have achieved, but also when it helps teachers plan and adjust instruction and operates as a learning experience in its own right (Bennett, 2010). This insight led ETS to conduct a long-term research and development initiative called Cognitively Based Assessment of, for, and as Learning (the *CBAL*<sup>®</sup> learning and assessment tool), which has since evolved into new assessments, such as ETS testlets, that are designed to integrate more closely with instruction (Wylie, 2017). This research yielded important insights into writing and especially highlighted the ways that reading and writing are mutually beneficial.

Reading and writing unfold together and build upon common skills (Bennett et al., 2016; Deane & Sparks, 2019; Song et al., 2017; Song & Sparks, 2019; Sparks et al., 2021). Some reading skills (such as decoding a word's pronunciation from its spelling) are gateway skills; people who cannot read and comprehend what they read are unlikely to produce much when they write. Skills cannot be divorced from knowledge; people who know little about a subject are unlikely to understand what they read and will have difficulty generating ideas for writing (O'Reilly et al., 2019; Wang et al., 2019). In practice, people read and write in tandem. In a research project, for example, people may

write down research questions to help them select useful sources, take notes on what they have read, use graphic organizers to organize their notes, and reread all of those materials as they write up their final report. This sequence of activities functions as a bundle of skills that go together because they help the reader/writer to achieve some larger purpose within a specific cultural context; for instance, research is important in professional contexts in order to locate critical information and synthesize it into a form that the intended audience can readily comprehend.

As part of our research into reading and writing, we have identified several of these key practices that underlie reading and writing in academic and professional disciplines (Ackerman, 1991) and described typical scenarios within which these practices are deployed (Deane et al., 2015). These include building and sharing knowledge from texts (O'Reilly et al., 2015), discussing and debating ideas (Deane & Song, 2015), conducting inquiry and research (Sparks &

---

**27%**  
**of 12th-grade students**  
**demonstrated proficiency in writing**  
**on the National Assessment of**  
**Educational Progress**  
**(The Nation's Report Card, 2022).**

**27%**  
**of employers classified**  
**recent college graduates as**  
**"well-prepared" for written**  
**communication in the workplace**  
**(Stewart et al., 2016).**

---

---

***In the end, writing only makes sense when it is part of a rich sequence of activities in which people read, think, and communicate with other people.***

---

Deane, 2015), building and sharing stories and social understandings (Deane et al., 2019), and building rhetorical and literary interpretations of texts (Deane, 2020). These key practices give us a way to describe typical scenarios in which people deploy their ability to read and write.

Writing cannot really be divorced from the larger scenarios in which it functions. This has led ETS to research the use of “scenario-based assessments,” that is, assessments that simulate a sequence of meaningful reading and writing tasks within an authentic context (O’Reilly & Sheehan, 2009; Sabatini et al., 2014; Sabatini et al., 2020; Sheehan & O’Reilly, 2012; Shore et al., 2017; Song & Sparks, 2019; Wang et al., 2021). For example, we have created assessments that walk students through the process of building a written argument, from reading source texts to evaluating the quality of arguments and, finally, to building and presenting an argument of their own.

Many of the scenario-based assessments we have developed culminate in extended writing tasks, allowing us to place student levels on targeted learning progressions, such as those relevant to argumentation (van Rijn et al., 2014). Because the tasks give us a sense of where students are on critical skills, they can enable teachers to determine where students need additional instruction in specific supporting skills (Deane, Song, et al., 2018). The scaffolding provided by the scenario structure appears to reduce the cognitive load and increase the efficiency of student writing processes

(Guo et al., 2020), arguably providing a fairer and more engaging form of assessment that is likely to increase student learning.

In the end, writing only makes sense when it is part of a rich sequence of activities in which people read, think, and communicate with other people. People learn to write well when the writing activities they are asked to complete matter to them and their community and help accomplish meaningful goals (Graham et al., 2013).

## **Teachers matter**

### **Writing does not develop without support**

Teachers play an important role in helping students learn how to write (Graham et al., 2013). Effective teachers know how to engage meaningfully with assessment information and how to engage students in formative assessment practices (Wylie & Lyon, 2019). They know how to use classroom formative assessment strategies productively in their discipline (Heritage & Wylie, 2020). They understand how students learn, and they know how to provide students with effective scaffolding and support. We have therefore developed a rich program of research focusing on the knowledge and skills that K–12 teachers need, attending to teachers both as impactful mediators of equitable student opportunity to learn writing skills and as adults who are themselves writers and professional writing instructors. To teach writing effectively, teachers

need to know how to engage in ambitious, standards-aligned teaching practices. Research at ETS continues to extend our knowledge of how to use automated writing evaluation to support classroom assessment and learning while also supporting the development of practical tools that teachers can use (see the Helpful resources sidebar).

Writing isn't easy; neither is teaching—which makes the teaching of writing a challenge. Few things are more important than providing teachers with the knowledge, tools, and support that will enable them to teach writing effectively. We intend, through our research at ETS, to provide that kind of support.

## Helpful resources

<https://www.ets.org/s/k12/pdf/ets-assessment-literacy-modules.pdf>

Assessment Literacy Models Theory of Action

Learn about assessment literacy, see how the modules may improve student learning, and find more research.

<https://www.planwise.org/rsc/pdf/npd-planwise-planwise-toa.pdf>

The *PlanWise*<sup>™</sup> Tool Theory of Action

Learn how to incorporate formative assessment into learning plans and find more research.

## References

- Ackerman, J. M. (1991). Reading, writing, and knowing: The role of disciplinary knowledge in comprehension and composing. *Research in the Teaching of English, 25*(2), 133–178. <https://www.jstor.org/stable/40171186>
- Almond, R., Deane, P., Quinlan, T., Wagner, M., & Sydorenko, T. (2012). *A preliminary analysis of keystroke log data from a timed writing task* (Research Report No. RR-12-23). ETS. <https://doi.org/10.1002/j.2333-8504.2012.tb02305.x>
- Aschliman, C. (2016). *Write to work: The use and importance of writing as perceived by business leaders*. Virginia Commonwealth University.
- Attali, Y., & Powers, D. (2008). *A developmental writing scale* (Research Report No. RR-08-19). ETS. <https://doi.org/10.1002/j.2333-8504.2008.tb02105.x>
- Baaijen, V. M., Galbraith, D., & de Gloppe, K. (2012). Keystroke analysis: Reflections on procedures and measures. *Written Communication, 29*(3), 246–277. <https://doi.org/10.1177/0741088312451108>
- Bennett, R. E. (2010). Cognitively based assessment of, for, and as learning (CBAL<sup>®</sup>): A preliminary theory of action for summative and formative assessment. *Measurement: Interdisciplinary Research & Perspective, 8*(2–3), 70–91. <https://doi.org/10.1080/15366367.2010.508686>
- Bennett, R. E., Deane, P., & van Rijn, P. W. (2016). From cognitive-domain theory to assessment practice. *Educational Psychologist, 51*(1), 82–107. <https://doi.org/10.1080/00461520.2016.1141683>
- Bennett, R. E., Zhang, M., Deane, P., & van Rijn, P. W. (2020). How do proficient and less proficient students differ in their composition processes? *Educational Assessment, 25*(3), 198–217. <https://doi.org/10.1080/10627197.2020.1804351>
- Bennett, R. E., Zhang, M., & Sinharay, S. (2021). How do educationally at-risk men and women differ in their essay-writing processes? *Chinese/English Journal of Educational Measurement and Evaluation, 2*(1), 1.
- Bennett, R. E., Zhang, M., Sinharay, S., Guo, H., & Deane, P. (2021). Are there distinctive profiles in examinee essay-writing processes? *Educational Measurement: Issues and Practice*. Advance online publication. <https://doi.org/10.1111/emip.12469>
- Brandt, D. (2005). Writing for a living: Literacy and the knowledge economy. *Written Communication, 22*(2), 166–197. <https://doi.org/10.1177/0741088305275218>
- Burstein, J. (2003). The *e-rater*<sup>®</sup> scoring engine: Automated essay scoring with natural language processing. In M. D. Shermis & J. Burstein (Eds.), *Automated essay scoring: A cross-disciplinary perspective* (pp. 113–122). Lawrence Erlbaum Associates.
- Burstein, J., Chodorow, M., & Leacock, C. (2004). Automated essay evaluation: The *CRITERION*<sup>®</sup> online writing service. *AI Magazine, 25*(3), 27. <https://doi.org/10.1609/aimag.v25i3.1774>
- Burstein, J., Kukich, K., Wolff, S., Lu, C., Chodorow, M., Braden-Harder, L., & Harris, M. D. (1998, August). Automated scoring using a hybrid feature identification technique. In *36th annual meeting of the Association for Computational Linguistics and 17th International Conference on Computational Linguistics* (Vol. 1, pp. 206–210). Association for Computational Linguistics. <https://aclanthology.org/P98-1032.pdf>
- Burstein, J., Riordan, B., & McCaffrey, D. (2020). Expanding automated writing evaluation. In D. Yan, A. A. Rupp, & P. W. Foltz (Eds.), *Handbook of automated scoring* (pp. 329–346). Chapman and Hall/CRC.

- <https://doi.org/10.1201/9781351264808-18>
- Cao, Y., Chen, J., Zhang, M., & Li, C. (2020). *Examining the writing processes in scenario-based assessment using regression trees* (Research Report No. RR-20-18). ETS. <https://doi.org/10.1002/ets2.12301>
- Choi, I., & Deane, P. (2021). Evaluating writing process features in an adult EFL writing assessment context: A keystroke logging study. *Language Assessment Quarterly*, 18(2), 107–132. <https://doi.org/10.1080/15434303.2020.1804913>
- Choi, I., Hao, J., Deane, P., & Zhang, M. (2021). *Benchmark keystroke biometrics accuracy from high-stakes writing tasks* (Research Report No. RR-21-15). ETS. <https://doi.org/10.1002/ets2.12326>
- Deane, P. (2011). *Writing assessment and cognition* (Research Report No. RR-11-14). ETS. <https://doi.org/10.1002/j.2333-8504.2011.tb02250.x>
- Deane, P. (2014). *Using writing process and product features to assess writing quality and explore how those features relate to other literacy tasks* (Research Report No. RR-14-03). ETS. <https://doi.org/10.1002/ets2.12002>
- Deane, P. (2018). The challenges of writing in school: Conceptualizing writing development within a sociocognitive framework. *Educational Psychologist*, 53(4), 280–300. <https://doi.org/10.1080/00461520.2018.1513844>
- Deane, P. (2020). *Building and justifying interpretations of texts: A key practice in the English language arts* (Research Report No. RR-20-20). ETS. <https://doi.org/10.1002/ets2.12304>
- Deane, P., O'Reilly, T., Chao, S.-F., & Dreier, K. (2018). *Writing processes in short written responses to questions probing prior knowledge* (Research Report No. RR-18-39). ETS. <https://doi.org/10.1002/ets2.12226>
- Deane, P., Roth, A., Litz, A., Goswami, V., Steck, F., Lewis, M., & Richter, T. (2018). *Behavioral differences between retyping, drafting, and editing: A writing process analysis* (Research Memorandum RM-18-06). ETS.
- Deane, P., Sabatini, J. P., Feng, G., Sparks, J., Song, Y., Fowles, M., O'Reilly, T., Jueds, K., Krovetz, R., & Foley, C. (2015). *Key practices in the English language arts (ELA): Linking learning theory, assessment, and instruction* (Research Report No. RR-15-17). ETS. <https://doi.org/10.1002/ets2.12063>
- Deane, P., Somasundaran, S., Lawless, R. R., Persky, H., & Appel, C. (2019). *The key practice, building and sharing stories and social understandings: The intrinsic value of narrative* (Research Report No. RR-19-31). ETS. <https://doi.org/10.1002/ets2.12266>
- Deane, P., & Song, Y. (2015). *The key practice, discuss and debate ideas: Conceptual framework, literature review, and provisional learning progressions for argumentation* (Research Report No. RR-15-33). <https://doi.org/10.1002/ets2.12079>
- Deane, P., Song, Y., van Rijn, P. W., O'Reilly, T., Fowles, M., Bennett, R. E., Sabatini, J. P., & Zhang, M. (2018). The case for scenario-based assessment of written argumentation. *Reading and Writing*, 32(6), 1575–1606.
- Deane, P., & Sparks, J. (2019). Scenario-based formative assessment of key practices in the English language arts. In H. L. Andrade, R. E. Bennett, & G. J. Cizek (Eds.), *Handbook of formative assessment in the disciplines*. Taylor and Francis. <https://doi.org/10.4324/9781315166933-4>
- Deane, P., Wilson, J., Zhang, M., Li, C., van Rijn, P., Guo, H., Roth, A., Winchester, E., & Richter, T. (2021). The sensitivity of a scenario-based assessment of written argumentation to school differences in curriculum and instruction. *International Journal of Artificial Intelligence in Education*, 31(1), 57–98. <https://link.springer.com/article/10.1007/s40593-020-00227-x>
- Deane, P., & Zhang, M. (2015). *Exploring the feasibility of using writing process features to assess text production skills* (Research Report No. RR-15-26). ETS. <https://doi.org/10.1002/ets2.12071>
- Deane, P., & Zhang, M. (2020). Automated writing process analysis. In D. Yan, A. A. Rupp, & P. W. Foltz (Eds.), *Handbook of automated scoring* (pp. 347–364). Chapman and Hall/CRC. <https://doi.org/10.1201/9781351264808-19>
- Diederich, P. B., French, J. W., & Carlton, S. T. (1961). *Factors in judgments of writing ability* (Research Bulletin No. RB-61-15). ETS. <https://doi.org/10.1002/j.2333-8504.1961.tb00286.x>
- Finn, B., & Arslan, B. (in press). Memory and metacognitive processes recruited during educational assessment. *The Oxford handbook of memory*. Oxford University Press.
- Finn, B., Morehead, K., & Dunlosky, J. (2020, September 9–11). *Using cognitive theory to inform human constructed response scoring training* [Paper presentation]. National Council of Measurement in Education, Virtual.
- Gong, T., Zhang, M., & Li, C. (2022). Association of keyboarding fluency and writing performance in online-delivered assessment. *Assessing Writing*, 51, Article 100575. <https://doi.org/10.1016/j.asw.2021.100575>
- Graham, S., MacArthur, C. A., & Hebert, M. A. (Eds.). (2013). *Best practices in writing instruction*. Guilford Press.
- Guo, H., Deane, P. D., van Rijn, P. W., Zhang, M., & Bennett, R. E. (2018). Modeling basic writing processes from keystroke logs. *Journal of Educational Measurement*, 55(2), 194–216. <https://doi.org/10.1111/jedm.12172>
- Guo, H., Zhang, M., Deane, P., & Bennett, R. E. (2019). Writing process differences in subgroups reflected in keystroke logs. *Journal of Educational and Behavioral Statistics*, 44(5), 571–596. <https://doi.org/10.3102/1076998619856590>
- Guo, H., Zhang, M., Deane, P., & Bennett, R. E. (2020). Effects of scenario-based assessment on students' writing processes. *Journal of Educational Data Mining*, 12(1), 19–45. <https://jedm.educationaldatamining.org/index.php/JEDM/article/download/443/115>
- Heritage, M., & Wylie, E. C. (2020). *Formative assessment in the disciplines framing a continuum of professional learning*. Harvard Education Press.
- Kellogg, R. T. (1996). A model of working memory in writing. In C. M. Levy & S. Ransdell (Eds.), *The science of writing: Theories, methods, individual differences, and application* (pp. 57–71). Erlbaum.
- Leijten, M., & Van Waes, L. (2013). Keystroke logging in writing research: Using Inputlog to analyze and visualize writing processes. *Written Communication*, 30(3), 358–392. <https://doi.org/10.1177/0741088313491692>
- Madnani, N., Burstein, J., Elliot, N., Klebanov, B. B., Napolitano, D., Andreyev, S., & Schwartz, M. (2018). *WRITING MENTOR®: Self-regulated writing feedback for struggling writers*. In *Proceedings of the 27th International Conference on Computational Linguistics: System demonstrations* (pp. 113–117). Association for Computational Linguistics. <https://www.semanticscholar.org/paper/Writing-Mentor%3A-Self-Regulated-Writing-Feedback-for-Madnani-Burstein/173a6149cbfad343fb274b9be10cf8e951ca40e1>
- McCutchen, D. (1996). A capacity theory of writing: Working memory in composition. *Educational Psychology Review*, 8, 299–325. <https://doi.org/10.1007/BF01464076>
- The Nation's Report Card. (2022). *How did U.S. students perform on the most recent*



- assessments? Retrieved April 1, 2022, from <https://www.nationsreportcard.gov/>
- O'Reilly, T., Deane, P., & Sabatini, J. P. (2015). *Building and sharing knowledge key practice: What do you know, what don't you know, what did you learn?* (Research Report No. RR-15-24). <https://doi.org/10.1002/ets2.12074>
- O'Reilly, T., & Sheehan, K. M. (2009). *Cognitively based assessment of, for, and as learning: A framework for assessing reading competency* (Research Report No. RR-09-26). ETS. <https://doi.org/10.1002/j.2333-8504.2009.tb02183.x>
- O'Reilly, T., Wang, Z., & Sabatini, J. P. (2019). How much knowledge is too little? When a lack of knowledge becomes a barrier to comprehension. *Psychological Science, 30*(9), 1344–1351. <https://doi.org/10.1177/0956797619862276>
- Potter, A., & Wilson, J. (2021). Statewide implementation of automated writing evaluation: Analyzing usage and associations with state test performance in Grades 4–11. *Educational Technology Research and Development, 69*, 1557–1578. <https://doi.org/10.1007/s11423-021-10004-9>
- Roberts, J., Nardone, C. F., & Bridges, B. (2017). Examining differences in student writing proficiency as a function of student race and gender. *Research & Practice in Assessment, 12*, 59–68. <https://files.eric.ed.gov/fulltext/EJ1168687.pdf>
- Sabatini, J. P., O'Reilly, T., Halderman, L., & Bruce, K. (2014). Broadening the scope of reading comprehension using scenario-based assessments: Preliminary findings and challenges. *L'Année Psychologique, 114*(4), 693–723. <https://doi.org/10.3917/anpsy.144.0693>
- Sabatini, J. P., O'Reilly, T., Weeks, J., & Wang, Z. (2020). Engineering a twenty-first century reading comprehension assessment system utilizing scenario-based assessment techniques. *International Journal of Testing, 20*(1), 1–23. <https://doi.org/10.1080/15305058.2018.1551224>
- Sheehan, K., & O'Reilly, T. (2012). The case for scenario-based assessments of reading competency. In J. Sabatini, E. Albro, & T. O'Reilly (Eds.), *Reaching an understanding: Innovations in how we view reading assessment* (pp. 19–33). Rowman & Littlefield Education.
- Shore, J. R., Wolf, M. K., O'Reilly, T., & Sabatini, J. P. (2017). Measuring 21st-century reading comprehension through scenario-based assessments. In M. K. Wolf & Y. G. Butler (Eds.), *English language proficiency assessments for young learners* (Vol. 2, pp. 234–252). Routledge. <https://doi.org/10.4324/9781315674391-13>
- Sinharay, S., Zhang, M., & Deane, P. (2019). Prediction of essay scores from writing process and product features using data mining methods. *Applied Measurement in Education, 32*(2), 116–137. <https://doi.org/10.1080/08957347.2019.1577245>
- Song, Y., Deane, P., & Fowles, M. (2017). *Examining students' ability to critique arguments and exploring the implications for assessment and instruction* (Research Report No. RR-17-16). ETS. <https://doi.org/10.1002/ets2.12166>
- Song, Y., & Sparks, J. R. (2019). Measuring argumentation skills through a game-enhanced scenario-based assessment. *Journal of Educational Computing Research, 56*(8), 1324–1344. <https://doi.org/10.1177/0735633117740605>
- Sparks, J. R., & Deane, P. (2015). *Cognitively based assessment of research and inquiry skills: Defining a key practice in the English language arts* (Research Report No. RR-15-35). ETS. <https://doi.org/10.1002/ets2.12082>
- Sparks, J. R., van Rijn, P. W., & Deane, P. (2021). Assessing source evaluation skills of middle school students using learning progressions. *Educational Assessment, 26*(4), 213–240. <https://doi.org/10.1080/10627197.2021.1966299>
- Stewart, C., Wall, A., & Marciniak, S. (2016). Mixed signals: Do college graduates have the soft skills that employers want? *Competition Forum, 14*(2), 276–281.
- van Rijn, P. W., Graf, E. A., & Deane, P. (2014). Replicación empírica de las progresiones de aprendizaje de la capacidad para argumentar en una evaluación basada en escenarios de competencias de lectoescritura [Empirical recovery of argumentation learning progressions in scenario-based assessments of English language arts]. *Psicología Educativa: Revista de las Psicólogas de Educación, 20*(2), 109–115. <https://doi.org/10.1016/j.pse.2014.11.004>
- Wang, Z., O'Reilly, T., Sabatini, J. P., McCarthy, K. S., & McNamara, D. S. (2021). A tale of two tests: The role of topic and general academic knowledge in traditional versus contemporary scenario-based reading. *Learning and Instruction, 73*, Article 101462. <https://doi.org/10.1016/j.learninstruc.2021.101462>
- Wang, Z., Sabatini, J. P., O'Reilly, T., & Weeks, J. (2019). Decoding and reading comprehension: A test of the decoding threshold hypothesis. *Journal of Educational Psychology, 111*(3), 387–401. <https://doi.org/10.1037/edu0000302>
- Warren, J. (2013). The rhetoric of college application essays: Removing obstacles for low income and minority students. *American Secondary Education, 42*(1), 43–56. <https://www.jstor.org/stable/43694176>
- Wylie, E. C. (2017). *WINSIGHT assessment system: Preliminary theory of action* (Research Report No. RR-17-26). ETS. <https://doi.org/10.1002/ets2.12155>
- Wylie, E. C., & Lyon, C. (2019). The role of technology-enhanced self- and peer assessment in formative assessment. In S. M. Brookhart & J. H. McMillan (Eds.), *Classroom assessment and educational measurement* (pp. 170–191). Routledge. <https://doi.org/10.4324/9780429507533-10>
- Zhang, M., Bennett, R. E., Deane, P., & van Rijn, P. W. (2016, June 20–22). Are there group differences in essay-writing processes? [Slide presentation]. In P. Carr (Chair), *Test performance can tell us about problem-solving processes: Implications for building equitable assessment systems* [Symposium]. National Conference on Student Assessment, Philadelphia, PA. <https://ccsso.confex.com/ccsso/2016/webprogram/Presentation/Session4426/FINAL%20Bennett%20NCSA%20GENDER%20ONLY%20Process%20Analysis%202016.pdf>
- Zhang, M., Bennett, R. E., Deane, P., & van Rijn, P. W. (2019). Are there gender differences in how students write their essays? An analysis of writing processes. *Educational Measurement: Issues and Practice, 38*(2), 14–26. <https://doi.org/10.1111/emip.12249>
- Zhang, M., & Deane, P. (2015). *Process features in writing: Internal structure and incremental value over product features* (Research Report No. RR-15-27). ETS. <https://doi.org/10.1002/ets2.12075>
- Zhang, M., Guo, H., & Liu, X. (2021, June 29–July 2). *Using keystroke analytics to understand cognitive processes during writing* [Paper presentation]. Conference on Educational Data Mining, Paris, France. [https://educationaldatamining.org/EDM2021/virtual/static/pdf/EDM21\\_paper\\_167.pdf](https://educationaldatamining.org/EDM2021/virtual/static/pdf/EDM21_paper_167.pdf)
- Zhang, M., Hao, J., Li, C., & Deane, P. (2016). Classification of writing patterns using keystroke logs. In L. van der Ark, D. Bolt, W. C. Wang, J. Douglas, & M. Wiberg (Eds.), *Quantitative psychology research: The 80th annual meeting of the Psychometric Society, Beijing, 2015* (pp. 299–314). Springer. [https://doi.org/10.1007/978-3-319-38759-8\\_23](https://doi.org/10.1007/978-3-319-38759-8_23)
- Zhang, M., van Rijn, P. W., Deane, P., & Bennett, R. E. (2019). Scenario-based assessments in writing: An experimental study. *Educational Assessment, 24*(2), 73–90. <https://doi.org/10.1080/10627197.2018.1557515>
- Zhang, M., Zhu, M., Deane, P., & Guo, H. (2019). Identifying and comparing writing process patterns using keystroke logs. In M. Wiberg, S. Culpepper, R. Janssen, J. González, & D. Molenaar, *Quantitative psychology: 83rd annual meeting of the*

*Psychometric Society, New York, NY, 2018* (pp. 367–381). Springer.  
[https://doi.org/10.1007/978-3-030-01310-3\\_32](https://doi.org/10.1007/978-3-030-01310-3_32)

Zhang, M., Zou, D., Wu, A. D., Deane, P., & Li, C. (2017). An investigation of writing processes employed in scenario-based assessment. In B. D. Zumbo & A. M. Hubley (Eds.), *Understanding and investigating response processes in validation research* (pp. 321–339). Springer. [https://doi.org/10.1007/978-3-319-56129-5\\_17](https://doi.org/10.1007/978-3-319-56129-5_17)

Zhu, M., Zhang, M., & Deane, P. (2019). *Analysis of keystroke sequences in writing logs* (Research Report No. RR-19-11). ETS. <https://doi.org/10.1002/ets2.12247>

## Acknowledgments

Paul Deane is a principal research scientist in the Natural Language Processing group in the Center for Cognitive and Technical Sciences, ETS. [pdeane@ets.org](mailto:pdeane@ets.org).

## About ETS

At ETS, we advance quality and equity in education for people worldwide by creating assessments based on rigorous research. ETS serves individuals, educational institutions, and government agencies by providing customized solutions for teacher certification, English language learning, and elementary, secondary and postsecondary education, and by conducting education research, analysis, and policy studies.

Founded as a nonprofit in 1947, ETS develops, administers, and scores more than 50 million tests annually — including the *TOEFL*® and *TOEIC*® tests, the *GRE*® tests and *The Praxis Series*® assessments — in more than 180 countries, at over 9,000 locations worldwide.

[ets.org](https://ets.org)

Suggested citation: Deane, P. (2022). *The importance of assessing student writing and improving writing instruction* (ETS Research Notes). ETS.

Copyright © 2022 by Educational Testing Service. All rights reserved.

CBAL, CRITERION, E-RATER, ETS, the ETS logo, GRE, THE PRAXIS SERIES, TOEIC, TOEFL, and WRITING MENTOR are registered trademarks of Educational Testing Service (ETS). PLANWISE is a trademark of ETS. All other trademarks are property of their respective owners.