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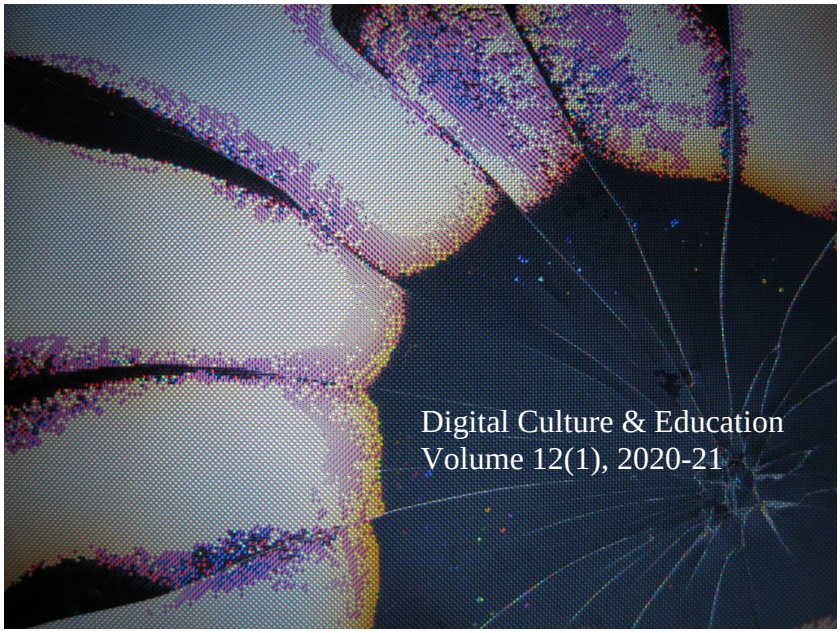

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TEACHERS, AI GRAMMAR CHECKERS, AND THE NEWEST LITERACIES: EMENDING WRITING PEDAGOGY AND ASSESSMENT

Jason Toncic

Abstract: *High school English (Language Arts) teachers are experiencing the most impactful shift in literacy practices since the advent of digital word processing: Artificial Intelligence literacies, which impact the production of writing with high-accuracy grammar suggestions. However, the specific role that AI grammar checkers play in teaching and assessing writing has been widely overlooked to date. In this focused study, seven New Jersey (USA) high school English teachers were initially asked about their current writing and grammar pedagogy and assessment. When participants were then introduced to an AI grammar checker, the emergent findings of this study showed that grammar is an implicit factor in student assessment, despite many high school English teachers no longer explicitly teaching grammar lessons. Furthermore, the participating teachers perceived AI grammar checkers as possible "personal assistants" that could improve student writing, teach grammar, and reduce teacher workloads. This study suggests that online grammar checkers can bring about meaningful critical reflection regarding the assessment of Standard English in high schools for teachers and researchers.*

Keywords: *Artificial intelligence, new literacies, grammar checkers, critical pedagogy*

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Artificial Intelligence and Grammar Considerations in English Teaching

Recent advances in artificial intelligence (AI)—such as machine learning deep neural networks—have engendered a revolutionary way for people to write: crafting compositions that are augmented by algorithmic grammar checkers correcting writing in real-time (Alshemali & Kalita, 2020; Yang, Luo, Chueng, Ling, & Chin, 2019). Grammar checkers, in the past often unreliable, have recently made major strides in accuracy through advances in natural language processing: the resulting subfield from the convergence of AI, linguistics, and computer science as pertains to human-machine natural language interaction (Madi & Al-Khalifa, 2018). Online and free-to-use grammar checkers like Grammarly (https://www.grammarly.com) are now helping various students to hand-in error-free, grammatically clean text (Koltovskaia, 2020; O'Neill & Russell, 2019b; Zhang, Ozer, & Bayazeed, 2020). They are using grammar checking software interfaces or in-browser extensions to automate grammatical revision, both at home and in classrooms. It has seemingly paid off for those who use it. Drawing from a 2011-2012 survey (Grammarly, 2012), Grammarly (2020) has claimed that 99% of students who used its grammar checking algorithm self-reported receiving better grades in writing. If

such claims are even partially accurate today, this raises the need to rethink writing pedagogy's practice and assessment for high school English (i.e., Language Arts) teachers within an education system that has reified grammar-based writing grades as markers of proficiency.

But, to date, educational policy in the United States, in particular the State of New Jersey as pertains to this study, has little incorporated or responded to AI-improved grammar checkers, perhaps because it is difficult to predict the scale to which these newest literacies are (or will) impact student learning, teacher pedagogy, and written assessment. That said, writing and grammar remain some of the most frequently tested areas in U.S. college "readiness" measures/protocols, such as on New Jersey's Student Learning Assessment. Furthermore, both the ACT and SAT (U.S.-based college admissions tests) base a quarter of students' composite scores on sections dedicated to Standard English language conventions—not to mention an additional, optional writing section that also judges students' grammar usage and mechanics. The stakes of these two exams are so high that some wealthy families have resorted to cheating for higher scores, as revealed by federal prosecutors in March 2019 (Korn, Levitz, & Ailworth, 2019). A media firestorm followed this scandal (see, for example, Kates, 2019; Richer & Binkley, 2019; Levenson, 2019), but the content of the exams, like grammar, went largely undiscussed. And although the production of student writing may be changing with new AI-based grammar checking technologies, students are nevertheless not permitted to use them on the exams.

Outside of schooling, grammar presides as a shibboleth for access to many desirable careers, separating those with proper grammar from those without. For example, Kyle Wiens, CEO of tech companies iFixit and Dozuki, wrote that applicants to his companies were screened by a grammar test (Wiens, 2012). CBS MoneyWatch likewise warned its readers that sloppiness, including bad grammar, was stopping applicants from getting the jobs they wanted (Lucas, 2012). More recently, the CEO of public relations firm Babbit Bodner said that she scours potential employees' social media profiles for proper grammar usage before hiring an applicant (Cornfield, 2019). Bleske-Rechek, Paulich, Shafer, and Kofman (2019) found that non-professional adults who read cover letters with grammar errors, as compared to cover letters free of errors, were more likely to make negative judgments about applicants.

Perhaps consequently, grammar is a major focus of teacher certification in the United States. The Praxis examination for English and Language Arts, required for English teacher certification in 40 different U.S. States, including New Jersey (New Jersey Department of Education, 2016), asks aspiring English teachers to demonstrate grammar comprehension by, for instance, identifying whether selected sentences have errors of split infinitives, subject-verb disagreement, or faulty parallelism (Educational Testing Service, 2018). This seems remarkably similar to an 1877 certification English grammar exam that required prospective teachers to "Define and give etymology of verb, pronoun, conjunction and adverb. Give example of a defective, an auxiliary, an impersonal and a redundant verb." (Velz, 1977, p. 36). Grammar conventions in education appear to have remained fixed and testable, just like the ideal of "perfect" grammar as a marker of someone who is employable still lingers.

This study was guided by the following research questions: How do English teachers currently conceive of school-based writing (pedagogy and assessment), and how might they respond to AI grammar checkers that facilitate grammatically sound writing? In addressing these inquiries, this paper focuses on New Jersey English teachers, grammar in schools, and assessment at a moment when profound changes are occurring in how people produce writing. The New Jersey State Board of Education's (2016) high school Student Learning Standards for Language require students to "demonstrate [a] command of the conventions of standard English capitalization, punctuation, and spelling when writing" (NJSLSA.L2). This wording is borrowed directly from the Common Core State Standards Initiative, a collective that once included 43 states. Although New Jersey is no longer a member of the Common Core State Standards Initiative, the retention of its language in this standard suggests that New Jersey's high school Student Learning Standards for Language are likely similar to those of many states: students must demonstrate a mastery of traditional grammatical conventions, although many of the listed conventions (e.g., using a semicolon or colon) can now be automated with basic grammar checking software. This paper presents the outcomes of a focused, somewhat speculative study that first examined seven high school English teachers' conceptions of writing and grammar pedagogy and assessment in their New Jersey, public school classrooms. Participants were then instructed to use an AI grammar checker, most for the first time. By initially speaking to the participants about writing pedagogy and assessment and then introducing them to Grammarly's AI-powered grammar checking, I gleaned insights into their reported methods for teaching before learning about their future-looking speculations regarding AI grammar checkers.

Today, students who are using AI grammar checkers in classrooms are self-reportedly receiving higher grades (Grammarly, 2012, 2020). But, as this paper will suggest, some teachers may not yet know or understand what these programs can do. Interestingly, before even considering grammar checkers, the high school English teachers who took part in this study said in interviews that they either rarely taught grammar or did not teach it at all. However, grammar nonetheless continues to be a major determinant of grades and college admission test scores. All participants in this study predicted AI grammar checkers like Grammarly could become pedagogical tools that could improve teachers' ability to give feedback on written work by eliminating grammatical corrections. Furthermore, by dint of this reduction, struggling writers may be less discouraged from writing.

Questions remain, however, about the long-term efficacy of AI grammar checkers, how students use such programs, the ways in which teachers implement them, and whether, when, and how standardized testing may respond. As one of the newest changes to literacy, AI-augmented writing requires discussion from teachers, researchers, and policy makers in education. This article will first briefly recap upgrades made to grammar checkers over the last five years. I then look more broadly at the current field of New Literacy Studies and theoretically explore the game-like structure of Standard English grammar in schools and AI's proficiency in rule-based endeavors, which makes a fascinating, critical analogy between grammar-based grades in schools and gaming. I next discuss the methodology of this study and its findings regarding the assessment of grammar in high school English classrooms and the interviewed teachers' speculation about the role of AI grammar checkers in teaching. I

consider the implications of these findings in light of English pedagogy and assessment. Lastly, I suggest some directions for future research that this exploratory study has revealed.

Ramifications of Recent Improvements in Grammar Checkers

AI grammar checkers are an under-researched software application in the field of education, particularly in high school English studies. While some high school students recently found grammar checkers beneficial for writing (Nobles & Paganucci, 2015), I have not found studies within the last five years that examine grammar checkers from the perspectives of high school English teachers, pedagogy, curriculum, or assessment. This paucity of research could be explained by the low quality of previous generations of grammar checkers, which often mistakenly identified errors or offered nonsensical changes (Fischer & Gruschin, 1992; McAlexander, 2000). Gerrard (2002) cautioned writing instructors that these early grammar checkers were unable to "understand the content of a sentence" and failed to be "consistently accurate" or "offer appropriate alternatives" (Gerrard, 2002, p. 488). In a fitting summary statement for the time, linguist Geoffrey Pullum (2007) wrote on the University of Pennsylvania Language Lab blog that "accepting the advice of a computer grammar checker on your prose will make it much worse, sometimes hilariously incoherent."

However, advances over the past decade have revolutionized the accuracy of AI grammar checkers. In particular, developments in deep neural network learning have led to more robust and precise grammar checking systems (Goldberg, 2016; Goodfellow, Bengio, & Courville, 2016; Kurdi, 2017). Studies using newer generations of grammar checkers have reported that the programs have provided useful feedback to university students on writing assignments, improving writing quality overall (Cavaleri & Dianati, 2016; O'Neill & Russell, 2019b).

Grammarly and programs like it operate through machine learning deep neural networks (McCracken, 2019). In short, programmers input a large corpus of examples of grammatically "correct" writing in order for the artificial intelligence to "learn" which grammar paradigms are right. By then identifying grammatical errors and labeling them as incorrect in another set of examples, programmers taught the AI to find and label potential mistakes. In practice, Grammarly marks errors in a text with one of four different colors: red denotes a mechanics or spelling error, blue indicates an issue with clarity, green suggests ways to improve reader engagement, and purple offers ways to strengthen delivery (see Figure 1).

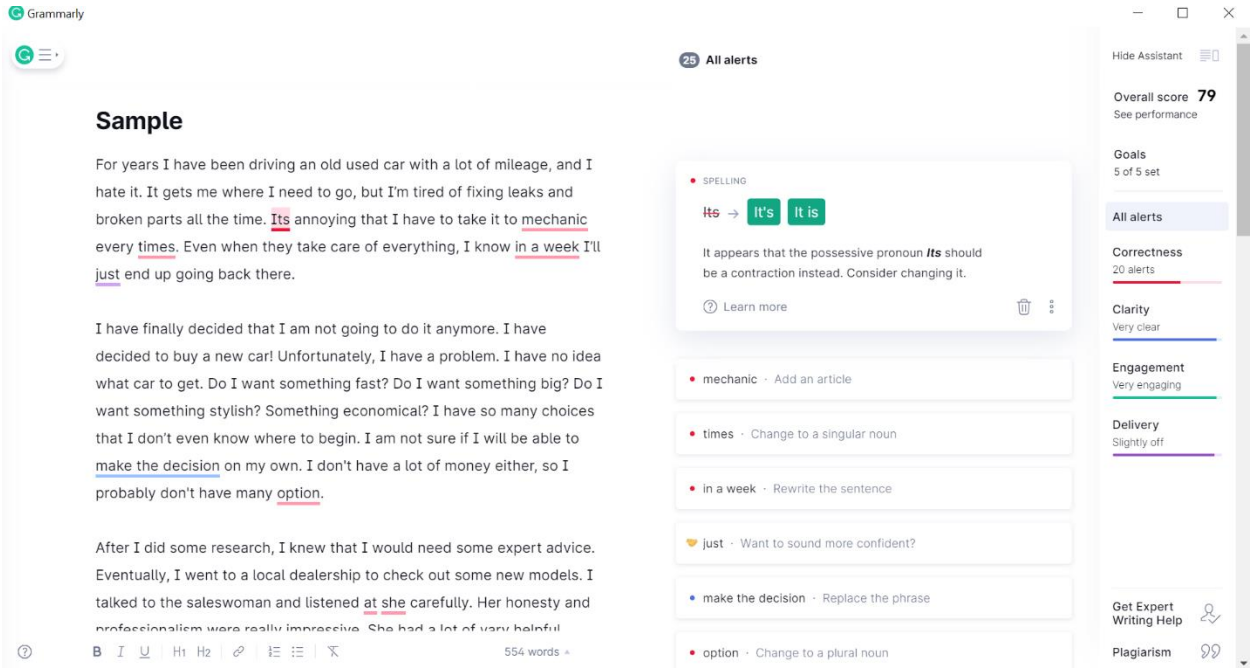

Figure 1. A screenshot of the Grammarly software suggesting corrections on the sample text (Appendix) used in this study.

Although the effect of AI grammar checkers on high school English pedagogy and assessment remains underreported, studies have been more frequently conducted in the fields of English language learning and higher education. Some were critical about the role of AI grammar checkers. Zaini (2018) found that English language learners may have used the AI grammar checkers of Microsoft Word and Grammarly, but that these programs also exerted control and power over the writers. Similarly, Koltovskaia (2020) reported case studies on two ESL college students who overly relied on the AI grammar checking software, without adequately verifying the suggestions. Others, however, acknowledged their widespread use. Researchers found that over half of the students at the largest Engineering school in India, Manipal Academy of Higher Education, were using Grammarly (Gain, Rao, & Bhat, 2019).

Still other researchers seem to confuse students' writing ability with students' written products—arguing that Grammarly improved students' writing skills in an Indonesian classroom by leading to passing scores (Karyuatry, 2018). However, I would argue that such a conclusion is difficult to make: after all, the assessment criteria remained the same regardless of students' AI-augmented writing ability. Furthermore, research out of South Korea-based English language schools suggested that the inconsistency of correct feedback limits the applicability of Grammarly in classrooms (Park, 2019). This was echoed by research at the university level in Australia which found the grammar program to need complementary guidance from a human advisor (O'Neill & Russell, 2019a). Other research reinforced this finding, suggesting that Grammarly could benefit students with basic mechanics but

still required a human teacher to assist with content and organization (Ghufron, 2019; John & Woll, 2018).

Considering the profound changes to school-based writing occurring with the advent of AI grammar checkers, it is important to consider the ramifications of this technology before it emerges ubiquitously in Language Arts classrooms. Consequently, this study is deliberately somewhat speculative in nature by focusing on teachers who are not yet taking AI grammar checkers into consideration.

The Newest AI-Literacies: Recasting "New" Literacies

New Literacy Studies are epistemologically based on anthropological conceptions of meaning-making in people's everyday lives, as well as on social constructivism, which posits learning as a situated, dialogic relationship between participants (e.g., Barton & Hamilton, 2005; Street, 1984, 2003; Gee, 2007; Heath, 1983; Scribner & Cole, 1981). A subset of this work focuses on "new literacies," or new literacy practices often made possible by the advent of digital technologies (e.g., Alvermann & Sanders, 2019; Coiro, Knobel, Lankshear, & Leu, 2014; Gee, 2018; Knobel & Lankshear, 2007; Lammers, Magnifico, & Curwood, 2018; Lankshear & Knobel, 2018). The research on these "new" literacies continues to be productive and has yet more to say about education, teaching, and learning.

However, I contend "new" literacies as applied to *all* digitally transmitted person-to-person communication obscures the *newest* literacies, those mediated by artificial intelligence. I have thus invoked "newest" literacies to point to AI-mediated literacy practices that are currently emerging. I argue that we are well-served by considering these *newest* AI-literacies, which have only emerged in the last decade. AI-literacies, as intimated earlier, describe reading and writing practices augmented or replaced by artificial intelligence technologies. Beyond this, the newest AI-literacies are also reifications of already-in-place embodied and enacted linguistic practices. That is, they automatize specific types of discursive practices but not others. Grammarly (2020), for example, only corrects for American English, British English, and Australian English—other varieties of English, such as Canadian English or South African English, typed into the grammar checking program would have aspects (which native speakers would consider to be correct) marked as wrong.

Furthermore, these newest literacies are often intentionally non-transparent about the role of AI online, which Selwyn (2019) has described as "behind-the-scenes" (Selwyn, 2019, p. 65). In fact, programmers often use the affordances of online communication to *mask* the role that AI plays on the internet, which exacerbates long-standing transparency issues (Jenkins, Clinton, Purushotma, Robison, & Weigel, 2006). The following examples I provide foreground this AI transparency crisis. First, it was discovered in 2016 after a data breach that male users of Ashley Madison (a website for people looking for extramarital affairs) were more likely to be messaging an AI-powered chatbot than a human woman—a ruse designed to hide the fact that few human women were registered on the site (Morris, 2016). Second, AI-produced "deepfake" videos are becoming nearly indistinguishable from

reality, threatening public perception of political leaders and popular personalities (CNBC, 2019; Simonite, 2019). And third, as this paper discusses and I have learned from students as a practicing high school English teacher, students use AI grammar checkers to privately edit their writing. Each of these, in turn, conceals AI to achieve a goal: placated users, misleading video propaganda, and improved writing grades.

As these new AI-literacies improve, teachers who do not incorporate assessment strategies that preclude the use of these technologies (e.g., pen-and-paper, revision tracking software) may instead need to decide a submission's legitimacy. And this need is not at all a far future prospect or science fiction. In a youth essay contest in 2019, *The Economist* included an entry created entirely by natural language processing AI (specifically, the GPT-2 algorithm). Rather than being tossed out as unintelligible rubbish, the entry received two "maybes" alongside four "nos" from the judges, with one judge writing, "It is strongly worded and backs up claims with evidence, but the idea is not incredibly original" (Intell, 2019, para. 33). The convincing, human-like quality of AI-generated writing will make it increasingly difficult to discern whether conventional schoolwork was written by human or machine.

This study hopes to contribute to opening up what we examine in relation to literacy and digital technologies. Studies of new literacies up until now have tended to emphasize how people have taken up and made meanings with or connected with others via digital technologies and networks (e.g., Black, 2009; Lammers, 2011; Lankshear & Knobel, 2011; Leu, Kinzer, Coiro, Castek, & Henry, 2017; Street, 2017; Thomas, 2007). The rise of natural language processing AI gives us pause and suggests that examining the ways in which the newest AI-literacies are being used by students and understood by teachers may be epistemologically and fundamentally distinct from earlier interdigital literacies. In short, I argue that literacy scholars will be well served by conducting and attending to research into the newest AI-literacies.

AI and Winning the Grammar Game

In addition to what AI may do *for* English teachers as captured in this study, it is important to theoretically consider what AI says *about* the educational institutions in which teachers and students act. As grammar checkers only correct for some varieties of English, marking others as errors, they seem to contribute to a deepening of school-based grammar as a locus of privilege and advantage for an elite few (cf. Bourdieu, 1991). To explore this in light of AI, I will briefly introduce two distinct domains: 1) the history of AI development in games, and 2) Wittgenstein's theory of "language games."

Contrary to advertising claims made about IBM's Watson, current AI technology is not all that intelligent (Smith, 2018). AI does not think critically, infer, or theorize; instead, it is merely an algorithmic means whereby massive amounts of data are processed according to rules or examples (Pearl, 2019). It is nowhere near as "smart" as the layperson might think. These deflationary realities

originally confronted AI researchers in the 1960s when the US government, concerned about a lack of progress in machine language translation, set-up the Automatic Language Processing Advisory Committee, which determined that machine language translation was more expensive, less accurate, and unlikely to improve (Hutchins, 2005). What ensued has been called the "AI winter," a period of simmering expectations and diminishing interest in AI (Kurzweil, 2005). At the risk of oversimplifying its complex history, suffice it to say that AI research continued in various fields but ultimately found its niche in gaming. AI is indeed skilled at operating within the parameters of specifically defined gaming rulesets. For example, in 1997, IBM's chess-playing AI computer, DeepBlue, used a brute force method to defeat the world chess grandmaster Garry Kasparov (Harmon, 2019). The feat was impressive, but it was also limited: in order to defeat its human opponent, the AI algorithm computed potential moves (numbering in the millions) to choose the best path.

AI's next highly publicized achievement was in 2011 when IBM's Watson program defeated Jeopardy (a trivia game show that employs pun and allusion in its text-based clues) champions Ken Jennings and Brad Rutter in a televised match. Then, in 2016, the AI program AlphaGo defeated Lee Sedol, a world-renowned 9-dan professional Go player (Krieg, Rosen, Proudfoot, & Kohs, 2017). The game of Go has so many possibilities that even a supercomputer cannot calculate every outcome, vastly differentiating it from chess. Experts had long thought that teaching a computer to play Go would be a true test of a system's abilities (cf. early predictions in Good, 1965; Johnson, 1997). To meet the challenge, AlphaGo used deep neural nets trained through millions of games to learn the most effective strategies.

Major improvements in AI since the 1960s, such as these examples sketch, may lead some to assume that AI can do everything and anything: this is not the case, though (Lloyd, 2019). AI excels at computation and optimization within specific rulesets, which is why it has been deployed in fields that operate with specific "win" parameters, like gaming. In fact, one of AI's most recent gaming applications has been in archaeoludology, the study of ancient games. Boards and pieces of these old games still exist, but most of the rulesets have been lost, so AI considers historically related games and the games' structures to determine how they might have been played (Soemers, Piette, & Brown, 2019; Soemers, Piette, Stephenson, & Brown, 2019). In other words, AI makes the ultimate gamer.

In what at first may seem to be the unrelated field of philosophy, Wittgenstein (1953/2009) argued that language is a game. His "language-games" conceptualization proposed that language was not objective but, rather, related to the context within which it was used. For example, the exclamation of "Water!" could variably indicate a person shouting, answering a question, making a demand, or placing a request—what mattered was context. Perhaps not surprisingly, this situatedness of language was later picked up by James Gee (2003), who in his writing about video games discussed the "situated meaning" of signs, connecting language and gaming at that level.

Developments of AI in gaming and Wittgenstein's language games come together in AI grammar checkers. Formal academic language uses specific, unchanging (grammar) rules. To AI, using a specific

set of grammar rules is quite like winning at chess, Jeopardy, or Go. With a clear and varied understanding of "success" in the system, AI can become impressively efficient in these areas, whether gaming or grammar. That AI can accurately perform grammar correction says more about institutional academic systems than it does about technology.

School grammar based on Standard English conventions *is* a game, and English teachers are often the referees who penalize players (i.e., students) for infractions. For many students, it is not about writing "well" but rather about convincing those who arbitrate the rules, the gamemasters (i.e., teachers, test makers), that the directions (of grammar) were followed. However, a mastery of formal grammar does not mean that an AI system will start composing good poetry, just like winning at Go does not mean the machine will creatively invent brand new games. Those tasks are beyond AI.

Still, through the lens of AI's success in grammar checking, school-based Standard English grammar is revealed as an artificial "language game" that penalizes those who do not know the rules. School-based grammar often undervalues the sociocultural situatedness of language by privileging an academic Standard English; likewise, grammar checkers operate within circumscribed rule sets for just a few standardized language varieties. In short, AI grammar checkers may tend toward exacerbating existing grammar-game systems in schools that already disadvantage some students. It is this inequity that AI reveals about those practices *already* in our schools and on standardized tests. To that end, artificial intelligence can be used to analytically and critically examine human institutions. With this, one can consider 1) why some smart machines fit so neatly into certain aspects of human society, and 2) what this suggests about the nature of human institutions, including normative assumptions and reified hierarchies.

Methods

I used purposive sampling (Merriam & Tisdell, 2016) to select seven New Jersey high school English teachers from different districts. For this exploratory study, seven teachers, albeit a small participant pool, provided a varied sample that provided meaningful insights (Kuzel, 1999; Marshall, 1996; Patton, 2015). Explaining the benefits of small empirical studies, Malterud, Siersma, and Guassora (2016, p. 1755) wrote that small studies can elucidate new knowledge with close analysis and posited, "Empirical studies with very small numbers can make a difference if they address and elucidate something crucial to theory." With purposive sampling and an iterative coding data analysis process, I found that my sample size of seven teachers resulted in a saturation of new insights. Teachers were not compensated for being part of this study. Pseudonyms have been used throughout (see Table 1). This study was approved by the Institutional Review Board at Montclair State University.

Table 1

Participants

Pseudonym	Gender	Years of Teaching Experience	School District (Urban/ Suburban)	School District (Public/ Charter)	Grade Level(s) Taught	Aware of/used Grammarly Prior to Study?
Bill	Male	22 years	Suburban	Public	Grades 9, 10, 11	Yes/No
Mark	Male	4 years	Suburban	Public	Grades 9, 12	Yes/Yes
Tony	Male	14 years	Suburban	Public	Grades 9, 11	Yes/No
Allison	Female	6 years	Suburban	Public	Grades 10, 11	Yes/No
Vanessa	Female	4 years	Urban	Charter	Grade 11	Yes/No
Shirley	Female	3 years	Urban	Public	Grades 9, 10	Yes/No
Gloria	Female	14 years	Urban	Public	Grades 9, 10	Yes/No

Data collection was conducted through semi-structured interviews that included an elicitation device. The first part of the interview queried participants about how they taught and assessed writing in their high school English classrooms. For example, I asked questions such as "How do you teach students about writing?" and "What do you look for when grading a student's writing?" A semi-structured interview methodology allowed me to interact with the participants as an "insider," as participating teachers tended to be more open with me when I shared that I was also an English teacher.

To get a better understanding of how they might usually approach assessing and giving feedback to students, I asked participants to read and score a writing sample as if it were a student's work. Unbeknownst to the participants at the time, this writing sample was publicly available from Grammarly as a demonstration document, used by newcomers to explore the interface (see Appendix). The participants each gave written feedback and then selected a rating from the following options:

Failing, Poor, Below Average, Average, Above Average, Good, Excellent. After the participants independently assigned a rating, I continued the interview by asking them about their feedback.

I then used my laptop to show participants a Grammarly window with the same uncorrected writing sample displayed (see Figure 1). I explained that Grammarly would either offer options to change an error or simply identify an issue, which the writer could then fix. I also showed them how to dismiss unwanted suggestions. Users can write directly in Grammarly, paste text into the program, or integrate it as an extension within Google Chrome. Together, we went through the writing sample in the Grammarly program; this time, the participant chose which corrections to accept (or dismiss) based on Grammarly's feedback. Grammarly Premium, a more robust grammar checker that also offers vocabulary enhancement suggestions, was used for this study so as to more completely capture AI capabilities. While this study used Grammarly, its findings are likely transferable to other comparable AI grammar checkers.

Finally, I prompted participants to compare the edits and feedback they had given with those provided by Grammarly. After making those comparisons, I then asked, "In what ways, if any, might your scoring of the writing sample change if you were to consider this new, revised document instead of the original?" Participants reflected on how AI grammar checkers—based on this experience—might influence writing instruction and testing in the next decade. On average, the seven interviews lasted approximately 60 minutes each, ranging from a half-hour to nearly two hours in duration.

This study's data comprised the seven transcribed interviews and the teachers' written corrections and feedback on the writing sample. I used an ongoing, iterative coding process to analyze data as it was collected (Saldaña, 2015). A recursive analysis of earlier interview transcripts and artifacts, conducted as I continued to collect new data, aided pattern recognition and categorization.

Findings

The findings that follow have emerged as the most important in understanding shifting conceptions of writing pedagogy and assessment for participating high school English teachers with the advent of AI grammar checking.

Some high school English teachers do not explicitly teach grammar lessons but nevertheless weigh grammar errors when assessing students' writing.

The participants each, in turn, talked about the importance of syntax, punctuation, and writing mechanics as crucial components of students' writing, but most of the participants did not appear to think of grammar as part of their teaching responsibilities. In fact, five participants said that their classroom lessons did not include explicit grammar teaching. Bill, a white teacher in a suburban district with 22 years of experience, taught his students about formal structures like expository essay writing, but he did not explicitly teach grammar. After making comments on the writing sample, Bill wondered

aloud whether the writer might have been an English language learner. Underlying this statement appears to be an assumption that a student who had been immersed in Standard English from childhood might not have made the same mistakes. More directly, Mark, a white English teacher with four years of experience in a suburban school district, said that he believed students come to school with "a level of syntax and sentence structure that that really only requires honing."

Although it seemed possible that these beliefs about grammar were localized to their particular suburban districts, a similar sentiment was expressed by teachers in urban schools. Vanessa, a Latinx teacher in an urban charter school for four years, said that students' grammar competence should already be "solidified in fifth grade." Similarly, Gloria, a Latinx teacher with 14 years of experience in an urban public school, said bluntly, "We can't just sit there and teach them all the grammar lessons that they should have already had when they were younger." As an exception, Allison said that she teaches "a lot of grammar" because—although she too believes students learn grammar in "third and fourth, fifth grade"—her students' grammar proficiency nevertheless "falls off" and becomes "terrible." More than half of the participants seemed to believe that high school students should be competent in grammar before entering high school and thus did not teach it directly. By framing grammar as a prerequisite, these teachers validated grammar as a grading mechanism.

Four participants explained that they were instructed to not teach grammar lessons by their school administrators. Shirley, a third-year English and Special Education teacher in an urban public school, said that she was "told not to spend a ton of time on [grammar]." Likewise, Gloria had been told by a supervisor that English teachers "don't really need to sit there and do a whole lesson on grammar." In sum, four teachers reported that their supervisors initiated a "move away from grammar [instruction]," as Tony expressed it. Gloria offered a possible explanation for the circumscription. Her supervisors claimed that students' grammar proficiency would improve naturally with more reading, leading one supervisor to tell her, "Don't do a full lesson on grammar." Thus, not only did some participating teachers assume that students should already have grammar knowhow, but they also were told by administrators to not teach it.

All participants nonetheless maintained that students needed to be proficient in grammar because it would eventually be judged by university professors and bosses. Gloria explained that she thought her students would "need to be able to fill out an application or write a personal statement" in the appropriate way, which would require an understanding of language rules. Six participating teachers said that their students' future economic or academic success would be impacted by their proficiency in grammar. For example, Mark said, "...to become a significant person in any industry, you need to learn what the [grammar] rules have become established to be." When Bill (who had told me that he includes "mechanics" on his writing rubrics) talked about writing, he said that he wanted to prepare students for their first years in college. The teachers were conscientiously considering their students' futures and were thoughtful educators. But this ultimately yielded an often contradictory situation—students who were not taught grammar in their high school classes were nevertheless graded on it in their writing.

The surveyed teachers assessed grammar both explicitly with rubrics and implicitly through holistically graded writing. In their classrooms, four teachers reported using rubrics with a "usage and mechanics" component. Allison, Shirley, and Gloria (all who taught in urban districts) used the district-mandated New Jersey Student Learning Assessment writing rubric to grade students' written assignments. The NJSLA writing rubric allots three of its seven points to students' grammar proficiency. An emphasis on grammar appeared in the written comments that each of these three teachers wrote on the elicitation device. Allison wrote as one comment, "Watch grammar throughout." She then commented on five other locations with just the word "grammar." Shirley was more specific in her commentary. She flagged word choice problems, added missing words, removed unnecessary punctuation, and fixed pronoun case confusion. In similar fashion, Gloria's comments mainly discussed grammar. She wrote, "Include apostrophes in contractions; Keep all verbs in the past tense; Proofread; Check spelling; Be sure to include proper punctuation marks." The point is that participating English teachers were free to comment on and score the writing assignment in any way they chose, but they opted to include grammar as a metric.

Not surprisingly, participants unanimously said that they would have given a higher rating to the writing sample that had been corrected with Grammarly because grammar errors indicated to them a lack of effort, sloppiness, or carelessness. For instance, Mark explained that the writing sample was strong overall but that "the sloppy stuff" (i.e., grammar errors) had undermined the grade. He thought that a high school student could "put the effort in." Gloria and Allison, too, noted that the student writing sample had "careless errors," lowering their ratings. As for whether automated grammar correction could account for perceived laziness or lack of effort is debatable, but this mindset may explain why our discussions of grammar seemed to portray grammar punitively—students lost points for mistakes but did not gain points (or praise) for correctness. Grammar competence was the assumed baseline and mistakes were due to effort, not ability. However, penalizing students for a perceived lack of effort is a slippery slope, rife with an implicit bias toward students' personal lives and variations in linguistic practices (Kozlowski, 2015). The findings from this focused study suggest that grammar in schools is disproportionately weighted toward assessment even in the absence of explicit grammar teaching.

Participants seemed to perceive of AI grammar checkers as personal assistants that could improve student writing, help students learn, and reduce teachers' workloads.

Although each of the participants had heard about Grammarly prior to our interview, only Mark had used it before—albeit personally, not in classroom teaching. After learning about its capacities, however, all participants expressed a desire to incorporate AI grammar checkers into their classroom teaching. Teachers framed AI grammar checkers like Alexa or Siri as personal assistants for simple tasks. Specifically, they suggested the application of AI grammar checkers in three areas: 1) improving student writing, 2) helping students to learn grammar, and 3) reducing teachers' workloads.

All of the participating English teachers said that Grammarly gave feedback that either exceeded or echoed their own. Bill, who muttered "Wow, wow, wow" to himself while using Grammarly, said that the AI grammar checker "noticed a lot more" than he had. Another teacher was impressed by the program's capacity for correction. The participants all found that Grammarly had performed just as well as they did in correcting usage and mechanics, if not better. As Gloria summarily said, "Grammarly is good for grammar." Notably, not one Grammarly suggestion in this study was rejected by a participant because of incomprehensibility or illogicality (although admittedly this is in part attributable to the writing sample, which was a Grammarly-provided demo document).

The teachers seemed to think that Grammarly could be a teaching assistant for students, giving them individualized, just-in-time feedback. A number of teachers came separately to the conclusion that it could help students with "wording issues" in real-time as a way for students to get "instant feedback with notes." Teachers saw the process of grammar editing and teaching as a process that might be automated, since Grammarly was a "resource that is not only telling them what they need work on but how to fix it" (Vanessa). Furthermore, Grammarly was perceived of as a tool specifically tailored to help English language learners. Bill added, however, that "even the most advanced students could benefit from it." Teachers thus saw AI grammar checkers as a way to educate students, even when no teacher was present, thus giving teachers time to provide more meaningful writing feedback—welcoming AI-literacies into the classroom without explicitly considering how grammar checkers eschew many equally valid varieties of English in favor of just a few privileged, standardized varieties.

By taking away some of burden from teachers in the feedback process, some of the teachers thought about the time they might recover in already too-busy classrooms. AI grammar checking, one teacher said, could reduce "editing time" and allow students to be "independent learners" (Shirley). Gloria, who taught in a large urban district, noted that she often had "100 papers" to grade and that feedback with Grammarly would be "quicker." This time could then be put into reviewing "the content of their paper, on their thesis statements, on their support." Large classes sizes seemed to be a driving factor in considering Grammarly as a tool for automated editing. Vanessa was unable to give feedback to students that was "as lengthy as [she] wanted it to be" because of the number of students in her English classes. She envisioned her students first using Grammarly and then submitting written assignments to her for improved "efficiency."

Importantly, participants did not see Grammarly as a replacement for teacher-provided feedback, but rather as a way to make written feedback and in-person conferences more effective. By using Grammarly, participants anticipated that they would be able to "focus more on the content" (Gloria) or could look at "the strength of [a student's] claim" (Shirley) rather than spending time correcting grammar mistakes. Tony, who had been considering adding more grammar review to his teaching at the beginning of our interview, ultimately recast grammar lessons as "one thing that maybe [the teacher] can cut out in order to do some other things that might be more important."

Despite their reported interest in using AI grammar checkers in their classrooms, five teachers expressed concerns about Grammarly. Bill wondered what would happen to "variety and tone within a student's writing" when entire classes were using Grammarly, since they might all be making similar errors. While this rings true, it should be noted that grammar rules are standardizing themselves.

In a differently framed critique, one teacher considered AI grammar checking to be analogous to putting "training wheels back on the bike" (Mark) and said that promoting higher levels of writing mastery was beyond Grammarly's capacity. As the only individual with prior Grammarly experience, he felt that AI grammar checkers were limited in nature and that while they could assist with grammar mistakes, they would not be able to provide the scaffolding necessary for written nuance and mastery. His insight sheds light on a reason that AI is not likely to eliminate the need for human teachers: the limitations of AI do not make it a replacement for educators but rather an augmentative component to writing pedagogy and assessment.

Three other participants worried that the grammatical reasons behind corrections might not be easy for students to comprehend. One teacher reported that former students had told her that "they don't understand the [Grammarly] corrections" (Allison) while another wondered whether users "have to have grammar foundations in order to use Grammarly" (Tony). In that same vein, Shirley (who was dual certified in English and Special Education) said that she would likely have to explain the corrections to some students with disabilities.

Despite these limitations and concerns, participants remained steadfast in their interest in adding AI grammar checking to their curricula. Two of the surveyed teachers noted that students were already communicating through and with technologies in their everyday lives, so it was better to embrace new literacy practices than to try to put them back in the box.

Implications

The findings of this study and the dearth of literature about the newest AI-literacies in teaching has suggested that English teachers (and teacher educators) are not yet talking in sustained or theorized ways about these kinds of technological services. Vanessa, who had once been told by a student that the student was using Grammarly to write papers, never even thought about it. Vanessa said, "...now that I'm looking at the actual program, I'm thinking [using Grammarly is] extremely smart. And I should probably look into it more." The newest AI-literacies hide behind the familiar mask of word processing. As a result, students can produce and submit written work that leaves no trace of a grammar checker's corrections. Vanessa acknowledged that her student's work had indeed been free of grammatical errors. Since natural language processing artificial intelligence is often designed to be invisible, a major implication of this study is that educators may benefit from being made explicitly aware of the newest AI-literacies, grammar checking being one of them, so that they can consider the ramifications for teaching.

Drawing from Selwyn (2010), the "state-of-the-actual" based on the evidence from this small sample is that English teachers have not yet incorporated AI grammar checkers into their teaching—but an alternative, equally valid state-of-the-actual is that students are *already* using AI grammar checkers to augment their writing assignments (and consequently grades). This is inherently different from top-down EdTech that has trickled from professional development seminars and into classroom practice. For the newest AI-literacies, change is occurring outside of the classroom first: Some students are using AI grammar checkers at home and submitting their augmented-written assignments online. By gaming the grading system, as Vanessa's student appeared to do, students have laid bare the problems of traditional writing assessment.

Another implication of this study is the importance of categorically distinguishing between new AI-literacies and earlier online technologies. Like Vanessa who had originally learned about Grammarly from a student, each of the seven participating English teachers had heard about Grammarly prior to the study. However, only Mark had previously considered the role that this new technology could and, in some cases, already was playing in his classroom. During their interviews, participants by-and-large thought about applying this one technology (i.e., Grammarly) to their teaching. Teachers in general often struggle with new technologies because they learn about individual applications rather than *about* technology in general (Bullock, 2016). While I was interested on one hand to see the excitement with which the participating English teachers considered AI grammar checkers, I was, on the other hand, concerned that AI might be chalked up to being another passing app in the minds of participating teachers (see also Toncic, 2020). And although grammar checkers appear to be becoming more standard in word processing with, for example, Google Docs integrating its own grammar-checking algorithm in 2019 (Sivaji, 2019), grammar checking programs are not permitted on formal state testing in New Jersey and no Statewide guidance exists regarding its use in public school classrooms.

The findings of this study imply that certain empirical research might be particularly insightful: examining how AI grammar checkers might change, if at all, classroom-based teacher grading practices. Recent research that has reported that technological advances, such as AI, are likely to augment performance in certain aspects of jobs by automating rote, mundane tasks (Autor, 2015; Autor & Salomons, 2018; Frey & Osborne, 2017; Reese, 2018). In English teaching, basic grammar correcting automation is made possible by AI grammar checkers such as Grammarly. In this study, much of the written feedback that the participants provided on the writing sample was in the form of grammar corrections. With the automation of grammar checking, however, teachers may find that students begin to write better—not because of error identification but rather from its lack of visibility by taking advantage of AI's ability to be hidden to circumvent a traditionally punitive grammar "game." Focusing on students' mistakes can exacerbate writing difficulties. Some studies have found that teachers overemphasize spelling and mechanics, losing aspects of idea composition (Graham & Perin, 2007; Hall, Cohen, Vue, & Ganley, 2015). Struggling writers with histories of failing grades and frequent grammatical corrections from teachers have felt fear or anxiety when tasked with writing (Berninger, Nagy, Tanimoto, Thompson, & Abbott, 2015; Conti-Ramsden, Durkin, & Walker, 2010; Michael & Trezek, 2006; Pruden, Kerkhoff, Spires, & Lester, 2017; Schumaker & Deshler, 2009).

Struggling writers may consequently focus on improving mechanics in their compositions rather than on expressing ideas or concepts, resulting in a self-perpetuating cycle (MacArthur, 1999). This earlier research suggests that traditional teacher feedback and grading practices may have a detrimental effect on students' writing production. The findings of this study imply, however, that teachers' feedback practices might change if they incorporated AI grammar checking into their curricula.

As noted by the study participants, teachers (whose students use AI grammar checkers) would aim to instead provide more content-oriented feedback on writing assignments. Students who are penalized less for "mistakes" may less associate writing with failure, potentially motivating students for whom traditional writing instruction has failed for years. By engaging with composition more readily, these students could find themselves becoming better overall writers. This is further possible since receiving just-in-time feedback through AI grammar checkers could lead to a more nuanced understanding of grammar. Most importantly, grammar parity facilitated by AI grammar checkers could promote a classroom environment of creativity and productivity rather than one of punishment.

Significance and Directions for Further Research

Albeit currently limited in its overall breadth (Tse, Esposito, & Goh, 2019), artificial intelligence is impressive in its capabilities for grammar correction. AI's high-accuracy grammar checking suggests that, in writing, teachers traditionally assess students on their ability to reproduce rote grammatical processes. Teachers in this study conceived of AI grammar checkers as personal assistants that could help with their workloads while also promoting better student writing and grammar learning. As Turkle (2017) points out, people are comforted by the belief that their failures might be compensated for by artificial intelligence. A direction for further research could be to investigate how English teachers' perceptions of their "failures" (in grammar teaching, etc.) might be (or might have already been) compensated for by artificial intelligence.

This study reveals that AI grammar checkers can inspire critical reflection about the assessment of Standard English grammar conventions. High school transcripts and standardized tests, which are in part based on grammar, continue to determine students' candidacy for higher education. But some students are better aligned with school language practices than others, resulting in an (un)natural advantage (Gee, 2004; Heath, 1983; Street, 1995; Schieffelin & Ochs, 1986). As for students without this "linguistic capital," Bourdieu and Passeron (1990) wrote, "the educational mortality rate can only increase as one moves towards the classes most distant from scholarly language" (p. 73). AI grammar checkers used in classroom teaching offer a potential solution to some of this inequity at the level of graded results, as they can assist students who have trouble reproducing Standard English conventions. However, it remains to be seen the extent to which these AI grammar checkers have any lasting effect on students' writing or other people's perceptions of their writing post-secondary school.

AI is unlikely to replace the need for good, human teachers (Tegmark, 2017). But it is undeniably changing the way that students are interacting with the world. The advances in natural language

processing artificial intelligence seen in this study imply major ramifications for how writing is taught and assessed. Up until now, though, the educational policy has remained noticeably quiet about AI grammar checkers. This study strongly suggests that the field of education might benefit as a whole when policy makers and researchers take up the mantle of the newest AI-literacies. With artificial intelligence as their lens, researchers and scholars can critically examine both AI and the inequitable institutions we humans have been complicit in perpetuating.

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Appendix

Writing Sample

For years I have been driving an old used car with a lot of mileage, and I hate it. It gets me where I need to go, but I'm tired of fixing leaks and broken parts all the time. Its annoying that I have to take it to mechanic every times. Even when they take care of everything, I know in a week I'll just end up going back there.

I have finally decided that I am not going to do it anymore. I have decided to buy a new car! Unfortunately, I have a problem. I have no idea what car to get. Do I want something fast? Do I want something big? Do I want something stylish? Something economical? I have so many choices that I don't even know where to begin. I am not sure if I will be able to make the decision on my own. I don't have a lot of money either, so I probably don't have many option.

After I did some research, I knew that I would need some expert advice. Eventually, I went to a local dealership to check out some new models. I talked to the saleswoman and listened at she carefully. Her honesty and professionalism were really impressive. She had a lot of vary helpful suggestions and showed myself some safe affordable choices. After a long discussion I finally decided which one I wanted. She not only helped me with the paperwork and finished the sale, but also the insurance. I was expecting this purchase to be a serious hassle, but the experience was almost painless. Everything went smoothly, and now I have a brand new car!

I was so excited when I pulled out of the lot that the first thing I did was change lanes right in front of other car. "That wasn't very nice," I thought to myself. I needed to relax. I didn't realize what a serious mistake I had made however. I hadn't just cut off any other car, I had cut off a police car! It took a few seconds to realize what was happening when I saw the flashing lights in my rearview mirror. By the time I had managed to pull over, my heart was racing. I gathered all the paperwork as he approached my window.

"You forgot to signal back there" said Officer Johnson, according to his nametag.

"Yes, well, it's a new car so I guess I was a bit unfamiliar with the controls," I stammered.

He looked at me skeptically.

"I'm pretty sure the controls for the turn signal are in the same place on every car."

What could I say? He was right.

"I'm sorry," I ventured.

He looked over my paper work and noticed that the car was new.

"It would be unfortunate to get a ticket on your first day in a new vehicle," he said, smiling. "Try not to cut in front of anyone on your way home."

I had never felt so relieved in my life.

"Thank you, officer!"

As he made his way back to his car I let out a huge sigh. I took a few seconds to compose myself before shifting into gear and driving away from the side of the rode. Now I have a brand new car and a story to tell!

Score

Failing - Poor - Below Average - Average - Above Average - Good - Excellent