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# From Disrupted Classrooms to Human-Machine Collaboration? The Pocket Calculator, Google Translate, and the Future of Language Education

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This article argues that consumer-oriented machine translation software applications are disrupting foreign language education. In order to mitigate this impact, the article provides guidance on how to transform teachers' perceptions of online translators. This process is a critical precondition for the gradual and thoughtful implementation of online translators in the foreign language classroom. The first part of the articles will define the concept of *disruption* and use the pocket calculator as an historical example to illustrate challenges and solutions for an educational setting that was fundamentally impacted by a new technology. The second part will turn to the present and focus on the impact of online translators not only on ways humans communicate across languages in authentic real-world settings, but also on the foreign language classroom. In the third part, we will argue that a careful recalibration of educational objectives that will have to include the students' ability to engage effectively in tasks that rely on human-machine collaboration will provide an opportunity to integrate online translators and related technologies into foreign language curricula. To this end, we propose that future generations of language learners need to develop specific competencies that will qualify them to effectively collaborate with online translators and related technologies. The conclusion will outline future leadership priorities for professional organizations and teacher training programs while acknowledging the limitations associated with the integration of the machine translation technologies into language learning environments.

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## INTRODUCTION

This article approaches the question of how consumer-oriented machine translation software platforms, such as Google Translate, will impact language education in the future. Further, the article will provide guidance on how to transform teachers' perceptions of online translators, which is a critical precondition for the gradual and strategic implementation of online translators into the language classroom. The first part of the text will define the concept of *disruption* and use the pocket calculator as a historical example to illustrate challenges and solutions for an educational setting that was fundamentally challenged by a new technology. The second part will turn to the present and focus on the impact of online translators on ways humans communicate across languages in real-world settings and in language learning environments. The third part outlines the future. Here, we will argue that a careful recalibration

of educational objectives that include the learners' ability to engage effectively in tasks that rely on human-machine collaboration will provide an opportunity to integrate online translators and related technologies into language curricula that will resonate with the future needs of learners. To this end, we propose four fundamental skills that future generations of language learners need to develop in order to use online translators in a context of human-machine collaborative problem solving. The conclusion will outline future leadership priorities for professional organizations and teacher training programs to manage the gradual and strategic implementation of online translators into language learning environments. Here, we will also outline risks associated with an instrumentalist view on language and proficiency that can be promoted through an unreflective introduction of machine translators in language classrooms.

## **THE PAST: THE POCKET CALCULATOR—DISRUPTING MATH EDUCATION**

After defining the concept of *disruptive innovations* in the beginning of this section, we will turn to the difficulties among math educators to react to the electronic pocket calculator in the 1970s and 1980s. This historical example will help us not only to better understand the challenges that online translators are currently representing for language educators, it will also provide language educators with a template for a successful integration of a new technology into a learning environment.

The adjective *disruptive* was first used in the 1990s by the American economist Clayton Christensen and his collaborator Joseph Bower to describe innovations that create a new value system and as a result replace existing market leaders (Bower & Christensen, 1996). Although the term is today often used to describe digital technologies, Christensen and Raynor (2003) later declared that few technologies are intrinsically disruptive and preferred the term *disruptive innovations* to stress his view that disruptive shifts are the result of certain business models that a new technology enables.

Disruption has become a buzzword in corporate settings (Weeks, 2015). Hence, the label *disruptive innovation* is often misapplied simply to describe market developments that result from breakthrough technologies and offer entirely new products or vastly improved solutions. However, markets are more likely disrupted if an existing product or service is simplified and thus made affordable to a larger population (Christensen & Raynor, 2003). To be truly disruptive, an innovation needs to merely transform an existing product or solution that historically was only accessible to few consumers with extraordinary resources. Therefore, a disruptive market shift occurs with the introduction of a simpler, cheaper, more convenient, and often lower-quality product that is more affordable and thus accessible to a much larger population. This downgrading process enables the disruptor to appeal to an exponentially larger market segment and overthrow established industries.

When the pocket calculator entered American households in the late 1970s, the technology in itself was far from novel. The underlying principle of digital calculators using binary-coded decimal arithmetic operationalized through a system of on/off switches. This technology had been developed in the 1940s. Whereas early calculators were large machines that relied on electrical tubes and transistors, semiconductor technology allowed engineers to construct circuit boards that enabled them to dramatically shrink the calculator to a pocketable device (O'Regan, 2008). Through mass production in low-wage countries with a highly skilled workforce, consumer electronics such as the electronic pocket calculator became affordable

for the middle class in the United States (Sachs, 2020). By 1975, a simple four-function electronic calculator was available to American consumers for under \$20, circa \$100 in today's dollars, and could be found in 11% of American households (Weaver, 1977). When pocket calculators became affordable consumer electronics products in the late 1970s, mathematics educators faced a huge dilemma: Should they allow their students to use calculators, or would they serve young people better by banning such devices?

The initial reaction among math educators was to prohibit the use of pocket calculators in their classrooms and for homework. They feared that students would be unable to learn basic arithmetic skills if the calculator were to be introduced into the primary and secondary schools (Pendleton, 1977). Further, educators were concerned regarding matters of equity as a result of the cost of devices and batteries (Pendleton, 1977). Nevertheless, progressive educators started to change their attitude and created approaches that taught children to use calculators in meaningful ways without compromising their development of basic arithmetic skills. Some teachers recognized not only that the use of the pocket calculator increased the motivation of many of their students, but also that instruction could focus more on problem solving and the development of mathematical thinking, as the use of the pocket calculator accelerated the pace of instruction (Pendleton, 1977).

The standards for curriculum, instruction, and evaluation, updated roughly every 10 years by the National Council for Teachers of Mathematics show how the introduction of the pocket calculator inspired a shift in rethinking the objectives of mathematics education. Whereas the recommendations issued in 1980 merely suggest the use of the pocket calculator (National Council of Teachers of Mathematics, 1980), subsequent guidelines for the 1990s (National Council of Teachers of Mathematics, 1989) and 2000s (National Council of Teachers of Mathematics, 1999) clearly reinforce this recommendation through the endorsement of a pedagogy that aims to a larger degree at problem solving and the development of mathematical thinking. In other words, the introduction of the pocket calculator in American classrooms required rethinking educational objectives that led to the deemphasizing of basic arithmetic skill development. Instead, new approaches emerged that focused on enabling students to solve problems through a combination of mathematical thinking and human-machine collaboration.

The ultimate acceptance of the pocket calculator among American math educators occurred as a result of a “washback” effect. Throughout the early 1990s, many of the rules that regulated standardized testing at the state and federal levels still did not allow test takers to use pocket calculators. However, when the S.A.T. permitted the use of calculators in 1994, classrooms across the country moved into this new direction (Scheuneman et al., 2002).

Before turning to the second part of the article on machine translation, we would like to summarize the main findings: (1) The pocket calculator needed about 20 years to graduate from a clunky, expensive piece of office (and subsequent home office) equipment to become an established, uncontroversial tool used by millions of students and embraced by many of their teachers across middle and high school classrooms in America. (2) The gradual and intentional implementation of the pocket calculator into the educational system coincided with a rethinking of educational objectives that gradually deemphasized basic arithmetic skill development and focused more on teaching children to solve problems through a combination of mathematical thinking and human-machine collaboration.

## THE PRESENT: GOOGLE TRANSLATE—DISRUPTING LANGUAGE EDUCATION?

As stated above, disruptive innovations offer access to a “new tool” for a large group of people and replace an “old tool” that was previously only accessible to a limited number of individuals. This new tool is often simpler, cheaper, more convenient, and a lower-grade solution compared to the old tool, but it is much more affordable and thus accessible to a much larger population.

Before declaring Google Translate to be such a new tool that will disrupt language education, we would like to first turn our attention to the old tool. In order to solve cross-linguistic communication challenges, the individual’s language proficiency acquired through schooling or bilingual exposure represents the old tool. Language proficiency is a tool that allows individuals to communicate across languages and to access culture products, practices, and perspectives that are rendered in a language different from their native language. Acquiring this tool, in other words developing functional language proficiency in a second language, is resource intensive. Individuals need years of dedication and access to a well-funded educational system that supports them to develop a functional level of second language proficiency (Rifkin, 2003).

Americans by and large regard second language proficiency as a valuable asset (Commission on Language Learning, 2017). However, as a result of an underfunded educational system with racial and socioeconomic inequalities, only 20% of Americans self-report that they speak a second language, and only a fraction of these individuals have acquired these skills as a result of language instruction (Commission on Language Learning, 2017).

The significant individual and societal resources required to acquire the tool of functional language proficiency creates a market situation that inspires the development of a disruptive innovation, a new tool that has the potential to challenge the monopoly of the old tool. In order to successfully challenge the old tool, this new tool must be affordable and accessible to a large number of consumers, but it does not necessarily have to offer a solution that is superior or equal to the old tool.

We acknowledge that reducing language proficiency to a communication tool is problematic. Language is much more than a system to communicate ideas. Our complex use of language and variations not only reflects our complex identities; our selves are also constructed, refined, and renegotiated as we use language. Lastly, linguistic expression is also a marker of the individual’s place within (or outside) society, their group membership (or outsider status), and signals a sense of belonging (or alienation). These sociocultural dimensions of language use will be highlighted again in the conclusion, when we outline limitations of the use of machine translators in language classrooms.

Today, Google Translate leads the market in free consumer-oriented online translation platforms. The technology is the result of decade-long efforts in the areas of computational linguistics and artificial intelligence (AI) research. Efforts to automate translation processes date back to the middle of the last century (Poibeau, 2017). Despite generous federal funding and promising joint ventures connecting expertise in industry and academia, initial progress was slow, as a 1966 report of the Automatic Language Processing Advisory Committee (ALPAC) concluded (Automatic Language Processing Advisory Committee, 1966). However, a technological breakthrough occurred in the late 1980s. As processing power increased and costs decreased, computational linguists changed their strategy. Instead of using a traditional rules-based approach, they started developing statistical models whose parameters were

derived from the analysis of multilingual text corpora (Koehn, 2009). Statistical machine translation was also the underlying principle of the first consumer-oriented online translation service, Babel Fish, which was launched in December 1997 by AltaVista, about nine months before the birth of Google (Gaspari & Hutchins, 2007). The success of Google's search engine allowed the rapid development and acquisition of a large portfolio of internet-based services. In 2006, Google Translate was launched. Initially based on the same algorithm that Babel Fish used, Google's in-house linguists and engineers launched in 2007 a proprietary, in-house translation engine that still used a statistical approach to translation ("Google Translate," 2020). Although Google's translation engine quickly increased in accuracy and outperformed Babel Fish, Google Translate did not yet represent a real challenge for modern language educators. The translation output was still so flawed that teachers could easily convince their students of the uselessness of the service by demonstrating—often in humorous ways—the technology's massive shortcoming.

Two developments that occurred in the second decade of the 21st century contributed to the proliferation of Google Translate: (1) Advances in artificial intelligence research in the form of artificial neural networks; (2) Advances in hardware development that enabled the design of powerful and affordable mobile devices.

**Artificial Neural Network.** In late 2016 Google revolutionized the underlying principle of the machine translation software. The tech giant supplemented the statistical approach by introducing an artificial neural network that enabled Google Translate to learn from the many examples the system encounters across multilingual corpora. These corpora are derived from the massive amount of linguistic data that is entered, processed, and stored across Google's entire portfolio of internet-based services. This approach results in higher accuracy of translations between languages that are more frequently used on the internet. The deep learning accomplished by Google's Neural Translation system is not only an important milestone in the history of artificial intelligence, it also resulted in massive gains in accuracy (Poibeau, 2017) virtually overnight. These developments were also noted outside the computational linguistics community as the general public developed more interest in artificial intelligence applications (Lewis-Kraus, 2016). Today, Google Translate delivers reliable translations with an astonishing degree of accuracy, and it is becoming very difficult even for the trained eye of a language educator to distinguish the output of Google Translate from a translation created by a human.

**Mobile Application.** In 2010, Google Translate left the confinement of the personal computer and became available as a native application on Android smartphones and a year later on iOS devices ("Google Translate," 2020). The migration into mobile devices added a great deal of convenience for the user of the translation service. Over the following years Google added additional features to the app. In 2011, the "conversation mode," a feature that allows users to communicate orally with a nearby person in another language, was piloted with the English/Spanish language pair and subsequently implemented across a wider selection of languages ("Google Translate," 2020). Further features include text input through the smartphone's integrated digital camera, the representation of translation output in an augmented reality environment, and the *tap to translate* feature that allows users to quickly translate texts they encounter while browsing the internet ("Google Translate," 2020). The offline translation mode, introduced in 2016 and refined in 2019 to benefit from Google's

neural translation system, improves accessibility and benefits in particular users who are located in regions with limited cellular networks (“Google Translate,” 2020).

As a result of these two advancements, we argue that Google Translate has had a disruptive impact on how humans communicate across languages. Current figures are not available, but already in 2016, the service had more than 500 million users who translated 100 billion words per day with Google Translate (Turovsky, 2016). But the technology also impacts verbal behavior. For example, the 2018 FIFA Soccer World Cup hosted by the Russian Federation is widely considered the first global event that demonstrated the emerging role of mobile translation apps in linguistic communication with hundreds of thousands of users navigating a speech community through machine translation (Smith, 2018). The service that this technology promises—and in the eyes of the users often fulfills—is the ability to communicate across languages without the efforts and resources necessary to invest years in language study. Deficiencies in accuracy are either not recognized or tolerated by users and regarded as a trade-off against the convenience of the technology. Many users appear to simply sacrifice accuracy standards and embrace Google Translate as a solution with a somewhat lower level of quality but a much higher level of convenience compared to the conventional solution of hundreds of hours of language study.

Further, we argue that the disruptive impact of Google Translate also triggers attitudinal change among learners and members of the society: In an era when the value of internationalization and global exchanges of ideas is routinely questioned and educational budgets are likely to further shrink, the existence of Google Translate will help to legitimize future public policy suggestions that will further question the value of language education. Pundits can simply refer to an app on our smartphone as they suggest that we do not have to invest individual or public resources to language education. In their view all we need is to open an app on a phone.

In contrast to the National Council for Teachers of Mathematics, the organization that issued official recommendations to teachers at all levels in response to the pocket calculator since 1980, the American Council on the Teaching of Foreign Languages (ACTFL), the main national professional organization for language educators in the United States, has not issued guidelines regarding the use of Google Translate in language education to their members. This silence, however, does not mean that language students in America do not use Google Translate and teachers do not struggle with finding appropriate pedagogical responses to this challenge. A survey study conducted at Duke University among more than 900 undergraduate students shows that learners frequently use online translators (Clifford et al., 2013). Although many students use Google Translate similarly to a digital dictionary and enter individual words into the system, they overwhelmingly believe that they benefit from online translators and that their use should be allowed in their language courses (Clifford et al., 2013). This is surprising, considering the fact that entering individual lexical items into today’s online translators is the least effective way to operate the technology, because the algorithm relies heavily on the linguistic context that sentence-level entries offer to accurately predict the meaning of synonyms and to tackle ambiguities. In contrast, their instructors overwhelmingly do not recognize the pedagogical value of online translators in language classrooms and many consider their use as a form of academic dishonesty (Clifford et al., 2013). Such concerns among the instructors are mirrored in the exchanges that can be found on online discussion boards, where language teachers discuss pedagogical matters. These reactions among teachers are consistent with a case study on teacher beliefs by Hellmich (2019) that revealed a general skepticism of language instructors towards technology.

Applied linguists have started in the early 2000s to investigate the possibilities of integrating online translators into their learning environment. Initially, this work focused on instruction aimed at training professional translators and highlighted positive contributions of the use of online translators in instructional settings (Somers, 2003). This is not very surprising, since translators started in the 1990s to use translation software in their professional practice (Austermühl, 2014).

A number of articles on online translators in modern language instruction discuss more broadly advantages and disadvantages of the implementation of online translators into educational settings (Benda, 2013; Ducar & Schocket, 2018; Niño, 2009; Valijärvi & Tarsoly, 2019). In addition, a large number of studies assess the use of online translators in learning environments that focus on second language writing (Correa, 2014; Garcia & Pena, 2011; Groves & Mundt, 2015; Kazemzadeh & Fard Kashani, 2014; Lee, 2020; Niño, 2008; O'Neill, 2013, 2016, 2019; Stapleton & Kin, 2019; Tsai, 2019). Although most studies report increased motivation and improved L2 writing performance if students were trained to use online translators, the question of whether the use of online translators in instructional settings will prevent learners from being able to produce written texts in the target language without the aid of the online translator remains unresolved.

A number of applied linguists have looked at the possibility of using online translators to elevate the metalinguistic awareness of language learners and empower learners by offering instant feedback on written and spoken language (Aikawa, 2018; Correa, 2014; Enkin & Mejías-Bikandi, 2016). The findings of these studies suggest that students can develop higher levels of linguistic awareness through the use of online translators by using the technology to elicit feedback on both their written and spoken language. However, there are also studies that feature instructional units that aim at discouraging students from using online translators. For example, Steding (2009) and Faber and Turrero-Garcia (2020) include pedagogical suggestions that target the discovery of flaws of an online translator's linguistic output. These suggestions aim to support teachers who intend to appeal to their students' reason to adhere to a classroom policy that prohibits the use of online translators. Lastly, several studies conclude that a viable strategy for instructors who prohibit the use of online translators and want to discourage them from violating this policy is to design tasks for homework assignments that do not invite the use of online translators (Ducar & Schocket, 2018; Henshaw, 2020). The problem with what Ducar and Schocket called a "Google-irrelevant classroom" is that tasks that are central to the development of L2 literacy, such as compositions, will either disappear or they will be administered during class time and thus eliminate valuable class time that otherwise would be dedicated to oral proficiency development.

A problem with the research database on online translators in language learning environments is the fact that the technology has significantly evolved over the past years. Due to Google's implementation of a deep learning neural approach in 2016, the scholarship on this topic that is older than five years investigates a product that is very different. Arguments against the use of online translators in instructional settings due to quality concerns are quickly outdated. However, the voices raising quality concerns have still considerable impact on research and pedagogy.

Another weakness of the present research on online translators in language learning environments is that few scholars have made significant attempts to think beyond their immediate institutional setting and approach the issue at a systemic level and discuss the matter in the context of broader policy frameworks. Ducar and Schocket (2018), who consider the challenge of online translators in the context of the ACTFL national standards, as well as



Mundt and Groves (2016), who discuss online translators within the European educational system, are notable exceptions. More contributions with a policy focus are necessary to help the profession to develop an informed and nuanced perception of the challenge that online translators create for conventional modern language classes.

Before turning to the last part of this article, we would like to summarize our main findings: (1) Online translators have evolved from primitive instruments producing crude output to sophisticated AI-powered engines that create increasingly accurate and elegant translations at every smartphone user's fingertips. As a result, Google Translate has transformed the way humans communicate across languages and is therefore disrupting the language education system. (2) Applied linguists have generated inconclusive results regarding the affordances of online translators in the modern language classroom. Some studies suggest that well-designed instructional units can yield benefits for students. (3) Students use online translators, whether they are allowed or not. However, if they are not trained by their instructors, many tend to use Google Translate like a dictionary and enter individual words, which is the least effective way to operate the technology that relies on linguistic context to accurately predict the meaning of synonyms and to tackle ambiguities. (4) Teachers' instructional designs that intend to discourage the use of Google Translate have potentially negative effects on other dimensions of the curriculum. (5) As a result of the lack of a clear consensus in the research community, a lack of research that considers the challenges of online translators at a systemic level, as well the absence of recommendations from ACTFL, a large number of practitioners have to create sensible and consistent policy for their individual classrooms or at the program level. They tend to prohibit the use of Google Translate both in the classroom and for homework.

## **THE FUTURE: CROSS-LINGUISTIC COMMUNICATION AIDED BY HUMAN-MACHINE COLLABORATION**

The last section of this article is geared towards the future. An aphorism attributed to Microsoft founder Bill Gates states that we tend to overestimate the pace of technological developments that will occur within the next two years, but that we often underestimate the extent of change over ten years. This aphorism is guiding us in our reflections regarding the future. Accordingly, many of the ideas outlined in this last part of the article appear to be not yet highly relevant in the immediate future. However, we believe that the profession must now engage in a robust and open debate on the future of the field in the era of vastly improved consumer-oriented online translation services that have started and will continue to transform the ways humans communicate across languages. If we miss the opportunity to have this discussion today and urge our professional organizations to develop evidence-based recommendations, we will simply be overrun tomorrow by the ongoing proliferation of increasingly sophisticated online translators and their impact on human communicative behavior.

When confronted with a new phenomenon, especially one that can be perceived as an existential threat, a common human reaction is to wish the problem away. Conveniently, within the immediate context of their classrooms, teachers are in a powerful position, and many choose to eliminate the challenge of online translators through classroom policy and mandate a prohibition of online translators in their learning environment through their syllabi. In fact, today many course descriptions at the collegiate level include statements similar to the following sentence: "The use of Google Translate or similar online translators is prohibited during class and for all homework assignments; any violations of this policy will be treated as

acts of academic dishonesty and reported to the Dean’s Office.” Through such actions we may be able to temporarily confront the challenge of Google Translate in our learning environments. However, this prohibition of Google Translate in our classrooms will have no impact on the further proliferation of increasingly sophisticated online translators in the “real world” and the impact of this technology on human communicative behavior in general and our students’ and society’s perceptions of the purpose of language education.

We do not want at all to discredit the many colleagues who are using such policies to regulate the disruptive impact of Google Translate on their language classes. Like our colleagues, we ourselves establish clear ground rules that are required to maintain consistency and equity in an institutional context, and often these ground rules simply mandate the general prohibition of Google Translate in any dimension of the learning environment. Besides concerns regarding the development of basic linguistic skills in a classroom that overemphasizes the use of online translators, we understand and share a large number of the ethical concerns that many members of our professions associate with a future in which more and more human functions are delegated to machines. For example, the use of Google Translate by members of the law enforcement community as well as among US federal immigration officers to vet refugees has drawn fierce opposition not only from civil rights experts and activists. Even the tech giant itself has issued a recommendation not to use Google Translate in these contexts in lieu of a human translator (Torbati, 2019). The complete replacement of human translators and interpreters by even the most sophisticated and intelligent machines, as has sporadically happened in the law enforcement community, is a dystopian nightmare. However, banning Google Translate from our classrooms does nothing to prevent such developments. Quite the contrary: If we fail to equip language teachers today with the tools they need to teach students to engage with online translators in meaningful ways, tomorrow an out-of-touch profession will be at much risk to be overrun by technological progress. We need to seriously engage with this issue now, so that we maintain some ownership of this discourse. Otherwise the technological progress itself will make critical decisions without our field’s input.

Inspired by the developments in mathematics education in the past century, we propose that language educators consider gradually lifting the prohibition of machine translators. However, the integration of online translators into the learning environments must happen intentionally and strategically. It also needs to be understood that once a general prohibition of online translators is partially lifted, the technology will not become an uncontrolled omnipresence in the classroom. Its use will only be allowed in certain contexts. Table 1 sketches four global educational objectives associated with the use of Google Translate in modern language classrooms.

Table 1

<p>1. <b>Task Analysis:</b> Students need to be able to recognize scenarios and tasks that would benefit from the use of an online translator and be able to identify tasks where online translators are of no help or even create disadvantages. This requires them to gain an understanding of whether or not an online translator would provide an advantage to accomplish a task, or if the online translator can be appropriated to enhance the learning experience. The first step towards this goal is to help teachers build a more nuanced understanding of the affordances and limitations of online translators both in the “real world” and as learning aids in the modern language</p>
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classroom. We are offering in Table 2 an outline of four scenarios that can be used in teacher training contexts that help instructors to develop a more nuanced perception of Google Translate in language educational settings.

2. **Input Modification:** As students start developing the ability to identify tasks that benefit from a human-machine collaborative approach, they need to be trained in operating the technology. In our context, that means to choose and to optimize input to leverage the affordances and avoid the shortcomings of Google Translate. We know from the research that when the larger majority of our students use online translators without the guidance of their instructors and in violation of classroom policy, they tend to use the technology ineffectively by entering single lexical items instead of entering phrases and sentences or paragraphs. Besides avoiding word-level entries into Google Translate, there are a number of strategies that users can use in order to increase the accuracy of the translation. Teachers must know these strategies and teach them to their students in the context of tasks where the use of Google Translate makes sense.
3. **Output Analysis:** Sophisticated users of online translators do not only pay close attention to the input, they also do not consider the output of the translation engine as the endpoint of the process. Like professional translators, who use the output of high-grade professional tools as a text that requires a high level of quality control and editing, students who use Google Translate must learn to critically interrogate the output.
4. **Learning Opportunity:** Lastly, not only teachers but also their students need to learn how to recognize opportunities where the use of an online translator can actually enhance their learning process. For example, the use of Google Translate at the end of an unaided writing task to get feedback can be operationalized in ways that the technology provides a dynamic scaffolding for the learning. Other learners have successfully used Google Translate’s audio input and output to improve pronunciation. Teachers must make students aware of such opportunities and train their students to use Google Translate as a study aid.

The first step towards the strategic and intentional implementation of online translators in the modern language classroom needs to start with helping instructors to develop a more nuanced perception of the affordances and limitations of the technology. Therefore, in the following, we are sketching out the initial phase of an instructional unit for future and in-service language teachers as well as graduate teaching assistants in university settings. Based on the discussion of four scenarios, the goal of this initial unit is simply to help practitioners to develop a more nuanced perception of online translators. Any considerations about the implementation of online translators into the classroom must be based on a consensus that that this technology is not only widespread, but that there are contexts in the “real world” in which the use of the technology makes sense. Table 2 provides an outline of the four scenarios which represent fictional but plausible ways in which online translators are used in the “real world.” Table 3 suggests open-ended questions that participants can use for pair work and that facilitators can use to structure a group discussion.

Table 2

*Four Scenarios of Online Translators in the “Real World”*

**Scenario 1:** *Mr. Miller is a huge soccer fan. For his 40th birthday, he receives the ultimate gift: a trip to Portugal and tickets for the finals of the UEFA Champions League tournament. A few days before the trip, Mr. Miller gets a bit nervous. He does not speak Portuguese. How will he manage to find his way without any language skills in an unfamiliar city in a foreign country? His colleague at work tells him not to worry. “Just download Google Translate and you’ll be fine!” She was right. During his stay in Portugal, Mr. Miller used the app every day many times. He chatted with cab drivers,*

telling them that he prefers their European cars over his Cadillac back home. The app even helped him to find a vegan dish on the menu of a local restaurant, and he asked the waiter through the app to alert the chef and his staff of his culinary preference. Yes, sometimes it was clunky and there were a couple of hilarious misunderstandings, but Mr. Miller is thankful for all the new friends he made in Portugal and the lifelong memories he created thanks to that little app on his phone.

**Scenario 2:** A few years ago, Dr. Clarkson, an environmental scientist, attended an international conference where a presenter from the University of Copenhagen gave a paper on a particular design of an off-shore wind energy park. Today, Dr. Clarkson is working with a team to establish a similar project. She remembers his Danish colleague's name and finds all her publications on her website. Unfortunately, the article that describes the project has only been published in Danish. Dr. Clarkson decides to "cut and paste" the article and enter it into Google Translate. She reads the output to get a general understanding of the gist of the article and sends a summary of the paper to her team members.

**Scenario 3:** Recently, the Ivanovs, a family that had immigrated about 15 years ago from Moscow to the United States, moved into a suburban neighborhood in New Jersey. Their new neighbors, the Hendersons, and the Ivanovs quickly became friends, but during a storm, an oak tree fell from the Henderson's yard on the Ivanov's property and damaged Mrs. Ivanova's car. Although the insurances quickly solved the problem, the Hendersons decided to give a bouquet of flowers and a card to Mrs. Ivanova. Mr. Henderson wrote a lovely apology in English, but he also wanted to close the note in his neighbor's native language. He went online and typed "Sorry about the tree!" into Google Translate and copied the output onto the card.

**Scenario 4:** Mrs. Schmidt volunteers for a group based in Hamburg that helps refugees to navigate the German bureaucracy and legal system. Recently, she started working with Mr. Ibrahim, a Syrian man, who managed to escape the horrors of the civil war. Usually, Mrs. Schmidt and Mr. Ibrahim communicate quite effectively in a mix of German, English, and Arabic, but the young asylum seeker still has difficulties to explain complex events in stressful situations in a language that he has only started learning a few months ago. Today, Mrs. Schmidt is accompanying Mr. Ibrahim to an official court hearing that is critical to his ability to remain in Germany. It is indeed his very last opportunity to challenge the German government's failure to recognize him as a war refugee and grant him asylum. His deportation has already been scheduled for the following day. The court has made the necessary arrangements so that a certified translator can facilitate the hearing. Mr. Ibrahim has prepared to give his testimony in his native language. The meeting had been set for 10am. At 10:10am, the translator still has not yet shown up. The judge, who has a long docket of cases for the day, is getting impatient, but Mrs. Schmidt and Mr. Ibrahim insist on waiting for the translator. At 10:15am the judge decides to conduct the hearing with the assistance of Google Translate instead of the certified human translator.

Table 3  
Discussion Questions

1. How realistic is this scenario? Have you used Google Translate in similar ways or have you heard about others using it in this way?
2. List and discuss the alternatives that the individuals in this scenario have to engage in cross-linguistic communication without an online translator.
3. Please discuss the risks and the benefits associated with Google Translate in this particular case.
4. Are there any strategies that the users of Google Translate in this particular scenario could use in order to mitigate some of the shortcomings of Google Translate?
5. Do you feel that it was inappropriate, appropriate, or even beneficial to use Google Translate in this particular case?

By articulating different reactions to each of the four scenarios, language teachers start developing a more differentiated view on the role of online translators in human communication outside the language classroom. Such a nuanced perception becomes the basis to lead language teachers into an open discussion and subsequently hands-on training that will help them to implement online translators strategically and intentionally into some dimensions of their teaching and to help students to develop the four fundamental skills

outlined earlier in this section. Table 4 represents a prompt that will bridge the discussion on the use of online translators in the “real world” towards a segment that will help instructors to rethink the prohibition of online translators in an educational setting and engage them to reflect international implementation of Google Translate in parts of the language classrooms.

Table 4

*Bridging insights about “real world” with educational needs of language learners*

*If you came to the conclusion that at least in some of the described scenarios the use of Google Translate was appropriate or even beneficial, what are some possible implications for language teachers who intend to prepare learners for the “real world”?*

## CONCLUSION

Once you have a hammer, every problem tends to look like a nail. This dictum by the American psychologist Abraham Maslow suggests that the greatest danger associated with the integration of online translators into modern language learning environments is that students believe that the technology can solve all linguistic problems. It becomes the responsibility of future language teachers not only to help learners to operate their new hammer in productive and responsible ways, but also to help learners to recognize that most linguistic tasks are not nails. Indeed, despite the impressive capabilities of online translators, most linguistic problems need to be tackled without the help of online translators.—Achieving this goal is not possible for individual educators who operate within an institutional context. Therefore, in conclusion we want to highlight the need for a systemic approach to this challenge and highlight the critical roles of two stakeholders to help manage the incremental implementation of online translators into modern language classrooms: our professional organizations and teacher training programs, including the preparation of graduate teaching assistants. After having articulated this call for action, we want to close the article with a more reflective tone and share our views on limitations of instructional approaches that heavily pivot to machine translators.

**Professional organizations:** In order to avoid being overrun by the new, disruptive technology, the profession needs now to start developing approaches that will help language teachers in the future to incorporate online translators into their classrooms. Engaging in such a discussion today will mitigate most negative effects of the inevitable disruption tomorrow. Forty years ago, our colleagues in mathematics as well as their major professional organization created a powerful template on how to manage the transition towards a new technology. Early in this process, a major professional organization started to moderate an inclusive debate and manage the incremental implementation of the pocket calculator in math classrooms. All steps were intentional and strategic in order to avoid making any curricular modifications that might have a negative impact on the acquisition of basic arithmetic skills. However, in this historic case a professional organization had assumed a critical role in reforming educational standards that needed to resonate with the emerging importance to teach learners to engage effectively and critically in human-machine collaboration. The leadership exemplified in mathematics education must inspire ACTFL to engage with the matter in a substantial way.

**Teacher education/TA preparation:** Teacher education programs, graduate teaching assistant training, and workshops geared to in-service teachers must help language instructors

to develop informed and nuanced perceptions of machine translators. The ideas sketched out in the third part of this article have the potential to contribute to such an outcome. However, awareness is only the very first step. Teacher trainers and language program directors must develop pragmatic approaches and materials that guide teachers as they start to open some aspects of their classrooms to machine translators.

**Limitations:** The overall optimistic tone of this article should not lead the reader to conclude that even an intentional and strategic introduction of machine translators into language education is without risks. Although we do not have any major concerns that relate to quality of machine translators nor believe that learning will be substantially compromised in an environment where online translators are meaningfully integrated in the learning experience, we do think that there is a real danger that the technology will lead to reductionist perceptions of language among both students and teachers. As mentioned earlier in this article, language proficiency is more than a tool. If proficiency is merely treated as a tool, it reduces human beings to speakers exchanging messages in crude manners that are agnostic of the sociocultural embeddedness of message and speaker. This is achievable by machine translators, but such an instrumentalist notion of language fails to acknowledge the richness and complexity of human interaction, identity, and culture. However, if we understand proficiency as the ability to encode and decode meaning in a nuanced and context-sensitive way that is simultaneously a reflection and an expression of identity and sense of belonging, we quickly recognize the limitations of the technology. Learners at all levels interacting with machine translators must recognize these limitations. The future language classroom that integrates machine translators in sophisticated ways must constantly provide learners with experiences where they discover the limitations of machine translators that result from the fact that language is much more than merely a tool.

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