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Google Translate as a Resource for Writing:
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Abstract

This action research was prompted by the question “Does using Google Translate improve students’ writing?” When implemented according to guidelines from previous research, students produced writing with fewer syntactic and semantic errors. Data was collected through student work samples, classroom observations, and a questionnaire. Three themes arose through data analysis: that students found value in Google Translate, that one instance of instruction was not sufficient for all students to acquire necessary strategies, and that students’ lack of familiarity with both Google Translate and the Spanish language hampered their success. These findings demonstrate the importance of providing teachers and students with instruction on Google Translate, as well as the need for further research on the effects of translators on vocabulary acquisition.

Google Translate as a Resource for Writing

In the past decade, the quantity and availability of technology for use in the classroom has skyrocketed. Although these improvements are not yet ubiquitous across the country, many schools have been able to improve accessibility and usability of technology through utilizing funding from their tax base or by procuring state and federal grants. These improvements include, but are not limited to the installation of high-speed wireless internet connections, the replacement of overhead projectors with SMART Boards, VHS cassettes with DVDs and Youtube videos, and the provision of iPads, eReaders, and other tablets laden with educational offerings for their students. Computers have increased in storage capacity and operating speed, with USB drives all but replacing compact discs. As new technologies emerge with potential classroom applications, they are met with excitement, skepticism, and in some cases hostility by educators (Clifford, Merschel, & Munné, 2013). It is important for teachers to carefully consider the impact and value of new technologies in their classroom, as new technologies provide students with new avenues of literacy to explore.

This study is designed to explore the potential use of Online Translation (OT) as a tool in the Foreign Language classroom. The majority of research shows that OT applications are not a strong enough tool to completely facilitate translation between two parties that do not share a common language (Costa-jussà, Farrus, & Pons, 2015; Sheppard, 2011). Groves and Mundt (2014) found that when students wrote essays in their native language, and used an OT application to translate them into English, the translation application was incapable of providing error-free text when translating an entire essay. Although not perfect, their analysis of the translated essays showed that the writing was almost to a level where it would be accepted by university admission departments. Groves and Mundt concluded that should OT services

continue to evolve and refine their accuracy, they would eventually become a useful tool for educators.

This study focuses particularly on Google Translate, an OT application useable as a website, or as an app on smartphones. Google Translate, like many other successful OT applications, uses a statistical translation model, which takes the word or words to be translated, and searches a bilingual text corpus for that word or words. It returns the most likely match as the result, with information such as what part of speech the word or words is, the definition, suggestions for other phrases, and other possible translations of the word or words. In addition to a vast text corpus developed from official United Nations documents (which are published in multiple languages), Google Translate also provides an opportunity for the user to improve upon the translation and input a suggested translation. These suggested translations are vetted by the “Google Translate Community,” an open online group created by Google to help improve their software, which has over three million members, and has adjusted and corrected over 90 million translations (Google, 2016).

Many foreign language educators are hesitant to allow Google Translate into their classrooms for fear that “the sanctioned use of translation tools may undermine the actual language acquisition process” (Groves & Mundt, 2014, p.119). As the software exists, it is not a suitable replacement for a human translator, or even for a basic competency in the target language. Similar to how a calculator cannot cause one to become proficient in math, Google Translate cannot cause one to be able to effectively communicate with speakers of languages other than English. Just as a calculator is a valuable tool for helping students build proficiency in mathematics, there is also the possibility for Google Translate to support learning in the foreign language classroom. Without measuring the effects of the use of OT applications in the

classroom, there is no certain way for teachers to know if they are denying a useful resource, or if by abstaining from using it, they are ensuring that their students are successfully acquiring language for themselves.

Knowing the limitations and the best use-case scenario is important when selecting tools, whether that tool is a writing implement, a power tool, or software. In anecdotal evidence, the author has found that Google Translate excels in certain areas of Foreign Language curriculum, but also reveals one of its larger weaknesses. Groves and Mundt (2014) state that Google Translate suffers when translating single words and functioning as a bilingual dictionary, due to only giving one meaning at a time. The software has since been improved upon, and Google Translate now provides multiple definitions of a word in the field underneath the main output. The author contests that this adjustment has greatly improved its efficacy in translating nouns, adjectives, and adverbs, but that Google Translate still suffers when translating verbs, especially into non-Romance languages. Because English does not provide unique conjugations for verbs, and relies on auxiliary verbs to construct the majority of its tenses, without the context of the rest of the sentence, the software is unable to determine the correct equivalent, and in some cases, unable to provide a correct translation, because an equivalent does not exist.

Despite its shortcomings, the use of OT software provides students with an avenue towards building foreign language literacy (Garcia, 2010; Garcia & Pena, 2011). The use of OT tools is becoming a common occurrence for the language learner, as a portable way to facilitate interacting with texts and communicating with people (Clifford et al., 2013). Providing instruction to students on the strategic use of OT software equips students with both the tools to aid in developing their foreign language literacy and with linguistic skills to aid in their comprehension (Alley, 2005).

In Jin and Deifell's (2013) study concerning online dictionary use in foreign language learning finds several benefits to using OT software in addition to using online dictionaries. Their review of the literature explains that previous research on print dictionaries found that they were helpful tools for aiding foreign language comprehension, however the amount of time spent looking up words could result in too much time spent away from the text, which resulted in decreased comprehension. They found that the speed of online dictionaries allowed for learners to spend more time with the text and lead to deeper comprehension of the overall meaning of the text, instead of a solely focusing on an individual word at a time within the text. Similarly, the use of OT as a dictionary replacement provides a similar benefit to speed and time with text, but can additionally be used as a way to provide instruction on language features, differences, and on the use of idioms (Alley 2005; Jin & Deifell, 2013).

This action research project was designed to discover the effects of using Google Translate on student writing in Spanish. Specifically, the study was built to investigate changes in the quality of student writing, measured by error production. Based primarily in the theory of New Literacies Studies, which states that technology is a tool for transferring meaning between two or more parties, and that different technologies will alter the meaning transferred in different ways (Gee, 2009; Lankshear & Knoebel, 2007). Previous studies in this field have largely been focused on using Google Translate and other online translators at the intermediate or advanced collegiate classroom. In addition, much of the research has focused on the need for informed, strategic use of Google Translate in the classroom, by both teachers and students. Through analysis of student writing, questionnaires, and teacher observations, this study found that the using Google Translate as a tool to aid writing did reduce certain types of error in student writing. However, the benefits in error reduction were not present across all students nor all

categories of error. The findings of this research also include that students place a high value on Google Translate despite its flaws, that students require tailored instruction to be able to properly implement strategic use of the translator, and the negative impact that low levels of language proficiency have on students' ability to monitor their use of the translator. The implications of this research provide further support for providing teacher training in the use of Online Translators due to their ability to be successfully leveraged as instructional tools. Additionally, while Google Translate provides a large amount of support for beginner level students, that potential benefit is hampered by a lack of familiarity with the Spanish language.

Theoretical Framework

The skills required to be literate are context-specific, and change as new forms of reading and writing technologies are developed. Ferdman (1990) argues that in a culturally heterogenous group, literacy can no longer be constrained by a single definition, because literacy practices and events vary between cultures and social groups. Due to this variation, literacy is more than just the skills required to interact with persons and texts, but also the skills required to comprehend persons and texts. Literacy is the ability to communicate with and draw meaning from texts and persons both within a certain community and from those of a different community.

Gee defines literacy as “control of secondary uses of language,” (1989, p.) which is the ability to use language in situations outside of one's primary discourse. In Gee's research, he calls these different sets of social environments “discourses,” which function as social identity kits, providing all the necessary cultural information needed to participate in a group. Every human is born into their “primary discourse”, their acquired methods of interacting with the

people closest to them (generally their family.) All other discourses acquired by persons are called “secondary discourses,” in which we use “secondary uses of language” to communicate with people outside our primary discourse group. When acquiring a foreign language, in addition to learning about the cultural variations of literacy, students must also learn a new set of linguistic information, whose syntax and grammar will not completely align with that of their native language. Using OT as a reference tool can help students identify important differences and similarities between their native language and the learned language (Alley, 2005).

Lankshear and Knoebel (2007) define literacy as “socially recognized ways of generating, communicating, and negotiating meaningful content through the medium of encoded texts within contexts of participation in discourses” (p. 64). This view of literacy is similar to Gee’s Discourses, but instead of literacy requiring complete mastery of a discourse (Gee, 1989), Lankshear and Knoebel (2007) say that literacy is simply the act of participating in a discourse. When the secondary discourse involves a secondary language, the process of discourse and literacy acquisition also involves first acquiring the tools and skills and understandings required to communicate in that language. Although not the only skills required for effective communication, two often stressed skills are vocabulary and comprehension. Using OT as a support for language learning reduces the amount of time required to discover new vocabulary, which can result in increased comprehension of text, as the student has more time to direct their attention to the passage as a whole, instead of focusing on one word at a time.

Lankshear and Knoebel also focus on how the improvements in modern technologies have changed literacy practices, and the roles that learners and teachers must adopt. They argue that Freebody and Luke’s (1990) four roles of the learner, the code breaker (being able to read text), the text participant (being able to understand text), the text user (being able to correctly use

the information), and the text analyst (making connections within the text or to other texts), are not distinct enough when dealing with modern, multimodal texts. Instead they suggest four new roles for the learner to adopt, the text designer (being able to create a digital text), the text bricoleur (being able to modify a digital text), the text mediator (being able to summarize and present a digital text), and the text jammer (being able to change the purpose or form of a digital text). Being able to use OT software as a support to foreign language learning allows students to practice being a text participant, text user, and importantly, gives them a way to test the waters of becoming a text designer.

This study will be guided primarily by The New Literacies Studies, an extension of the New Literacy Studies (NLS). The NLS defines literacy as primarily a social and cultural event, as opposed to something that occurs only in one's mind (Gee, 2009). The NLS believes that both oral language and written language do not occur in the isolation of the mind, but in specific cultural and social contexts and practices, which cannot be separated from language (Gee). Because language is distributed to others, language serves as a vehicle for meaning, especially when dealing with written language. However, meaning is also partially determined by the literacy practices of the writer and the reader.

New Literacies Studies takes the association of language as a vehicle for meaning a step further, and states that new technologies and digital literacies are also vessels for transferring meaning, and that the social and cultural contexts in which the technologies are used can affect the meaning transferred (Gee, 2009; Lankshear and Knobel, 2007). When working with OT, in order to successfully convey their intended meaning, students must use several strategies in conjunction with the tool itself in order to best ensure the correct transfer (Alley, 2005; Jin & Deifell, 2013; Zanettin, 2009). Baron (2000) states that since the invention of writing,

technology and literacy have become inextricably linked. From reeds and clay to modern word processing software, smartphones, and tablets, writing technology has continued to change the written literacy practices of society. Baron also describes the stages through which new literacy technologies progress, starting with invention. When invented, many literacy technologies are restricted in their ability to facilitate communication, and are not widespread, due to either prohibitive costs, lack of public knowledge, or by being regarded as unimportant by the public. When machine based translation was first conceived, it was done via a complicated system of punch cards, as modern computers had not yet been invented. Even after the invention of the computer, the initial model of machine based translation was found to be prohibitively complicated to develop, as it would require every rule and every exception to be programmed into a computer, which would use this information to analyze the possible meaning of the text. After invention, the technology is then adapted and changed in by users in order to better fulfill a specific function, usually not the one it was originally designed for. Baron (2000) describes the invention of cuneiform (ancient Sumerian script) not being designed as a way to convey stories, nor traditional texts, but as a way to record transactions. Only once ancient Sumerians found that it was suitable to their needs and could be used as a trusted, binding account, did it begin to see use conveying written messages. Although Google Translate was not specifically developed to aid in second language acquisition, if research finds it a valuable support, then it would be a disservice to students to deprive them of the use of this tool.

Research Question

Within the context of a rules-based approach to second language acquisition, what impact does the use of Google Translate as an authorized classroom resource have on error production in student writing in the target language?

Literature Review

In order to conduct effective and efficient action research, it is necessary to gather what information has already been studied and analyzed on any topic. To identify what has already been discovered about the effects of student use of Online Translation (OT, occasionally referred to in research as Machine Translation, or MT) and to discover what has not yet been explored, a review of recent studies will follow. For the purposes of this review of the literature, three primary themes will be addressed. The first theme is the need for teachers and students to obtain proper strategies before using Online Translation technology in the classroom. As with any tool, before using it, one should know how, when, and why the tool is used. In particular, OT is not yet a perfected product and in order to use it effectively, one has to learn in which contexts it produces acceptable translations. In addition, there are also a number of strategies employable by students that allow for greater accuracy in text production. This theme also discusses a sub-theme, which is the growing yet incomplete nature of OT software. Online Translation has grown by leaps and bounds, but is still not (and may never be) a substitute for proficiency in a language. The second theme shows that the proper use of OT technology can aid in student comprehension and communication. By providing a quick and reliable way to translate, students can spend less time focusing on individual words, and work towards sentence-level comprehension. The ability to access a wide variety of vocabulary is also a boon for students' writing production as well, though it does not eliminate all sources of error. Thirdly, this review

will highlight the narrow focus of research concerning student achievement and the use of OT technology at the beginner level of language learning. The majority of research concerning OT has been conducted in classes of intermediate or advanced language learning, and most commonly at the university level. Due to technology commonly being used as a motivator in the classroom, a significant portion of the research focuses on students' perceptions and attitudes towards the use of OT and other online resources. This theme will also address the importance that future studies focus on the effects of OT on beginner level vocabulary development and reading comprehension.

The Necessity of Strategies When Using Online Translation

Due to the rapid growth of technology available for classroom use, teachers do not always receive training on every tool that at their disposal. Even when time and funding permit, some tools are left without support, either due to their perceived simplicity or their unsanctioned status. Online Translation, specifically Google Translate, often falls into both of these categories. According to multiple studies, many teachers believe that because Google Translate isn't completely accurate in all instances of translation, it should not be permitted in the classroom (Clifford, et al., 2013; White & Heidrich, 2013). Such claims show the need for further improvement of the technology, but overlook the potential benefits available. Other research has also found that teachers believe that the use of OT impedes language learning by creating a shortcut that encourages cheating and plagiarism (Pritchard, 2008; Stapleton, 2005).

While the use of an online translator does provide users access to new vocabulary, it is only cheating if the rules are designed to reward memorization. It shifts the required knowledge from definitions of words to how to correctly implement new words within the structure of a sentence.

Pritchard found that “faculty are skeptical of a positive impact on language learning but do not see it as a threat to the profession” (p. 116), and that “overall there are many opinions on how it should (not) be integrated and what constitutes academic dishonesty” (p.116). Many faculty view the use of OT and the use of a bilingual dictionary differently, even when used for the same purpose. However, just as using a dictionary or a thesaurus in English does not constitute plagiarism, neither does the use of OT. The more worrisome portion of OT is the ability for students to easily use it to copy someone else’s writing from elsewhere on the internet, paste it into the translator, and claim it as their own (Stapleton, 2005). However, the potential use of a tool for illicit purposes should not wholly ban its use in the classroom. As Stapleton writes, the ease with which Foreign Language students are now able to plagiarize “renew[s] the need for teachers to stress the unethical and damaging nature of translators and electronic ‘lifting’” (p. 187), where students copy text from other sources and paste it into the translator.

On the opposite side of the coin, many teachers who believe that OT can be a useful tool for students do not always provide strategies for use. They either assume that the technology is simple enough that no instruction is required or that the students already know how to use the technology properly, due to their age. Despite having been born into an age of rapid technological advancement, not all students are what Prensky (2001) classified as “digital natives” (p.1). While many students do grow up with access to computers, tablets, and mobile phones, there are also many students who do not. Access to technology is largely dependent on socio-economic status, and while the percentage of households with computer and internet access continues to grow, more than 25% of households in the United States do not own a computer (U.S. Census, 2010). Furthermore, just as students are not born with traditional literacies, such as the ability to read and write, no one is born with the knowledge of how to use a

computer. If the members of a child's home discourse community do not value, possess, or teach the skills and knowledge of digital literacies, their first introduction may be in the classroom.

Researchers agree that in order for OT to have a successful, positive impact, students and teachers need to be trained in the use (Fredholm, 2014; Fredholm, 2015; Gabarre, Gabarre, Din, Shah, & Karim, 2014; Jin & Deifell, 2013; Karnal & Pereira, 2015; Stapleton, 2005; White & Heidrich, 2013; Zanettin, 2009). In order to be able to properly instruct their students in how to use any tool, teachers must first become proficient in using it themselves. Jin and Deifell (2013) state, "Foreign Language educators must address the use of digital resources by learners and understand how their language learning and educators' own teaching may benefit from such tools" (p. 515). By studying how and how well OT tools function, teachers can use that knowledge to improve their teaching. Zanettin (2009) states that in order to ensure the usefulness of Google Translate, there must be sufficient classroom time allotted to ensuring that the students know how to properly make use of it. Unfortunately, OT tools often come with very little instruction for the user, and little indication that a translation may not be correct. White and Heidrich (2013) conclude from their results in using OT (referred to as "Web-based Machine Translation) with German students that:

This shows that no learner's intuited strategy resulted in a perfect interaction with the machine interface. The problems of the wide range of student views on WBMT and the inaccuracies in students' edited texts could likely be mitigated if instructors would work with students to demonstrate the limitations of WBMT, and then utilize the training strategies that demonstrate how to use these programs in order to produce more accurate writing. (p. 242)

Even among advanced-level language learners, because OT presents itself as an authoritative source, uninformed students are unlikely to discover all of its flaws. According to Stapleton (2005), “Awareness of the possibilities and pitfalls of this environment by both teachers and learners can lead to an improved written product (p. 188). One activity that can be used to both instruct students in the use of the program and help them discover its strengths and limits is to demonstrate the use of the program in class, with texts of various length and complexity. Using OT as an exploration of the differences between languages and as an exploration of the limits of the system has multiple benefits. Primarily, it can be used to ensure that students do not become dependent on nor overly trusting of the output of OT software. Additionally, according to Alley (2005), knowing both how to use the translation program and knowing the limits of the program can help improve students’ skills in their native language as well as in the foreign language. Using OT in this way can also be used as a way to build students’ confidence in their own writing and abilities. Niño (2009) builds on Alley’s (2005) ideas of exploring the limits of translation software, emphasizing that by showing learners that their abilities are often more accurate than the output of a translator, in the hopes of lowering their reliance on such tools as exclusive means of text production.

Although Online Translation has many benefits to offer language learners, it is not always the best tool at a student’s disposal. Before using OT as a language learning resource, students need to be informed on its capabilities, and be informed how to recognize when OT has failed to produce an acceptable translation (Alley, 2005; Niño, 2009; Zanettin, 2009). Instead of abandoning the technology when it is unsuccessful, these strategies should be seen as an evolution of the literacy practices involved in selecting the correct translation from a bilingual dictionary. Due to this failure to consistently provide quality output, Online Translation,

particularly Google Translate, is not a very well-received phenomenon among researchers, particularly in the field of medicine (Costa-jussà, Farrus, & Pons, 2015; Groves & Mundt, 2015; Karnal & Pereira, 2015; Sheppard, 2011; van Rensburg, Snyman, & Lotz, 2012; White & Heidrich, 2013). Due to the potential severity of a poor translation, online translators are less suitable for medical translations. However, in an academic setting, errors are less likely to be life-threatening, and can be used as opportunities to learn from mistakes. White and Heidrich (2013) state that “Much of the research has focused on the limitations of these programs”(p. 230), despite the continual improvements being made. A focus on the shortcomings of OT often leads to classroom policies that prohibit and punish the use of OT. However, even in situations where students are forbidden from using OT as a support, they often attempt to find ways to hide their use of it, instead of passing up the use of a helpful tool. Unfortunately, the lack of instruction on how to use OT often means that it is not used to its greatest potential, as students have no one to inform them about best practices (White & Heidrich, 2013), and continue to use the software incorrectly. While some students will discover errors and dismiss the tool as inaccurate, students who believe that they have found a shortcut may become dependent on the translator instead of being able to use it as a support. Findings from Kelly and Bruen (2014) support the negative attitude towards translation, but state that even offline translation has a negative connotation amongst educators, due to its association with an outdated model of language learning. Established primarily as a way of teaching Latin, the Grammar-Translation model was the predecessor to the communicative approach commonly found in Foreign Language classrooms today. It fell out of favor due to the lack of focus on verbal communication and the almost exclusive use of the native language as the language of instruction. The Grammar-Translation model involved students being instructed in their native

language about the rules of the grammar of the target language, and being given texts (both in the target language and in the native language) to translate in order to build their reading and writing proficiencies. Translation was deemed an inauthentic use of language by critics of the Grammar-Translation model, and replaced with instruction designed to promote speaking and listening as well as reading and writing (Kelly & Bruen, 2014). Despite the association with the Grammar Translation model of language learning, Kelly and Bruen find that when translation activities are presented to teachers under different names, they support the use of translation as a language learning activity, and find that it is an important and authentic use of language for their students.

Even among translation educators, OT is recognized as having useful qualities for the training of translators, as well as for the learners of foreign languages (Garcia, 2010; Zanettin, 2009). Professional translators often use similar corpus-based translation software to aid them in their everyday work. Zanettin writes that students who are aware of the shortcomings of Google Translate are more likely to critically examine the quality of the output. This metacognitive view of Google Translate has multiple benefits, as it helps ensure that students are monitoring their learning and tool usage, as well as promotes the usage of strategies by the student. According to Pritchard (2008), using metacognitive strategies and critically examining the text produces an overall greater focus on the words themselves, which leads to improved language acquisition. There are multiple ways to incorporate critical examination of the text into the use of OT, but not all methods are equally suited for all skill levels. Alley (2005) provides three potential strategies for exploring the usage and limits of OT in a beginner or intermediate level classroom: demonstrating the use of cognates in reading comprehension, using OT to attempt to decipher idioms, and using OT to translate L2 writing into English. These demonstrations allow students to explore the capabilities of OT before diving into using the software themselves. These

strategies allow students to minimize the failings of OT, but even so, the results from translation software are still far from accurate. The research has found three major areas of weakness within OT output. Primarily, Online Translators suffer heavily when translating English into non-Romance and non-Germanic languages, and in languages whose syntactic structure varies from English (Groves & Mundt, 2015). In addition to sharing linguistic features, Romance and Germanic languages also have a larger available corpus of pre-translated texts to search. Google Translate's corpus is primarily built upon official United Nations documents, but is also supplemented by the large body of European literature that has been professionally translated into English (Google, 2016). However, this leaves Asian and African languages at a severe disadvantage in accuracy. Van Rensburg et al. (2012) focus on the unsuitability of Google Translate when translating educational materials into Afrikaans, citing that texts would require "extensive post-editing" (p. 522) and were often worse off than student translations of the same texts. This reinforces that OT should not replace proficiency in a language, and shows a need for further development of OT software and further research of whether or not it is as effective a tool across all available languages. Another common pitfall of OT tools is the inability of statistical translation models to handle idiomatic expressions and figurative language (Groves & Mundt, 2015; Shih, 2016; White & Heidrich, 2013). Despite the high frequency of idioms in language, statistical models of machine translation are ill-equipped to deal with their occurrence within text. Idioms are based in the cultural component of a language, and due to the different experiences involved in the development of different languages, there are often not equivalent translations. Without these equivalents, statistical models are unlikely to correctly interpret the idiom, often instead translating it literally word by word. Studies agree that technical, scientific, and academic texts are much easier translated, due to their lack of figurative language and their

stricter grammatical requirements (Shih, 2016). Although using OT on these types of texts results in a higher level of success, it does not result in a completely accurate translation. In their study on translating medical informational texts, Khanna et al. (2011) confirm that Google Translate results in sentences that have a higher amount of grammatical errors, but will often keep the meaning of the phrase intact. Despite the meaning often being preserved, the study found that OT alone was not a suitable way to communicate patient information. The third area of difficulty is the translation of complex verb tenses and moods (Fredholm, 2015). English verbs are often constructed with the use of auxiliaries (do, will, have, had, etc.), resulting in phrases with multiple adjacent verbs. When translating into languages that use auxiliaries differently, or replaces auxiliaries with verb endings, OT will not always output a corresponding translation. These errors can result in OT outputting a nonsensical string of infinitives or inserting nouns into phrases that require the use of a verb. In addition, many languages have separate translations for the verb “to do” and the auxiliary “do.” Further complications arise from the use of the present participle (the gerund) both as a verb and as a noun in English. Especially when used to translate words in isolation, OT is unable to predict which translation will be required by the user. By combining situations where meaning is able to be translated with metacognitive awareness of the capacity of OT, students and teachers are able to overcome, or at least work around the inherent flaws.

Beyond simply being aware of the limits and strengths of Online Translation tools, researchers have studied several other strategies used to aid student comprehension and writing. Researchers have taken two different approaches: either observing strategies that students use to support their learning while using Online Translation, or suggesting a strategy for use and measuring the effect on student comprehension or writing. Regardless of approach, the studies

also indicate the importance of using OT as a support, and not allowing students to become dependent on its use. As Garcia and Pena (2011) note, using OT is like using a Global Positioning System. It can assist someone who needs to get from point A to point B, but it cannot train a user how to navigate without it. Another common metaphor used by researchers (Clifford et al., 2013) is that of the calculator. Although unable to teach mathematics, the use of a calculator certainly aids students in performing calculations quickly, leaving them more time to grapple with the concepts. Pritchard (2008) indicates the importance of not over-using dictionaries and translators, writing that if the use of a translator or a dictionary will not enable a student to reach an independent level of word recognition (95% or higher), that their time would be better spent building sight-word knowledge. However, Pritchard also notes the effectiveness of print dictionaries on comprehension in previous studies, and hypothesizes that the usage of online dictionaries and translators will have a similar use, when used with a similar frequency. However, the use of OT is slightly more risky in this scenario, as it does not always have the same reliability as a dictionary. These findings are corroborated by Niño (2009) in her review of translator use in the foreign language classroom. She finds that using translators with other tools, such as online dictionaries and thesauri is a benefit to students' ability to produce text in a foreign language. This usage falls into the "use of MT as a good model" (p.242), where the output of the translator is used as a supporting tool. The use of multiple supports and strategies is an important way to ensure an accurate product. Niño also finds value in the "use of MT as a bad model" (p. 242), where students use the errors produced by translators as a way to explore both their native language and the foreign language.

In their study on Online Dictionary use, Jin and Deifell (2013) found that many students would use Google Translate to translate at the sentence level, and use a different dictionary to

check the definitions of words that looked out of place. This strategy requires the students to be aware of the limitations of Google Translate and to be familiar with the structural and grammatical conventions of the target language. Alley (2005) describes having students use OT as a type of grammar checker for their own writing, by using it to translate text that they've composed in the L2, and translate it into English. Using OT in such a manner allows students to compare their output with what they think they've written. From that point, students would need to refer back to their notes, or other classroom resources, before attempting another translation, requiring students to depend on other resources, and not wholly on the translator. Pritchard (2008) also suggests selective translation as a viable strategy to using Online Translators and Online Dictionaries. By focusing on high-frequency words, and analyzing the structure of the text, students can maximize the effectiveness of their tools. Like previous studies, he suggests a critical look at the text, but instead of just focusing on meaning, having students pre-read the text to get an idea of what they're reading, and what the most important words might be. Words in titles or words that are repeated often throughout the article are the best candidates for translation.

The most common strategy associated with OT use was post-editing the text after it had been translated (Garcia, 2010; Garcia & Pena, 2011; Kucis & Seljan 2014; Niño, 2009). Post-editing was commonly one of the taught strategies, because it requires that the user have a healthy skepticism of the validity of the output of the OT program, which not all students possess. Niño defines post-editing as “the correction of raw MT output into an acceptable text for a particular purpose” (p.243), and as a valuable way to build vocabulary and grammatical knowledge for students. In addition to building language competency, post-editing strategies also provide students with potential career skills, should they eventually chose a career in

translation. Garcia (2010) found that students using OT in this fashion did not work any faster than students using a standard dictionary, despite the increased speed of online tools. While this type of use requires constant use of OT, which could build dependency, it combines the reduction of errors with a critical analysis of the text, resulting in a high-quality, usable (but not professional) text. Shih (2016) chose to focus on a similar strategy, but instead of editing the flaws in the text post-translation, Shih focuses on pre-editing texts to conform to the norms of online machine translation. Instead of changing the input after viewing the output, pre-editing requires critically examining a text and searching for linguistic elements that are likely to create errors in translation. Similar to White and Heidrich's (2013) use of using the pitfalls of OT to highlight the differences in languages, Shih (2016) uses the strengths of OT to create a standard to which a text can be conformed. Pre-editing does also require students to examine the translated product in addition to examining their original writing and may lead into post-editing as well. Using these errors as a framework for exploring the construction of a language can lead to increased student understanding of the language and of the translation software. Finally, although the strategy is unlikely to be as successful with novice language learners, Hwang, Finch, and Sasaki (2007) also found success in analyzing the morphosyntactic patterns within sentences in order to achieve improved translation quality. By taking into account what parts of speech are involved in each sentence, and if the target language shares structural similarities, such as Subject-Verb-Object order, a translator can prepare a sentence that shares as much structure and syntax as possible. Although OT technologies do not use rules-based translation as their default method, by choosing sentences that will more likely match the structure of the corresponding text corpus, translators can improve the quality of the program's output. This strategy requires advanced knowledge of both the grammatical structure of English and the target

language, including what features are common to each language, and what features they do not share. Both Shih's (2016) and the methods used by Hwang et al. (2007) are more suitable for advanced levels of foreign language instruction, but can be broken down to be implemented for beginner classrooms. By selecting broader constructs and focusing on single word translation instead of sentence translation, the teacher can help students incrementally build a set of guidelines for using OT. Alley (2005) asserts that "Most beginning foreign language students have at best a superficial understanding of the second-language learning process" (p. 63), and that students studying foreign languages often believe that all languages are constructed and function similar to their native language. This theory, along with Shih's breakdown of translation norms provides several points that could be focused upon in an introductory classroom, but have yet to be researched.

Proper Use of Online Translation Aids L2 Comprehension and Writing

According to Karnal and Pereira (2015), comprehension is not a single process, and varies from reader to reader. When reading, comprehension is created from two different levels of information. Shallow comprehension is information gathered directly from the text, while deeper comprehension relies on the reader's ability to draw inferences from the text and to connect prior knowledge with the information within the text. This deeper comprehension varies greatly from reader to reader, because no two people have the same knowledge and experiences. In order for full comprehension to occur, the reader must simultaneously activate multiple strategies and multiple levels of comprehension (Karnal & Pereira, 2015). According to their definition of comprehension:

It does not occur by summing up the meanings of individual sentences, on the contrary, it is based on the implicit or explicit coherence relations in the text which are processed in the mind of the reader through inferential activity. In order to achieve this it is necessary to perform such cognitive operations of logical connections to world knowledge. (Karnal & Pere, 2015, para. 3)

Traditionally, this deeper comprehension is difficult to achieve for readers with limited vocabularies, even with the use of a bilingual dictionary, as time spent away from the text reduces the amount of mental processing occurring (Jin & Deifell, 2013). Students must not see OT as a way to replace vocabulary knowledge, but as a way to improve it. Karnal and Pereira (2015) also name word identification and the use of strategies as important components in second language reading comprehension. These skills are even more crucial when learning languages other than Romantic or Germanic languages, due to the lack of structural similarities with English. While traditionally, the use of background knowledge has been an important part of comprehension, without a high enough level of vocabulary, students will be unable to create connections with the text (Karnal & Pereira, 2015). While using OT does provide students with access to vocabulary, there is no definitive research showing whether or not it can aid in students retaining that vocabulary for future use. Pritchard (2008) also claims that vocabulary knowledge is critical to comprehension, stating that “When learners come upon an unknown word that they cannot infer from context, they can either ignore the word or consult a dictionary” (p. 216).

When being used as an alternative to a dictionary, the near-instant speed of OT can result in improved comprehension, because less time is spent away from the text. In addition, the use of OT allows greater levels of vocabulary identification, which allows students to paint a clearer picture of the meaning found in the text.

From a constructivist standpoint, the use of OT has a strong place in comprehension, as it helps the student become an active participant in the process of defining vocabulary (Peters, Weinberg, Sarma, & Frankoff, 2011). Instead of being confined to a set list of vocabulary found in a textbook, OT gives students some degree of freedom in constructing knowledge by allowing them to explore vocabulary of their choosing. In the results from twenty focus groups describing their reasons for using internet-based resources, 16 of the 20 groups stated that their primary purpose was seeking new information about the language to improve their proficiency (Peters et al., 2011). Students described their use of dictionaries and translators as important aspects in learning new words and improving their understanding. Students in these focus groups did not believe that using online translators and dictionaries was a meaningful way to save time, due to the large amount of time spent ensuring an accurate output. Continuing from a sociocultural perspective, using OT software is an important step for learners, as their mental framework shifts from being other-regulated, to being object-regulated, to finally, as the student acquires more language, being self-regulated in their use of language (Jin & Deifell, 2013). While OT alone cannot complete this process, it provides students with an avenue to provide themselves with culturally relevant terms. As defined by Lantolf and Thorne (2006), humans use “higher-level cultural tools” (p. 198) such as language, literacy, and logic to “mediate the relationship between the relationship between the human and the social-material world” (p. 199). One of the ways behaviors are mediated is through regulation. When learning a second language, the learning is both a regulating behavior as it is acquired, and also a regulated behavior, in how and from whom or what it is acquired (Lantolf & Thorne, 2006). As students are exposed to more language, they are able to use more language, which reduces their dependency on tools such as OT. In both cases, the move from object-regulated (in this case, language use is primarily

governed by the use of tools) to self-regulated (internalizing the second language) comes about in part by the learner deciding for themselves on which aspects of the language to focus (Lantolf & Thorne, 2006). As such, the use of OT helps advance comprehension by allowing the student access to language, and allowing the discovery and exploration to be decided by the user.

Karnal and Pererira (2015) find that a different set of strategies are used when reading with the use of an online translator than when reading foreign language text unaided, suggesting that different mental processes occur, and that the use of OT changes the reader's comprehension and processing of information. In using Google Translate, users were able to focus less on individual words, and were able to devote more cognitive resources to understanding the text, due to the simplicity of the online interface. In addition, they found that in addition to using different strategies, the amount of strategies used increased while using Google Translate. This increase is partially attributed to the need to examine the output of the translator, but additional strategies for monitoring meaning also occurred more frequently during the course of the study.

Using OT in this manner is able to provide novice and intermediate learners a boost towards being able to access meanings within the text, by providing the meaning of the text in an expedient manner. These results are in line with Zannetin's (2009) findings that students using Google Translate as a support tool were able to shift their focus from the single word, to understanding phrases and sentences. By spending less time looking up individual words, the mind is able to better focus on the relationship between the words within a sentence, helping to access the deeper literacies within a text. Jin and Deifell (2013) come to a similar conclusion, stating that the "skillful use of technology resources is an indicator of language development" (p. 517). They also find that just as print dictionaries help promote vocabulary development, and eventually reading comprehension, that online dictionaries and translators fill a similar role, with

the benefit of taking less time away from the text. Pritchard's (2008) views on strategies and comprehension are similar, highlighting the importance of using support strategies while reading. Because students' literacy practices will vary from their native language to their acquired language, it is important to provide explicit instruction in L2 reading strategies. In his review of the literature surrounding dictionary use and comprehension, Pritchard found that there was a high correlation between strategy use and increased language proficiency. In addition to enabling further comprehension, the act of knowing when to use a strategy is part of the many processes of comprehension.

Although the use of Online Translation has been linked to improved reading comprehension by several studies (Jin & Deifell, 2013; Karnal & Pereira, 2015; Pritchard, 2008; Zanettin, 2009), it has yet to be the focus of any long-term studies focused on learning. It is unknown if the exposure to language from the use of OT has any meaningful long-term impact on students' language acquisition. Karnal and Pereira (2015) categorize learning as "involving remembering and applying components that cannot be part of the comprehension process, we can understand and then forget. However, learning involves long-term memory and high level of awareness and attention" (p. 69). While using OT may be beneficial in the moment for many students, further research is required to find out whether those benefits accumulate over a longer period of time. Due to the constraints of the existing studies, it cannot be definitively stated whether or not OT usage helps students learn vocabulary and grammar, or whether it is like a calculator, and simply enables language to be processed more efficiently. No matter the outcome of such a study, there is no doubt a need for OT to be integrated into the process of second-language acquisition at some level, due to its widespread use and importance as a support to reading comprehension (Clifford et al., 2013).

In addition to being a valuable tool to support reading, OT technology is an important aid in writing in a foreign language (Fredholm, 2015; Gabarre et al., 2014; Garcia, 2010; Garcia & Pena, 2011; Sagarra & Zapata, 2008). Just as OT can increase the amount of vocabulary a student can comprehend, it is able to provide students with a resource for producing unfamiliar vocabulary. Online Translation tools were found to increase both the quality and the quantity of writing in the foreign language, though the effects were not consistent across all levels of language proficiency (Fredholm, 2015; Garcia & Pena, 2011). As language learners continue to study a foreign language, they continue to acquire vocabulary, increasing the variety and depth of topics they are able to discuss. Consequently, research has shown that composition length is roughly inversely related to language proficiency; at beginner levels, OT provides a large amount of vocabulary support, which tapers off as the learner commits more vocabulary to memory (Fredholm, 2015; Garcia & Pena, 2011). When using OT as a writing support at beginner levels, it is important that it only be used when necessary, so that students do not become dependent on the software as a way to acquire vocabulary. Despite the potential benefits of OT at a beginner level due to this trend in vocabulary identification, many researchers choose to study the use of OT with intermediate-level students, due to their higher amount of grammatical knowledge (Clifford et al., 2013; Fredholm, 2015; Prichard, 2008). The increased grammatical knowledge makes it much easier for teachers to explain differences in language structure, and also reduces the likelihood that students will become dependent on the use of OT. Regardless of the quantity of words produced, researchers agree that the use of OT technology has a positive impact on the quality of words produced (Fredholm, 2014; Garcia, 2010; Garcia & Pena, 2011). In addition to providing students with access to vocabulary, OT software also provides students with the proper spelling of a word. Although the imperfect nature of OT results in errors within the text,

research has shown that when students use OT, they make fewer errors in their writing, especially errors involving orthography and syntax (Fredholm, 2015; Kucis & Seljan, 2014). The one caveat to this benefit is that it is dependent on the user's ability to spell correctly in English. When provided with a misspelt English word, OT software is unable to properly translate it. Combined with the conclusion reached by many researchers (Clifford et al., 2013; Garcia, 2010; Groves & Mundt, 2015; Kucis & Seljan, 2014;) that OT technologies will continue to improve, gives OT an important place in the foreign language classroom. Notably, this increase in quality is independent of the use of OT strategies in some cases. Fredholm (2014) did not provide training or strategic instruction for students on Google Translate, and noticed that without information on how to use the technology, the subjects used it in ways that did not align with the strengths of the tool. Students used Google Translate for phrases more often than for individual words, and did not often engage in post-editing the output. Due to the students' lack of natural strategies in using Google Translate, and the increase in syntactic and verb-related errors, Fredholm concludes that the use of OT is best left to students who have a higher level of linguistic knowledge, as they would be more apt to catch errors in the output. While an advanced level of proficiency would be required to recognize errors in verb mood and tense, such errors can be avoided by careful planning and editing of the writing (Niño, 2009). When using OT software, the students' level of language proficiency is not a replacement for strategy instruction and use. The conclusion drawn by Garcia and Pena (2011) is opposed to Fredholm's (2015), that Online Translation "may be even more relevant to the beginner than to the advanced user" (Garcia & Pena, 2011, p.485). Because beginner level students have more gaps in their knowledge of a language, proper use of OT as a support will be far more of a benefit. In their study, students used the Tradukka interface for Google Translate, in order to provide students

with tools to verify their results. Tradukka is a custom interface built using the Google Translate API, which provides users with access to a bilingual dictionary, unit converter, and currency converter (Tradukka.com). Students engaged in both pre-editing and post-editing their translations, which resulted in a higher quality of text production. The amount of time spent editing resulted in text production taking a similar amount of time to students who did not use OT, but eliminated a significant amount of errors, and allowed the students a greater range of communication (Garcia & Pena, 2011).

Research on the Effects of Online Translation is Sparse, Especially at the Beginner Level

The majority of research on Online Translation has not occurred in a beginner's learning environment. In their study, Garcia and Pena (2011) discuss the high overlap in the research of classroom application of OT with research regarding translator training programs. Thankfully, several studies have since been published focusing on the use of OT in the classroom. However, due to the perception of translation requiring a significant level of mastery of a language (Clifford et al., 2013; Fredholm, 2015; Prichard, 2008), a majority of the research has been conducted at the intermediate or advanced level of language learning.

The majority of studies on the perceptions and attitudes about the use of OT have been focused on student belief. Interestingly, in Fredholm's studies (2014, 2015), he argues that not enough of the research focuses on student perceptions of online tools. While student perceptions of OT are important to discover, they must be paired with reliable data on the effectiveness of Online Translation. This sentiment is somewhat supported by Clifford et al. (2013), who mention that it can be difficult to obtain reliable data on student OT use by their professors, especially when OT use is so often against academic codes of conduct. In future studies it is

important that the teacher be well versed in the use of OT software, as well as ensure that participants feel they are free from academic consequences. In his review of the literature on student attitudes towards technology use, Fredholm (2014) argues against the belief held by many researchers that “Computers are often thought to automatically motivate pupils” (p. 92). Due to varying levels of pre-existing digital literacies, student personalities, and the types of activities, students have not expressed an overwhelming preference for exclusively digital tools. These findings are supported by Pena’s (2011) research on blending digital and traditional language tools and learning environments. In her study, she encouraged the use of the Tradukka interface for Google Translate, believing that it has a place in a beginner-level environment. At the time of the study, Tradukka was a noticeable improvement over Google Translate, due to the inclusion of a dictionary, which allowed students to verify translations. The students surveyed indicated that it was a useful support to comprehension and vocabulary, and best used in combination with other language learning resources, because the output is not always correct. Her findings report that “students found the online activities more useful (87.5%) than motivating (62.5%) and they found the face-to-face component slightly less useful (86.8%) than the online component (87.5%) but far more motivating (86.7%) than the online component (62.5%)” (p.61).

Although OT cannot be considered a motivator in itself, it has still been found to be a highly valued and commonly used tool for language learning. In the study conducted by Clifford et al. (2013), 88% of the respondents (Foreign language students at Duke University) answered that they used OT, with Google Translate being used by 81% of respondents. While Google Translate may be the de facto standard for use, future studies should endeavor to measure other forms of OT against it, in order to determine if any one product is superior. Jin and Deifell

(2013) also found that Google Translate was the second most popular online dictionary, despite the fact that its primary purpose is not to provide definitions. Google Translate now does provide definitions for single words, allowing it to truly fulfill both the role of a bilingual dictionary and a translator. The results from Clifford et al. (2013) also show that students primarily use Google Translate to help define unknown words and build vocabulary. While Google Translate is a useful application for defining unknown words, there is no research on whether or not it has any effect on long term vocabulary acquisition. Just as it is important to know how to best use OT software in short-term applications, further research must be undertaken to discover how best to use OT over a longer period of time. Niño's (2009) study found that 75% of her population believed that using translators was useful, and 80% of the population believed that the use of translators had improved their comprehension, critical awareness of the texts, and increased their focus when writing.

Perhaps unsurprisingly, teacher attitudes on OT do not mirror student belief and acceptance. In part, this may stem from its connection with the Grammar-Translation method of language learning, as described by Kelly and Bruen (2014) and its inability to consistently translate (Groves & Mundt, 2015; etc), but also from the idea that using OT is dishonest or plagiarism (Clifford et al., 2013). The use of OT is as dishonest as the use of any other tool when testing memory, but banning OT in favor of slower tools solely to combat plagiarism is only advantageous to the teacher. A determined student with a dictionary is equally capable of plagiarism, but at a slower pace. Among the foreign language faculty surveyed by Clifford et al., 42% believed that any use of OT by students was equivalent to cheating, with an additional 37% qualifying that the use of OT could be considered cheating depending on the type of assignment. While translating someone else's words is certainly plagiarism, using OT to aid in reading

comprehension is a similar process to using a dictionary. Despite 77% teacher disapproval, students continued to use OT in their coursework, leading the researchers to describe the use of OT as “pervasive” (Clifford et al., 2013, p. 116). It appears unlikely that students will cease using OT as a resource, especially with the continued growth and improvement of the text corpora and the tools themselves. White and Heidrich (2013) support these findings, continuing to state that “depriving students of real-world, electronic resources appears to stand directly in opposition from recommendations from the American Council on the Teaching of Foreign Languages” (p. 230). It appears unlikely that teachers’ perceptions of Google Translate and other OT tools will change, unless a significant body of research is developed showing the benefits of OT use for students. With more results, hopefully teachers will heed White and Heidrich’s call to change policies that outright ban the use of OT so that classrooms can accommodate the newest tools available to students.

As previously mentioned, there is a common belief among teachers and researchers that translation is more acceptable for intermediate and advanced level language learners (Clifford et al., 2013; Fredholm, 2015; Jin & Deifell, 2013; Niño, 2009; White & Heidrich, 2013). While using OT as an aid for reading comprehension is achievable at the beginner skill level, successfully producing text using a translator requires that the writer be able to notice errors produced by the software. Fredholm (2015) argues that “students need a certain level of grammatical competence in order to successfully use OT for writing” (para. 5). OT strategies for writing, such as pre and post-editing, rely on the user to have some degree of competence with a language, which means that more proficient students are able to better put these strategies into effect. This theory is supported by multiple researchers, due to their focus on intermediate and advanced level studies, and their beliefs that OT is best utilized when the language learner is

aware of grammatical differences between the native language and the target language (Alley, 2005; Niño, 2009; Zannetin, 2009). If OT is less useful for beginners, but still a useful tool, it should be incorporated into their language learning skillset. Research has also demonstrated that the more language a learner has acquired, the less of an impact using OT has on the learner's reading and writing (Garcia & Pena, 2011).

Based on the findings from the studies concerning OT use so far, the need for additional research at the beginner level is paramount. Based on the findings of many researchers, there is no reason to believe that the use of OT by students at all levels will do anything but increase (Clifford et al., 2013; Groves & Mundt, 2015; Jin & Deifell, 2013; Stapleton, 2005). As the technology grows and continues to improve to meet the needs of its users, students will find more reasons to use it. Given the current state of OT, students already find it helpful enough to break class contracts and academic codes of conduct (Clifford et al, 2013). For obvious reasons, OT websites do not advertise their current inconsistencies and shortcomings, which can lead beginner language learners to accept the output as a credible translation. As seen in Fredholm's (2015) study on OT use, without explicit instruction in how to use OT, even advanced students will accept poor quality translations. Running studies at the intermediate and advanced level still provides useful and important results in determining the effectiveness of OT as a resource, but providing beginners the necessary tools to support their language comprehension and growth is largely unexplored, and could lead to greater gains in comprehension and language production. The conclusions drawn by Garcia and Pena (2011) are most compelling in this area, stating that the use of OT in producing text held the greatest potential when the learners knew the least. Because OT excels in giving the user access to a large amount of vocabulary with limited time spent away from interacting with the text, it stands to reason that students with the least amount

of vocabulary would stand to gain the most. Jin and Deifell (2013) encourage beginner foreign language learners to use OT as a way to develop vocabulary, with the caution that they should not become dependent on OT nor fail to critically examine the results. They recommend the user be thoughtful and cautious, and stress the importance for teachers and students alike to critically examine the usefulness of OT. Alley's (2005) methods of OT use also focus on the importance of introducing beginners to the benefits of OT and the strategies required to utilize those benefits. By introducing beginners to some of intricacies of a foreign language, learners become conscious of how languages differ. This realization is the first step of the metacognitive strategies required to maximize the effectiveness of translation. It also provides teachers an avenue for building cultural awareness, and exploring how different cultures reflected in their evolutions of language. Karnal and Pereira (2015) close their study with the conclusion that the use of OT as a valid strategy, stating:

The contribution of this research points out to the use of Google translator as a support strategy which can be beneficial when other strategies are at stake. Altogether they can promote and accelerate comprehension by readers at different levels of knowledge. Thus, both intermediate and basic level students could master an advanced student comprehension if they read strategically. (p.78)

Conclusion

Given that Online Translation is a relatively recent addition to the large list of technologies available to the language learner, it is still a somewhat unexplored topic.

Furthermore, due to poor teacher and professional opinions of OT tools, its negative reputation also serves as a possible deterrent to its study in the field. Despite all this, the research that has

been completed points to a need for deeper and broader study of the effects of OT on student comprehension, writing, and learning. There is also a stated need by researchers for educators to overcome biases toward the use of OT and develop the skills necessary to instruct their students how to best use the technology in their reading and writing. As Fredholm (2015) and White and Heidrich (2013) mention, without explicit instruction in the best practices, students often make incorrect assumptions about the capabilities of OT tools, and accept any output as valid. In order to make the best use of OT, students need to employ several strategies. So far, the strategy deemed most important by the research is using metacognition and critical awareness to monitor the use of the translator and detect errors in output (Alley, 2005; Niño, 2009; Pritchard, 2008; Zanettin, 2009). In order for this strategy to be effectively implemented, teachers must demonstrate the uses of the software to their students, so that the students are aware that OT is not a perfect product. Simply knowing that the output is fallible, and knowing what causes the output to be fallible has been enough to improve the quality of text production by foreign language students in numerous studies (Garcia, 2010; Garcia & Pena, 2011; Jin & Deifell, 2013; Niño, 2009; Zanettin, 2009). Armed with this knowledge, students are then prepared to add additional strategies to their repertoires. When strategies such as pre-editing, post-editing, and selective use are also employed, students have been shown to improve their reading comprehension and writing (Garcia, 2010; Garcia & Pena, 2011; Niño, 2009). Although OT can provide a large benefit to students, it is important that students only use OT when they require the support. When used selectively, OT also has the potential to provide the user with access to more vocabulary in a quicker time frame than other reference tools (Pritchard, 2008). It is important for teachers to also be proficient in the use of OT software, so that they may aid their students in selecting appropriate combinations of strategies for different tasks. While successful

strategy use does increase the time spent using resources, it also allows students to spend more of their mental faculties interpreting the text, rather than searching for the definitions of individual words (Jin & Deifell, 2013; Pritchard, 2008).

According to both constructivist (Peters et al., 2011) and sociocultural theorists (Lantolf & Thorne, 2006; Jin & Deifell, 2013), allowing students the use of a tool that permits them to direct their language acquisition is an important step in second language learning. It is also important to note that access to vocabulary is most helpful at beginner levels of language learning. In spite of this, the majority of research on the effects of OT on comprehension and text production has been done at an intermediate or advanced level of language learning. Both researchers who have studied the use of translators at the beginner level (Garcia & Pena, 2011; Pena 2011) and researchers who focused on higher levels of use (Jin & Deifell, 2013; Niño, 2009; Pritchard, 2008) have concluded that the use of OT offers the beginner benefits in reading and writing. By using OT as a support for reading comprehension, beginners are able to process higher level text and explore more of the structure and subtleties of the language. When using OT as a support for writing, students are able to both communicate more and communicate more effectively. Either by using OT as a way to ensure proper text production by translating it back into English, or by using it as a dictionary replacement, students are able to write with fewer errors and about a wider variety of topics.

Despite Fredholm's (2014, 2015) belief that more research is required on what students believe the benefits of OT and other online tools are, studies from Clifford et al. (2008), Jin and Deifell (2013), and Niño (2009) show the widespread use and acceptance of OT by university students. It certainly appears that Online Translation programs are here to stay, and continue to improve in order to provide a more useful product. In addition, findings from Clifford et al.

(2008) show that even among students who are forbidden from using OT, an overwhelming majority choose to risk its use. The next step in research is to conduct additional studies at beginner levels of use, and also to conduct long-term studies that focus on whether or not OT use simply aids in comprehension in production, or if it actually an aid to language learning and acquisition. Provided that future research continues to draw the same conclusions as current studies, access to a larger, cohesive body of literature supporting the use of OT in the classroom is needed to effect changes in the widespread policies prohibiting the use of OT in academics. It is the responsibility of the research community to bring about this change, and provide students access to the tools that will enable their success as language learners.

Method

Research for this study took place at a middle school, located in one of the suburbs of a city in Western NY. According to the 2010 census, this town's population is 36,242. The majority of the population of is White (90.8%). The next highest racial population is Asian, at 3.1% of the population, followed by Hispanics and African Americans at 2.5% and 2.1%. 1.3% of the population is classified as multiracial, while 0.08% identifies as "Other single race" (2014 census). For population 25 years and older, 91.3% have graduated high school, and 46.2% have a Bachelor's degree. Just under 20% of this population have a graduate or professional degree and 3.2% of this population is unemployed (total unemployed percentage is 4.4%).

At the time of this study, this specific middle school had a total enrollment of 1,100 students in grades 6 through 8. Of these students, 52% were male, and 48% were female. The majority of the student population was white (84.5%), with Hispanic / Latino students comprising 6% of the student body, and Asian students 4%. African American students made up

3.7% of the population and the remaining 1.8% was coded as multiracial. There were eight students labeled as Limited English Proficient and 84 students with disabilities. Thirteen percent of the student body was considered economically disadvantaged, and eight and four percent of the students were eligible for free and reduced lunch, respectively. The school had an attendance rate of 97% in the previous school year and 8 suspensions over the course of the same year.

Approximately 365 students were in 6th grade, 374 were in 7th grade, and 358 were in 8th grade, with two students belonging to ungraded elementary grades and two students belonging to ungraded secondary grades.

The participants of this study were all in the same 7th grade Spanish class. There were 19 students in the class, nine male, and 10 female. One student was Middle Eastern, one student was African-American, one student was Hispanic, and one was Multiracial (African-American and White). The remaining 15 students were all White. None of the students were eligible for free or reduced lunch, and none of the students had an IEP or Section 504 plan. Four of the students, three male and one female, received RtI interventions for reading support, 11 students, four male and seven female, received RtI interventions for mathematics support. Thirteen of the students received parental permission to be included in this study. In order to protect participant confidentiality, all participants will be referred to by pseudonyms.

Participants

Arthur is African-American, and 12 years old. He lives at home with both of his parents, and two older siblings. Arthur is physically active and enjoying playing sports such as football and wrestling. He is intelligent and quick-witted, but struggles in Spanish due to his poor ability

to spell in both English and Spanish. He is not formally diagnosed, but often states that he may be “dyslexic like his mother is.” Despite his difficulty spelling, he has a very positive attitude, and works diligently the majority of the time. He notably mentioned that he uses Google Translate very often at home to help him complete his homework, and that he was excited to use it in class.

Cynthia is 12 years old, white, and lives with both of her parents, and her three year old little brother. She is athletic and intelligent, though not as studious as some of her peers. She is very rarely afraid to say exactly what she means, even if it means getting in trouble. She enjoys the creative portions of Spanish class, especially the freedom to choose in which way she creates her projects, often requesting to take a different approach to presenting information.

Gina is 13, white, and lives with her mother, father, and younger sister. She has a tendency to become distracted, but always makes sure she asks clarifying questions when she doesn't understand something. Spanish does not come incredibly easy to her, but she works very diligently to make sure she succeeds.

Helen will be 13 years old by the time the study concludes. She is white, and lives with her mother, father, and older sister. She is very talkative and social. She is intelligent, but doesn't focus as much on her work as she does striking up conversations with her peers. That being said, she always happily complies with directives to focus on her work and to wait until class is over to continue engaging in off-topic conversations. She is intelligent, but has struggles more and more with Spanish as the year has progressed into more difficult grammatical constructions.

Issac is 13, and lives with his mother, father, and older brother, who attends a local private school. He is also very athletic and good friends with both Edward and Helen. He has a

very positive attitude towards Spanish, and takes mistakes and corrections in stride. He works hard to keep his grades in the nineties, and ensures that he studies before upcoming tests without fail.

Jane is 12, and lives with her mother, father, and is the oldest sibling of six. She is very quiet, creative, and a talented artist. She is very good friends with Danielle, and the two often pair up to complete creative projects, which are of outstanding artistic and grammatical quality. Spanish comes very naturally to her, but she is reluctant to show off her prowess in front of the class.

Kelly is 13 and lives with her mother, father, and younger brother. She is quiet as well as good friends with Helen. She does not often participate unless she is fully certain that she knows that her answers are correct. She has difficulty with the more advanced concepts in Spanish, but tries her best to understand her mistakes and not to repeat them.

Mary is 13 and lives with her mother, father, and two older sisters, who are twins. She is very soft-spoken and intelligent. Spanish comes very naturally to her and she often participates in class. She is very competitive, and often becomes more vocal and animated during review games.

Natalie is 13 and lives with her mother, father, and her two brothers. Spanish is a difficult subject for her. As a result she is happy to pass, and doesn't feel the need to come in for extra help unless it is mandated by the teacher. She enjoys working alone, and despite her troubles with vocabulary and grammar, her spoken accent is among the best in the class.

Owen is 12 and lives with his mother. His father lives in a neighboring suburb. He is intelligent, but constantly attempts to put the smallest amount of effort required for a 90 or above into his work. He attempts to rush through his work as quickly as possible, and rarely goes back

to check for errors. In the rare cases where he does not remember something, he is more prone to leaving it unanswered instead of attempting to guess or decipher the material.

Patrick is 13 and lives with his mother, sister, stepfather, stepbrother and stepsister. He is constantly in a good mood, and attempts to be friendly towards all of his classmates. He is of average intelligence and often speaks before thinking. He isn't very patient, and when he feels that he needs to say something or when he has a question will repeatedly ask the teacher to call on him instead of waiting.

Quinn is 13 and lives with her mother, father, and older sister. She is intelligent and very determined to succeed. On occasions where she does not understand, she will always advocate for herself. She is very good friends with Gina, and often partners with her during activities and helps her. She participates often and is very competitive during class games.

Richard is 13, multiracial (African American and White) and lives with his father, mother, and younger sister. He has a very negative attitude towards school. He often expresses his lack of interest in Spanish and is resistant to any explanation of "why we can't we all just speak English?" He is very disorganized, has trouble focusing on his classwork, and often engages in disruptive behavior. His primary motivating factor is that if he doesn't keep his grades up in Spanish, his mother takes away his access to his cell phone and his video games.

He listens well, even while partially distracted, but doesn't have a good way to transfer what he hears into long-term memory, and often doesn't write things down for future reference. He often absent mindedly shreds paper, which includes his vocabulary lists (often replaced at least once per unit).

Researcher Stance

I am currently a graduate student at St. John Fisher College working towards a Master's of Science in Literacy Education from grades six to twelve. I also have a Bachelor's degree in Spanish, and am certified to teach Spanish and French from grades seven through twelve. I took the role of an active participant observer for this study, actively teaching strategies, making observations, and assessing the students' work (Mills, 2014). While I have ensured the participants that they will suffer no academic consequences for the use of Google Translate nor their honesty, because I am responsible for their grades in this class, they may have been afraid to be completely honest. In addition, because I was acting as the instructor and the observer, there may have been events that occurred that I did not observe, causing my data to be less complete.

Methods

For this study, I have collected both qualitative and quantitative data to assess the impact of student use of Google Translate when writing in Spanish. I provided students with instruction on the capabilities of the program and how to minimize the potential of errors in the output. Following this instruction, I collected two in-class writing assignments where students have used Google Translate, which have been compared to previous writings composed by the students. I also made observations and took notes during in-class assignments, focusing on how often students use Google Translate, and for what purposes (single words, phrases, nouns, verbs, adjectives, other parts of speech). Finally, I concluded the study with a student questionnaire designed to discover students' beliefs, opinions, and perceptions of the use of Google Translate in class.

The first phase of data collection was an in class lesson coupled with observations. The lesson began by informally collecting and recording students' beliefs on the effectiveness and appropriateness of using Online Translators in and out of class. Students also discussed the qualities and features of Google Translate, as shown in Appendix A. Following this exploration, I provided the students with a reference sheet and a short information session on Google Translate, and how to maximize success when using it. This explanation included examples of both successful and unsuccessful use.

The second phase of data collection consisted of two in class writing assignments accompanied by teacher observations during class periods. After providing students with instruction on strategies for the successful use of Google Translate, they completed two in class writing assignments while using Google Translate as a support (Appendix B). During the first assignment, students used Google Translate as a tool to help them discover and use new vocabulary by translating from English into Spanish. During the second writing assignment, students used Google Translate as a way to discover errors in their own writing, by using it to translate a Spanish text they had written into English. For both writing assignments, students were required to write a minimum of thirty words (standard composition length for Spanish I). Errors were analyzed for quantity and for type (incorrect word, noun-adjective agreement, spelling, verb tense or mood.).

The third and final phase of data collection consisted of a questionnaire given to the students at the conclusion of the study (Appendix C). Students described their opinions and usage patterns on a Likert scale. In addition, there were open-ended questions designed to elicit additional information about student beliefs as well as opportunities for reflection on their

strategy use while using Google Translate. These data points will be contrasted with and used to frame data gathered from student work and teacher observations.

Ensuring Quality & Credibility in Research

As a researcher, it is imperative that at all points of the research process that I ensure the study is both credible and of high quality. In order to ensure the quality and credibility of a study, Mills (2011) uses Guba's (1981) work in his explanation of the components of quality research. Each of the four components of credibility, transferability, dependability, and confirmability have been addressed in this study, in order to ensure that the research taking place is trustworthy (Mills, 2011).

Mills (2011) writes that credibility is "the researcher's ability to take into account the complexities that present themselves in a study and to deal with patterns that are not easily explained" (p. 104). Researchers must be aware that their study takes place in a non-sterile environment where inconsistencies and errors may occur. Researchers also must be able to explain data that may not conform to their expectations. In order to ensure that my study is credible, I have put into practice triangulation of data by comparing different sources of data against each other, in addition to highlighting their synergies. I have collected student work, primarily in the form of paragraphs written in Spanish, but also in the form of a questionnaire given to students.

In addition to being credible, Mills (2011), writes that studies must also be transferable. According to Mills' explanation, the researcher must not attempt to use the results of the study to develop a "truth" that can be generalized across all peoples, but that their results must be firmly situated within the context of the study. In order to ensure that my study is transferable, I

have followed the suggestions detailed by Mills and Guba (1981) and developed highly detailed explanations of the context and the participants of the study, which allows my data to be compared to data collected from other populations.

In order to ensure the trustworthiness of a study, it must also be dependable, which Mills (2011) defines as having stable data. To create a dependable study, I have collected as much data as possible within the time frame, and have overlapped my data collection methods, so that “the weakness of one is compensated by the strength of another” (Mills, p. 104). As an example, both the analysis of student work and the questionnaire measured the effectiveness of Google Translate, and both my questionnaire and my lesson observations were used to capture student perceptions.

As a final measure to establish trustworthiness, the data must be confirmable in addition to being dependable. Mills (2011) writes that confirmable data is both neutral and objective, free from the biases of the research. In order to prevent any skewing of the data, I have practiced triangulation in my study by using multiple methods of collections and sources of data to check my data against itself. Specifically, I have drawn qualitative data from my students via a questionnaire, from my own observations, and have compared and contrasted it with the quantitative data gathered from the analysis of student work.

Informed Consent and Protecting the Rights of Participants

In order to protect the rights of my participants, I have obtained assent from each participant, and permission from a parent or legal guardian, as all participants are under the age of 18. Each student received a letter of assent for him or herself, and a letter of permission for his or her parents. Each letter described the purpose and components of the study in age-

appropriate language, and that all names and identifying features would be anonymized to protect the confidentiality of the participants. In addition, each form also detailed that participation is a choice and not required by the teacher. Furthermore, that choosing to participate or not participate will have no effects, beneficial or adverse on the student's grades and treatment in class. Students and parents have been advised that there would be an additional opportunity at the conclusion of the study for students to request that their results not be included, should they wish. The forms were collected after signature, and stored in a secure location.

Data Collection

I have collected three different forms of data for this study, to ensure that data is well triangulated, in order to create a trustworthy study (Mills, 2011). The first form of data collected in this study was observational data and field notes from instruction. In order to ensure that I took the most accurate notes possible, in addition to any notes written during the class period, I made use of video recordings of the class to write supplemental field notes and make observations. During different class sessions, my observations focused on different areas. In my first lesson, where I discussed the use of Google Translate and the strategies required to make it an effective tool, my notes and observations were focused on students' pre-existing knowledge and beliefs about Google Translate, which were recorded on a SMART Notebook file in addition to the video. During class sessions where students wrote and used Google Translate as a support, observations and notes were focused on the frequency of use of Google Translate by students.

Secondly, I have collected student work as a source of data. During the study, students responded to two writing prompts, by composing paragraphs of 30 words or more in Spanish.

Students used Google Translate in a supporting capacity to supplement their writing,. These writings were analyzed both according to the writing rubric used in my classroom, and against previous writings composed by the students, comparing the amount and type of errors produced and the length of compositions.

Finally, I concluded the study with a short questionnaire designed to capture student beliefs and perceptions of how useful Google Translate is as a classroom support to writing. The questionnaire incorporated closed questions on a Likert scale to measure students' opinions on the effectiveness and frequency of use, and free response questions designed to elicit additional information. In addition, the questionnaire served as a student self-reflection of use of Google Translate, where participants assessed their own usage of Google Translate during the study, and whether or not they used the strategies given to them at the onset of the study.

Data Analysis

In order to protect participant confidentiality, all student work and questionnaire data was entered into MS Word and MS Excel under students' pseudonyms, which were stored on an encrypted hard drive. Original copies of student materials are kept in a secure location. In the MS Excel document, I entered the data from the Likert Scale questions from the questionnaire. I then created an additional chart where the letter based ratings were converted into numerical ratings, so I could look at the mean and mode responses to the questions.

I then typed up the all the student writing samples into separate MS Word documents. I then went over each piece of writing, marking errors in orthography, syntax, and semantics. Errors were also designated as critical or minor, based on if they changed the meaning of the word or sentence. Additionally, in the pieces composed with the use of Google Translate, I

marked how many words had been obviously translated. After coding all of errors in the compositions written during the study, I coded writing pieces from a previous assessment to use as a basis for comparison. I then entered each student's errors as a row in a new table in Excel.

Finally, I took a copy of my observation notes, and grouped observations together into like groups. From these groupings and the questionnaire data, I discovered consistent themes across the research. I tracked these grouping by using color coded background cells in Excel, which corresponded to the colors with which I annotated my observations when categorizing them by theme.

Findings and Discussion

The data consisted of observations and field notes, student writing samples, and student questionnaire answers. Before discussing the findings from the observations and questionnaires, I will report the findings from an error analysis of the student compositions, which will be used to support the themes found in the qualitative data. Each student's writings will be looked at individually, followed by a discussion of the general trends found in the class. In order to provide a baseline for analysis, a writing sample from a recent assessment was also coded for each student, along with writing samples collected during the study. Each table will feature the amount and rate of errors produced in each writing, as well categorizing the errors by type (orthographic, syntactic, semantic). Observational data from the first session indicated that students were largely not using Google Translate strategically, which prompted a change during the second session, where students were required to use Google Translate as a post-editor before submitting work.

Arthur did not submit a second writing sample during the study, leaving only two data points. Because Arthur did not submit a sample during the second session, this data can be used to look at the use of Google Translate in the classroom, but will not be considered when analyzing the use of post-editing as a strategy. The error analysis of Arthur's writings is shown in Table 1.

Table 1

Basic Error Analysis – Arthur

Sample ID	Total Errors	Percent Error	Error Breakdown by Type		
			Orthographic	Syntactic	Semantic
Baseline	18	44%	61%	11%	28%
Sample 1	20	50%	45%	10%	45%

Arthur's previous assessment data had a 44% frequency of error, the majority of which were orthographic. This concentration of error appears to be largely in part due to his trouble identifying correct letter-sound relationships, especially when dealing with Spanish vowels that correspond to different English vowels. When using Google Translate, Arthur had more errors and a higher frequency of error, indicating that using Google Translate did not help him write more or more accurately, per Garcia and Pena's hypothesis (2011). While the amount of syntactic errors remained consistent, the increase in semantic errors and minimal reduction in orthographic errors point to a lack of editing strategies used during translation. This increase could be the result of being unaware of the proper use of the program or an overestimate of the student's own writing. Arthur's results emphasize the importance of strategic use, especially

ensuring that the student is aware of both the structure of the language and the capabilities of the program (Alley, 2005).

Cynthia's results were equally surprising. When using Google Translate, Cynthia's error production rose drastically. Table 2 shows the error analysis from her compositions.

Table 2

Error Analysis – Cynthia

Sample ID	Total Errors	Percent Error	Error Breakdown by Type		
			Orthographic	Syntactic	Semantic
Baseline	9	17%	44%	0%	56%
Sample 1	18	40%	44%	22%	33%
Sample 2	15	25%	60%	20%	20%

In Cynthia's writing prior to the study, she made among the fewest errors of all the students, and her errors were spread over a longer composition, resulting in a 17% error frequency, the second-lowest in the class for this sample. During the first writing session using Google Translate, Cynthia doubled the amount of errors, without increasing the length of her composition, increasing her frequency of errors to 40%, the second-highest in the class for this sample. While the frequency of her orthographic errors remained constant, she committed twice as many, in addition to committing errors in syntax where she had previously had none. Her rate of semantic errors also decreased, but the total number of semantic errors grew. This change is likely due to her use of Google Translate; during my observations, I noticed that she was not checking her work and only using the translator to add additional vocabulary into partially

complete sentences (Observations, June 17). In order to ensure that translation results in as few errors as possible, the output of Google Translate must be critically examined, and not simply accepted as accurate (Fredholm, 2015; Niño, 2009; Pritchard, 2008). During the second writing session, when using Google Translate as a post-editor, as recommended by Alley (2005), Niño (2009), and Garcia (2010), Cynthia's total and frequency of errors fell from the previous sample, but were still far greater than her initial writing. She continued to make increased errors in orthography, but her errors in syntax and semantics fell.

Gina's compositions were all similar in length, providing an easily interpretable set of results. Gina's questionnaire results indicate a high level of confidence in her ability to use Google Translate (Questionnaire, June 17), which is reflected in the results from her error analysis. The error analysis of Gina's writing samples is given in Table 3.

Table 3

Error Analysis – Gina

Sample ID	Total Errors	Percent Error	Error Breakdown by Type		
			Orthographic	Syntactic	Semantic
Baseline	9	25%	33%	33%	33%
Sample 1	4	13%	50%	0%	50%
Sample 2	6	17%	50%	0%	50%

Gina's initial composition had the same number of errors as Cynthia's, but occurred over a much smaller text, and contained an equal amount of errors across all three categories. During the first writing session, Gina made roughly half as many errors, evenly split across orthography

and semantics. While the percentages increased for these two categories, the raw total of errors in each category was reduced. Similar results were found by other researchers that indicate using translators results in fewer errors, especially in orthography and syntax (Fredholm, 2015; Kucis & Seljan, 2014). During the second session, Gina made more errors, but still fewer than in her initial composition. The reduction of syntactic errors is likely related to the use of Google Translate as an editor instead of as a tool for vocabulary extension. Because beginner level students are less familiar with the structural differences between languages, using Google Translate provides students with a way to bridge these differences when using full sentence translation (Garcia & Pena, 2011).

Each of Helen's writing samples varied in length and in which type of error was most prominent. Helen's first writing sample was notable for featuring an obvious use of Google Translate in each sentence, leading me to believe that her use of Google Translate primarily consisted of vocabulary discovery (Student Work Samples, June 15). Helen's error analysis results can be found in Table 4.

Table 4

Error Analysis – Helen

Sample ID	Total Errors	Percent Error	Error Breakdown by Type		
			Orthographic	Syntactic	Semantic
Baseline	11	34%	45%	0%	55%
Sample 1	11	19%	18%	18%	64%
Sample 2	6	21%	50%	17%	33%

In Helen's initial writing, her errors were split nearly evenly between mistakes in orthography and slight errors in semantics. The absence of errors in syntax during unaided writing reflects a solid understanding of the structure of language, but a need for improvement in other areas of difference, such as the gendering of nouns, which comprised the bulk of her semantic errors. In her first writing sample during the study, Helen made the same number of errors, but in a passage almost twice as long, resulting in her error frequency nearly being cut in half. Using Google Translate appears to have aided her ability to spell words correctly in the target language, but using it simply as a vocabulary extender did not have an effect on other areas of writing. The sharp decrease in the rate of orthographic errors combined with the increase of semantic errors could represent a large amount of text being translated without being edited by the student. In his research, Pritchard (2008) cautions against relying too heavily on translators, especially at low levels of language proficiency. When using Google Translate strategically as a post-editor, Helen's overall number of errors fell, and saw a large reduction in semantic errors. One possible explanation for this is that errors in meaning were caught by the editing process, and that during editing, Helen used her knowledge of the construction of Spanish to edit translator output as well as edit her own writing. Being able to monitor translator output is a crucial skill in successful translator use, allowing students to identify incorrect translations (Alley, 2005; Niño, 2009; Zanettin, 2009).

Issac's first writing sample was roughly the same length as his baseline composition, allowing for an easy comparison of errors made. On his questionnaire, Issac indicated that he didn't believe he had been able to correctly use Google Translate, nor did he believe that it greatly improved his writing (Questionnaire, June 17). The results of Issac's error analysis are

displayed in Table 5, which show that Google Translate was able to improve some portions of his writing.

Table 5

Error Analysis – Issac

Sample ID	Total Errors	Percent Error	Error Breakdown by Type		
			Orthographic	Syntactic	Semantic
Baseline	18	36%	28%	33%	39%
Sample 1	6	11%	67%	0%	33%
Sample 2	10	28%	80%	20%	0%

In his baseline assessment writing, Issac had one of the highest totals and frequencies of error, spread fairly evenly across all three categories. When using Google Translate, Issac had more success using Google Translate to search for new words than using it as a post-editor. The reduced frequency of errors and elimination of syntactic errors could be due to translating phrases as well as individual words, in order to ensure that they are placed in their proper context. However, the lack of improvement in spelling throughout the composition also may be due to only using the translator as a method of obtaining new vocabulary. While Google Translate is a useful tool for exploring additional vocabulary, it is equally important to use it to check the accuracy of the student's own writing, especially at the beginner skill level (Jin & Deifell, 2013; Garcia, 2010). Half of Issac's orthographic errors in his second sample were divergent enough from a recognizable word that they would not be translated by the program. It is possible that Issac only used Google Translate to check the accuracy of words that he had

previously translated or only if he felt uncertain about a word. While Issac's writing during the second session was still improved from the first overall, the spike in orthographic errors and error frequency show that despite the benefits of post-editing as a strategy (Alley, 2005; Garcia & Pena, 2011; Niño, 2009), it is not universally the most beneficial for all students.

Jane did not submit a writing sample during the first writing session of the study, leaving fewer data points to analyze. Jane's compositions were also some of the longest in class, writing more than double the required word count for her unaided baseline assessment. Her error analysis can be found in Table 6.

Table 6

Error Analysis – Jane

Sample ID	Total Errors	Percent Error	Error Breakdown by Type		
			Orthographic	Syntactic	Semantic
Baseline	3	4%	0%	100%	0%
Sample 1	-	-	-	-	-
Sample 2	7	14%	43%	0%	57%

Jane's initial writing was an outlier amongst the class, having only a 4% error ratio, much lower than the next lowest value of 17%. She was also the only student in the class to commit no errors in semantics and one of two students who had no spelling mistakes in the baseline writing. While Jane did not submit a writing sample for the first session, her sample from the second session was very much the opposite of her initial writing. While the use of Google Translate eliminated errors in syntax, using it as a post-editor was seemingly less effective in eliminating

errors of meaning and spelling. The increase in errors could be the result of reliance on the translator without applying pre-existing knowledge of Spanish to the output. In order to ensure quality translations, students must maintain a critical awareness of the translator output and adjust it as needed (Alley, 2005; Pritchard, 2008; Zanettin, 2009).

Each successive writing sample from Kelly decreased in length, even when using Google Translate to supplement her vocabulary. The reduced length resulted in her second sample being slightly under the required word count. The error analysis of Kelly's writings can be found in Table 7.

Table 7

Error Analysis – Kelly

Sample ID	Total Errors	Percent Error	Error Breakdown by Type		
			Orthographic	Syntactic	Semantic
Baseline	13	30%	31%	23%	46%
Sample 1	11	32%	36%	9%	55%
Sample 2	6	25%	50%	17%	33%

Kelly's results in her initial writing show little improvement with the addition of Google Translate. When initially using the translator, she reduced her number of syntax errors, but made the same number of errors in other categories. When employing Google Translate as a post-editor, her total number of errors and frequency of error production fell sharply, even though no types of error were completely eliminated. This reduction of error may be due to using Google Translate to translate her completed text into English as an additional check. By taking the

completed text and translating it back into the user's native language, beginner level students will be able to more easily detect errors by working in a more familiar language (Alley,2005).

Because Mary made improvements in different areas of her writing in both writing samples, increases in error types in her second writing sample do not necessarily reflect an increase in that type of error, but a decrease in a different category. Mary's questionnaire data indicated that she did not believe that using Google Translate would greatly improve her writing (Questionnaire, June 17). Her opinion is likely due to her high level of success in Spanish throughout the year, and may also be affected by the inconsistencies produced by the program. The details of Mary's error analysis can be found in Table 8.

Table 8

Error Analysis – Mary

Sample ID	Total Errors	Percent Error	Error Breakdown by Type		
			Orthographic	Syntactic	Semantic
Baseline	9	20%	22%	44%	33%
Sample 1	11	16%	36%	18%	45%
Sample 2	8	24%	50%	25%	25%

During the writing from the prior assessment, Mary's largest groups of error involved syntax and semantics. Mary's frequency of error fell during her first writing sample, along with her syntactic errors, but made more spelling mistakes and errors in meaning. The reduced frequency is also indicative that she was able write a longer composition during the first writing sample, likely due to having access to more vocabulary available. Beginner level students are

able to benefit greatly from having a wide array of additional vocabulary at hand, which can help them write longer passages (Garcia & Pena, 2011). Google Translate helps beginner level students explore a wider range of vocabulary, increasing the potential length of compositions. In Mary's second writing sample, her total number of errors slightly decreases, but due to the reduced length of her writing, her rate of error increases past her baseline. Orthography continues to be a larger percentage of her errors, but using Google Translate as a post-editor appears to have somewhat reduced the frequency of semantic errors in her writing. The success of post-editing for beginner level students has been documented by both Alley (2005) and Garcia and Pena (2011), however the increase in her frequency of orthographic errors is concordant with Fredholm's (2015) findings that beginner students are often not linguistically knowledgeable enough to make the most use of the tool.

The findings from Natalie's error analysis can be found in Table 9. During Natalie's first writing sample, she wrote over 100 words, as compared to her baseline and second sample, both of which were under 50 words each. Despite improving in certain areas of writing, Natalie was also the only student to increase her error frequency with each successive composition.

Table 9

Error Analysis – Natalie

Sample ID	Total Errors	Percent Error	Error Breakdown by Type		
			Orthographic	Syntactic	Semantic
Baseline	15	28%	33%	33%	33%
Sample 1	27	31%	63%	11%	26%

Sample 2	11	34%	73%	18%	9%
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Natalie's errors were initially evenly split across all three categories, with a much lower frequency than many of her classmates, despite having one of the highest error counts. Natalie often writes very long compositions, and does not let mistakes stop her from attempting to communicate. During the first writing session, she used Google Translate to translate one word at a time, which led to an increase in the amount of semantic errors. Despite the large amount of translated text, Natalie's rate of orthographic errors nearly doubled, at odds with Fredholm's (2015) assertion that using an Online Translator was responsible primarily for reducing orthographic errors. The use of a post-editor helped reduce the number of errors somewhat, though her frequency of error production continued to increase. Additionally, the post-editing process may be responsible for the reduction in semantic errors. Because beginner level students are more proficient in their native language, they are more apt to catch differences in meaning when their text has been translated into their native language as part of the editing process (Alley, 2005).

Owen's baseline contained the highest rate of error across the class, which is not reflective of his observed abilities in Spanish. His poor performance may be due to external factors, and based on his performance on other assessments, I have concentrated his analysis on the difference between his first and second writing samples. Owen's Error Analysis can be found in Table 10.

Table 10

Error Analysis – Owen

Sample ID	Total Errors	Percent Error	Error Breakdown by Type		
			Orthographic	Syntactic	Semantic
Baseline	19	59%	32%	32%	36%
Sample 1	8	20%	25%	0%	75%
Sample 2	7	22%	72%	14%	14%

Owen's initial composition was the outlier opposite Jane's writing, with 59% of his words containing errors. The spike in Semantic errors in his first writing sample from the study is attributed to the elimination of syntactic errors and the large reduction in number (though not in percent) of orthographic errors in his writing. Owen's first writing sample is in line with findings from Kucis & Seljan (2014), as the use of an online translator mirrored a reduction in syntactic and orthographic errors. His second writing remains at a similar error frequency, but when using the translator primarily as a post-editor, Owen's reduction of spelling mistakes was replaced by a reduction in semantic errors. The swap in error majority could be caused by Google Translate attempting to be helpful and ignore minor spelling mistakes or could be the result of only post-editing text that had been previously translated, instead of the entire composition. While it is important that students not become overly reliant or trusting on Google Translate due to its inconsistent output (Fredholm, 2015; Niño, 2009; Pritchard, 2008), because beginner level students are still developing their knowledge of a second language, it is also important for them to use the translator as a check on their own writing (Alley, 2005).

Patrick's questionnaire data indicated that he followed few of the strategies given during the lesson, only using Google Translate as an editor when mandated to (Questionnaire, June 17).

Additionally, Patrick was observed as having not paid attention during the strategy lesson, possibly leading to a less strategic use during the first session. The findings from analyzing Patrick's writing samples can be found in Table 11.

Table 11

Error Analysis – Patrick

Sample ID	Total Errors	Percent Error	Error Breakdown by Type		
			Orthographic	Syntactic	Semantic
Baseline	12	31%	67%	25%	8%
Sample 1	15	27%	67%	6%	27%
Sample 2	7	21%	57%	43%	0%

Patrick's baseline data shows that despite having one of the highest frequencies of misspellings, he has a firm grasp on portions of the language that give his peers difficulty, such as noun-adjective and subject-verb agreement. When using Google Translate during the first writing session, Patrick did not appear to use that knowledge to modify the adjectives he translated. Instead, he accepted them in the form given by Google Translate, increasing his semantic errors roughly threefold. The shift from syntactic to semantic errors may be due to not correcting translator output. Without carefully examining the output, adding in translation to student writing often results in an increased frequency of error (Khanna, 2011; Fredholm 2015). During the second session, Patrick's error frequency continued to decrease, and by using the translator as an editor, completely removed semantic errors from his writing. The editing process did not appear to aid in reducing orthographic or syntactic errors, potentially due to

Patrick not checking his own writing and only proofing the translated portions of his text. While it is important to examine translator output (Alley, 2005; Niño, 2009), beginner level students also benefit from using the translator to check their own writing.

Quinn's questionnaire data indicated that while she found the strategy lesson helpful, she did not believe that she had applied the strategies well to her writing (Questionnaire, June 17). This belief is partially reflected in her results, but the reduction of her overall error frequency shows that she was successful in spite of the difficulty she had. The results of the error analysis of Quinn's writing can be found in Table 12.

Table 12

Error Analysis – Quinn

Sample ID	Total Errors	Percent Error	Error Breakdown by Type		
			Orthographic	Syntactic	Semantic
Baseline	10	18%	50%	0%	50%
Sample 1	5	10%	60%	0%	40%
Sample 2	6	14%	17%	17%	66%

Quinn's initial writing also had one of the smallest frequencies of error, and was one of the only students who made no syntactic errors in their baseline writing. When using Google Translate during the first session, Quinn was able to reduce her total amount and frequency of errors, in addition to using Google Translate carefully enough not to introduce any errors in syntax. Quinn was very attentive during the strategy lesson (Observations, June 15), which is likely responsible for her lower error production in text. By being aware of the limitations of

Google Translate, Quinn likely relied on it less during the writing process (Niño, 2009). During the second writing sample, Quinn's errors and frequency were still improved from her baseline composition, but slightly increased from her first writing sample. The sharp increase in semantic errors appears to be due to looking up portions of more complicated verb structures and combining them according to English structure (Student writing sample, June 16). The decrease in her orthography errors, combined with the majority of errors shifting to areas of the language that the student is unfamiliar with is congruent with Fredholm's (2015) findings that students without a high enough level of language competency will be unable to detect errors in translated output.

Richard's data is largely incomplete, as he did not turn in a sample during the first writing session and his sample from the second writing session was under the required word count, and not post-edited. The results from the error analysis of Richard's compositions are laid out in Table 13.

Table 13

Error Analysis – Richard

Sample ID	Total Errors	Percent Error	Error Breakdown by Type		
			Orthography	Syntactic	Semantic
Baseline	9	35%	0%	33%	67%
Sample 1	-	-	-	-	-
Sample 2	1	6%	0%	0%	100%

In his baseline writing, Richard was able to spell everything correctly, but did not choose words with the correct meanings and had issues with noun-adjective agreement in his writing. During the second writing session, Richard wrote only two sentences, both of which he typed into Google Translate in English, and did not check for accurate translations (Teacher Observations, June 17). His only error was in the opening of his writing, where he did not change the agreement of an adjective looked up in the translator when matching it to a proper noun. While his sample was incomplete, Richard wholly relied on the translator to compose his writing. Dependence on a translator should be avoided, as it often impedes the student applying their own knowledge to the writing process (Pritchard, 2008).

In order to observe larger trends in the data, the mean was calculated for each category. During the second session, students were required to use the translator to edit their compositions before submitting them to the teacher, which is likely responsible for some of the variation between the two samples. The mean values of the students' error analyses can be viewed in Table 14.

Table 14

Error Analysis – Class Summary

Sample ID	Total Errors	Percent Error	Error Breakdown by Type		
			Orthography	Syntactic	Semantic
Baseline	11.92	29%	36%	25%	39%
Sample 1	12.36	24%	48%	11%	41%
Sample 2	7.50	21%	57%	17%	26%

As a whole, the class' baseline compositions had the most semantic errors, followed closely by orthographic mistakes. During the first writing session, the rate of error went down, largely due to the drop in syntactic errors. Students made roughly as many errors in semantics while using Google Translate and increased the amount of misspellings in their writing. I had originally hypothesized that allowing students access to a translator would lower the amount of orthographic errors in their writing, much as Fredholm (2015) found in his study. Because the translator provides the correct spelling, it would be simple for students to check their spelling by entering their completed writing into the translator. This strategy may not have been highlighted enough in the lesson, or students may have found it too time consuming. By using a translator both as a way to use unlearned language and as an editor, students sacrifice a significant portion of their time (Garcia, 2010; Jin & Deifell, 2013). During the second writing sample, the class saw a further reduction in error frequency, along with a greatly reduced amount of total errors. Across this set of compositions there were far fewer semantic errors made, which is likely due to the added requirement of using Google Translate to check for mistakes before completing the assignment. By using Google Translate as recommended by Alley (2005) and Niño (2009), and using the side by side translation windows to edit in both English and Spanish, students are able to reduce errors in their compositions. However, Google Translate provided little overall benefit in orthography, despite the results reported by Fredholm (2015) in his study. Overall, using Google Translate appears to improve students abilities to construct grammatically correct sentences, and when used in a fashion recommended by other researchers (Alley, 2005; Fredholm, 2014; Fredholm, 2015; Garcia, 2010; Garcia & Pena, 2011; Jin & Deifell, 2013; Niño, 2009), leads to a reduction in semantic errors as well.

In addition to the reductions in error production, the data also revealed another benefit to the strategic use of Google Translate. During both compositions, in addition to being coded by type, errors were also coded as either critical (changing the meaning of a sentence) or minor (meaning preserved). Table 15 shows the results of the mean production of critical errors across student writing samples.

Table 15

Mean Percentage of Critical Errors

Sample ID	Critical Errors
Baseline	14%
Sample 1	13%
Sample 2	0%

In the students' baseline assessments, only 14% of their errors were deemed significant enough to change the meaning of their writing. Table 14 shows us that 39% percent of the errors made by the class were semantic in nature, leaving almost two-thirds of their semantic errors as minor. During the baseline assessment, critical errors were made by 62% of the class, with 38% of the class making only minor or no errors in semantics. During the first writing sample, the rate of critical error production did not vary greatly, dropping to 13% of the total error production, while the students' rate of semantic error production rose by 2% to a total of 41%. However, despite the lower frequency of critical errors, they were produced by a larger group of students, with 83% of the class committing critical errors in their compositions. INT. CON. For their second sample, students completely eliminated critical errors from their compositions. The lack of critical errors in the second sample is likely due to the required use of Google Translate as an editor. One of the many benefits of using Google Translate as an editor is outlined by Pena

(2011) in her research. Being able to edit both the original text and edit the translation allows students to use both their high level of English fluency and their understanding of Spanish to catch and correct mistakes in their writing.

Students Perceive Potential Benefit in Google Translate

During the brainstorming portion of the strategy lesson on Google Translate, eight students associated the word “helpful” with Google Translate, with one student remarking that “it could be more helpful than vocabulary lists” (Teacher Observations, June 15). Because Google Translate allows students access to a dictionary, but with much faster results, students are able to easily access far more vocabulary than they have access to in the curriculum. Using Google Translate as a tool to discover new vocabulary allows students to build their own knowledge, as they can search for words that they want to learn in addition to words the teacher requires that they learn (Peters et al., 2011). Thirty-eight percent of the students agreed with the statement that “Google Translate is a good tool for class” (Questionnaire, June 17), giving reasons such as “It really helps find words you forgot” (Questionnaire, June 17), and that “it makes everything less confusing” (Questionnaire, June 17). Quinn’s answer was slightly more elaborate, and specifically mentioned the strategic value of using Google Translate, saying that “it is helpful to check work and help figure out words you don’t know” (Questionnaire, June 17). As beginner level language learners, students have not yet mastered the differences between languages, nor acquired a large amount of vocabulary. While not a perfect tool, Google Translate helps students compensate for a lack of vocabulary, and with careful use, use translation to create properly formed sentences in a foreign language (Garcia & Pena, 2011). In Niño’s (2009) study, there was a much greater student support for Google Translate, with 75% of

students remarking that they believed it to be useful. However, an additional 54% of the students in this study marked that they neither agreed nor disagreed with Google Translate being useful, all expressing a qualifying statement similar to Helen's, who wrote that "sometimes it works, sometimes it doesn't" (Questionnaire, June 17). This could be partially due to the strategy session, where Google Translate was highlighted both for its strengths and for its weaknesses. Additionally, many students saw examples of imperfect translations when engaged in post-editing their second writing sample, which may have influenced their answer. This awareness that Google Translate is not perfectly accurate is critical to its successful implementation; if the output is accepted as is, incorrect translations cannot be discovered (Karnal & Pereira, 2015; Pritchard, 2008; Zanettin, 2009). Several students went on at length about what they perceived to be the failings of Google Translate, such as that "it doesn't conjugate verbs right" (Questionnaire, June 17), and "it doesn't teach students their language, and it's not reliable" (Questionnaire, June 17). Despite their negative impressions of the program, the potential benefits appeared to have balanced out these disadvantages for these students. These qualifications may also be due to students not wanting to show support for something that is normally forbidden in class. Even when assured that all results would be kept confidential, students often are hesitant to answer in a form that would normally result in disciplinary action (Clifford et al., 2013). The only student who disagreed that Google Translate was a useful classroom resource was Mary, who wrote that "if you use it in class no one will actually learn Spanish and they would just use Google Translate for everything" (Questionnaire, June 17). Becoming dependent on a translator for language production is an important concern, especially at the beginner level, where it may seem to students that the translator will always be more effective than they are. Despite the potential benefits to writing for beginner level students,

teachers must ensure that students do not overuse the translator. The primary benefit of translators over dictionaries is that they allow students to remain actively engaged with the text for longer periods of time; overuse of the translator will take attention away from the text, which has a negative effect on the student's ability to process the text (Jin & Deifell, 2013).

Students' belief that there was some value to using Google Translate was also reflected in their answers to Question 9, where students answered whether or not they would use Google Translate against the will of a teacher. This statement received less support from students, but was still favored by almost half the class. The students' responses are collected in Table 16.

Table 16

Percentage Scores of Student Questionnaire Responses

Question	Responses				
	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
Would you use Google Translate on future assignments, even if it was prohibited by the teacher?	0%	31%	23%	38%	8%

In total, 46% of the students agreed or strongly agreed that using Google Translate was worth it, even if it might lead to repercussions. In addition, one student who marked "Disagree" on her questionnaire indicated that she would not use Google Translate if it was expressly forbidden by a teacher, but would make use of it otherwise. During the questionnaire, Arthur asked if he should answer with what he really thought or "what you want to hear" (Observations, June 17). I reminded the class that the only answers that I was interested in were truthful

answers, and that their answers would be kept anonymous. It is likely that this was a concern for more than one student, which may have been enough cause for them to select an answer that does not reflect their intent. Even when data is kept confidential, students may not feel secure in producing responses that would otherwise be self-incriminating (Clifford et al., 2013).

Strategic Use is Not Automatic

During my observations of the strategy lesson and first occurrence of student writing, I came across several indicators that the strategy instruction had not stuck with all of the students. During the lesson, several students were distracted by their phones, and during the writing process, two of those students, Arthur and Patrick, came and asked me how to use Google Translate, because they didn't hear all of the explanation (Observations, June 15). Both students were given an explanation of the task, and an overview of the strategies presented. While they still had some exposure to the information, it likely had an effect on how they decided to use the program. During the writing period, I also observed students entering whole phrases into Google Translate without using the dictionary functionality to check the individual words, resulting in several critical errors in their compositions (Observations, June 15). These observations are resonant with the findings of White & Heidrich (2014), where they noted that students who were not using strategies to critically examine the output would accept any output as valid. Overall, the majority of the class did not appear to be using the strategies with any regularity during the first session, which is reflected in their answers to the questionnaire. One of the strategies during the lesson was to use Google Translate to check the definitions of individual words, and to primarily use it to search for nouns, which are less mutable than verbs

and adjectives. During the questionnaire, students were asked to rate their use of Google Translate in this manner, as seen in Table 17.

Table 17

Percentage Scores of Student Questionnaire responses

Question	Responses				
	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
I primarily used Google Translate to look up nouns (persons, places, things).	23%	23%	23%	31%	0%

In total, 56% of the class marked either Strongly Disagree or Disagree to the question, with only 31% of the class implementing the strategy. Without having recorded their translations, students may not have been able to answer this question with complete accuracy. The lack of students using this strategy could also be due to students picking one of the several strategies given during the lesson, rather than using multiple strategies in tandem. In order to ensure that strategies are adopted by students, teachers should ensure not only that students understand the tool, but that strategies are built on top of each other, rather than introduced all during one lesson. By understanding how different strategies are able to be used together to provide a better output, teachers will be able to design effective instruction for their students (Zanettin, 2009).

Question 7 also addressed students' strategic use of Google Translate, asking them to rate which language they translated into more commonly. During the strategy lesson, students were shown that using Google Translate to translate Spanish to English is an important way to verify

an error-free translation. Table 18 shows the results of students' answers to this statement, where students who marked Agree or Strongly Agree were not employing the strategy introduced during the lesson.

Table 18

Percentage Scores of Student Questionnaire Responses

Question	Responses				
	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
The majority of my translations were from English to Spanish.	0%	0%	38%	31%	31%

The results indicate that at least 62% of the class employed the opposite of the strategy, while the remaining 38% of the class either were unsure, or did not specifically use nor ignore the strategy in question. The high frequency of English to Spanish translation is likely due to the limited amount of language acquired by students. Searching for Spanish words is easier for beginner students, because they can use their much larger knowledge of English to supplement their Spanish vocabulary. Additionally, having an opportunity to express themselves beyond the vocabulary contained in the curriculum may also have motivated some students to use Google Translate primarily to look for new words in Spanish (Peters et al., 2011).

Students Suffer From Several Lacks of Proficiency

While the quantitative data does point to several positive trends in performance, especially in error frequency, there are several points with which it remains at odds with the

qualitative data. From my observation notes, I noticed that students had several issues with using the technology correctly. Students had “difficulty connecting to the school network” (Observations, June 15) and were “unsure how to add accent marks while on a computer or phone” (Observations, June 15). While students were proactive in solving their problems, the widespread frequency with which the same questions were posed indicates that lessons on “how to use Google Translate” should also more generic digital literacy practices, such as logging into a network, inserting non-standard characters, and the use of the internet as a problem solving resource. In order to provide students with the opportunity to successfully use Google Translate, teachers need to follow researchers’ instructions to tailor their instruction to reflect their students’ prior knowledge of Google Translate (Jin & Deifell, 2013; Zanettin, 2009), but also consider their levels of digital literacies.

In addition to the observation notes, the questionnaire data also indicates that the students’ beliefs on their use of Google Translate do not necessarily reflect the results of their use. Despite having provided answers that indicate minimal strategy use, many students believed that they were successful in using Google Translate to minimize incorrect translations. Table 19 shows students’ answers to Question 3, where students rated their ability to use Google Translate without introducing additional errors into their writing.

Table 19

Percentage Scores of Student Questionnaire Responses

Question	Responses				
	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree

I was able to use Google Translate appropriately in class and able to minimize the amount of errors it provided.	0%	0%	31%	46%	23%
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Overall, the students appear to believe that they were largely successful in using Google Translate, with nearly 70% of the class agreeing or strongly agreeing that they had eliminated errors. Sixty-two percent of the class was successful in an overall error reduction while using Google Translate, however, the students with the largest reductions in error frequency answered Neither Agree nor Disagree to this question, seemingly unaware of the improvements made in their writing (Questionnaire, June 17). While 16% of the class both marked Agree and reduced errors by over 10%, an additional 31% percent of the students who agreed or strongly agreed increased their frequency of errors produced (Questionnaire, June 17). The large trend in orthographic errors in student writing supports this to a degree. Students who were focused on ensuring that their translations were accurate may not have taken the same scrutiny to their own work. The lack of self-examination may be due to students' lack of familiarity with Spanish, making it difficult to identify errors in their own work, especially where spelling or structure differs slightly from their native language (Alley, 2005).

Another area of difficulty during translation was the lack of proficiency in English writing. While observing both writing sessions and coding student work, I noticed that many students "wrote without punctuation and occasionally without capitalization as well" (Observations, June 17). Providing proper punctuation is an important factor in obtaining a successful translation. When translating from English to Spanish, the addition or omission of punctuation often changes small details about the sentence, as the punctuation is part of the context analyzed by the translation program.

Finally, students' lack of familiarity with the Spanish language is another minimizing factor in the usefulness of Google Translate. In my observations of the second writing session, I noticed that students would often be able to notice an error when re-translating their composition into English, but were unsure of how to fix that error in Spanish (Observations, June 17). Their difficulty is likely due to a lack of familiarity with the Spanish language, as the students have less ability to fix errors when the structure of the language does not mirror that of English (Alley, 2005). This reasoning is further supported by the changes in syntax and orthography errors previously discussed in Table 15. While the initial decrease in syntax errors is promising, the lack of further increase when further editing strategies were employed shows that there are errors in student writing that students are committing that are not caused nor fixed by Google Translate. When coding errors, one of the most common syntax errors was the order of nouns and adjectives, which occurred in nine of the students' writings across both instances of using Google Translate (Student work, June 15; Student work, June 17). In some instances, Google Translate would automatically substitute the correct translation in the post-editing window, leaving the user unaware of the error. A potential solution to this would be to translate the English text into Spanish as a comparison with the original Spanish after the post-editing has occurred (Alley, 2005, Niño, 2009). The spike in orthography errors and the lack of improvement in orthography from the students' baseline compositions also correlates with a lack of familiarity with Spanish. Errors in orthography are not produced by Google Translate, and are either the result of students copying words incorrectly, students not using accent marks, or students not checking their work produced independently of Google Translate. In the case of cognates, students could also simply be rushing the editing process, and skimming over a word that contains a minor spelling mistake.

The data collected from this study shows that students were able to benefit from the use of a translator in class, though students did not all benefit in the same areas. On a class scale, introducing Google Translate led to the class reducing their syntactic errors greatly, while introducing strategies provided a benefit to semantic error production, but did not further reduce syntactic errors. Very few students noticed any improvement in orthography while using the translator. The students largely believed that the translator was a useful tool, but did not view it as necessary for success. This belief may stem from multiple sources, including students being able to recognize incorrect output, but not possessing a level of knowledge of Spanish that would allow them to correct their mistakes. Finally, this study shows that in order for students to be successful in using a translator, they must first acquire strategies that they can use to minimize the inconsistencies in the translator's output.

Implications and Conclusions

The findings discovered from this study, along with the conclusions drawn by researchers such as Garcia (2010), Pena (2011), and Niño (2009), suggest several implications for the use of Google Translate in the classroom. While these findings cannot be definitively expanded to every classroom, using Google Translate in the classroom where the study occurred did improve student writing. However, it did not do so unilaterally, or in all the ways expected by the researcher. From the analysis of the data, several themes emerged pointing to the limitations of using Google Translate, notably, the students' high opinion of Google Translate, the students' lack of familiarity with the tool, and the students' lack of familiarity with the Spanish language.

As found in Zanettin's (2009) and Jin and Deifell's (2013) research, it is imperative that both the teacher and the students have a thorough understanding of the tool before using it.

Without knowing what Google Translate cannot do, teachers will be unable to design meaningful activities, and students are more likely to accept the translator output as valid. At the beginning of this study, I believed that using Google Translate would reduce orthographic errors, due to not realizing that Google Translate is now able to translate some misspelled words, instead of leaving them untranslated in the output. While further research is still needed in order to determine the full extent of whether or not Google Translate is a useful tool, providing professional development to teachers on Google Translate would be an important step in establishing a common understanding of Google Translate. Once teachers are aware of the capabilities of Google Translate, they can come to an agreement on whether or not it is a permissible practice for their students. Even if teachers conclude that Google Translate is not an acceptable resource, it can still be leveraged for educational potential. As detailed by Alley (2005), Niño (2009), and Stapleton (2005), Google Translate can be showcased for situations where it does not provide a correct translation due to differences in features between languages. Teachers using Google Translate in such a fashion would also be able to employ it to demonstrate the necessity of language acquisition by proving that Google Translate is not effective enough to be the sole facilitator of communication.

The reduction of syntactic and semantic errors found during this study pairs with findings from Garcia and Pena (2011), showing that using Google Translate does result in an increased quality of writing by students. Furthermore, when using Google Translate to search for new vocabulary, students are able to write compositions of increased length, which aligns with findings from Fredholm (2014), in addition to the findings from Garcia and Pena (2011). Teachers may be able to leverage increased composition length as a way to increase student confidence, or to be used for journaling or current events assignments, where communication is

valued higher than students exclusively using the words they have memorized. Teachers using Google Translate in their classroom as a post-editor have a way to help students become more aware of mistakes in their writing and to be able to comprehend more of the language at once. This could allow for teachers to increase the amount of authentic cultural texts used in the classroom by lessening the reliance on the students' memories to be the sole navigator of the text.

This action research project was designed to discover the effects of using Google Translate on student writing in Spanish. Specifically, the study was built to investigate changes in the quality of student writing, measured by error production. Based primarily in the theory of New Literacies Studies, which states that technology is a tool for transferring meaning between two or more parties, and that different technologies will alter the meaning transferred in different ways (Gee, 2009; Lankshear & Knoebel, 2007). Previous studies in this field have largely been focused on using Google Translate and other online translators at the intermediate or advanced collegiate classroom. In addition, much of the research has focused on the need for informed, strategic use of Google Translate in the classroom, by both teachers and students. Through analysis of student writing, questionnaires, and teacher observations, this study found that the using Google Translate as a tool to aid writing did reduce certain types of error in student writing. However, the benefits in error reduction were not present across all students nor all categories of error. The findings of this research also include that students place a high value on Google Translate despite its flaws, that students require tailored instruction to be able to properly implement strategic use of the translator, and the negative impact that low levels of language proficiency have on students' ability to monitor their use of the translator. The implications of this research provide further support for providing teacher training in the use of Online

Translators due to their ability to be successfully leveraged as instructional tools. Additionally, while Google Translate provides a large amount of support for beginner level students, that potential benefit is hampered by a lack of familiarity with the Spanish language.

Were I to repeat this study in the future, I would change several aspects in the hopes of obtaining more scientific results. Prior to initiating any measured writing compositions, I would provide multiple sessions of instruction and practice with Google Translate, in the hopes of more effective student use. During the course of this study, students only had one session of strategy instruction. By ensuring that each student understands the strategic value and uses of Google Translate, I can likewise put more faith into the validity of the results of the error analyses done on student writings. Additionally, by performing this study over a longer period of time, I would gain access to a larger pool of student writing data, which would provide more insight into identifying trends in the data. This study is also limited in its scope, as there were only 13 participants, all of relatively similar socio-economic status.

The completion of this study, combined with previous research leaves me confident that the use of Google Translate provides at least some small benefit in short term writing. However, further research is still required to answer a more pressing question, is there any long term benefit to language acquisition? A longitudinal study of translator use would be both able to better identify short-term benefits and also be able to explore whether or not translators can be used as ways not just to reproduce, but to learn vocabulary. Additionally, further inquiry into the usefulness of Google Translate could be directed toward its use as a supplement to reading comprehension. While the findings from this study show that the lack of digital literacies and linguistic knowledge hampered Google Translate as a writing resource, would beginner level language learners have the same struggles when applying Google Translate as a support to

reading comprehension? Another question that arose during this study is whether or not Google Translate has as much potential as previously indicated by researchers. In an attempt to continuously refine their product, Google has sought to help the user as much as possible. In previous versions of the software, small errors would impact the translated output, but Google has introduced a small buffer of sorts against minor errors in Spanish and in English. Students who assign an adjective the opposite gender of a noun are not able to discover their error without composing the same noun adjective pair in English and comparing the output to their input. Additionally, the translator is now more forgiving of misspellings in the input, which makes mistranslations less easy to identify. How do these changes in the internal logic affect the potential of Google Translate in the classroom?

As technologies continue to improve and be adapted for use in the classroom, students' literacy practices will continue to evolve. Instead of being hostile or overly accepting of the use of new technologies in the classroom, teachers should take a critical, inquisitive approach. While language may be slow to change, technology grows by leaps and bounds, and educators have a responsibility to continue to develop their own digital literacies, so that they may continue to provide relevant instruction to their students.

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Appendix A

What do we know?
Put in word → translates it
lots of languages
"I don't think it conjugates verbs right"
Not the same words as vocab lists
Not reliable →
Helpful ✓✓✓✓✓
Words not always the same. sometimes
lots of English words are only a few
Spanish words
Let's you use own words and not just vocab

Appendix B

Me llamo _____

Práctica de escribir

Directions: Choose one of the two tasks provided below. Your answer to the question you choose should be written entirely in Spanish and contain a minimum of 30 words. You may use Google Translate to assist you during this assignment.

#1. Write a letter to your friend in México and tell them about your school. You may wish to include:

- The classes you are taking
- If you like your classes or not, and why
- School supplies you need
- Sports or other activities you are involved in

#2. You are getting an exchange student from Spain! Write him/her an email to introduce yourself! You may wish to include:

- Your name and age
- Your personality and what you look like
- Things you like to do
- Questions you would like to ask him/her

_____ (Number of writing task chosen)

Español – Writing Practice

Me llamo: _____

Directions: Choose one of the following topics, and write a short paragraph of at least thirty words about it in Spanish. After you have completed it, enter it into Google Translate, and use the side by side windows to read the English translation. If it looks good, you're all set! If it doesn't look right, use the Spanish to English translation to make changes to the Spanish until the results look correct.

Prompt 1: Write a short journal entry about your favorite class. You may wish to include:

- What class is your favorite
- Why it is your favorite class
- What you need for the class
- At what time the class starts or finishes

Prompt 2: You have an exchange student from Argentina coming to visit. Write a short e-mail to him/her about Penfield during the summer. You may wish to include:

- What the weather is like during the summer
- What activities you will do
- What places you will go
- Other interesting places nearby
- Questions about what he/she likes to do

Prompt # _____

Appendix C

Name: _____

REMINDER: All data will be kept confidential, and all published data will be under false names.

1. I believe that Google Translate is a good tool for Spanish class.

Strongly
Disagree

Disagree

Neither Agree
nor Disagree

Agree

Strongly Agree

2. Please explain your answer to question one – why is or isn't Google Translate a good tool for Spanish class?

3. I was able to use Google Translate appropriately in class and able to minimize the amount of errors it provided.

Strongly
Disagree

Disagree

Neither Agree
nor Disagree

Agree

Strongly Agree

4. I was able to spot errors from Google Translate

Strongly
Disagree

Disagree

Neither Agree
nor Disagree

Agree

Strongly Agree

5. For what purposes did you use Google Translate in class? Looking up words? Checking your writing? Looking up sentences? Other? Please list as many as possible.

6. I primarily used Google Translate to look up nouns (persons, places things).

Strongly
Disagree

Disagree

Neither Agree
nor Disagree

Agree

Strongly Agree

7. The majority of my translations were from English to Spanish.

Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
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8. I found the examples of how to use Google Translate helpful.

Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
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9. Would you use Google Translate on future writing assignments, even if it was prohibited by the teacher?

Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
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10. I could write the assignments equally well without using Google Translate.

Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
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Please use this space for any other information or thoughts you have about the use of Google Translate in class.