Machine Translation in the World Languages Classroom: Meeting the Challenge to Instructional Design

by Matthew Kelly, 2014 CTI Fellow
Independence High School

This curriculum unit is recommended for:
Spanish or Other Modern Alphabetic World Languages, Levels I and II

Keywords: Spanish, World Languages, Artificial Intelligence, Machine Translation, Computer Science

Teaching Standards: See Appendix 1 for teaching standards addressed in this unit.

Synopsis: World Languages curricula and instructional design must keep pace with social and technological realities. Every year, students ask, "Why do we need to learn a language when my phone can translate anything I want?" It's an existential question for World Languages teachers. The current state of the art in machine assisted translation is still entirely dependent upon the work of human translators. Machine translation does not make human expertise obsolete. Nonetheless, Smartphone-based machine translation does to language classrooms what the calculator did to math classrooms in the 1970's and 1980's. World Languages teachers are ignoring the phenomenon. Teachers must assume that any task that can be completed with the aid of machine translation will be. The impact of machine translation begs a redesign of our World Languages curricula, instructional methods and assessment strategies. This unit will present a brief history of machine translation and a simplified explanation of how machine translation works. The unit will go on to present suggestions for successfully engaging with the phenomenon of machine translation in the classroom.

I plan to teach this unit during the coming year in to 120 students in Spanish II.

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Machine Translation in the Classroom:
Meeting the Challenge to Instructional Design

Matthew Kelly

Rationale

"I had to find it in Dutch": Taking the Honor Out of Honors Course Work

It was two years ago, approximately. I don't remember why I was in the media center—I may have gone to laminate something or to use the printer—but I remember the girls' conversation. One was telling another about a paper she had to write on international affairs for a history class. "She makes us submit everything electronically," she said, of her teacher. "I had to find it in Dutch."

"You're doing research in Dutch?" I chimed in. "That's really amazing."

She rolled her eyes and snorted. "Hardly." Her friend snickered. She paused. "I don't know, though. I guess when you think about it, it is kind of awesome." The bell rang. We all headed to class. I don't think I ever spoke to either student again, but the incident stuck in my memory. A student motivated enough to do research in Dutch—that seemed remarkable to me. At the time, I didn't make the connection between electronic submission and the student's need to find her source material in another language. It wasn't until I began work on this curriculum unit that I realized the reason why the girls were so dismissive of my admiration, nor did I realize the impact of what our conversation meant for the future of education.

Machine Translation: An Existential Crisis for World Languages Instruction

Every year, a student asks me, "Why do we need to learn Spanish when my phone can translate anything I want for me?" I've realized that's the most important question anyone will ask all year, and it's one that World Languages teachers aren't addressing at our district level planning. Smartphone-based machine translation does to language classrooms what the calculator did to math classrooms in the 1970's and 1980's, and World Languages teachers are ignoring the phenomenon. The usual response from is to treat the use of machine translation in the context of a World Languages class as plagiarism and to leave it at that.

Simply classifying the use of machine translation as plagiarism doesn't address the problem; it's a refusal to engage with the problem. Plagiarism and other forms of cheating are endemic. Classifying use of machine translation as plagiarism without making other modifications in the methods and content of instruction puts an undue burden of proof on

the teacher. The rewards for cheating are too great and the resources for disciplinary interdiction so limited that the overwhelming majority of cases will be overlooked or simply tolerated.

World languages teachers must assume that any task that can be completed with the aid of machine translation will be. From a student's point of view, there is an apparent inconsistency: why are some academic uses of machine intelligence considered essential, while others are considered cheating? If it's legitimate for a student to use a spelling, grammar and usage tool writing a paper for an English class, why isn't machine translation allowed for World Languages tasks? Classifying machine translation as plagiarism is avoiding the real issues—indeed, I would say, the existential issue for the field of World Languages instruction. If a Smartphone can far surpass a third year language student in rendering thoughts from English into Spanish, why go through the effort at all? Shouldn't we be training our students to do the things their phone can't do, and won't for the foreseeable future be able to do? World Languages classrooms designed to foster integrity and to disincentivise plagiarism will place a premium on extemporaneous and interpersonal speech, self- and peer-scored extemporaneous writing, and tasks requiring creativity and invention.

It's Not Just a World Languages Problem

While researching this unit, I did some experimenting to see whether online plagiarism checker applications could detect an article on, say, Che Guevara that had been copied in English, pasted into a translator application, and translated into Spanish. It occurred to me: what about the other way around? If I take an article in another language and translate it into English, can I beat a plagiarism checker? I remembered the girls in the library, so I decided to start with Dutch.

The answer is yes, I certainly can. I picked five topics at random, translated each into Dutch using Google Translate, and found the corresponding article in Dutch Wikipedia. I copied and pasted a section of each article into Google Translate and converted it to English. The topics were: abiogenesis, Nicholas Copernicus, the Treaty of Versailles, fractal, and plagiarism[1] I pasted my English translation into different free plagiarism checkers (DupliChecker.com, Plagscan.com, and Grammarly.com). None detected any plagiarism. Google Translate beat the plagiarism scan five times out of five.

When I check students' work in Spanish for originality, I often reverse-translate their compositions into English and *then* run a plagiarism check. This method generally detects copied and pasted work. Would it not be a simple feat to build translation reverse-engineering into a plagiarism scanner?

Probably, but it would only be a stop-gap measure. We are most likely only a few years out from a portable application that writes original student compositions. Bots are

already writing a great many of the financial and sports news stories that we read.[2] Kristian Hammond of the robojournalism enterprise Narrative Science claims that by the time a child born today is in the eighth grade, 90% of all news stories will be electronically generated.[3]

Why should I assume that a portable application generating informational text would be developed and marketed to students? I can bet you $211 billion that it will. That, according the 2012 Harris Poll YouthPulse study, is the 2012 buying power of Americans between the ages of eight and 24. An application that writes homework assignments would tap into a huge and lucrative market and could give merchants and advertisers a tremendous amount of useful consumer data. With that kind of money at stake, I don't think we'll have to wait too long before someone develops such an app.

The implications for instructional design are clear. In an honors class with up to forty students, one teacher has little chance of effectively scanning forty research papers for originality. If there can be no guarantee that submitted work represents a student's own efforts, why assign a project of great length and complexity that for many students will amount to an exercise in cut-and-paste? If we're trying to assess and develop students' ability to synthesize information, wouldn't investing the same amount of time on a series of short, directly supervised assessments be a more worthwhile use of instructional time and resources? Wouldn’t an assignment requiring personal reflection or a creative response—something that can’t be cut and pasted—be a more meaningful exercise anyway?

At present, an interdiction-based regime of plagiarism prevention is cumbersome and readily defeated by machine intelligence applications, such as Google Translate, that are already several years old. Student plagiarism is so systemic that I believe we need to stop approaching the issue as one of personal integrity and instead treat it as an issue of instructional efficacy. It's not a question of rooting out moral turpitude. It's a question of verifying that students are really learning any of the content we're trying to teach them, and of maintaining a commitment to giving students meaningful work to do.

Background

I currently teach grades nine through twelve at Independence High School, a large public high school in Charlotte, North Carolina. The school's assignment area is something of a pie slice, with a broad edge on the outskirts of the district covering a suburban transitional area that maintains strong rural roots and a narrow point extending into the center city. Independence High School's overall enrollment stands at just over 2000 students. Demographically, the school is 40% black, 34% white, 18% Latino, 5% Asian, and 3% mixed race. About 55% of students qualify for free and reduced lunch.[4]

I teach in the Academy of International Studies, a magnet program housed at Independence High School. Originally part of the International Studies Schools Network, this global studies magnet was originally established with a grand from the Asia Society using funds from the Gates Foundation. The original mandate of the magnet program was to provide a challenging and demanding global studies program to inner city minority and underserved rural students. The program serves roughly 400 students. The student population within the magnet program is approximately 70% white, 13% black, 7% Latino, and 4% Asian, with a small remainder of mixed race students and students who decline to report their ethnicity.

A Brief History of Machine Translation

Machine translation isn't new. In fact, the concept goes back to 1947.[5] It's important for the field of artificial intelligence because it's the first non-numerical practical application developed for computing. It represents a huge leap developmentally in terms of how computers are conceptualized. The term *computer,* after all, originally meant a person who performs mathematical calculations.[6]

Warren Weaver was chief of the applied mathematics panel of the Office of Scientific Research and Development during World War Two.[7] In 1947, scientist Warren Weaver wrote a letter to MIT scientist Norbert Wiener in which he proposed that wartime advances in automated cryptography could be applied to the automated translation—in other words, he proposed to treat translation as a decryption problem. In light of developments in mechanized decryption, he wrote:

> …one naturally wonders if the problem of translation could conceivably be treated as a problem in cryptography. When I look at an article in Russian, I say "This is really written in English, but it has been coded in some strange symbols. I will now proceed to decode."[8]

He later disseminated the seminal essay "Translation" elaborating on this concept to some two hundred associates with the stated purpose of promoting cultural exchange and international understanding. By the 1950s, growing concerns about keeping abreast of Russian technological progress drove the field of machine translation.[9]

Work commenced at MIT and Georgetown; the first practical demonstration of machine translation was unveiled a mere five years later in 1954. In 1970, the French Textile Institute began using machine translation to translate technical abstracts, and Brigham Young University began a machine translation project to translate Mormon literature. By 1978, Xerox was using SYSTRAN to translate technical manuals, and in the 1980s machine translation companies began to appear.[10]

SYSTRAN first brought machine translation to the Internet in 1996, followed by AltaVista's Babelfish, launched in 1997.[11] In 2001, Google launched a service that translated eight languages to and from English.[12] The initial results weren't stellar, but in 2003 Franz Och won a Defense Advanced Research Projects Administration prize for speed machine translation. That year, he joined Google and is now the lead researcher for machine translation for that organization. Google Translate was launched in 2006 and now handles the majority of translation done on the planet. Over 200 million active users, 92% of them from outside the United States, make use of the service monthly—a figure that does not include mobile users. Google Translate translates the equivalent of one million books *each day*—performing in a day what the world's professional translators produce in a year. [13]

Types of Machine-Assisted Translation

In the Beginning: Rule-Based Methods

In 1968, Hungarian-born computer scientist Peter Toma launched SYSTRAN, a system based on the machine translation work begun at Georgetown in 1951. In 1970 he was awarded a contract by the United States Air Force to translate Russian documents and was adopted by the Commission of the European Communities in 1975.[14] Peter Toma wrote in 1986 about how his experiences as an unofficial translator and liaison in occupied Hungary following World War Two led him to see automated translation as a potential force for promoting international peace and understanding[15] SYSTRAN was long a world leader in machine translation; indeed, company promotional material claims it is still the leading translation system.[16]

SYSTRAN is a rule-based system. When text is submitted to SYSTRAN or other rule-based systems, the text is first parsed into sentences and then broken down into smaller segments for analysis. Then, the system performs the dictionary lookup, followed by a semantic analysis of the sentence, followed by the synthesis of the translation, all according to a flowchart driven by linguistic analysis of the language.[17]

The system relies on an internal dictionary. One of the first steps is the translation of all words or combinations of words that are uninflected and do not change. The dictionary then attempts to reduce compound nouns and inflected phrases according to the root forms of the words. The dictionary may be vast; for example, for a relatively uninflected language like English, it may be more efficient to load all the inflected forms of a word into the dictionary than to rely on the rule-based analysis to ferret out the root meanings of the words. For a heavily inflected language like Russian, though, such an approach would be cumbersome and unwieldy. Each language pair developed for machine translation must have its own dictionary and its own set of rules for grammatical analysis.[18]

SYSTRAN's approach represented the state of the art for over half a century. SYSTRAN was the first system available to consumers for internet-based translation in 1996, and was the foundation of AltaVista's Babelfish platform in 1997. Indeed, Google's own machine translation program relied on SYSTRAN until 2007.[19] However, Google's machine translation team had already decided to go in a different direction when they brought in Franz Och from DARPA.

Statistical Machine Translation

When Warren Weaver wrote his memorandum "Translation" in 1949, he approached the problem more as a cryptographer than a linguist, and indeed the cryptographical problems that led him to think about taking a decryption approach to machine translation were precisely those situations where an intercepted message had to be decoded without prior knowledge of the language it was written in. Automated decryption required a huge amount of statistical analysis, and Weaver believed that vast statistical semantic analysis would be the route around the shortcomings he foresaw for machine translation even at the genesis of the field. Weaver believed ultimately that effective machine translation would come out of discovery of universal principles of linguistics common to all languages; he had a confidence that the deep structures of language generation had to be biologically predicated and common to all humans just as the morphological structures that produce language—tongue, lips, vocal cords, and so on—are common to all.[20] So, one could say that he was ultimately looking ahead to a rule-based system, but he put paramount importance on the role of statistical analysis. This is the strand that Och and other researchers at Google have been following.

Statistical methods of machine translation take paired combinations of equivalent texts in the target paired languages for translation and compare literally billions of matched sets of words to find the statistically most likely equivalent based on other word combinations found in the sample for translation.[21] The system is more nimble than rule-based translations, because it doesn't rely on the maintenance and development of a vast dictionary and exhaustive flowcharts breaking down grammatical rules. What it does require, however, are those billions upon billions of equivalent word combinations for statistical analysis—the main reason a statistical method wasn't consider at the genesis of the field. Statistical machine translation, to function effectively, was waiting for the Internet. When Google Translate translates a piece of text, it's looking at millions of samples of text to compare in the two languages drawn from the entire World Wide Web. The weakness of rule-based systems is the difficulty and complexity of creating and maintaining the dictionary and sets of rules, not to mention the fact that people often speak or write in ways that don't follow the recognized prestige system of vocabulary or grammar for a given language.

The Achilles' heel for statistical models of machine translation, though, is that the sample size of paired equivalent texts for many languages may be relatively small. In

such cases it is necessary to use a pivot language, usually English. For example, there may not be a huge body of parallel equivalent texts in Bangla and Flemish, but there exists a much larger body of literature that has been translated from English into both Flemish and Bangla—*A Brief History of Time,* the Bible, *The Chronicles of Narnia,* the Universal Declaration of Human Rights, et al. The utility of English as a pivot language gives English-language authors, especially mass market authors, a huge stylistic influence over translated texts worldwide. Unfortunately, too, texts originally translated by Google Translate also serve as part of the corpus of parallel texts, creating a self-referential loop that can statistically reinforce the apparent validity of a less-than-stellar translation.[22]

Hybrid Machine Translation and the Problem of Statistically Relevant Sample Size

One way to perform an end run around the problem of small sample size is to combine both methods. Since 2010, SYSTRAN has adopted a system that relies on both rule-based and statistical methods of translation.[23] As the need to rapidly prepare automated translation for local languages which may have very small sets of equivalent text becomes a growing issue, I would expect to see more companies develop hybrid platforms. One such method for doing so is to use a sample of equivalent texts as a "training set". The computer performs statistical analysis of the "training set" to develop a set of rules in an automated fashion, rules which are then applied to the samples to be translated. Such a hybrid method essentially automates the development of the dictionary and morphological rules used in a rule-based system.[24]

Duolingo: A Web-based Return to the Human Computer

A web-based method for translation worth mention is Duolingo. Duolingo goes back to the old definition of a computer as a *person* who computes. Duolingo was developed by Luis von Ahn, and works on the same method as the reCAPTCHA system for web user authentication he helped design. ReCAPTCHA verifies that the user of a web service is a human being by having the user type two distorted words, a task a bot may be assumed to be unable to fulfill. The first word in the series is a known word; the second word is an optically scanned word that an optical scanning and uploading service (in this case, most likely Google Books) was unable to correctly recognize. A human user who successfully retypes the first distorted word may be assumed to have successfully recognized the second.[25] Duolingo essentially works the same way, giving language learners segments of language to translate. A learner who has successfully translated a known segment of language with an existing equivalent may be assumed with a degree of statistical certainty to have successfully translated a similar passage. Luis von Ahn claims with Duolingo to deliver human-generated web-based translation superior to machine translation and equivalent in quality to professional translation services.[26]

Strategies

As Fernando Vallejo said, "*Diez mandamientos son mucho*"— that is, ten commandments are an awful lot.[27] My strategies for meeting the challenge of machine translation in the classroom come down to just three core concepts: assign work to students they are capable of doing, give students the support of a teacher for work that challenges their capabilities, and give students work where possible that pushes them creatively.

First, give appropriate work. When we look for strategies to foster student integrity and independence from machine translation and other forms of cheating, I believe the most important is fidelity to the standards we teach—or, in other words, giving students developmentally appropriate work to do. The word "memorized" appears in thirteen of the Clarifying Objectives for the Essential Standards at the Novice Low level, and in another fifteen Clarifying Objectives at the Novice Mid level. The exit proficiency level for Level I of any modern alphabetic language is Novice Mid for interpretive listening, interpretive reading, interpersonal communication, and presentational writing. The exit proficiency level for Level II of a modern alphabetic language is still Novice Mid for the domain of presentational speaking.[28] In other words, for the first two levels of Spanish, French, or German, most of students' communication should be carried out using memorized phrases. When novice language learners are using memorized phrases, and are given daily work to do that allows them to commit those phrases to memory, there should feel less incentive to rely on electronic cheats. Put another way, if we give students work they could only hope to complete with the aid of Google Translate, we should expect the work to be done with Google Translate or not done at all. If an assignment requires vocabulary not yet mastered, better to give students a word bank and have them learn new phrases by using them than to have them use their Smartphones and learn nothing at all.

Why are teachers neglecting the memorization of communicative phrases in the first two years of language instruction? The reason is simple: the work is boring and traditionally doesn't carry much of a cognitive load. The repetitive exposure required for memorization can quite readily lend itself to boring drills, which in turn can lead to deteriorating motivation and can in itself cause classroom management problems. Worse, old-fashioned "kill and drill" memorization exercises don't engage critical thinking skills. Teachers give inappropriate assignments like research papers and country profiles in Levels I and II for perfectly laudable reasons—they feel their students should be getting more intellectually challenging work.

Repeated exposure, though, doesn't have to be dull. Teachers can enliven vocabulary drill with games and handheld technology. A platform such as Kahoot! (create.kahoot.it) allows teachers to build their own quizzes that students take in a game show format, accessing the quiz through their cell phones or other devices. Teachers have freedom to build quizzes as simple or as challenging as they would like, and at the end of each quiz can download a spreadsheet detailing individual student participation and performance.

Kids love it. Exposure to target phrases for memorization can also take place through students' critical evaluation of other students' work. I train my students to use the PALS rubrics adopted by our district for scoring productive language activities in the World Languages. When they read and score other students' writing samples or listen to and evaluate their peers' speaking presentations, they are exposed to communicative language at a developmentally appropriate level with a very high concentration of communicative phrases targeted for memorization. For novice language learners, student speech and writing has many ideal characteristics.

Second, make sure students have access to the support and supervision of a teacher when they are doing their most challenging and complex work. I'm not saying don't assign homework, and I'm not advocating for or against the "flipped classroom" model, where students from families wealthy enough to afford high speed Internet receive their instruction at home via video and use class time for practice. I am saying that when deprived of the coaching and supervision of a teacher, language learners doing difficult work on their own will predictably yield to the temptation to use machine translation. Teaching in the block schedule I have my students in class five days a week for roughly 86 minutes at a time. There is a lot of work that can be done in 430 minutes a week.

I try to be judicious about the amount of time students spend writing down

Third, foster creativity, improvisation and independence. Assignments requiring a personal or creative touch minimize the utility of electronic cheats. Try asking students to create a composition that rhymes, or ask students to improvise a scenario in the target language. Independent learning and self-assessment can be taught by allowing students to score their own speaking and writing assignments, and those of peers, using a concise rubric such as the PALS system.[29] When students are familiar with the rubrics by which their writing and speech is evaluated, they will feel more confident in the fairness of their assessment and will take more responsibility for their own output.

Classroom Activities

Piñatas Without Candy: The Curse of the Digital Literacy Project

Once upon a time, students would start the year in any given Level I or II Spanish classroom by asking, "When are we going to make a piñata?" Many teachers, apparently , like to build piñatas in class because the project gives students a well-earned "break", meaning, of course, a break from learning or using any Spanish.

Of course, World Languages teachers eventually figured out that in subjects any of the students either take seriously, like Math, or enjoy, like Crafts, they don't take "breaks" from the state course of study. That's when World Languages teachers discovered that

their schools have computer labs, where “breaks” from the regular routine could meet the mandate to teach “digital literacy”. Digital literacy projects are not at all the same as building a piñata. First of all, there's no papier-mâché to clean up in the last fifteen minutes of class, so the students can work right to the bell. Second of all, a piñata at least has candy inside, while most “digital literacy” projects are completely empty.

Here's a typical “digital literacy” project for Spanish II: narrate your typical daily routine, morning and evening, using x number of reflexive verbs in the present tense. Record your narration as a digital audio recording. Using a program such as PhotoStory or Movie Maker, turn your recording into a film by stringing together photographs set to your narration. You will have x number of days in the computer lab.

On the surface, the project drives straight to the heart of the Presentational Speaking objectives and does meet digital literacy objectives. They're using reflexive verbs, right? They're giving a presentational speech, right? Here's how it actually plays out: once in the lab, the student types out her presentation in English and pastes it into Google Translate, a process which takes about five minutes. The student then spends the next fifteen minutes finding a set of headphones with a microphone attached and then spends another fifteen minutes waiting for someone to show her how to make a digital voice recording using Audacity. She records the script she made with Google Translate in five minutes and spends fifteen minutes finding someone with a flash drive so she can save it. She spends twenty-five minutes playing an online game, and by that time class is about over.

The next day in the computer lab, she spends forty-five minutes getting someone to show her how to use Photo Story, then decides to use Movie Maker instead because she's already familiar with it. She spends twenty minutes finding still pictures on the Internet using Google Image Search, which she copies and pastes into her multimedia presentation without attribution. She watches the first ten minutes of an illegally uploaded motion picture still out in theaters, but is annoyed by the Russian subtitles and checks her grades online instead. She remembers to save and turn in her project. Out of about 180 minutes of class time, she spent literally ten or fifteen minutes may be spent engaged with the target language, and half of that with the aid of machine translation.

She gets an “A”, and the teacher shows her multimedia presentation to colleagues from around the district in an inservice workshop on Applying Twenty-First Century Skills in the World Languages Classroom. Several of them, impressed by the student's multimedia editing skills, rush to adopt the project in their own classrooms.

The following semester in Spanish III, her teacher requires her to interpret the *Versos sencillos* (“Simple verses”) of Cuban poet Jose Marti for a formal grade. She fails this assignment, becasue Google Translate is terrible with poetry. She fails a number of other assignments, too, especially interpersonal speaking activities, and has a terrible time with reading comprehension. Her parents get her a tutor and can't imagine how she got stuck

with such a miserably unqualified instructor for Spanish III when she had such good ones the first two years.

Is there any way to save the Level II Reflexive Verbs: Daily Routine Multimedia Presentation from uselessness? Here's a reimagined version: the teacher gives out a prompt with a graphic organizer as a paper handout and asks students to handwrite notes for their spoken presentation. Students prepare their presentations by hand and recite them to a peer, who scores the speech with an abbreviated rubric printed right on the handout. Students rewrite their presentations based on the peer feedback. Once students show the teacher that they have written their presentation, presented to a peer for a peer score, and then revised their presentation in another color, they are given another handout, a paper template for a storyboard. They fill in the storyboard with stick figures illustrating their presentations. Once they have completed their storyboards students use their own or a borrowed cell phone to make a digital recording of their presentations and upload it to a voice blogging website.

Students take turns at the two student computers in the classroom to make a print a QR code with a link to their recording in the voice blog. The teacher prints out the QR codes and each student glues the QR code link to the storyboards they made. The teacher gets volunteers to post all the storyboards on the walls up and down the hall. Students are given a form with four presentational speaking rubrics printed on it and are told they have to get in groups with someone who has a Smartphone. They go up and down the hall and use the QR code links to access the voice presentations. They score them, not realizing that at the same time they are doing an interpretive listening activity.

"El robot": Teaching Daily Routine, Informal Commands and Algorithmic Thinking

True "digital literacy" shouldn't just be about familiarity with one commercial application or platform versus another. I won't argue it isn't valuable to teach students to be capable consumers and users of commercial software applications commonly used for presentations in the workplace-this is what "digital literacy" is typically taken to mean. However, in addition to needing workers who can use digital applications, we also need workers who can create digital applications, and that requires a skill set beyond familiarity with the Graphical User Interface of products in the Microsoft Office suite. The most fundamental of the skills a developer needs is algorithmic thinking—the ability to formulate a solution to a problem, however complex and break it down into a series of steps or instructions.

Gerald Futschek of the Technical University of Vienna calls algorithmic thinking "one of the most important competences that can be achieved by education in Informatics."[30] Fortunately for students and teachers without access to extensive technological resources, algorithmic thinking can be taught independently of programming—indeed, independently of a computer.[31] The "El robot" project teaches algorithmic thinking while

covering key elements of the Spanish II curriculum, informal commands and daily routine.

The premise: you are a developer working at the Universidad Politécnica de Valencia. You work with a sophisticated robot programmed to designed to work with stroke and head injury patients in rehabilitation; the robot can perform patient care and can also demonstrate simple daily tasks the patient has to relearn how to do. The robot is programmed to respond to commands given in spoken Spanish. You must write a program—a series of commands—to the robot to instruct it to demonstrate brushing its teeth or perform some other task from a person's daily routine. (This robot has teeth. It's a very, very advanced robot.)

A team of students writes the "program" using target vocabulary for the chapter on health, daily routine and reflexive verbs. The teacher will want to provide a word bank of words the students will need that are not likely to be found in the unit vocabulary list. For example, in my Spanish II curriculum, the unit vocabulary list contains "el cepillo de dientes" (toothbrush) and "cepillarse los dientes" (to brush one's teeth) but not "las cerdas" (bristles), "la pasta dentrífica" (toothpaste) or "el mango" (the handle). Students will use affirmative informal commands in the target language to construct their series of commands. The students' "program" will consist of a series of cue cards. When the group of students has agreed on a full series of cards, they will move to the robot station to "run" their program. To do so, they will display the appropriate cue card and say the command aloud.

The teacher, or a previously coached student, will play the role of the robot. The key feature of the robot is that the robot executes commands exactly, without interpretation. If the student "programmer" says, "Put the toothpaste on the brush," the robot will pick up the tube of toothpaste and set it on top of the toothbrush. Each attempt of the programmers to "run" the program should be recorded on video. In the end, each team will compile a video of their successive attempts. Above all, the "robot" should be encouraged to be deliberately obtuse. Video recording of the programmers' test runs should provide a finished product that proves instructive and provides a good deal of unintended slapstick humor.

A successful tooth brushing program will walk the robot through the steps of twisting the cap off the toothpaste, squeezing the tube, applying a small amount of toothpaste to the bristles, brushing the exterior surfaces of the teeth, brushing the tops of the teeth, and brushing the interior surfaces of the teeth. Brushing the teeth is actually quite a complicated operation. The teacher may wish to select a simpler task such as putting on socks or getting out of bed. If the teacher is using students homogenously grouped by language skill level for differentiated instruction purposes, groups may be given tasks of varying degree of complexity based on ability level.

Romance Like Google Translate: A (Very Simplified) Manual Simulation

In this exercise, students will be given snippets of parallel texts in Spanish and English containing both known and unknown words and will be asked to compose a love note f(in this case, a love tweet) from an imaginary English-speaking boy, Bryan, to his Spanish-speaking girlfriend, Zulimar. They will guess the meaning of unknown words in Spanish based on comparison of the parallel texts and will compile a glossary of useful words and will then use them to compose their note. The activity can be completed done individually, in pairs, or in groups. (See Appendix 2 for the activity written up as you might submit it to students.) I chose the following snippets of text to create our paired combinations of equivalent texts:

Adapted from *Madrid, Parte 4: Qué Visitar*

> "El Parque del Retiro...es uno de los parques más bellos de Madrid."
> "*Parque del Retiro...*is one of the most [lovely] parks in Madrid."
>
> "No sólo es el lugar perfecto para dar un paseo o relajarse en el lago, aquí también se pueden visitar los maravillosos palacios de cristal y de Velázquez."
> "It is not only the perfect place to take a stroll or relax by the lake you can also visit the wonderful Crystal and Velazquez Palaces."
>
> "Los Jardines del Descubrimiento son hermosos jardines situados en la Plaza de Colón y vale la pena visitarlos."
> "*Jardines del Descubrimiento* are beautiful gardens located at *Plaza de Colón* and well worth visiting." [32]

From El Poeta Callejero:

> "Tú eres una loca." [33]
> "You are a lunatic."

You will notice I cheated a little to highlight some of the weaknesses of statistical machine translation. The snippets of text I provided in the activity as written only supply masculine plural forms of adjectives. Some students or groups of students are bound not to recognize this. While most students should complete the activity with some degree of success, some attempts are very likely to show errors in gender and number agreement at the very least.

Does this exercise represent a fair analogy? Ask the first four students to complete the task manually to compose their tweet again, each with the aid of a different translation engine (e.g., Google Translate, Microsoft Translate, SDL, PROMPT, etc.) When the class has finished, compare student-generated results with machine-generated results and show

the relevance to real life issues in machine translation. The machine-generated results are likely to show significant errors in gender and number agreement, even within the same sample. Explain that the machines are just making statistical predictions for the best equivalent to a given word based on comparisons with other texts—in a fully statistical translation engine, the machine won't actually "know" any grammar at all, any more than it can "know" that Bryan's girlfriend is a female and not a male.

Conclusion

Machine translation doesn't mean the end of language learning and instruction, and teachers aren't helpless in the face of digitally assisted plagiarism. There are many things we can do to avoid incentivizing academic dishonesty. The most important is fidelity to the standards, or, put another way, a careful dedication to giving language learners tasks appropriate to their developmental level. We should avoid the mistake of assuming students should be able to resist the temptation to cheat when unsupervised, and should assume that work which can be completed with the aid of a machine will be completed with the aid of a machine.

Google Translate has only been around since 2006. Most of our corpus of instructional activities and resources—the kinds of assignments we give and the ways we deliver instruction—predate that. It's a different world, and many assignments that may have made good instructional sense in 2006 will need to be radically revised. We need, frankly, to look at everything we do and ask, "How can I implement this in a way that doesn't reward a student for doing it all on her phone?" In doing so, we will not only update outdated assignments and ways of working; we'll likely discard a lot of assignments that were never really appropriate work for our students anyway. At the least we can move assignments that carry too heavy a language load for novice learners to higher levels where the students are ready to complete the work.

The advent of machine translation forces us to think about the functions that will be beyond the reach of machines for some time to come. By giving students tasks that ask them to do things computers can't yet do, we make our assignments more relevant. By incorporating improvisation, interactive speech, and creativity into our assignments, we will also make the work more intellectually demanding and more interesting for the learners—and, not least, for the teachers.

Resources

Resources for Teachers

I strongly recommend teachers take the time to familiarize themselves with these two works as part of their own digital literacy education:

Warren Weaver. "Translation." Machine Translation Archive. Accessed September 28, 2014.

Warren Weaver introduced the concept of machine translation in this memorandum.

A. M. Turing. "Computing Machinery And Intelligence." *Mind*, 1950, 433-60.
This article is essential background reading for anyone interested in the field of A.I.

Student Reading List

David Bellos. "How Google Translate Works." The Independent. Accessed October 21, 2014. http://www.independent.co.uk/life-style/gadgets-and-tech/features/how-google-translate-works-2353594.html.

This article written for a popular audience should give students a conceptual understanding of how their favorite work-avoidance application for the World Languages classroom functions.

Materials for Classroom Use

"Kahoot!" Kahoot! Game-based Blended Learning & Classroom Response System. Accessed December 1, 2014. https://getkahoot.com/.

Kahoot! is a wonderful resource for putting students' handheld technology to productive use in the classroom.

"PALS: Performance Assessment for Language Students." World Languages: PALS. Accessed November 6, 2014. http://www.fcps.edu/is/worldlanguages/pals/.

I find the PALS rubrics to be absolutely indispensible for their ease of use. The lowest level students can be readily trained to evaluate their own and others' output.

Reese, Malinda. ""Let It Go" from Frozen According to Google Translate (PARODY)." YouTube. February 10, 2014. Accessed November 6, 2014. https://www.youtube.com/watch?v=2bVAoVlFYf0.

I found this video hilarious. I think your students will enjoy it, too.

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Discusses a hybrid approach to machine translation.

Bellos, David. "How Google Translate Works." The Independent. Accessed October 21, 2014. http://www.independent.co.uk/life-style/gadgets-and-tech/features/how-google-translate-works-2353594.html.
Description of Google Translate's statistical translation method.

"Fractal." - Wikipedia. Accessed September 25, 2014. http://nl.wikipedia.org/wiki/Fractal.
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Futschek, Gerald. "Algorithmic Thinking: The Key for Understanding Computer Science."*Publikationsdatenbank Der Technischen Universität Wien*. Technischen Universität Wien, 1 Jan. 2006. Web. 1 Dec. 2014. <http://publik.tuwien.ac.at/files/PubDat_140308.pdf>.
Futschek points out that algorithmic thinking is a core skill in computer science that can be taught and developed independently of programming.

Jani, Saj-Nicole. "Help Yourself and Help the World: An Interview With Duolingo CEO Luis Von Ahn." Forbes. May 28, 2014. Accessed June 3, 2014. http://www.forbes.com/sites/forbesleadershipforum/2014/05/28/help-yourself-and-help-the-world-an-interview-with-duolingo-ceo-luis-von-ahn/.
Forbes magazine interview with Luis von Ahn.

King, Margaret, and Peter Wheeler. "SYSTRAN." In *Machine Translation Today: The State of the Art : Proceedings of the Third Lugano Tutorial, Lugano, Switzerland, 2-7 April 1984*, 192-208. Edinburgh: Edinburgh University Press, 1987.
A brief description of SYSTRAN.

Levy, Steven. "Can an Algorithm Write a Better News Story Than a Human Reporter? | WIRED." Wired.com. April 12, 1922. Accessed September 25, 2014. http://www.wired.com/2012/04/can-an-algorithm-write-a-better-news-story-than-a-human-reporter/all/.

Kristian Hammond of Narrative Science claims that by 2027, 90% of news stories will be machine generated.

Lohr, Steve. "In Case You Wondered, a Real Human Wrote This Column." The New York Times. September 10, 2011. Accessed September 25, 2014. http://www.nytimes.com/2011/09/11/business/computer-generated-articles-are-gaining-traction.html?pagewanted=all.

The company Narrative Science claims their language generation program gives more natural sounding results difficult to distinguish from adequate human-generated prose.

Melby, Alan K., and C. Terry Warner. *The Possibility of Language a Discussion of the Nature of Language, with Implications for Human and Machine Translation*. Amsterdam: J. Benjamins, 1995.

Discusses SYSTRAN, Peter Toma's pioneering rule-based translation system.

"North Carolina World Language Essential Standards: Classical Languages, Dual & Heritage Languages, Modern Languages." State Board of Education Department of Public Instruction. Accessed November 6, 2014. http://www.ncpublicschools.org/docs/acre/standards/new-standards/foreign-language/world-language.pdf.

North Carolina state guidelines for the teaching of World Languages.

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Article used in my test of online plagiarism checkers.

Novak, Matt. "The Cold War Origins of Google Translate." BBC Future. May 30, 2012. Accessed September 28, 2014. http://www.bbc.com/future/story/20120529-a-cold-war-google-translate.

Discusses the role of the technology race with the Soviet Union as a driving force in the development of machine translation.

Och, Franz. "Research Blog: Statistical Machine Translation Live." Research Blog: Statistical Machine Translation Live. April 28, 2006. Accessed September 28, 2014. http://googleresearch.blogspot.com/2006/04/statistical-machine-translation-live.html.

Franz Och announces the live release of a statistically based translation service.

Och, Franz. "Breaking down the Language Barrier—six Years in - Google Translate Blog." Google Translate Blog. April 26, 2012. Accessed September 28, 2014. http://googletranslate.blogspot.com/2012/04/breaking-down-language-barriersix-years.html.
Google Translate is the world's leading source of translation services.

"PALS: Performance Assessment for Language Students." World Languages: PALS. Accessed November 6, 2014. http://www.fcps.edu/is/worldlanguages/pals/.
The Fairfax County Public Schools Performance Assessment for Language Students rubrics are among the best student evaluation tools I have seen.

Philipson, Joseph. "The Lingua File: SYSTRAN: A Brief History of Machine Translation." The Lingua File. November 29, 2013. Accessed September 28, 2014. http://www.thelinguafile.com/2013/11/systran-brief-history-of-machine.html#.VChDeWddX4E.
A recent history of SYSTRAN.

Piore, Emanuel. "Warren Weaver Obituary." Physics Today. Accessed September 28, 2014. http://scitation.aip.org/content/aip/magazine/physicstoday/article/32/4/10.1063/1.2995512.
Obituary of Warren Weaver.

"Plagiaat." - Wikipedia. Accessed September 25, 2014. http://nl.wikipedia.org/wiki/Plagiaat.
Article used in my test of online plagiarism scans.

PR Newswire. "$211 Billion and So Much to Buy -- American Youths, the New Big Spenders." $211 Billion and So Much to Buy. October 26, 2011. Accessed September 25, 2014. http://www.prnewswire.com/news-releases/211-billion-and-so-much-to-buy----american-youths-the-new-big-spenders-132632108.html.
According to the 2012 Harris Poll YouthPulse study, eight to 24-year-olds control $211 billion in buying power.

Reese, Malinda. ""Let It Go" from Frozen According to Google Translate (PARODY)." YouTube. February 10, 2014. Accessed November 6, 2014. https://www.youtube.com/watch?v=2bVAoVlFYf0.
I found this hilarious. I think some of your students will enjoy it, too.

"SYSTRAN Software - History." SYSTRAN Software History. Accessed September 28, 2014. http://www.translationsoftware4u.com/systran-translation-software.php.
Promotional material for SYSTRAN applications.

"TAUS - Enabling Better Translation." A Translation Automation Timeline. Accessed September 28, 2014. https://www.taus.net/timeline/a-translation-automation-timeline.
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A condensation of the exhaustive timeline posted at https://www.taus.net/timeline/a-translation-automation-timeline.

Toma, Peter. "SYSTRAN's Contribution to Mankind." Machine Translation Archive. Accessed September 28, 2014. http://www.mt-archive.info/T&T-1986-Toma.pdf.
This article, originally printed in Terminologie et Traduction, no.1, 1986, highlights Peter Toma's vision of machine translation as a tool for promoting peace and international understanding.

Turing, A. M. "Computing Machinery And Intelligence." *Mind*, 1950, 433-60.
The seminal article in which Alan Turing outlined his theory of artificial intelligence and proposed the Imitation Game, now known as the Turing Test of artificial intelligence.

Vallejo, Fernando. "Diez Mandamientos Son Mucho. Fernando Vallejo." - Taringa! Accessed December 1, 2014. http://www.taringa.net/posts/info/15969783/Diez-mandamientos-son-mucho-Fernando-Vallejo.html.
Source of the quote from Fernando Vallejo, "Ten commandments are an awful lot."

"Verdrag Van Versailles (1919)." - Wikipedia. Accessed September 25, 2014. http://nl.wikipedia.org/wiki/Verdrag_van_Versailles_(1919).
Article used in my test of automated plagiarism scans.

Vesselinov, Roumen, and John Grego. "Duolingo Effectiveness Study Final Report." Duolingo.com. December 1, 2012. Accessed June 3, 2014. http://static.duolingo.com/s3/DuolingoReport_Final.pdf.
This effectiveness study of Duolingo attributes most of the Duolingo's advantages over regular classroom instruction to student motivation.

Warman, Matt. "Google Translate and the Future of Voice." The Telegraph. June 13, 1928. Accessed October 21, 2014. http://www.telegraph.co.uk/technology/google/8255920/Google-Translate-and-the-future-of-voice.html.

Explains the importance of human-translated source texts for Google Translate.

Weaver, Warren. "Translation." Machine Translation Archive. Accessed September 28, 2014. http://www.mt-archive.info/Weaver-1949.pdf.
Warren Weaver of the Rockefeller Foundation introduced the concept of machine translation in this memorandum he circulated among two hundred acquaintances.

"Where Did the Word Computer Come From?" Dictionary.com. Accessed September 28, 2014. http://dictionary.reference.com/help/faq/language/e51.html.
The word "computer" originally meant "a person who performs calculations" and later a mechanical calculating machine.

Wilson, Simon. "Babel Fish and the European Parliament." Mojo Working. Accessed October 21, 2014. http://mojoworking.eu/2011/01/13/babel-fish-and-the-european-parliament/.
Explains the importance of UN and EU proceedings for Google Translate.

Von Ahn, Luis, Benjamin Maurer, Colin McMillen, David Abraham, and Manuel Blum. "ReCAPTCHA: Human-Based Character Recognition via Web Security Measures." Science Magazine. December 12, 2008. Accessed September 28, 2014. http://www.cs.cmu.edu/~biglou/reCAPTCHA_Science.pdf.
An overview of the reCAPTCHA system. Taken from Science Magazine, December 12, 2008.

Appendix 1: Teaching Standards

North Carolina Essential Standards for World Languages, Novice Low[34]

Connections to Language and Literacy:

NL.CLL.1.3: Use a variety of verbal and non-verbal communication strategies to ask *memorized* questions and express ideas or thoughts with prompting and modeling. (Emphasis added; see also NL.CLL.2.5, NL.CLL.3.1, NL.CLL.3.3; NL.COD.1.1, NL.COD.3.1; NL. CMT.1.1, NL.CMT.2.1, NL.CMT.2.2; also standards for Novice Mid level.)

The word “memorized” appears in thirteen of the Clarifying Objectives for the Essential Standards at the Novice Low level, and in another fifteen Clarifying Objectives at the Novice Mid level. The exit proficiency level for Level I of any modern alphabetic language is Novice Mid for interpretive listening, interpretive reading, interpersonal communication, and presentational writing. The exit proficiency level for Level II of a modern alphabetic language is still Novice Mid for the domain of presentational

speaking. In other words, for the first two levels of Spanish, French, or German, a great deal of students' communication—indeed, in presentational speaking, the majority—should be carried out using memorized phrases. Lack of fidelity to this standard is a major reason students in the World Languages resort to use of machine translation.

Digital Literacy (Connections to Other Disciplines, 3.3)

NL.COD.3.3: Use readily available technology tools and digital literacy skills to present in the target language.

Careful instructional design is especially critical when students are working with technology that facilitates the copying, machine translation, and pasting of material purloined from the Internet. Shoddy instructional design and inattention to the Essential Standards for the appropriate level will virtually ensure that students execute a digital presentation assignment using cut-and-paste techniques, grooming them for later failure.

Appendix 2: Romance Like Google Translate!

Your task: help your friend Bryan send a love tweet to his girlfriend Zulimar. Bryan speaks only English and Zulimar speaks only Spanish. You don't know much Spanish, but you have some parallel texts in English and Spanish to help you. Use words taken from the texts to create your Tweet.

Adapted from *Madrid, Parte 4: Qué Visitar*[35]

1. "El Parque del Retiro...es uno de los parques más bellos de Madrid."
   "*Parque del Retiro*...is one of the most [lovely] parks in Madrid."

2. "No sólo es el lugar perfecto para dar un paseo o relajarse en el lago, aquí también se pueden visitar los maravillosos palacios de cristal y de Velázquez."
   "It is not only the perfect place to take a stroll or relax by the lake you can also visit the wonderful Crystal and Velazquez Palaces."

3. "Los Jardines del Descubrimiento son hermosos jardines situados en la Plaza de Colón y vale la pena visitarlos."
   "*Jardines del Descubrimiento* are beautiful gardens located at *Plaza de Colón* and well worth visiting."

From El Poeta Callejero:[36]

4. "Tú eres una loca."
   "You are a lunatic."

You must compose at least three sentences complementing Bryan's girlfriend, but may not exceed 140 characters. Start by identifying words you wish to use and compiling a glossary. Then, put them together to send your message of love!

Glossary			
Spanish	**English**	**Spanish**	**English**

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