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PEDAGOGICAL USES FOR MACHINE TRANSLATION:

KOREAN L2 WRITING

by

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ABSTRACT

PEDAGOGICAL USES FOR MACHINE TRANSLATION: KOREAN L2 WRITING

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Korean is a particularly challenging language for English speakers due to its typological distance from English, and as such, learning Korean typically requires hundreds or thousands of additional hours of instruction to reach intermediate and advanced levels. One solution that this study analyzes is the use of a rapidly improving technology: machine translation (MT). Participants were tasked with producing a short composition in Korean and then trained to use MT-based strategies to improve their writing; they also completed pre- and post-surveys to gauge their attitudes toward machine translation. Results showed improvement in vocabulary choice and grammar as well as case/locative markers with minimal improvements in other categories. Post-survey results showed participant beliefs that MT strategies allowed for better expression of ideas and were reliable for grammar and word order corrections. They also expressed that information provided about the issues of machine translation was beneficial. Feedback

from a Korean language educator stated that MT improved writing overall by correcting grammar and sentence structure, but levels of proficiency play an important role in effectiveness. This work extends existing research internationally in MT-based L2 learner strategies, in addition to confirming machine translation as a form of AI with strong potential in language education.

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CHAPTER 1

INTRODUCTION

This research explores the use of machine translation (MT) in the Korean language learning classroom. The study examines the impact of the strategic use of machine translation in Korean L2 language teaching and learning, as measured by changes in student attitude towards machine translation and improvements in student composition following MT strategy training. This work contributes to the broader literature concerning pedagogical uses of machine translation and discussion of the role of the human in AI progress internationally.

CHAPTER 2

LITERATURE REVIEW

2.1 Difficulty of the English to Korean Language Pair

As of 2016, Korean language study is growing at an impressive rate. It has become the 11th most popular language to learn in the United States, with a 13.7% increased enrollment in Korean programs from 2013 and a 53,500% increase since 1958 (Looney and Lusin 6). Korean is also becoming more and more relevant on the global stage. The increasing popularity of the Korean language and language study in the USA is largely due to the growing popularity of South Korean music, food and culture; and Korea is rapidly becoming very important in the technology industry as well (Ryu; Dayton). However, Korean is by no means an easy language to learn, especially for students who are native English speakers. This language pair is one of the most linguistically distant in terms of culture, syntax, and pragmatics (Kang 95). According to the Foreign Service Institute language difficulty rankings, Korean classifies as a Category V Language for English speakers, meaning that it would take upwards of 2200 hours of learning to reach a professional level of proficiency. While classes of common mistakes and challenges for Korean language learners have been identified - including word order, verb endings, connectors, and limited vocabulary range - only limited research has been carried out to address these problems (Kang 98; “6 Reasons Why Learning Korean Language Is Difficult”). Classroom instruction has its limitations, with one language teacher being

assigned to teach 15 or more students. One way to approach this problem is to use an existing technology - machine translation (MT) - for error correction.

2.2 Machine Translation

Machine translation (MT) has developed significantly since its invention. While initial translation engines were littered with problems and inaccuracies, since the introduction of artificial intelligence and machine learning to form neural MT engines, automated translation has taken a sharp turn and is now more important to the translation industry than ever. In a foundational study, Dr. Lynne Bowker states that “[t]hough still not perfect...results may be usable for some purposes...and more people are beginning to use machine translation, which is now freely available online...” (131). Also, as technology becomes increasingly integrated into education and openly available, it is an important consideration to educate students on proper usage as well as issues and dangers of using online translators.

2.2.1 Machine Translation in the Classroom

2.2.1.1 Language Educator Attitudes toward Machine Translation

As advanced as MT has become, attitudes toward MT in pedagogical settings are still largely negative. In a paper by Claire Knowles, the author states that, “[t]he often clunky and inaccurate early versions of online machine translators may have negatively influenced perceptions of OMT...” which could have been reinforced over time and lead to negative views of current machine translation (5). Therefore, many teachers are still reluctant to use MT in classroom settings. After surveying various language educators, Niño concluded that though some educators do hope to integrate the technology into the classroom, they lack an understanding of how to use MT effectively as the technology

stands nowadays (252). The main negative consensus of educators has been found to be that MT is still inaccurate, and therefore difficult or even impossible to use for language learning. However, regardless of the pursuit of near-perfect machine translators, they are not necessary to benefit current L2 students.

2.2.1.2 Integrating Machine Translation (MT) into the L2 classroom

It is clear that the majority of MT output, as advanced as it is, does still typically contain identifiable errors. However, it can nonetheless be used to teach language. In a study by Sungwoo Kim to explore the usage of machine translation for producing L2 English compositions by first language (L1) Korean speakers, it was found that both teachers and students are able to benefit from MT by, "...[exploring] machine translation as a context-sensitive tool, while paying close attention to [cross linguistic] features, culture-specific phrases, lexical and grammatical characteristics..." (26). This strategy has been explored for many language pairs in other literature, usually for those seeking to improve English language skills. In a study to integrate online translators (OTs) into the L2 Spanish classroom, the authors state that, "...the fact that these translations need to be edited turns OTs into an effective pedagogical tool to be used in the L2 classroom..." and argue that raising metalinguistic awareness of language differences through the use of OTs is an effective method of improving language learning (Enkin and Mejías-Bikandi 141). Another study conducted in a Korean university examined the use of OTs in a L2 English classroom and found that using MT reduced the overall number of errors made in written compositions that would be otherwise undetectable without direct feedback from an educator (Lee and Briggs 26, 29). These and other studies show the potential benefit for machine translation in a L2 classroom.

2.2.1.3 Machine Translation (MT) Literacy

While the benefits of machine translation are apparent and should be explored, it is also important to include discourse about “machine translation literacy” when encouraging the usage of free online translators. In a study by Lynn Bowker, she states that “while this [literacy] instruction is increasingly integrating information technology, machine translation literacy does not yet seem to be widely taught” (Bowker 144). This sentiment is supported by another study that states that, “...digital literacy must be developed and promoted among students to equip them with the tools...to understand better, interact with, and grapple with new, almost ubiquitous technologies that are affecting language acquisition” (Herschel and Munné). Machine translation literacy should be a necessary component of language programs to help students develop an acute awareness of the current capabilities of MT as well as the technology’s issues or dangers.

CHAPTER 3

METHODOLOGY

The research focus for this study was a voluntary group of five intermediate and advanced Korean students (originally numbered seven, but two elected to leave the study), who were initially given a pre-survey to gauge attitudes towards and experience with MT. The survey was adapted from a previous study conducted by Dr. Lynne Bowker on machine translation literacy (145-148). In an assignment already integrated into their curriculum, the students in that setting were tasked to produce a rough-draft composition in the target language (L2).

The participants then viewed a video that introduced strategies such as pre-editing (editing the L1 input), post-editing (editing L2 output), and OT-integrated tools to use MT for error correction and complexification. The video also introduced concepts of machine translation literacy, discussing issues with online machine translators and potential dangers. The participants applied the demonstrated strategies to their compositions, and in a final step produced a final draft with the corrections highlighted. The final composition was used to collect data on significant improvements from the rough draft to final draft, specifically in areas noted by the existing literature: word order, verb endings, connectors, and vocabulary choices. Also, there was special attention on the concept of complexification. In this study, complexification is understood as, "(a) syntactic complexity, including measurements of sentence length and sentence complexity; and (b) lexical complexity, including measurements of lexical diversity, lexical density, and lexical

sophistication" (Lu et al.). Then a post-survey, also adapted from the Bowker study (145-148), was collected to gauge changed student attitudes toward and experiences using the trained strategy regarding the compositions.

Pre- and post-test survey results (both quantitative and qualitative questions) were analyzed and reported. A single initial review was conducted of the composition by the researcher and with the assistance of a native Korean speaker L2 educator. An expert faculty review of the compositions produced by the Korean learners (rough draft and final draft) was conducted using the error/challenge rubric outlined above.

CHAPTER 4

RESULTS

4.1 Survey Results

4.1.1 Pre-Survey Results

Pre-survey results show that most participants utilize machine translation a few times a week or every day. Participants stated they used *Naver Papago* and *Google Translate* as well as computer assisted translation (CAT) tools such as *Smartcat* (*Yandex* engine) and *Matecat* (*Google Translate* engine). The majority of participants used MT for both reading and writing tasks. Regarding satisfaction with current MT capabilities, participants were either somewhat or very satisfied with results (Table 4.1).

Positive	Negative
<ul style="list-style-type: none">○ Time saving for simple translations○ Useful as a starting point○ Easy to verify spelling	<ul style="list-style-type: none">○ Many words don't translate well between Korean and English○ Not useful for academic settings○ MT results are not the best due to different structures in Korean and English○ Fails to capture important meanings or slang

Table 4.1: Positive and Negative Sentiments of Machine Translation

Finally, students stated that they wished to see improvements in grammar, usage of more natural language, verb endings, vocabulary choices, and communication of detailed, complex ideas through the use of the strategies which are the focus of this study.

4.1.2 Post-Survey Results

Four out of five participants articulated a willingness to use MT to support written composition stating that it improved grammar and ability to express ideas, reintroduced concepts of the Korean language that had been forgotten and was generally a useful tool. One participant expressly stated that the strategies taught in the video were helpful in improving their composition. Participants who stated that satisfaction with MT was improved commented, “Learning how to utilize a tool differently helps open up opportunities to see how the machine can help in different ways.” Another participant stated, “I find machine translation still to be very useful, especially when trying to save time translating.” Those who claimed no improvement in satisfaction stated that there was a lack of evidence of benefit or that MT was unable to consistently comprehend grammar as well as other parts of the Korean language. In regard to willingness to use MT in academic settings, sentiments included the following:

- *I find it to be helpful especially when I want to double-check the grammaticality or accuracy of what I've written.*
- *[It is] beneficial using it in an academic setting. It helps beginning speakers break down certain phrases and gives them examples as well.*
- *I think machine translation is helpful when you can't translate ideas that are complex or above your knowledge.*
- *I already use machine translation in academic settings.*
- *Not willing to use in academic settings*

Participants claimed the most beneficial strategies were error detection/correction and the usage of the tools as a dictionary or thesaurus. One of five participants claimed that complexification was a useful strategy (Table 4.2).

<i>I am someone who makes a lot of typos in any language so it was very helpful when I had to look over it and I spelled something as simple as house wrong. The dictionary is helpful because frankly I'm still expanding my vocabulary and Korean words can sometimes work as both adjectives and verbs and I can't always differentiate.</i>
<i>Machine translation is very helpful to me when I am looking for words that I do not already know, as well as helping with the accuracy of complex sentences I am not sure I have written correctly.</i>
<i>It is helpful for me to be able to break down the sentences and choose different vocab words based on context.</i>

Table 4.2: Comments on Most Useful Strategies

When asked about the usefulness of machine translation literacy, participants expressed surprise at all topics. The distribution is shown in Figure 4.1. Participants stated MT literacy strategies, issues, and potential dangers were beneficial for language students, expressing that it would show students not to rely on a machine, help students form more accurate and natural sentences, provide a wider view of MT, and show both the benefits and problems of the tools.

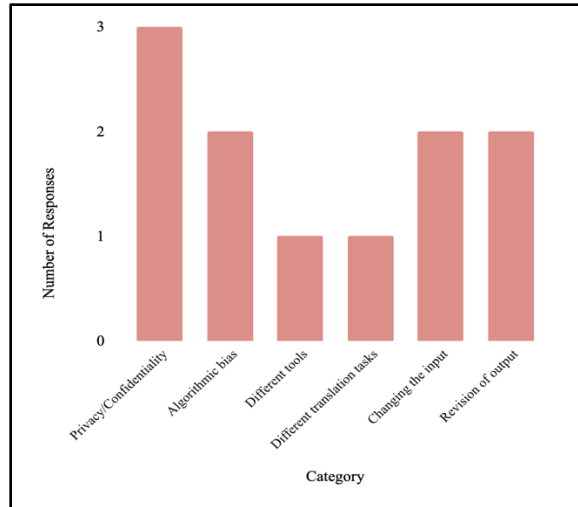


Figure 4.1: Post-Survey: Most Useful (New) Information

4.2 Composition Results

4.2.1 Overall Results

After initially reviewing all five compositions, it was observed that advanced students had better compositions and fewer errors overall. Intermediate students produced more errors by count than advanced students even after MT changes. As seen in Figure 4.2, the most commonly occurring change was vocabulary choice/correction followed by grammar correction.

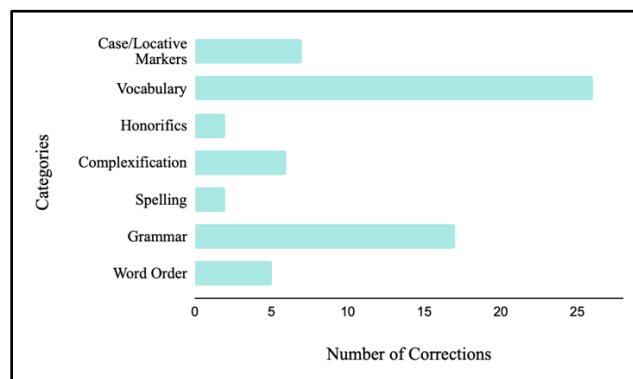


Figure 4.2: Total Number of Corrections

A notable and unexpected result from using MT-based correction was the removal of excess/unneeded words to make concise, natural sentences. Though not much complexification was observed, participants were able to make significant improvements to the initial draft using MT-based strategies.

4.2.2 Advanced Students

Advanced students showed stronger results, with final drafts showing noticeable improvements in all categories (shown in Figure 4.2). As seen in Figure 4.3, the participant made multiple changes including the removal of most unnecessary words and changing vocabulary to reflect required levels of politeness or improved grammar choices.

이번 학기에 제가 수업 4 과목을 듣는데 숙제와 프로젝트를 많으니까 이전에 생각했던 것보다 더 바쁜 것 같다. 월요일, 수요일과 금요일에 수업 2 과목 있고 수업들에 번역에 대해 배우고 제 교수님들께 배우기가 많이 좋아한다. 번역 수업들에 많은 게 배우고 기계 번역에도 배우고 있다. 화요일과 목요일에 언어학 수업 2 과목 듣고 정말 재미있다. 심리 언어학 수업에 뇌에 언어를 하기에 배운데 헛갈리는 게 많아서 어렵긴 한데 도전을 좋아하니까 어려운 게 배우기 좋다. 이번 학기에 수업들 때문에 가족과 친구들을 자주 볼 수 없으니까 조금 외로운 느낌이 있다. 다른 수업들에 친구를 사귀는데 고향에 사는 친구들을 만나는 기회를 없으니까 보고 싶다. 바란건데 추수감사절 방학에 친구들을 볼 수 있으면 좋겠다. 부모님도 자주 볼 수 없는데 고향에 갈 수 있는 기회를 있으면 가려고 한다.

이번 학기에 수업을 4 과목을 듣는데 과제와 숙제가 많아서 생각보다 바쁘다. 월요일, 수요일, 금요일 2 교시 수업이 있는데 그 수업에서 번역에 대해 배우고 교수님들께도 많이 배워서 좋아한다. 번역 수업과 기계 번역에 대해 많은 것을 배우고 있다. 화요일과 목요일에 언어학 수업을 두 개 듣는데, 그것들은 매우 흥미롭다. 심리언어학 수업에서 언어가 뇌와 어떻게 상호작용하는지 배운다. 헛갈리는 게 많아서 어렵지만 도전하는 걸 좋아해서 배우는 게 좋다. 이번 학기는 수업 때문에 너무 바빠서 가족과 친구들을 자주 볼 수 없어서 조금 외롭다. 모든 수업에서 친구를 사귀었지만 고향 친구를 만날 기회가 없어서 그들이 그립다. 추수감사절 방학 동안 친구들을 만날 수 있기를 바란다. 부모님을 자주 뵙지는 못하지만 기회가 된다면 집에 갈 계획이다.

Figure 4.3: Advanced Student Composition

In particular, the highlighted change (suggested by the MT and adopted into the second draft) shows a higher-level honorific address to parents who are noted in the composition. There were still identifiable issues, such as grammar mistakes not caught by machine translation, but in general, the final draft presented a natural, well-written composition.

4.2.3 Intermediate Students

Intermediate students showed minimal improvements, with final drafts showing small improvements in grammar and word choice.

Original Draft:

생활에 많이 바빠요. 아침에 여동생을 학교에 갈가요. 시간이있으면 집에 갈가요. 아니면 도서관에 가요. 영어 수업이 있어요. 주에동한 두게 수업이 있어요. 시간이있으면 다음 수업이 준비할거야. 다음으로 여동생 학교 갈가요. 그럼 집에 다시 가요.

Final Draft:

평상시에 엄청 바빠요. 아침에 여동생을 학교에 데려다 줘요. 시간이있으면 집에 갈가요. 아니면 도서관에 가요. 거기서 영어 수업이 있어요. 주중에 수업이 두게 있어요. 수업이 끝났어 다음 수업이 준비할거야 시간이있으면. 다음으로 여동생 학교의 갈가요. 그럼 우리는 집에 다시 가요.

Figure 4.4: Intermediate Student Composition

However, word order, case/locative markers, and spelling mistakes were still largely present and, in a few cases, of worsened quality.

CHAPTER 5

DISCUSSION

5.1 Participant Opinions

Participants expressed generally improved or more positive views of machine translation and the benefits of the strategies to their experience using MT following this experimental intervention and composition experience. Many expressed that the introduction of MT literacy and strategies helped their ability to properly use the tools. As stated by Dorothy Kennedy, an advocate for MT usage in language learning, “[l]earners who are trained, even briefly, in how MT works, write better compositions than those with no training” (Kennedy 191). This shows that introducing and educating students on the proper usage and strategies for MT is greatly beneficial to the student’s ability to use the technology.

5.2 Participant Compositions

Advanced students showed comparatively more improvements from initial to final composition than intermediate students. This finding suggests that machine translation is likely more beneficial to advanced students due to a higher understanding of the L2 and its structures. In the opinion of Dr. Sok Ju Kim, “students at [the] advanced level may benefit better than students at [the] intermediate level by using machine translation because advanced students understand grammar and sentence structure better than intermediate students.” This finding is corroborated by O’Brian who states that in order to gain a significant benefit from MT, “[a] post-editor must first have mastered translation

skills...” (O’Brian 118). Levels of proficiency are a significant factor in the effectiveness of MT usage. However, it is important to note that machine translation also made mistakes, exhibiting that there is still improvement to be made on the technology’s part.

The results of this study show the most demonstrable improvement in the categories of vocabulary (lexicon) and grammar (syntax), supporting the results in the broader research literature. Specifically, studies by Kim as well as Merschel and Munné, working in ESL and Spanish L2 pedagogy, respectively, focused this study on these two primary error/improvement categories. Lee and Briggs, working with learners of English and the impact of MT, provided the strategies central to MT use specifically. This study also supported Lee and Briggs in that all subjects showed a decrease in errors by count. It is important to note that Lee and Briggs concentrated on Korean-to-English translation, whereas this work focuses on Korean language production in an English language setting.

5.3 Future Prospects

Limitations of the study include a small sample with an unequal number of advanced and intermediate students, no facilitation from the researcher during the writing process, and participant attrition. This may lead to skewed results on the true benefits of MT-based strategies. Future studies might include additional language pairs, the involvement of multiple faculty experts or language educators, and more long-term studies on MT usage and the effects on overall language learning. Notably, the majority of publications which represent pre-post research on MT in language learning settings describe a one-time, shorter-term intervention in the long-term language learning process.

CHAPTER 6

CONCLUSION

Paper-and-pen translation is becoming progressively obsolete as automated translation technology comes to the forefront of many industries, with approximately one trillion words automatically translated daily in the global context (Vashee). And though machine translation has been widely criticized in the past for its inaccuracies, machine translation has improved greatly since the introduction of AI and machine learning, especially neural machine translation improvements (Lewis-Kraus). However, these steps forward have not yet received widespread attention in pedagogical settings. In pedagogy, many teachers are still reluctant to introduce machine translation to students, but students should be taught to use machine translation with the proper strategies and be educated for awareness of MT's capabilities as well as drawbacks.

In this study, through both improvements in student compositions and positive student feedback, it has been shown that current MT capabilities have apparent benefits to language learning. And while MT is not a replacement for traditional language learning (Nemcova and Wooten), it can serve as a tool that enhances the language learning experience. There is a long history in the L2 scholarly literature in considering the use of technology to enhance language learning both inside and outside of the classroom, as seen in Garrett.

However, with the increasing relevance of machine translation in society, it is important to recognize AI as a way to, "...increase and amplify human knowledge or reduce

errors in human performance” (Markauskaite et. al 4). The integration of MT into the classroom also deserves to join the bigger debate of AI and human interaction. Researchers such as Siemens et al. consider AI issues in the educational sphere and strive to answer the question explored in this study - “How can AI be integrated into education and society?” This study builds on this question and contributes to the cited scholarly debate.

APPENDIX A
PRE-SURVEY

<p>Q1: What level of Korean are you studying at currently?</p> <ul style="list-style-type: none">a) Intermediateb) Advanced
<p>Q2: How often do you use machine translation?</p> <ul style="list-style-type: none">a) Every dayb) A few times a weekc) Once a weekd) A few times a monthe) Once a monthf) Never
<p>Q3: What machine translation engine(s) do you use? Pick all that apply.</p> <ul style="list-style-type: none">a) Google Translateb) Naver Papagoc) Otherd) N/A
<p>Q4: If you picked other, please list it below.</p>
<p>Q5: What do you use machine translation for?</p> <ul style="list-style-type: none">a) Readingb) Writingc) Bothd) N/A
<p>Q9: How satisfied are you with current machine translation capabilities/results?</p> <ul style="list-style-type: none">a) Completely satisfied. It meets all my needs.

- b) Very satisfied. It meets most of my needs.
- c) Somewhat satisfied. It meets a reasonable number of my needs.
- d) Somewhat dissatisfied. It meets a few of my needs.
- e) Completely dissatisfied. It does not meet any of my needs.

Q10: Why? (Explain previous answer).

Q11: Do you think machine translation is beneficial in academic settings?

- a) Yes
- b) No
- c) Sometimes

Q12: Why? (Explain previous answer)

Q13: What would you like to see improve in your Korean composition/writing?

APPENDIX B
POST-SURVEY


<p>Q1: What level of Korean are you studying at currently?</p> <ul style="list-style-type: none">a) Intermediateb) Advanced
<p>Q2: Are you more willing to use machine translation in regard to written composition than before?</p> <ul style="list-style-type: none">d) Yese) No
<p>Q3: Why? (Explain previous answer)</p>
<p>Q4: How (if at all) has your satisfaction changed with current machine translation capabilities/results?</p> <ul style="list-style-type: none">a) Improvedb) Not changedc) Reduced
<p>Q5: Why? (Explain previous answer)</p>
<p>Q6: Have your thoughts about using machine translation in academic settings have changed?</p> <ul style="list-style-type: none">a) Yesb) No
<p>Q7: Why? (Explain previous answer)</p>
<p>Q8: Which of the key elements of machine translation usage was the most surprising to you (i.e., something that you didn't know before or hadn't thought of when using machine translation tools before)? Pick all that apply.</p> <ul style="list-style-type: none">a) Privacy/confidentiality

<ul style="list-style-type: none">b) Potential for algorithmic biasc) Awareness of different toolsd) Awareness of different translation taskse) Improving the output by changing the inputf) Improving the output through revisiong) N/Ah) Other
Q9: If other, please specify.
Q10: What was the most beneficial strategy to you? (Pick all that apply) <ul style="list-style-type: none">a) Error Detection/Correctionb) Dictionary/Thesaurusc) Complexification
Q11: Why?
Q12: Do you think knowing strategies as well as issues/dangers of using machine translation is beneficial to language students? Why?
Q13: Do you have any other comments or notes about this study?

APPENDIX C

POWERPOINT – TEACHING MATERIAL

Improving Korean Writing through Machine Translation



1. What is Machine Translation (MT)?



Pros and Cons of Korean-Supportive Engines



Google Translate

Pros -

- Allows for easy input changes

Cons:

- Average quality translations
- No other features
- Inconsistent with constant back and forth translations

Naver Papago

Pros -

- Dictionary and Thesaurus applications
- More accurate translations
- Relatively consistent with constant back and forth translations

Cons:

- Overloads
- Doesn't allow for input changes

Strategies - Error Correction and Mock Dictionary/Thesaurus

Error Detection/Correction

- Run Korean draft through engine
- Check translated text for mistakes in intended meaning, vocabulary, etc.
- Make changes accordingly

Dictionary/Thesaurus (Papago)

- Run Korean draft/text through engine
- Definitions, synonyms and antonyms for words in text will be present
- Change according to preferences

Strategies - Complexification



What to do next...

- 1) Make changes to your draft based on the strategies
- 2) Put both the original draft and the final draft together in a document (preferably word) and highlight all the differences/changes you made. You don't need to put your name on it.
- 3) Email the document to me
- 4) Take the post survey (I will send it through email once I start receiving submissions)

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Manali Khandekar is a senior liberal arts student at the University of Texas at Arlington. She will be graduating with an Honors Bachelor of Arts in Critical Languages and International Studies-Korean and a Bachelor of Arts in Psychology in December 2022. Her research interests include acquisition of language and machine translation or AI applications to language education. Manali's future career plans include joining a language service provider as a localization or translation project manager.