Comparing Post-Editing Translations by Google NMT and Yandex NMT

Azza Rabiatul Adawiyah[1], Baharuddin[2], Lalu Ali Wardana[3], Santi Farmasari[4]
azzara_ed039@mhs.unram.ac.id[1], bahar@unram.ac.id[2], aliwardana@unram.ac.id[3], santifarmasari@unram.ac.id[4]

Universitas Mataram

Abstract

This study is aimed at examining the naturalness of post-editing translations using Google NMT and Yandex NMT by English Department students and to determine which of the two NMT tools came closest to the naturalness of a short story's translation. The subjects of this study were English Education students from the University of Mataram who come from the native area. Meanwhile, the object of this study was a short story entitled "Jack and The Beanstalk," in English version. In this study, the researcher used Larson's theory as the study's reference to analyze the naturalness of translation in the short story "Jack and The Beanstalk" from English to Indonesia. The data were obtained by two methods of data collection: observation and documentation. The total data in this study was 1248 sentences, which were analyzed descriptively. The result of this study showed the percentage of text quality in naturalness translation that students produced in conducting post-editing. In GNMT most of the post-editing quality is "highly natural" with 88%, followed by "natural" with 5%, "less natural" with 6%, and "unnatural" with 1%. On the other hand, little few differences were found in YNMT, which shows that most of the post-editing quality is "highly natural" with 81%, followed by "natural" with 6%, "less natural" with 8%, and "unnatural" with 4%. According to that percentage, it can conclude that the quality of naturalness translation in post-editing from GNMT is easier to edit and produce better-translated text than YNMT.

Keywords: GNMT, YNMT, naturalness, post-editing, short story

Introduction

In this globalization era, everyone needs to be able to communicate in English orally and in writing to access all news and information in all aspects of life. The majority of news, books, and journals are published in English. As a result, many people who do not speak English will have difficulty accessing information and fall behind. However, not all information in English books is easy to understand by those who speak English as their second language. Due to these factors, translation tools need to be fast and productive. One of these technical services is machine translation (MT). MT is a type of computer software that uses an automatic translation system to process a source text in one language and generates a target text in another (Anggrina, Bella; Suparmi; Pramudita, Ellan Kripa, 2017). Thus, machine translation (MT) supports individuals in automatically converting one language into another without the need for human interaction, and non-native speakers easily comprehend the material in the foreign language.

In the 1970s, the first machine translation software employed rules-based machine translation (RBMT). This machine translation method is translating text word for word using a set of grammatical rules and the required language pair dictionary. However, this

frequently resulted in stilted translations that were neither readable nor usable. As a result, machine translation quickly earned a negative reputation. After complaining about the inaccuracies of machine translation, people began to criticize it as inferior to "real" (human) translators (Alsan, 2022).

NMT can deliver high-quality translations with the help of sophisticated language translation algorithms. Not only are these translations more exact, but they also sound more natural than those produced by RMBT and SMT technologies. The success of NMT has now silenced the majority of machine translation critics. Even arguments such as "but machine translation can't pick up or translate text in photos and PowerPoint slides!" have been mostly calm since the emergence of advanced machine translation systems that can (Alsan, 2022).

Google Translate (Google NMT) and Yandex Translate (Yandex NMT) are two popular machine translations many people use worldwide. Google Translate is a free machine translation service made available by the Google Company for translating texts and messages from one language into another (Google, 2016). At the same time, Yandex Translate (Russian: ндекс ереводик; stylised as Yandex. Translate) is a Yandex web service for translating text or web pages into another language (Yandex, 2011). It is not only facilitated for professional translators for publication and assisting readers in understanding ideas in foreign languages but also applied to language learning in helping learners deal with linguistic differences to obtain information and access new knowledge in another language. The two most common reasons for using MT were reading comprehension and writing in a foreign language. Students acknowledged that MT provides them with academic and scientific opportunities for terms used in writing assignments. However, Google Translation has some translation limitations. It generates less accurate meaning and many errors in its output. It may cause issues when students enter words, phrases, and full texts into the software without being aware of the limitations (McCarthy, 2004).

English as a Foreign Language (EFL) students continues relying on MT tool to aid their translation work. It is because MT is simple to use and familiar. However, they recognize that incorrect translation from MT will impact their translation quality because "machines'" knowledge of grammar and words - and, more importantly, world knowledge - is limited compared to humans. As a result, MT systems typically make more errors than humans, and the results may be challenging to comprehend. To achieve high-quality results, EFL students must use their translation knowledge to correct the MT output. Post-editing is the process of remedying MT translation output. It entails tidying up the raw output, correcting errors, revising or, in the worst case, entirely retranslating sections, and making corrections to texts that have been machine translated from a source language into a target language (Somers, 2001). As a result, after completing the machine translation (MT) process and evaluating its output, the post-editing process is required. A human translator should ensure that the source and target texts convey the same information and that the translation tone is consistent with the original document.

Based on the explanation above, this study expects to compare English department students' post-editing on Google NMT and Yandex NMT English-Indonesian translation output at the Mataram University in terms of naturalness in the translation product, and answering the question related to naturalness GNMT and YNMT output.

Theory and Method

In translating a text, the translator must consider several aspects to ensure the translation is of high quality. The factors are related to culture (particularly the source language), syntactical words, and the text's message. Furthermore, the translator should pay attention to the following key factors: First, there is the translation procedure. It addresses

the source text's reading, the target text's writing, and the process itself (Schaeffer & Carl, 2013). Post-editing in this study refers to the activities of translators / internal translators. Post-editing is the task of editing, modifying, and modifying pre-translated text processed by the MT system from the source language to the target language (Allen, 2003), and the post-edited text.

Google Translate is a multilingual neural machine translation service developed by Google to translate text, documents, and web pages from one language to another. It provides website interfaces, mobile apps for Android and iOS, and APIs that help developers create browser extensions and software applications (Ulatus, 2020). Yandex Translate service uses self-learning statistical machine translation (Yandex, 2011), developed by Yandex. The system builds a dictionary of word-for-word translations based on analyzing millions of translated texts. In translating text, the computer first compares it with a database of words. The computer then compares the text with basic language models, trying to determine the meaning of an expression or text in the context of how natural the language is.

Naturalness is reflected through sentence construction, information truth, aestheticism, sense, corresponding word, life-cultural custom, and communicative expression (Baharuddin, 2015). The goal of a translator should be to produce a receptor language text (a translation) that is idiomatic; that is, one that has the same meaning as the source language but is expressed in the natural form of the receptor language (Larson, 1984). According to Nida (1964), naturalness in the target language should be attained so that readers of the translated version are unaware that they are reading a translation result. Natural translation comprises two significant areas of adaptation: grammar and lexicon.

Naturalness tests aim to determine whether the translation's form and style are natural. Larson (1984) provides the following indications for the quality category of naturalness: (1) Unnatural: Unnatural form, with awkward language, culturally unnatural, and stylistically awkward. (2) Less natural: Use as few unnatural words, grammar, phrases, and idioms as possible. (3) Natural: Correct meaning, proper idioms, and words, but some grammatical and structural mistakes. (4) Highly natural: make sense, read naturally (written in ordinary language, common grammar, proper idioms, and words)

This study uses a descriptive-comparative method with a qualitative approach. The descriptive method examines the status of a group of people, an object, a set of conditions, a system of thought, or a class of events in the present. Descriptive research aims to make a systematic, factual, and accurate description, picture, or painting of the facts, properties, and relationships between phenomena being investigated. In addition, in the descriptive method, researchers can compare certain phenomena to be a comparative study.

Comparative is a study that compares the existence of one or more variables in two or more different samples or at different times. Therefore, this study's descriptive-comparative method compares the naturalness of translation quality between Google NMT & Yandex NMT in students' ability to conduct post-editing on the text.

The data collection was carried out in 2022 from September to December; English Education students at Mataram University participated in this study. They were all enrolled in the 5TI-1 translation and interpreting class in 2022. They all had the same language background, with Indonesian as L1 and English as L2 and a similar English language proficiency.

Observation and document study (Translation text assignment) was chosen as the research instrument by the researcher. This observation will be carried out directly in the learning class taken by the participants to be studied (5TI-1, IT Based Translation class of 2022). The students must be completed several assignments within one semester in this translation and interpreter class. Still, the researcher will only take one assignment as the

research data source. The short story title "Jack and The Beanstalk" was chosen as the subject of this research. The data is explicitly collected through a Google Form intended for analysis; in that form, participants will enter the results of editing translations from Google Translate and Yandex Translate.

Findings and Discussion

During the process of data gathering, researchers observe in the classroom. In class, pupils were enthused about their education and worked diligently to revise the text provided by the instructor. The task required pupils to comprehend the text. The professor elaborated on the meaning of each sentence in the original language, as well as the application of translation theory, in great depth. Then, the students will correct elements such as grammar, word choice, punctuation, subject/object, and decide the appropriate vocabulary to produce acceptable, natural, and understandable sentences within the text. Therefore, matching source and target text vocabulary requires experience. For post-editing translations, dictionaries are required to find lexicons or acceptable terms for constructing accurate target text. Similarly, there are current projects in which text is entered into Neural Machine Translation (NMT), post-edited to create the desired content, and then compared to the original text to determine how it varies.

From the class observation, the researcher collected some data. Among the processes seen in sentence correction, relevant data will be collected for debate and interpretation in this study. Each student will individually submit their revised sentence translation using the Google Form that was built for this purpose. Students were assigned to translate a short story using either Google Translate or Yandex Translate. The translations produced by the two machines were revised to attain a high degree of naturalness. The short narrative content comprises of 6 paragraphs and 48 sentences in total. 26 students were responsible for the collection of 1,248 sentences from the short narrative. To determine the translation's naturalness, analysis and evaluation have been conducted by applying translation theory and modifying it based on suitability and clarity. The results indicate that the two GNMT translation machines are easier to edit during post-editing operations; this is demonstrated by the existing data. GNMT assigns a higher proportion of highly natural scores to sentences than YNMT. Some results of post-editing can be classified as highly natural, natural, less natural, and unnatural. However, the majority of post-editing results are extremely natural, as seen in the table below.

Table 0.1 The quality of naturalness translation after conducting post-editing

Criteria	Sentences	
	GNMT	YNMT
Highly natural	554	511
Natural	31	34
Less natural	37	52
Unnatural	2	27

According to the findings above, the quality of the text produced by students who conduct post-editing can result in the text being highly natural. Students conducting post-editing can generate the quality of the post-editing text by making changes such as word choice, punctuation, subject/object substitution, and cutting phrases or sentences. Furthermore, all of the students have submitted their post-editing text; it can be seen from the Google Form that 26 students submitted their work.

ISSN 2656-6842

The translation of edited text looks relatively natural. This is because the language in the text sounds natural and easy to understand. Several additions of words in a new text version improve the clarity of the output text from the NMT, making the translation into the target language easy to read. On the other hand, post-editing with the reduction or deletion of a certain word in the sentence looks like a must since the word seems unimportant and makes the translation very awkward. Then, the types of words that can make the sentence look weird should be omitted to have a meaning that matches the target language's grammar. Therefore, the post-editing will help the translated text from NMT better. The results of the translation process are presented in the following diagram showing the quality percentage of the translation between two NMT.

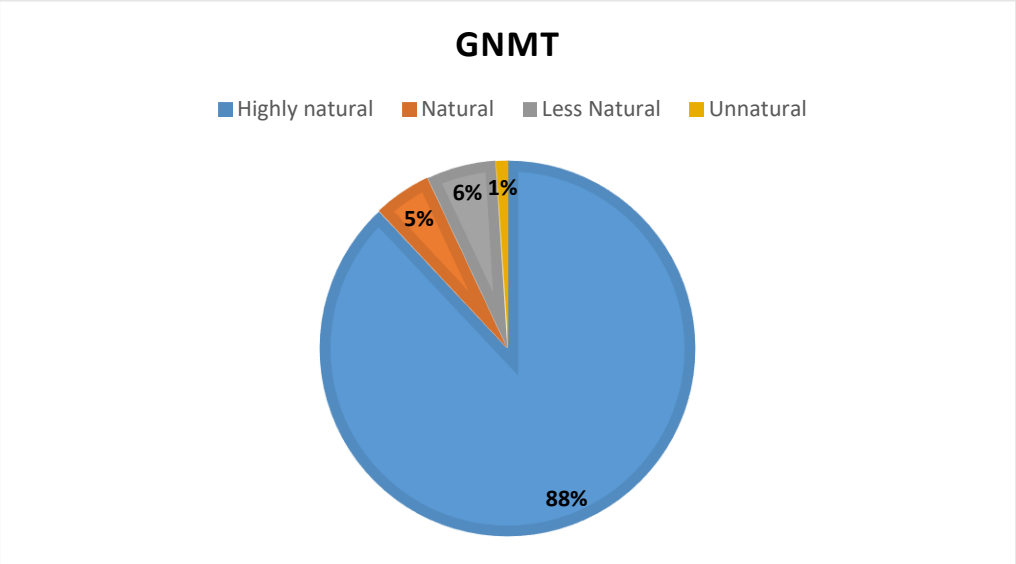

Diagram 0.1 Percentage with the criteria of text quality on GNMT

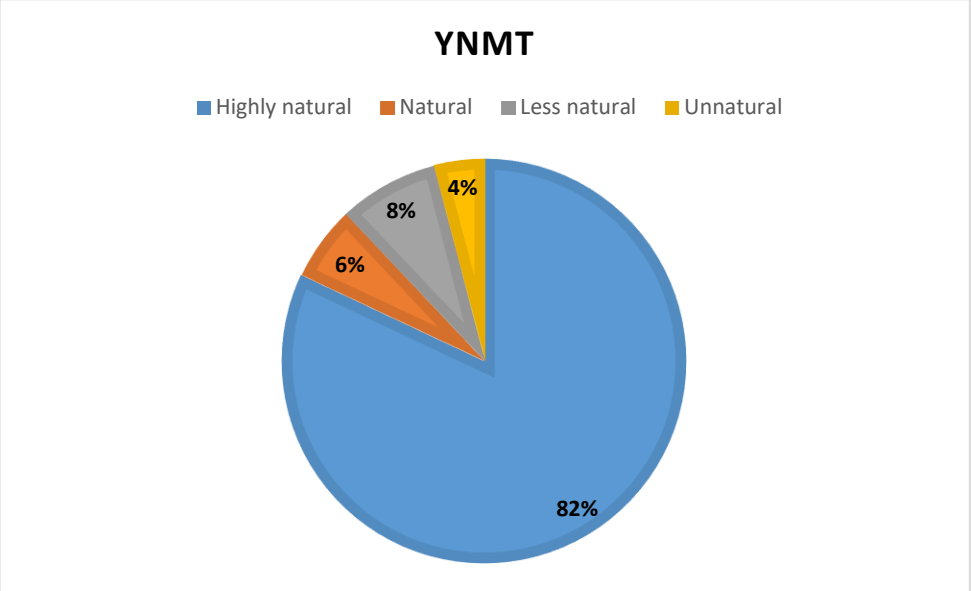

Diagram 0.2 Percentage with the criteria of text quality on YNMT

The diagram above shows the percentage of text quality in naturalness translation that students produced in conducting post-editing. For example, GNMT shows that most of the post-editing quality is "highly natural" with 88%, followed by "natural" with 5%, "less natural" with 6%, and "unnatural" with 1%. On the other hand, little few differences were found in YNMT, which shows that most of the post-editing quality is "highly natural" with 81%, followed by "natural" with 6%, "less natural" with 8%, and "unnatural" with 4%. According to that percentage, it can conclude that the quality of naturalness translation in post-editing from GNMT is easier to edit and produce better-translated text than YNMT.

The source text of this study is a short story text that needs an editing process after inputting it to NMT. The source text is a short story text in English with the title "Jack and The Beanstalk".

Naturalness Quality of GNMT and YNMT

Table 0.2 An example of text that produces the naturalness quality of the text with **highly natural** criteria in conducting post-editing

Sentences	Source text	Original GNMT	Edited GNMT	Original YNMT	Edited YNMT
2	One day, Jack's mother told him to sell their only cow.	Suatu hari, ibu Jack menyuruhnya untuk menjual satu-satunya sapi mereka.	*Pada* suatu hari, ibu Jack menyuruh Jack untuk menjual satu-satunya sapi *yang* mereka *miliki*.	Suatu hari, ibu Jack menyuruhnya untuk menjual satu-satunya sapi mereka.	*Pada* suatu hari, ibu Jack menyuruh *anaknya* untuk menjual *sapi mereka satu-satunya.*

Based on the text edited GNMT by the first student above, the changes in the original GNMT text have been obtained in a new version of the text by making improvements such as the preposition *"pada"* at the beginning of sentences, adding the conjunction *"yang"* to the sentence *"satu-satunya sapi mereka"* and the last one adding word *"miliki"* as an explanation of ownership at the end of the sentence *"satu-satunya sapi mereka,"* these word additions make sentences easier to understand and sound more natural.

The same thing is also found in the YNMT edited text by the second student; there are improvements by adding several words, such as the preposition *"pada"* at the beginning of sentences, changing the word *"menyuruhnya"* to the word *"menyuruh anaknya"*, and the student rearranging the word *"satu-satunya sapi mereka"* to be *"sapi mereka satu-satunya"*. All the word additions and rearrangements made by students make the translations sound more natural and easier to read.

Table 0.3 An example of text that produces the naturalness quality of the text with **natural** criteria in conducting post-editing

Sentences	Source text	Original GNMT	Edited GNMT	Original YNMT	Edited YNMT
6	She said, “You fool! He took away your cow and gave you some beans!” She threw the beans out of the window.	Dia berkata, “Kamu bodoh! Dia mengambil sapimu dan memberimu kacang!” Dia melemparkan kacang ke luar jendela.	Dia berkata, “Kamu bodoh! *Dia mengambil sapimu dan menukar dengan kacang!*” Dia melemparkan kacang tersebut ke luar jendela	Dia berkata, " Kamu bodoh! Dia mengambil sapi Anda dan memberi Anda beberapa kacang!" Dia melemparkan kacang keluar dari jendela.	Dia berkata “Kamu bodoh! *Dia mengambil sapimu dan menukarnya dengan beberapa kacang!” Ibunya* melemparkan kacang-kacang *itu* keluar jendela.

According to the text edited GNMT by the first student above, the changes in the original GNMT text have been obtained in a new version of the text by changing the sentence *“Dia mengambil sapimu dan memberimu kacang”* to *“Dia mengambil sapimu dan menukar dengan kacang”*; this sentence is a comparative sentence, in this case, the mother is comparing cow and beans where these two things are different. In Indonesian, these two things do not have comparable dimensions, but the comparison is only based on objects and objects in general. The use of the word “some” is not correct or should not be used. However, in the changes made by this student, there is one shortfall, the absence of the addition of the word *“hanya”,* which functions as a word that explains that Jack does not get a return that is nothing more than beans which are not equivalent to the price of the cow.

For the YNMT edited text by the second student above, we can conclude that the student made some changes, including changing the word *“Dia mengambil sapi Anda dan memberi Anda beberapa kacang”* to *“Dia mengambil sapimu dan menukarnya dengan beberapa kacang”* Although in this change the same thing happened as students did in the edited GNMT; there was a little difference found in the edited text, student change the word *“Dia”* to *“Ibunya”,* the use of the word *“Ibunya”* in this sentence as a substitute for the third person pronoun *“Dia”.* The last one was the addition of the word *“itu”* in the word *“Dia melemparkan kacang keluar dari jendela.”*; this word is a demonstrative determiner that refers to the beans that were thrown.

Table 0.4 An example of text that produces the naturalness quality of the text with **less natural** criteria in conducting post-editing

Sentences	Source text	Original GNMT	Edited GNMT	Original YNMT	Edited YNMT
15	The giant cried, “Fee-fi-fo-fum, I	Raksasa itu berteriak, “Fee-fi-fo-	Raksasa itu berteriak, “Fee-fifo-	Raksasa itu menangis, "Fee-fi-fo-	Raksasa itu berteriak, "Fee-fi-fo-

	smell the blood of an Englishman.	fum, saya mencium bau darah orang Inggris.	fum, saya mencium bau darah *orang Inggris.*	fum, aku mencium bau darah orang Inggris.	fum, aku mencium bau darah *orang Inggris.*

In this criteria, whether it's edited text GNMT or edited text YNMT by the two students, there is one word that sounds less natural, the translation of "an Englishman." becomes "orang Inggris.". In the dictionary translation from English to Indonesian, the word "Englishman" is translated as a person or a man with English nationality. However, in this text, the context of the sentence does not discuss a person's nationality, but only refers to someone hiding from the giant. Therefore, this word should use "manusia" instead of "orang Inggris" to achieve a more natural translation.

Table 0.5 An example of text that produces the naturalness quality of the text with **unnatural** criteria in conducting post-editing

Sentences	Source text	Original GNMT	Edited GNMT	Original YNMT	Edited YNMT
4	Jack asked, "What will you give me in return for my cow?" The man answered, "I will give you five magic beans!" Jack took the magic beans and gave the man the cow.	Jack bertanya, "Apa yang akan Anda berikan sebagai imbalan atas sapi saya?" Pria itu menjawab, "Saya akan memberi Anda lima kacang ajaib!" Jack mengambil kacang ajaib dan memberi pria itu sapi.	Jack bertanya, "Apa yang akan kamu berikan sebagai *balasannya? untuk sapi saya?"* Orang itu menjawab, "Aku akan memberimu lima kacang ajaib!" Jack mengambil kacang ajaib dan memberi pria itu sapi.	Jack bertanya, " apa yang akan Anda berikan saya kembali untuk sapiku?" Pria itu menjawab, " aku akan memberimu lima kacang ajaib!"Jack mengambil kacang ajaib dan memberi pria itu sapi.	Jack bertanya, "apa yang akan Anda berikan *kepada saya kembali* untuk sapi saya?" Pria itu menjawab, "Aku akan memberimu lima kacang ajaib!" Jack mengambil kacang ajaib dan memberi pria itu sapi.

In this GNMT edited text by the first student, one sentence is translated very unnaturally: "balasannya? untuk sapi saya?" students put a question mark in the middle of a sentence that is not in accordance with its placement and function. While in the YNMT edited text by second student there is a translation *"apa yang akan Anda berikan kepada saya kembali untuk sapi saya?"*. The translation of the word "return" in the context of this sentence refers to "payment" that the buyer of the cow will give; therefore, the correct translation for this sentence is *"bayaran"* so the meaning of this sentence is in accordance with the context being discussed and does not change the meaning of the sentence.

The Comparison of GNMT and YNMT

Table 0.6 The comparison of the original translation from GNMT and YNMT.

Sentences	Source Text	Original GNMT	Original YNMT
16,26, and 36.	Be he alive, or be he dead, I'll grind his bones to make my bread!" The wife said, "There is no boy in here!" So, the giant ate his food and then went to his room.	Baik dia hidup, atau mati, aku akan menggiling tulangnya untuk membuat rotiku!" Sang istri berkata, "Tidak ada anak laki-laki di sini!" Jadi, raksasa itu memakan makanannya dan kemudian pergi ke kamarnya.	Jadilah dia hidup, atau menjadi dia mati, aku akan menggiling tulang-tulangnya untuk buatkan rotiku! Sang istri berkata, " tidak ada anak laki-laki di sini!" Jadi, raksasa makan makanan dan kemudian pergi ke nya kamar.

The sentence above is an example of a sentence that produces a different translation from the two NMTs. This sentence itself is repeated three times in the short story. As we can see in the original translations of the two NMTs above, the translation results in GNMT produce more natural results and require fewer additions or changes to achieve a natural translation than the original YNMT translation. The first comparison can be seen from the translation at the beginning of the sentence "Be he alive, or be he dead", GNMT translates this sentence into *"Baik dia hidup, atau mati"*. In contrast, YNMT translates it into *"Jadilah dia hidup, atau menjadi dia mati"*, the translation produced by YNMT is a very unnatural form, with awkward language. The second comparison is the translation "So, the giant ate his food and then went to his room.", GNMT translates this sentence into "Jadi, raksasa itu memakan makanannya dan kemudian pergi ke kamarnya." while the result of YNMT's translation is *"Jadi, raksasa makan makanan dan kemudian pergi ke nya kamar."*. The sentence "ate his food" in this sentence is more accurately translated like the translation produced by GNMT, namely *"memakan makanannya",* the YNMT translation, which produces *"makan makanan"* has a grammatical error resulting from the absence of a pronoun used, resulting unclear sentences. Besides, the sentence "went to his room" in the YNMT translation produces *"kemudian pergi ke nya kamar."*, this sentence has an incorrect sentence pattern where it has an incorrect meaning and grammatically incorrect.

Based on the overall results, the researcher concluded that GNMT has better translation results and requires less post-translation editing. This statement is also supported by data generated by students, which shows that 88% of students produce a natural level of translation in the "highly natural" category in GNMT. In comparison, YNMT is 81%. In another category "Unnatural" percentage, GNMT only gained 1% while YNMT gained 4%.

New Findings in Post-editing Translation

From the data gathered, researcher find some words that students used in conducting their post-editing to gain natural translation. Students translated some words with a different translation, such as:

1. I (“Saya”, “Aku”)

“Saya” according to KBBI (Kamus Besar Bahasa Indonesia), means the first person who is more respectful than *“aku”.* Meanwhile, *“aku”* according to KBBI, is the first singular pronoun, usually used in intimate conversation, such as between friends from the same age or village, brothers and sisters, parents to their children, as well as in prayer. Objectively, these two words have no difference in meaning. The only difference is the level of politeness. In this case, a story writer is not facing a social relationship that requires politeness. What he employs is a language technique that can make the characters in the story have a special affinity with the reader, make the reader no longer distant from the fictional character, even in some ways the writer wants readers to identify themselves with the fictional character. In conclusion, the translation of the word “I” here is more appropriate to use the word *“aku”* as the translation.

2. Crept out (“Merayap”, “Merangkak”)

“Merayap” movement is almost the same as the *“merangkak”* movement. But, *“merayap”* movement position of a body is attached to the ground, and the body position when crawling is lower than when *“merangkak”.* In this short story, it is stated that “Jack crept out of his hiding place” hiding places are generally narrow places, and when someone comes out of their hiding place, they tend to make more careful movements so their enemies don’t notice them. The word *“merayap”* is more appropriate to represent that Jack came out of hiding with a lower body position so the giant would not see him.

3. Harp (“Harpa”, “Kecapi”)

Both of these musical instruments are musical instruments that are played by plucking with the fingers. However, the physical form of these two musical instruments is very different. *“Harpa”* is a stringed musical instrument whose shape resembles a bow spanned by 46 strings in a vertical position and a foot-pedal, played by plucking the strings with the fingers of both hands. While the *“kecapi”* is a traditional stringed musical instrument with three, five, six, and so on strings, without a line of notes, and is played with the fingers. In this Jack and The Beanstalk story, we all know that the giant’s musical instrument is a *“harpa”,* not a *“kecapi”.*

4. Master (“Tuan”, “Guru”)

The word “master” can be translated as a man who has people working for him, especially servants or enslaved people, or this word can also be translated as someone who has or shows very great skill or proficiency. In this short story text, this word is used by the harp that would be stolen by jack. The harp called out the giant because Jack had taken him. As we know from the story, the magic harp is one of the giant’s magical treasures. Therefore, the correct word to translate this is *“tuan”.*

5. Chop (“Memotong”, “Menebang”)

This word appears in the sentence, “He began to chop the beanstalk”. The context spoken in this sentence is that Jack is cutting a huge beanstalk. The translation of the word “chop” as *“memotong”* is not quite right because this word is used when cutting (something) into pieces with repeated sharp blows with a knife. The correct word to use is *“menebang”* because in this context, Jack is cutting through the base of (a tree or similar plant) with blows from an axe or other implement in order to fell it.

Conclusion

By the end of the discussion, the inference might be roughly drawn. The majority of the students have sufficient command in conducting post-editing text after being input to the NMT. The ability, as measured by Larson's theory of naturalness translation level is at a highly natural level. In GNMT most of the post-editing quality is "highly natural" with 88%, followed by "natural" with 5%, "less natural" with 6%, and "unnatural" with 1%. On the other hand, little few differences were found in YNMT, which shows that most of the post-editing quality is "highly natural" with 81%, followed by "natural" with 6%, "less natural" with 8%, and "unnatural" with 4%. The students should learn more about the use of words in accordance with the context of sentences. In addition, students must also understand the use of punctuation and their placement appropriately.

References

Allen, J. (2003). "Post-editing". In H. S. (ed.), *Computers and translation: A translator's guide.* Amsterdam: John Benjamins. Retrieved July 10, 2022

Alsan, M. (2022, January 12). The best machine translation software you can try in 2022. Retrieved June 1, 2022, from https://weglot.com/blog/machine-translation-software/

Anggrina, Bella; Suparmi; Pramudita, Ellan Kripa. (2017). EFL LEARNERS' POST-EDITING ON GOOGLE ENGLISH-INDONESIAN TRANSLATION OUTPUT. *Challenges and Opportunities in Multi-dimensional English Language Teaching in Changing EFL Contexts,* 130-137. Retrieved June 1, 2022

Baharuddin. (2015). Naturalness in Translation of English Novel into Indonesian. *Master Program in Linguistics, Diponegoro University in cooperation with Balai Bahasa Provinsi Jawa Tengah.* Retrieved July 23, 2022, from http://eprints.undip.ac.id/55355/1/Proceedings_LAMAS_5_2015_Edisi__Revisi._Baharuddin.pdf

Google, I. (2016). *Inside Google Translate.* Retrieved May 25, 2022, from Google, Inc.: https://translate.google.com/about/intl/en_ALL/.

Larson, M. L. (1984). *Meaning Based Translation.* America: University Press of America. Retrieved August 5, 2022

McCarthy, B. (2004, June). Does Online Machine Translation Spell the End of Take-Home Translation Assignments? *Translation and Foreign-Language Teaching in the 21st Century, 6*(1). Retrieved June 2, 2022, from http://callej.org/journal/6-1/mccarthy.html

Nida, E. A. (1964). *Toward a Science of Translating: With Special Reference to Principles and Procedures Involved in Bible Translating.* Netherlands: Brill Archive. Retrieved August 25, 2022

Schaeffer, M., & Carl, M. (2013). Shared representations and the translation process. *Translation and Interpreting Studies*. Retrieved August 25, 2022, from https://doi.org/10.1075/tis.8.2.03sch

Somers, H. (2001). 'Machine Translation'. In K. M. Mona Baker, *Routledge Encyclopedia of Translation Studies* (pp. 136-140). London and New York. Retrieved June 2, 2022

Ulatus. (2020, April 8). Translations Made Simple: The Usefulness of Translation Apps. Retrieved June 2, 2022

Yandex, I. (2011). *Yandex launched an online translation service.* Retrieved May 29, 2022, from Yandex,Inc.: https://yandex.ru/company/press_releases/2011/0316/