Similarities and Differences in Correction Operations

Quantitative and Qualitative Analyses based on a Learner Corpus

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1. Introduction

Correction is an essential process for academic writing in a foreign language. In most cases, the correction is not systematically but occasionally processed, and its result could reflect a sense of the language and individual educational experience of the language teachers massively. However, the teachers and the learners are often in trouble over correction and writing. In applied linguistics, there is not still a correction methodology to improve the writing skills of learners.

Based on this fact, the present study took it as a starting point to clarify the operation in the cognitive process of correction with computer technology. This paper put forward practical approaches to correction methodology at first. Here we report applied characteristics of a learner corpus, which consists of written texts by Japanese German Learners (JGLs) in comparing the corrected by a Japanese German Language Teacher (JGLT) and three German Native Speakers (GNSs). To elucidate the similarities and differences in correction between the teachers and between native speakers and the teacher whose mother tongue is the same as the learner, we analyzed the original and corrected texts. We demonstrated the operations of correction quantitatively and qualitatively.

2. Research Question

We designed the present study to make a system that can provide all possible suggestions for word choice to write academic papers in a foreign language with computer technology. This study's principal aim was to characterize what words, phrases, and expressions one group of JGLs likes to choose when writing texts in the German Language (cf. Entani & Isobe 2018, 763ff.). To verify this characteristic, we have built a learner corpus of written texts in the class that consists of 11 Japanese students in German Studies.

Based on this learner corpus, we analyzed the experts' corrected texts in the quantitative and qualitative perspectives to clarify the correction process's operation. Here we describe how different the language teachers as an expert judge written texts by JGLs. The critical issue of judgment in the correction is how to be tolerant of the words that

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were chosen by the learners (cf. Isobe 2017b, 49ff.). For instance, these words like that can be judged as follows:

- They must be corrected because of grammatical, lexical, or syntactical errors.
- They can be corrected. Although they are not an error, they can be replaceable with other words or phrases.
- They do not need to be corrected because of understandable, for the context suitable or adequate expressions.

Primarily the last two judgments differ depending on the teachers, to be exact, depending on their sense of the language and individual educational experience. It is, at times, impossible to explain for the judgment. Namely, it is based on the teachers' cognitive operation and occasionally, according to each teacher. On this account, the result from the correction reflects the writing style of the teacher. Many words, phrases, or expressions selected by the learner are deleted and replaced by the others. The original text will already be a text written by someone else. It could cause discontentment of the learners, and on the other hand, the teachers are embarrassed.

In this way, the correction is an individual and occasional operation, but we hypothesized that such operations have differences and could have similarities besides. We analyzed 11 original texts written by JGLs and 40 corrected texts by the teachers to test this hypothesis. For this analysis, the JGLs summarized a German text about the media in National Socialism and added some comments on those topics as a class assignment. Each original text has a text code with JGLs' Initials, such as FT, KT, and FW[3]. On average, it has 21.4 sentences and 269.4 words. They have been corrected by a JGLT and three GNSs who work and teach at three different Japanese universities named in this study for each one GNS1, GNS2, and GNS3:

Table 1: Word Length and Text Length by JGL, GNSs, and JGLT

	JGL	GNS1	GNS2	GNS3	JGLT
Word	269.4	260.5	270.7	269.3	277.1
Text	21.4	20.1	21.6	20.9	23.0

As a quantitative analysis, first, we measure the similarities among the original and corrected texts to show the teachers' differences, and then apply morphological analysis to characterize the texts in terms of nouns and articles. The second quantitative analysis focused on the adequate usage of the article semantic. We took out three summaries and their corrected texts from the database and counted the definite, indefinite, and zero articles to verify how potential failures have been corrected by each of the JGLT and the GNSs. Finally, with the qualitative analysis, we demonstrated the empirical correction

[3] If JGLs have the same Initials, we have added the number to each text code. For instance, we have the text codes KY and KY2 because of two JGLs with the same Initials KY.

operations classified into two kinds of perspectives: paradigmatic and syntagmatic. This analysis focused on the initial position in the sentences because it plays an essential role in the text parts' semantic connection.

3. Similarity and Difference among Original and Corrected Texts

In this section, we use 51 original and corrected texts. We obtain the similarities between all the original texts' pairs, between all pairs of the corrected texts by each teacher, and between all pairs of the original and corrected texts. The similarity of a pair of texts or sentences is defined, for instance, based on Word2vec technology (cf. Miklov et al. 2013, 1ff.). The average similarity of 55 pairs of the 11 original texts is 0.9899. Such a high similarity is understandable since the JGLs wrote these texts as a class assignment. The average similarity of the corrected texts by GNS1, GNS2, GNS3, and JGLT are 0.9906, 0.99136, 0.99142, and 0.9919, respectively. The corrected texts' similarities increased from those of the original texts, and the smaller increases result from correcting the original texts faithfully. Furthermore, the corrected texts' similarities to each original text are shown in Fig. 1, where vertical axis represents similarity. The dots and bars represent the teachers and the average. We find that GNS1 and GNS3 are similar, and their correlation coefficient reaches 0.97. The correlation coefficients between JGLT and GNS2 and GNS1 and GNS2 are positive, though they are less than 0.5. The correlation coefficient ranges between -1 and 1, and -1, 0, and 1 mention negative linear correlation, no linear correlation, and positive linear correlation, respectively.

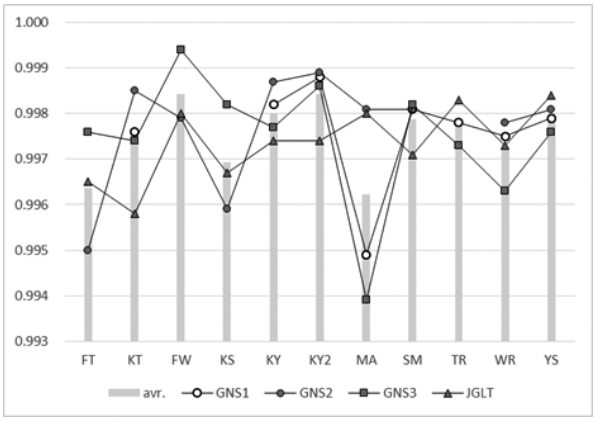

Fig. 1: Similarities of Corrected Texts to Each Original Text

One of our research questions is to find out the difference between texts by non-native and native speakers. The goal is to derive some common factors in JGLs' texts in which native speakers feel unusual and corresponding options given by them. Therefore, in the following, we focus on sentences instead of texts and determine a pair of sentences for comparison. Namely, we compare the original and corrected texts sentence by sentence. It should be noted that the numbers of sentences of the original and corrected

texts are not always equal since a long sentence may be divided into two, while two short sentences may be merged into one. For instance, although the original KY2 consists of 17 sentences, the corrected one by JGLT consists of 23 sentences. Therefore, we determine the sentences' correspondence in the original and corrected texts based on a similarity of sentences. We consider merging the original sentence to its next one or the corrected one to its next one when the original sentences and the corrected sentences are not similar. The merge algorithm is illustrated in Fig. 2, where I and J correspond to the numbers of sentences of the original and corrected texts, respectively, and α and β are the predetermined thresholds of similarities. It is based on the idea that the two sentences are merged if it makes the original and corrected sentences more similar. In other words, the original and corrected sentences become a comparison sentence (Y_{oi}, Y_{rj}) when they or their next ones are similar enough, or merging does not improve their similarities. Otherwise, original or corrected sentences are merged, such as ($Y_{oi}+Y_{o(i+1)}$, Y_{rj}) or (Y_{oi}, $Y_{rj}+Y_{r(j+1)}$), respectively. In the following analysis, the merged sentence is considered as one sentence. For instance, the merged original sentence $Y_{oi}+Y_{o(i+1)}$ is considered one sentence, and the corrected sentence Y_{ri} is. Starting merging from the first sentences of both texts does not certify ending with their last sentences. However, since the number of sentences in the corrected text is not very different from the original one, the algorithm is practically acceptable. In this study, we set α=0.94 and β=0.93. Our merge algorithm did not work for only four pairs of texts in 94 pairs, and 3 of 4 pairs do not include the original texts. In the following analysis, we ignore the sentences left at the end of the merge algorithm.

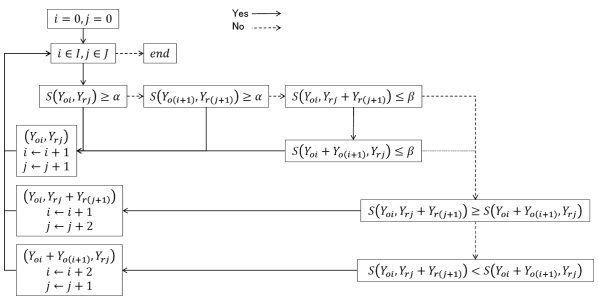

Fig. 2: Merge Algorithm

The data consists of 51 texts with 1095 sentences, and there are 40 pairs of texts regarding the original texts, each of which consists of about 20 sentences. A GNS can correct huge texts written by foreigners; however, even in 40 pairs, it is burdensome for an expert to compare each pair of the original and corrected texts and analyze the differences systematically. As one technique to summarize, we apply morphological analysis, which is one of the underlying technologies in natural language processing. In some tools for morphological analysis, we use TreeTagger for German[4] (cf. Schmid 1995, 1ff.), which assigns part-of-speech to each word, and the number of parts-of-speech is 50. In

the following, we concentrate on 3 of 50 parts-of-speech, which are "normales Nomen" (NN), "bestimmter oder unbestimmter Artikel" such as *der*, *die*, *das*, *ein*, and *eine* (ART), and "Präposition mit Artikel" such as *im* and *zur* (APPRART). For simplicity, we denote ART and APPRART as a group of articles, *ART. It is noted that *ART includes both definite and indefinite articles. They are distinguished in section 4. In section 4 discussing noun phrases, in addition to *ART, we consider the other article words, such as *jener* in "attribuierendes Demonstrativpronomen" (PDAT), *mein* in "attribuierendes Possessivpronomen" (PPOSAT), and *kein* in "attribuierendes Indefinitpronomen ohne Determiner" (PIAT).

First, we counted the numbers of *ART and NN in each of 51 texts, as shown in Fig. 3, where vertical and horizontal axes represent *ART and NN numbers in each text. In each bracket, an average absolute deviation from the regression line is shown. Since an article accompanies a noun but not all the nouns are accompanied by articles, the numbers of nouns in a sentence are equal or more than that of the articles. They have a positive correlation, and its correlation coefficient is 0.9. As shown in Fig. 3, the regression coefficient of a noun is 0.79, which mentions that there are 79 articles if there are 100 nouns, and in other words, 20% of nouns are not accompanied by articles. The corrected texts by GNS2 and GNS3 lay around the regression line from 2.91 and 1.75, respectively, which are smaller than those of the others, so that at least two experts firmly support this finding. Hence, it may indicate one of the primary or common styles of writing regarding articles and nouns.

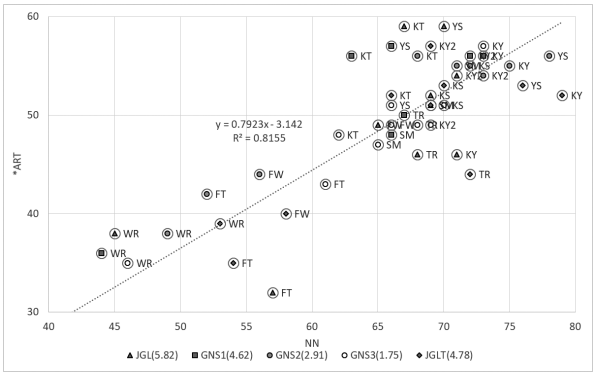

Fig. 3: Numbers of NN and *ART

Some parts-of-speech in an original sentence is deleted in its corrected text, and the others are added to it. Therefore, we count the added or deleted parts-of-speech by the correction. It is noted that the replacement of words in the same part-of-speech does not appear in the added or deleted part-of-speech. The results are as shown in Fig. 4, where the numbers of addition and delete of *ART and NN in each sentence are summed up.

[4] Tree Tagger a part-of-speech tagger for many languages: https://www.cis.uni-muenchen.de/~schmid/tools/TreeTagger/ (accessed 2020-09-11)

Although the corrected texts GNS1 and GNS3 are similar in the sense of the similarities to the original texts, GNS3 tends to convert nouns and articles more than GNS1 does. In the native speakers' corrected texts, adding or deleting articles occurs significantly more often than nouns, in spite that the number of articles used in a text is less than that of nouns, as mentioned before. It is consistent with the fact that JGLs have difficulty using articles and the deviation of JGL is the largest, 5.82, in Fig.3. Moreover, the Japanese expert, JGLT, understands such a Japanese inhabited problem, and that is one reason why she corrected nouns rather than articles comparing to GNSs:

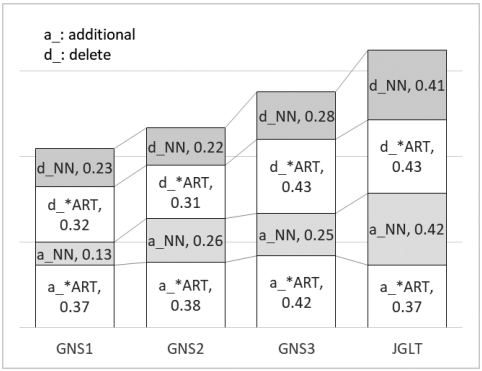

Fig. 4: Numbers of Addition and Delete of *ART and NN in Each Sentence

On the one hand, the part-of-speech is not suitable for context-based analysis. On the other hand, such partial information makes it possible to increase the number of data that we can look through at one time. As an example, in this section we concentrated on nouns and articles. We can intentionally pick up the other parts-of-speech. For instance, one of the viewpoints, some of whose examples are shown in section 5, is to focus on a typical structure of beginning a sentence by analyzing the first few words. Furthermore, we find unique addition/delete tendency via survey the detailed counts or the categorized counts. Our future approach aims to be data-oriented; in other words, we analyze the given data to determine the viewpoints that may be worth discussing.

4. Adequate Usage of the Article Semantic

4. 1. Data Analysis

For this paper's following data analysis, we examined three original texts in the German Language by three JGLs with the text code MA, WR, SM, and corrected by one JGLT and three GNSs. All original and corrected texts consist of a total of 939 noun phrases, which have been analyzed in a first step by regarding the semantic usage of articles or article markers such as definite article, indefinite article, zero-article, or definite and indefinite pronouns by JGLs and in a second step by how JGLT and GNSs corrected potential failures and if there is a difference between the corrected texts by JGLT and GNSs. The data have been compared to the data corpora of Kraus (2019, 55ff.) and Kraus (2021, in

preparation) with each 1000 and 1383 noun phrases of written summaries by JGLs in the third and fourth semester in different faculties and universities.

Analog to Kraus (2017) or Kraus (2019) for the analysis of the semantic article usage of each JGL, GNS, and JGLT, we divide here, too between the following six categories 1) Sort of the article noun phrase, 2) Form of the article noun phrase – definite article / indefinite article, 3) Semantic of the article noun phrase, 4) Numerus of the article noun phrase, 5) Reference object mentioned / not mentioned in the context ahead and 6) Judgement of the article noun phrase while the main focus here will be put on the categories 1), 2) and 4). For each of these three categories, we will adduce one example marked with underlined letters as follows:

1) Sort of the Article Noun Phrase:

1.1.) Formal-Definite:

(1) *Adolf Hitler verfolgte politische GegnerInnen mit dem Recht.*

1.2.) Formal-Indefinite:

(2) *Wie Hitler kann man Leute mit den Medien steuern.*

We use the following categories for definite and indefinite noun phrases, as shown in table 2 for formal-definite noun phrases and table 3 for formal-indefinite noun phrases. The terminology of each "formal-definite" and "formal-indefinite" relies on Kraus (2017, 61ff.), presuming that a noun phrase can syntactically be indefinite but semantically definite like i.e., proper names. For this reason, we divide proper names under formal-indefinite noun phrases since there is no syntactic form of an article existing:

Table 2: Formal-Definite Noun Phrases

Category	Example
Definite Article	*der …*
Definite Article Word	*dieser … , solch … , all …*
Definite Contraction	*im, zum, vom*

2) Form of the Article Noun Phrase – Definite Article:

2.1.) Definite Article:

(3) *Die NSDAP bildete die Printmedien wesentlich aus.*

2.2.) Definite Article Word:

(4) *Durch diesen Hergang wurde die Presse- und Meinungsfreiheit unfrei.*

2.3.) Definite Contraction:

(5) *Im Alltagsleben hängen verschiedene Wahlen von den Medien ab.*

Table 3: Formal-Indefinite Noun Phrases

Category	Example
Indefinite Article / Zero-Article	*ein … / -*
Zero-Article Singular (Generic Names, Proper Names, Substance Names)	*Hitler, SPD, Meinungsfreiheit …*
Indefinite Article Word	*mein … ,*
Negation Article	*kein …*

3) Form of the Article Noun Phrase – Indefinite Article:

2.4.) Indefinite Article:

(6) *Er erklärt ein Beispiel für die Zeit des Nationalsozialismus.*

2.5.) Zero-Article Plural:

(7) *Medien haben wichtige Rollen in unserer Gesellschaft.*

2.6.) Zero-Article Singular:

(8) *Ihre Berichte wurde Propaganda von dem Nationalsozialismus.*

2.7.) Indefinite Article Word:

(9) *Medien haben wichtige Rollen in unserer Gesellschaft.*

2.8.) Negation Article:

(10) *Die Zeitungen hat seitdem keinen Vortrag mehr mit dem/der VerlegerIn oder dem/der LeserIn, sie haben nur den Vortrag mit dem politischen Führer.*

4) Numerus of the Article Noun Phrase

4.1.) Singular Noun Phrase:

(11) *Er erklärt ein Beispiel aus der Zeit des Nationalsozialismus.*

4.2.) Plural Noun Phrase:

(12) *Aber die NSDAP bildete die Printmedien stark aus.*

In the following, we show with table 4 the total results of all original and corrected texts made and then take a closer look at specific data of the JGLs as presented in table 5. Categories with the focus of interest are marked in bold letters:

Although the total amount of 50.58% (all) and 50.79% (JGLs' only) for the definite article and 16.71% (all) for the zero-article plural might surprise, the data of Kraus (2017) and Kraus (2019) make clear that the default value for the definite article is usually represented with a higher amount as well as the zero-article plural comes with a higher frequency than the zero-article singular which was already pointed out in the corpus of Kraus (2017). Comparing these data to the one of table 5 for the original texts by the JGL, we can see that the frequency for the zero-article singular is with 19.04%, almost one fifth higher than the zero-article plural, which comes close to the data of Kraus (2021, in

Table 4: Total Amount of All Original and Corrected Texts

Category / Text	MA	SM	WR	Total	(%)
Definite Article	131	203	141	475	**50.58**
Definite Article word	12	12	11	35	3.72
Definite Contraction	8	17	8	33	3.51
Indefinite Article	8	23	25	56	5.96
Zero-Article Singular	57	39	44	140	**14.9**
Zero-Article Plural	58	54	45	157	**16.71**
Indefinite Article Word	9	22	9	40	4.25
Negation Article	0	2	1	3	0.31
Total	283	372	284	939	

Table 5: Total Amount of All Original Texts (JGLs texts only)

Category / Text	MA	SM	WR	Total	(%)
Definite Article	24	41	31	96	**50.79**
Definite Article Word	3	2	1	6	3.2
Definite Contraction	2	4	1	7	3.74
Indefinite Article	1	4	4	9	4.81
Zero-Article Singular	14	11	11	36	**19.04**
Zero-Article Plural	12	10	6	28	**14.97**
Indefinite Article Word	2	1	2	7	2.67
Negation Article	0	0	0	0	0
Total	58	73	56	189	

preparation) where we had 356 cases (356/1383 = 25.7%) for the zero-article singular and 306 cases for the zero-article plural (306/1383 = 22.1%). In contrast, in GNS1 we had a ration of 12.7% to 19.88%, in GNS2 14.81% to 16.93% and in GNS3 14.28% to 16.93% and even 13.61% to 15.18% for the JGLT.

A more detailed analysis of all original texts shows that under a total of 189 JGLs noun phrases, we can find 55 (55/189 = 29.1%) potential failure cases under which 40% (22/55 = 40%) have been used with a zero-article singular, a result which comes close to the 50.23% (108/215 = 50.23%) of potential failure cases for the zero-article singular in Kraus (2019) and the 43.47% (130/299 = 43.47%) in Kraus (2021, in preparation). Thus the data show clearly that JGLs show difficulties with handling the zero-article singular as well as there are significant differences in how JGLT and GNS correct potential failures of the JGL when JGLT correct only what is necessary and GNS add more information to the context on which we put focus in the following step of the analysis.

4.2. Potential Failures for the Zero-Article Singular

As table 6 below demonstrates, we can find under the total amount of 189 JGLs noun phrases a potential failure frequency of 55 cases (29.1%), which is a little bit higher than the frequency in Kraus (2019) with 21.5% (215/1000 = 21.5%) and Kraus (2021, in preparation) with 21.6% (299/1383 = 21.6%). With the terminology "potential failures", we imply noun phrases in which we can find an unusual use of the article of the JGLs judged by each GNS and JGLT:

Table 6: Potential Failure Cases in three Original Texts

Category / Text	MA	SM	WR	Total	%
Definite Article	5	7	6	18	32.72
Definite Article Word	0	0	0	0	0.00
Definite Contraction	1	1	0	2	3.63
Indefinite Article	0	2	2	4	7.27
Zero-Article Singular	8	7	7	**22**	**40.00**
Zero-Article Plural	4	4	1	9	16.36
Indefinite Article Word	0	0	0	0	0.00
Negation Article	0	0	0	0	0.00
Total	18	21	16	**55**	

Table 6 shows evidently that with 40% (22/55 = 40%) of potential failure cases for the zero-article singular, we have an unusually high frequency, which is comparable to the data of Kraus (2019) and Kraus (2021, in preparation). In the following step, we put the focus on these 22 cases for the zero-article singular and examine how GNS and JGLT corrected on these cases. Each of these 22 cases has been categorized under the system following Kraus (2019, 71ff.), in which we can see how potential failures should be corrected with which adequate article form. The noun phrases with a focus on are marked with underlined letters. The frequency of each category is added in brackets:

a) Zero Article Singular instead of Indefinite Article as Numeral (7/22 = 31.81%)

(13) *Ich denke, man soll <u>eigene Willen</u> haben und alle nicht glauben.*

b) Zero Article Singular with Text-Extern Reference instead of Definite Article (14/22 = 63.63%):

(14) *Aber <u>NSDAP</u> bildete die Printmedien zum starken Wesen aus, das Führung und die Regelmäßigkeit hält.*

c) Zero Article Singular with Attributive Completion instead of Definite Article (1/22 = 4.54%):

(15) *Der Text handelt von Zusammenhang zwischen dem Nationalsozialismus und den Medien.*

Analyzing these 22 cases for the zero-article singular it turns out that 7 cases (7/22 = 31.81%, category a) use the zero-article singular instead of an indefinite article as numeral, while 14 cases (14/22 = 63.63%, category b) use the zero-article singular instead of a definite article singular with the semantic function of a text-extern reference as shown in Kraus (2017, 76ff.). Only one case (1/22 = 4.54%, category c) uses the zero-article singular instead of a definite article singular by adding an attributive completion. Putting the focus on the 7 cases of category a) and the 14 cases of category b) it turns out that under the total of 28 corrections (GNS1 = 7, GNS2 = 7, GNS3 = 7, JGLT = 7) made by each the JGLT and GNSs for category a) 21 noun phrases (21/28 = 75%) have been corrected while 7 noun phrases (7/28 = 25%) remained (GNS1 = 1, GNS2 = 2, GNS3 = 1, JGLT = 3), whereas under the 54 corrections (GNS1 = 13, GNS2 = 14, GNS3 = 14, JGLT = 13) made for category b) only 24 noun phrases (24/54 = 44%) have been corrected while 30 noun phrases (30/54 = 56%) remained (GNS1 = 7, GNS2 = 10, GNS3 = 5, JGLT = 8). A detailed analysis of these non-corrected cases shows that under the 7 non-corrected cases for category a) we can find 4 noun phrases with an attributive completion, 1 noun phrase with a proper noun, and 2 failures which stayed non-corrected as seen in (16) and (17):

(16) *Die Verordnung vom 4 Februar 1935 ermöglichte Eingriff in die Versammlungs- und Pressfreiheit und legalisierte die Verfolgung politischer GegnerInnen.* (JGLT)
(17) *Die Niederdeutsche Beobachter trieb mit ihrem Bericht die Rostocker Anzeiger in schwache Position.* (JGLT)

Under the 30 non-corrected cases for category b) we find 11 proper nouns, 16 examples of noun constructions where the definite article of the first noun phrase replaces the zero-article of the second noun phrase like in *die Meinungs- und Willensbildung* whereas 3 cases have not been appropriately corrected as seen in (18), (19) and (20):

(18) *Die NSDAP entwickelte die Printmedien dergestalt, dass sie Führung und die Regelmäßigkeit vermittelten.* (GNS2)
(19) *Auf dem Text Der Bürger, die Medien und die Politiker wird geschrieben, die Medien hatten einen großen Einfluss auf menschliches Leben.* (JGLT)
(20) *Ihre Beiträge wurden Propaganda des Nationalsozialismus.* (GNS2)

The analysis shows furthermore that there are significant changes in the number of correction operations of each the JGLT and the GNS. While the JGLT corrected only 45% (10/21 = 45%) of the 22 potential failure cases with the zero-article singular, we can find

almost 73% (16/22 = 72.72%) under GNS3, 61.90% (13/21 = 61.90%) under GNS1 but only 45.45% (10/22 = 45.45%) under GNS2 which points out clearly that JGLT only corrects what really seems necessary whereas GNS3 and GNS1 turn out to correct more than might be relevant but GNS2 is close to JGLT. To back up the thesis that GNS, in general, adds more corrections to the original texts than as the ones made by JGLT and to point out why GNS2 is close to JGLT, it is more than relevant to analyze as a next step the here presented data under different circumstances. In contrast, real-time correction operations made with Eye-Trackers could be a germane option to see far more precisely how each JGLT and GNS do corrections and which grammatical markers are in the point of the cognitive focus.

5. Correction Operations for the Initial Position in Sentences

In the present section, we empirically note some kinds of correction operations, as by examples from the learner corpus, focused on the initial position in sentences. This sentence position has text-grammatically an essential role as a syntactic and semantical connection between the text parts and forms a coherence[5]. In focusing on this text-grammatic point, JGLs and GNSs have different word choices at the beginning of a sentence. JGLs often put conjunctional words at that position such as *und*, *aber*, and *denn*, etc. or preposition with a demonstrative pronoun, for example, *dazu*, *damit*, and *darauf*, etc. to make the semantic relation to the preceding sentence expressive clear (Isobe 2017b, 46ff.). As contrasted with that, GNSs tend to connect the sentences with the help of a word-formation, for instance, the nominalization of verbs and noun compounds to refer a preceding topic to the sentence again (Isobe 2017a, 196ff.). Which word to choose at the beginning of a sentence is, however, not grammatically determined. Rather it depends on the context and an individual writing style. This preference for writing could involve correction operations too. To analyze how the word in the initial position is corrected, it helps determine the cognitive correction process and verifies tolerance in the correction. The first words or phrases of a sentence are compared with the original and the corrected texts from paradigmatic and syntagmatic perspectives.

5.1. Paradigmatic Operations

Paradigmatic operation means the vertical replacement of words for words in the same sentence position. The analysis results showed at first that JGL's vocabulary acquisition level and teachers' vocabulary selection make a difference in correction results, in particular, when replacing content words. Secondly, it was clarified that adequate context usage of words, especially considering the preceding sentence's relation, motivates the correction. At this correction operation, the replacement of function words is the point of

[5] For the term *coherence*, refer to Dijk 1980, Bußmann 2002, Brinker 2010.

the analysis. In the former case, the vocabulary is proposed rather than to correct an error. See an example from the learner corpus:

(21) *Die Verordnung von 4. Februar 1933 wurden Eingriffe und Verboten an die Medien starker. Die Presselandschaft, die keine politische Richtung haben, kamen in Krisensituation.* (FT)

In these original sentences, the JGL summarized that government intervention in the media brought the press situation into a crisis. The word choice of the noun *Presslandschaft* (in Englisch: press situation) is certainly not an error, but the two teachers GNS2 and JGLT have suggested other words. According to the context, what has fallen into a crisis is strictly not the press situation, but the press organs or the press itself. The correction results are as follows:

(21')

		Initial Position	
JGL	[...] *an die Medien starker.*	*Die Presselandschaft,* [...]	*kamen in Krisesituation.*
GNS2	[...] *den Medien starker.*	*Die Presseorgane,* [...]	*gerieten in eine Krise*
GNS3	[...] *den Medien starker.*	*Die Presselandschaft,* [...]	*kam in eine Krisesituation.*
JGLT	[...] *die Medien ein.*	*Die Presse,* [...]	*geriet in die Krise.*

Compared with the two corrected texts, GNS3 has corrected only grammatical errors in replacing a finite verb *kam* for the incongruent verb *kamen* and inserting an indefinite article *eine* in the prepositional phrase. This minimal operation of a GNS shows that readers can understand the sentences without replacing the word *Presselandschaft*. The replaced words *Presseorgane* (in the corrected sentence by GNS2) and *Presse* (in the corrected sentence by JGLT) belong to vocabulary selection preferences and suggestions to JGLs. In the correction operation, it could be tolerant of checking the adequate usage of the content words, especially if they have the same semantic role in a sentence. The differences in correction results help learners respect their word choice preferences. It is theoretically possible to propose a variety of vocabulary when replacing nouns, such as (21').

Nevertheless, it cannot be systematically processed, even if we analyze how big the data is because what kind of vocabulary can be proposed depends on each text's content. However, if it replaces a synonym in adverbs, the analysis results prove the correction operation's similarity. See the following example:

(22) *Nach dem Reichstagsbrand (27. Februar 1933) wurde die Presse- und Meinungsfreiheit völlig unfrei und Vorgaben für Berichterstattung wurden gemacht. Zudem beschränkten Zeitungen sich auf den Niederdeutschen Beobachter.* (FW)

(22')		Initial Position	
JGL	[...] *wurden gemacht.*	*Zudem*	*beschränkten Zeitung* [...]
GNS2	[...] *wurden festgelegt.*	*Außerdem*	*wurde nur noch der NB* [...]
GNS3	[...] *wurden festgelegt.*	*Zudem*	*beschränkten Zeitung* [...]
JGLT	[...] *gemacht.*	*Außerdem*	*beschränkte sich* [...]

In this correction operation, GNS2 and JGLT have replaced the conjunctional adverb *außerdem* (in English: moreover or beside) for *zudem*. Referred to the German dictionary (cf. DUDEN 2007[6], 228 and 1987), the two adverbs have no difference in meaning. They are synonymous with each other. Unlike nouns, such conjunctional adverbs are used to express the semantic relation of sentences. It does not depend on the entire content of the text. Furthermore, the number of synonyms is, to some degree limited. The similarities in which the data analysis can result may enable systematic correction operation.

In the second case, the correction operations replacing function words by considering the preceding sentence's relation are more similar than the first case above. This operation is a replacement of articles, which we also discussed in section 4. In the initial position, when connecting sentences, what was already expressed in the preceding text parts is expressed again. If the nouns are in this position placed, they should have a definite or demonstrative article. In the following example, the similarity of the correction operation shows it:

(23) *Vom 4. Februar 1933 wurde die erste Bestimmung des Reichspräsidenten ausgegeben. Dank der Bestimmung konnte der Nationalsozialist in die Versammlungs- und Pressefreiheit und Meinungsfreiheit gänzlich unfrei.* (KT)

(23')		Initial Position
JGL	[...] *die erste Bestimmung des Reichspräsidenten.*	*Dank der Bestimmung*
GNS1	[...] *die erste Verordnung des Reichsprasidenten ausgegeben.*	*Dank dieser Verordnung*
GNS2	[...] *die erste Anordnung des Reichsprasidenten ausgegeben.*	*Dank der Anordnung*
GNS3	[...] *die erste Bestimmung des Reichspräsidenten ausgegeben.*	*Dank dieser Bestimmung*
JGLT	[...] *die erste Bestimmung aus.*	*Dank dieser Bestimmung*

This JGL has repeated the word *Bestimmung* from the preceding sentence in the initial position. Similarly, GNS3 and JGLT have put the word *Bestimmung* in the initial position again but replaced the demonstrative article *dieser* for the definite article *der*. It is not in error to insert this article *der*, as the GNS2' sentence also begins with the prepositional

phrase, which has a definite article *der*. However, in the same text object's repetition in the following sentence, the demonstrative article clearly indicates that the word is repeated. Text-grammatically explained, the demonstrative article is used more adequately to the repeated word.

As the analysis result revealed the paradigmatic operation's differences, it is difficult to explain a rule of the replacement in content words. If a part-of-speech has more replaceable words, such as nouns, it is more difficult to systematically correct. However, also, it can tolerate the learner's choice of words. On the contrary, the replacement of function words can be explained with grammatical knowledge, and data analysis will be sufficient for systematization of the correction operation.

5.2. Syntagmatic Operations

Syntagmatic operation means exchanging words in the horizontal direction in a sentence related to text-grammatical word order. In this operation, the analysis result showed more similarity among the corrected texts than the paradigmatic operation. The syntagmatic operation is based on the information structure in which already known information is described first. New information is described later.[6] This structure comes from the cognitive operation of the writer. In other words, they can automatically write sentences with this information structure based on their advanced writing skills. However, when writing in a foreign language, especially the learner does not have such an ability. Probably, they can only write as they have learned in the textbook. It is difficult for them to write sentences with the information structure considering the text's coherence. In writing a text, the corrected word order motivated by teachers' empirical and cognitive reactions helps the learner. See the following example:

(24) [...] *wie Radio und Kino nötig. Die Medien sind auf diese Weise kontrolliert worden. Ich bin der Meinung, dass wir selbständig die Informationen vergleichen müssen, wenn wir uns auf die Informationen aus solchen Medien beziehen.* (FW)

(24')		Initial Position	
JGL	[...] *wie Radio und Kino nötig.*	*Die Medien*	*sind auf diese Weise kontrolliert worden* [...]
GNS2	[...] *wie Radio und Kino.*	*Auf diese Weise*	*wurden die Medien* [...]
JGLT	[...] *wie Radio und Kino nötig.*	*Auf diese Weise*	*wurden die Medien* [...]

For example (24), the JGL has made the sentence that begins with the subject *Die Medien*, as he learned. The sentence is entirely correct. In the German textbook, the JGL first learn

[6] See the item of *Thema vs. Rhema* in Bußmann (2002, 695ff.).

that the finite verb is in the second position of the main clause. The other sentences can be placed relatively freely in each sentence position if the sentence is not complicated. The learners tend to put the subject at the beginning of the sentence, as the textbook explains. In the two corrected texts by GNS2 and JGLT, however, the subject *die Medien* was shifted to the sentence's middle position. For the initial position, the phrase *auf diese Weise* (in English: in this way) is replaced. This idiomatic phrase with the determinative article *diese* summarizes the preceding content. It is semantically relevant to the connection of sentences. The Experts put the words accompanied by the determinative article in advance as same as that we showed in example (23) in section 5.1. This correction operation is based on the style convention in writing to constitute the information structure of sentences.

We show another example from the same original text. This JGL has made the following sentences, for example (25) in the other text part. In this case, the JGL put the idiomatic phrase in the initial position and the subject *es* after the finite verb. GNS2 and JGLT have corrected that word order as follows:

(25) *Aber wir nehmen ohne Zweifel die gegebenen Informationen auf, daher sind die Medien jederzeit ideal für Herrscher. Im Grunde genommen ist es am wichtigsten, selbst die Informationen zu vergleichen.* (FW)

(25')		Initial Position	
JGL	[...] *Ideal für Herrscher.*	*Im Grunde genommen*	*ist es am wichtigsten,* [...]
GNS2	[...] *einen ideales Mittel für Herrscher.*	*Es*	*ist im Grunde genommen* [...]
JGLT	[...] *einen ideales Mittel für Herrscher.*	*Es*	*ist im Grunde genommen* [...]

GNS2 and JGLT have changed the sentence's word order by replacing the pronoun *es* for the noun phrase *im Grunde genommen* (in English: essentially) in the initial position. JGL's sentence is entirely correct. This advanced learner did not put the subject *es* in the initial position in contrast to what he has learned in the textbook. Instead of that, he began the sentence with the phrase *im Grunde genommen* to modify the sentence's entire meaning. However, the two teachers have reacted to that word order of the JGL's sentence. In explaining this correction operation's motivation, they may have judged that the phrase contains new information. It is essential information for the reader because it adds the writer's opinion. As mentioned above, the German word order is relatively free, except for the finite verb's place. When writing text with several sentences, the learner must decide each sentence's word order for himself. The textbook is helpless with this decision. For this, the problem with the word order confronts the JGL at the intermediate level.

The syntagmatic operation is related to the operations in the other part of the sentence too. If deleting the words in the initial position, then another one must be replaced there. JGLs like to use conjunctional words or prepositions with a demonstrative pronoun to connect sentences, as indicated above. In comparing the corrected texts, GNSs judge these words as unnecessary. As the following example shows, the conjunction *denn* (in English: because) has been deleted by two GNSs, while the JGLT left it. In this text part, she may have read it forward without paying attention to the conjunction.

(26) *Es gab einen öffentlichen Boykottaufruf von Friedlich Hildebrandt gegen den Rostocker Anzeiger, aber der Boykott wurde nach der Installierung des SA-Strumbannführers Klaus Gundlach aufgehoben. Denn Nationalsozialisten zielten auf die volle Kontrolle der öffentlichen Medien sowie die Gewalt über die Meinungs- und Willensbildung, sie mussten nicht nur die Printmedien, sondern auch Radio und Kino kontrollieren.* (KS)

(26')

JGL *Denn Nationalsozialisten ziehlten auf die volle Kontrolle der öffentlichen Medien sowie* [...]

GNS2 *Die Nationalsozialisiten ziehlten auf die völlige Kontrolle sowohl der öffentlichen Medien* [...]

GNS3 *Die Nationalsozialisten ziehlten auf eine vollkommene Kontrolle der öffentlichen Medien* [...]

JGLT *Denn Nationalsozialisten ziehlten auf die volle Kontrolle der öffentlichen Medien sowie* [...]

In contrast, she has deleted the conjunctive word and shifted the subject out of the middle into the initial position. GNS2 also has the same, but GNS3 left these words. See the example (27):

(27) *Wenn wir eine Auswahl unparteiisch treffen werden, sollen wir nie mehr Informationen aus Medien bekommen. Dadurch gehen wir im früher Leben zurück. Dafür brechen wir alle ringsum Mediumapparate.* (FT)

(27')

JGL *Dadurch gehen wir im früher Leben zurück. Dafür brechen wir alle ringsum Mediumapparate.*

GNS2 *Wir müssen leben wie in früherer Zeit. Wir dürfen keine Medien mehr benutzen.*

GNS3 *Dadurch bekommen wir unser altes Leben zurück. Dafür müssen wir alle Medien geräte um uns herum* [...]

JGLT *Wir müssen leben wir in früherer Zeit. Wir brechen alle Mediumapparate.*

The syntagmatic operation is mainly about the word order. The learners follow the textbook in vain how the words are placed or used in the initial position. When writing text with connecting several sentences, the teachers' sense of language and educational experience could improve learners' writing skills. In particular, it is due to the individual cognitive operation to make an information structure of the sentence. The similarities among the corrected texts enable correction operation systematically. The differences in the syntagmatic operations among the teachers depend on their writing style too. It lies in what drew their attention to or what kind of grammatical matters they are interested in. The next step in this study will be to clarify under what conditions the correction operation is similar, regardless of individual experience or interest.

6. Conclusion

With analyses based on three perspectives, we characterized the similarities and differences in correction operations. The first perspective was quantitative and evaluated the similarities and differences of all the original and corrected texts. Then, the data analysis focused on the article words to compare the correction operations. The last analysis illustrated the corrected texts' examples to verify the similarities and differences in correction empirically. We confirmed that the correction operations of the JGLT and GNSs are often similar. When further verifying similar operations, this study could approach the systematic methodology of the correction. The analyzes also made clear that the corrected texts differ depending on the teacher. Their cognitive behavior is involved in the correction with an individual and occasional operation. The corrected texts have various factors such as the situation, when and where to correct, the teacher's physical condition, and the relationship between the teacher and the learner. If removing these factors, it may be possible to approach a more useful methodology to verify the correction operations more objectively.

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