

Studying From Home During COVID-19: A Many-Facets Rasch Model (MFRM) Analysis

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Abstract—This study proposes to measure students' grammar distancing while studying from home and explore their strengths and weaknesses with a grammar test. It is a descriptive quantitative study, the participants being 55 students in their fifth (5th) semester of the 2020/2021 academic year at a university in Tanjungpinang, Riau Islands, Indonesia. Data is retrieved from the grammar test and analyzed using the Many-Facet Rasch Measurement (MFRM) Model Software Version 3.83.3. This research highlights that studying from home, or distance learning, impacts grammar distancing as seen in the students' varying achievements in grammar, the breakdown being 10.91% lower achievement, 5.45% low achievement, 27.27% high achievement, 43.64% higher achievement and 12.73% highest achievement. The results also indicate their strength in sentence translations and jumbled words; 83.64% of the students displayed good understanding. Their weakness lies in rearranging compound-complex sentences with phrasal verbs. The students' different achievements in grammar demonstrate the need for improvement for future use and better student performance.

Index Terms—distance education, E-learning, grammar

I. INTRODUCTION

Distance learning transpired during the Covid-19 outbreak, and it was inevitable. Covid-19 originated in China and afflicted the world in late 2019; by early 2020, it significantly changed people's habits (Favale et al., 2020). Before the pandemic, students had face-to-face learning activities in the classroom; this changed when the pandemic caused governments to implement lockdowns and social distancing policies, forbidding the conventional learning system (Kapasia et al., 2020). New learning habits had to correspond to school programs and holidays (Trung et al., 2020). The pandemic held off their learning and teaching activities, resulting in other challenges (Tran et al., 2020; Trung et al., 2020). For instance, students' academic achievements were at stake against the schools' effectiveness (Gamoran & Long, 2007). Covid-19 adjusted students' learning habits (Turner et al., 2009; Warner et al., 2008) with the shift to online lessons (Favale et al., 2020; Vu et al., 2020). With increased cyber businesses such as online platforms and changes restricting people's mobilities, remote working, online learning, and meetings became new habits (Favale et al., 2020).

Appropriate selection and application of learning habits facilitate obtaining new knowledge to help students adapt to changes quickly (Urh & Jereb, 2014). The question is how fast students adapt to new habits due to the sudden changes during Covid-19. The answer depends on their readiness and other supporting factors such as their education, occupation, and economy. Learning habits are ways and means of acquiring information consciously or unconsciously. They allow students to define their abilities to overcome problems, expand skills, obtain knowledge, and meet school needs as their obligations (Carter et al., 2014). Old and new habits take time to change (Urh & Jereb, 2014).

Covid-19 has been unprecedented, forcing teachers to change to new online learning systems (Abidah et al., 2020). The outbreak forced university students to install and use various learning applications for virtual online courses, materials, examinations, and meetings (Kumar, 2020; Strielkowski, 2020). Tutors, teachers, instructors, and lecturers adjusted their learning habits to correspond to the pandemic. It compelled them to distance learning. Learning activities were conducted through virtual courses and other creative platforms like nursing programs (Bradley et al., 2020). However, online courses cost too much; not all students can afford online learning. Online learning methods seem

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discriminatory, favoring students with internet access. Those with limited access and locked down physically and economically acquired nothing during the pandemic (Kapasias et al., 2020).

Studies show significant results regarding the changes in student learning habits. An Italian study reveals that Covid-19's lockdowns and physical distancing forced people to shift to online studies and remote working, resulting in the unprecedented use of the internet. Another study on the campus internet traffic for online learning in the Politecnico campus in Torino discovered that the outgoing traffic was more than enough to espouse online learning (Favale et al., 2020). A Vietnamese study found school type and level differences in their students' learning habits spanning the pandemic. The first difference pertained to their distance learning enrolment policy, which was to consider students from families with above-average income between USD 860 and 1,290. The second difference was in the varying capabilities of self-competence, the English language, and jobs. The outbreak exposed students' perception and their diverse learning habits (Tran et al., 2020). Additionally, the unexpected changes in the educational system resulted in other significant impacts (Trung et al., 2020).

Grammar learning and teaching have been contentious (Agust & Subroto, 2020; Başöz, 2014; Uysal & Yavuz, 2015). Language teachers and practitioners continue to design new strategies, techniques, methods, media, and approaches to teaching grammar efficiently and effectively (Agust & Subroto, 2020). The studies stimulate different perspectives, showing that grammar remains notable in the teaching of language (Połczyńska et al., 2014; Sik, 2015). It is the primary language unit that enables users to deploy detailed information efficiently (Hong et al., 2017). English is usually learned as a foreign language, and its grammar and assessment are considered necessary (Liu, 2009; Lu & Chang, 2016). Grammar mainly comprises rules for changing sequences, explaining how to organize the sequences of letters through syntax. Therefore, grammar is usually seen as a language producer; its process commences with a single initial symbol (Shao & Liu, 2020).

Using the internet for grammar teaching provides lively and attractive features for instructors and students alike (Arikan, 2014). Language teachers display distinct ways to manage grammar, such as playing games, singing songs, and using media and realia as practical communication tools (Uysal & Yavuz, 2015). Educators reiterate that utilizing games and installing applications positively contribute to teaching and learning processes (Hung et al., 2018). Similarly, language learners manage English grammar by accessing the internet for authentic materials such as sample sentences emphasizing correct grammatical forms or teachers' methods in or outside the classroom (Castañeda & Cho, 2016).

Teachers and experts have different perspectives on managing grammar. Some studies report that learning and teaching English grammar is about hard choice and dichotomy (Başöz, 2014), accuracy versus fluency, form (Gascoigne, 2005; Połczyńska et al., 2014) versus forms (Davis, 2015; Marsden & Slabakova, 2018; Nishimuro & Borg, 2013), and direct versus indirect instruction (Lee et al., 2015; Petraki & Hill, 2011; Richards & Reppen, 2014; Tammenga-Helmantel & Maijala, 2019). Accuracy (Davis, 2015) pertains to grammar, but spelling and pronunciation are a part of fluency. The ability to quickly perceive the language spoken by people implies fluency (Özkan & Kesen, 2009). Students taking English as a Foreign Language (EFL) cannot learn grammar conventionally because they become bored easily. It becomes worse when teachers purely serve them with grammatical matters (Lardiere, 2014; Richards & Reppen, 2014) or present them with lectures (Phoocharoensil, 2012). Grammar instruction becomes controversial when implemented in the second language (L2). A similar problem lies with EFL teachers who emphasize grammar rules (Agust & Subroto, 2020).

Grammar distancing emerges when studies are inspired by social and physical distancing. Maragakis (2020) states that physical distancing is when people keep a physical distance of at least 1.5 meters from others to minimize Covid-19 transmission. In line with this, grammar distancing occurs among students studying from home during the pandemic. One student's achievement compared to another can show a significant difference. Recent studies investigated how students should have been taught and the applications used. They analyzed discriminatory learning accesses between working and middle-class families. The results indicate that only middle-class families gained more access to online learning since they had more internet data. While the studies also investigated government policies through online learning systems and new habits within the new normal, they did not examine a specific course, such as university students' grammar-learning progress during Covid-19. This descriptive quantitative study aims to measure students' grammar distancing while studying from home and explore their strengths and weaknesses with a grammar test.

II. METHODOLOGY

A descriptive quantitative approach (Creswell, 2014; Fauziati, 2017) was applied to forty-eight (48) female and seven (7) male students in their fourth (4th) semester of the 2019/2020 academic year at a university in Tanjungpinang, Riau Islands, Indonesia. Purposive sampling was the method of selection. The respondents were divided into two (2) learning advanced grammar classes under the same lecturer. Eight (8) students from the same classes were recruited as raters based on their achievements in grammar and assigned to assess the ratees. The instrument used was a grammar test with fifteen (15) items. The first five (5) items of jumbled words comprised one (1) category in the scoring rubric. The other ten (10) items of sentence translations from Indonesian to English formed the other two (2) categories. The test was assigned before the semester break, generating 55 ratees x 15 items x 8 raters into 6,600 pieces of data. The study was conducted from February to June 2020 during the lockdown in Indonesia. The Many-Facet Rasch Measurement (MFRM) Model (Maryati et al., 2019; Wang et al., 2020; Wind et al., 2016) Software Version 3.83.3 analyzed the

multi-rated data.

III. INSTRUMENT

The scoring rubric was based on the study objectives. The rubric for the jumbled words category focused on grammar developed by Ariyani (2013) and the sentence translations assessed grammar mechanics and translation skills modified by Angelelli and Jacobson (2009). The grammar test was administered to the students as the final examination at the end of the semester. Tables 1 and 2 describe the jumbled words and sentence translation rubrics. The rating scale of each item in both rubrics was 1 - 5.

IV. DATA ANALYSIS

The multi-rated data were collected through the online grammar test, exported, and downloaded into MS Excel. Eight (8) raters assessed the rates using modified scoring rubrics through online Google sheets. The scores were similarly downloaded into MS Excel for coding using the MFRM Software Version 3.83.3 to analyze the fifteen (15) items, rates, and raters.

The MFRM measured the raters' severity symbolized with (C) and (j). The severity predisposed the rates' probability to manage the grammar test (n), corresponding to the rubric items (i), and specifying the categories of the threshold (k) with which the raters dealt (j). The equation of this description is as follows:

$$P_{nikj} = \frac{e^{(\beta_n - \delta_i - F_k - C_j)}}{1 + e^{(\beta_n - \delta_i - F_k - C_j)}}$$

This equation was provided for the grammar test (β_n), the severity of the jumbled words and sentence translation rubric items (δ_i), the threshold (F_k), and the verity of the raters (C_j) (Boone et al., 2014; Engelhard & Wind, 2018). As part of the Rasch model development, the MFRM's logistic measurement is by probability and logarithm, informing the raters' accuracy, reliability, and validity. The scores of the outfit means-square (MNSQ), the standardized outfit (ZSTD), and the point measure correlation (Pt.MeasCor) were the sub-computation results analyzed by the MFRM (Bond & Fox, 2015; Boone et al., 2014; Linacre, 2017).

V. RESULTS AND ANALYSIS

A. The Quality of the Rubric Items of Jumbled Words and Sentences Translation

Table 1 summarizes the MFRM analysis of rates and items, providing the standard error (RMSE), logit mean, standard deviation (SD), separation, strata, and reliability. It also shows the index separation of items and raters. The reliability of the rates and items in Table 1 is high because it almost reaches 1.00. It indicates that the measurement is reliable because the values exceed 0.9 (Bond & Fox, 2015; Linacre, 2020).

The high reliability indicates that the latent variables have been well-described to correspond to the jumbled words and sentence translation items. It implies that the fifteen (15) grammar test items are reliable and feasible for the respondents across the different groups. The item separation value denotes the range of difficulty (Perera et al., 2018). The MFRM analysis presents the statistic summaries similar to logit values, infit to outfit, and reliability indices from item to person reliabilities. It also presents item separation obtained from the instrument and respondent analysis (Daher et al., 2015). The items' separation value of 13.60 and SD of 0.69 show an effective severity distribution (Fisher, 2007). The criteria indicate that the scoring rubrics used as the grammar test instrument fit and are reliable in measuring the jumbled words and sentence translations. The rates' separation value denotes the rubrics' effectiveness in measuring the respondents' ability to manage the grammar test.

TABLE 1
RELIABILITY AND SEPARATION COMPUTATION THROUGH THE MFRM ANALYSIS

	Value of RMSE	Logit Mean	Value of SD	Value of Separation	Value of Strata	Value of Reliability
Ratee	.10	.00	.54	5.40	7.53	.97
Item	.05	.00	.69	13.14	17.85	.99

Table 2 shows the quality of the jumbled words and sentence translations as rubric items. Column 2 shows that the logit scores of the measured items are at +1.48 logit through +0.61 logit and -0.26 logit through -0.64 logit, meaning that MFRM has not detected any outliers. The scores of the measure correlation point are included in $0.30 < x < 0.6$, indicating that the items correspond to the agreed latent variables. Furthermore, the standard scores of the outfit MNSQ indices are between 0.5 - 1.5. The measurement of the MFRM for all items denotes the item's high unidimensionality, shown by a minimum variance of 40% in the Rasch Model (Engelhard & Wind, 2018). The percentage of the variance is 43.69%, signifying that all items measure one dimension.

B. Students' Grammar Distancing While Studying From Home

The MFRM analysis of the students' grammar distancing while studying from home is shown in Column 2 of Figure 1. The rubric items for the jumbled words and sentence translations are available in Column 3. Column 1 shows the logit scale from the lowest to the highest, where zero logit is the mean of the logit distribution scale (Boone et al., 2014).

TABLE 2
MFRM ITEM MEASUREMENT REPORT

Items	Measure	Model S.E.	Infit		Outfit		Correlation PtMea
			MNSQ	ZSTD	MNSQ	ZSTD	
JW27	1.48	.06	1.30	4.1	1.47	5.7	.21
JW29	1.07	.05	1.26	3.9	1.38	5.3	.34
JW28	.82	.05	1.14	2.2	1.20	3.1	.40
JW26	.70	.05	1.06	1.0	1.18	2.7	.17
JW30	.61	.05	1.28	4.2	1.30	4.5	.31
GM34	-.26	.05	.87	-2.1	.88	-1.8	.62
TS34	-.34	.05	.92	-1.2	.93	-1.1	.64
GM31	.44	.05	.74	-4.3	.73	-4.5	.44
GM35	-.45	.05	.92	-1.2	.93	-1.0	.62
TS35	-.45	.05	.95	-.7	.96	-.6	.58
GM33	-.50	.05	.83	-2.7	.86	-2.2	.61
TS31	-.51	.05	.83	-2.7	.83	-2.7	.48
GM32	-.52	.05	.76	-3.9	.75	-4.1	.57
TS33	-.60	.05	.93	-1.1	.95	-.6	.61
TS32	-.64	.05	1.03	4	1.06	8	.53
Mean	.00	.05	.99	-.3	1.03	.2	.48
SD	.69	.00	.18	2.8	.22	3.2	.15

Figure 1 and Table 1 show the distribution logit of rates at +1.48 through -0.64, the lowest to the highest logit values. The mean of the logit value is 0.00, and the SD is 0.54, as shown in Table 1. Two (2) students coded with NTP and ARS belong to the highest logit, while one (1) student coded with JEP belongs to the lowest logit, as seen in Figure 1 Column 2. The rates' logit value and SD are compared to identify how the students fared with the grammar test. Rates with logit values exceeding the SD performed better at the grammar test; those with logit values lower than the SD performed otherwise. Furthermore, rates with in-between logit values indicate moderate ability with the grammar test (Perera et al., 2018). Figure 1 Column 2 also shows that the students coded with ARS, NTP, Nd, Na, NMJ, NVZ, and IS have the highest ability in the grammar test. The other 24 students coded with Ru, FS, FT, RTMH, NATE, SAF, AS, AK, NAP, DHK, TA, HM, RR, Sa, RAF, AW, AT, NK, RY, NDS, Ke, JF, MP, and RLNP scored the higher-ability category. Students coded with NAL, RKW, RA, IS, SDS, IWS, RARN, Ri, De, NKP, ZR, DK, NPN, TW, and GA gained high ability. The students coded with GJM, NAS, and MBM attained low ability; those coded with An, Nu, AOW, MN, Am, and JEP received lower-ability scores. The rates are grouped based on the value of the index separation of 5.40 rounded to 5, as shown in Table 1 Column 5. The seven (7) male students are spread across three (3) categories: the higher-ability group with *Ru*, *Ke*, *JF*, and *MP*, the high-ability group with *Ri* and *GA*, and the lower-ability group with *Ke*. In contrast, the 48 female students are spread across the five (5) categories.

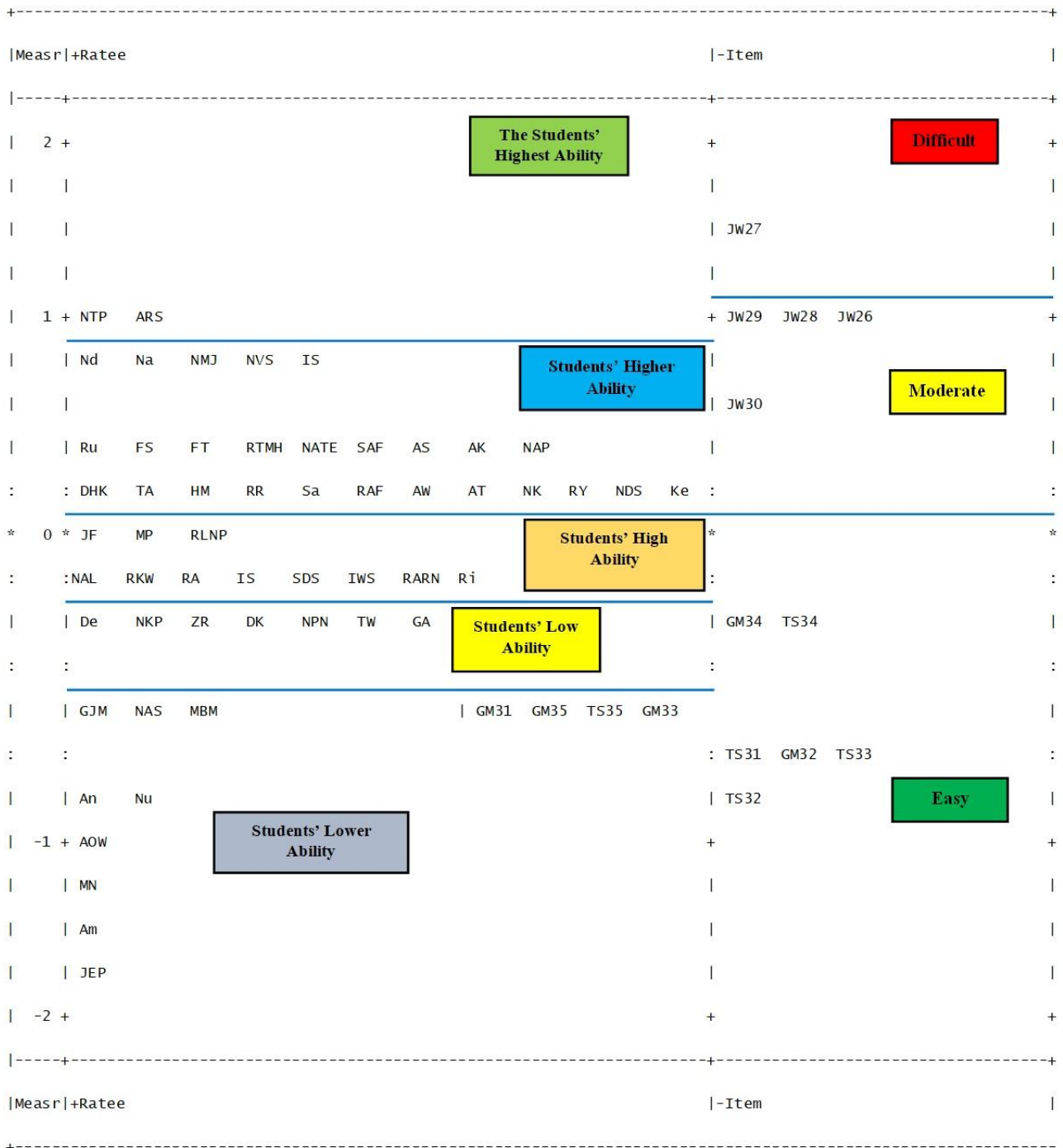


Figure 1. Variable Map of Rates and Items

C. The Grammar Item Measurement

Table 3 shows the movements of the fifteen (15) grammar items distributed based on their difficulty levels. The items' logit values in Table 2 were obtained from the raters and show the grammar test's severity level. The grammar items are grouped into three (3) severity levels through the item logit, followed by the mean and SD scores. The four (4) items with 26.67% and a logit score > +0.69 fall in the difficult level. One item with 6.67% and a logit score of +0.00 through 0.69 are at the moderate level. Ten (10) items with 66.67% and a logit score of 0.00 through -0.69 are at the easy level. The raters were selected based on their grammar mechanics and translation skills. However, there is room for improvement with the jumbled word items.

TABLE 3
THE GRAMMAR ITEM HARDSHIP LEVEL

Level of Hardship	Items		
	Jumbled Words	Grammar and Mechanics	Translation Skill
Difficult	JW27, JW29, JW28, and JW26		
Moderate	JW30		
Easy	-	GM34, GM31, GM35, GM33, and GM32	TS34, S35, TS33, TS31, and TS32

Table 3 shows that the students displayed their capability to manage the sentence translation items coded with GMs and TSs. The MFRS analysis of the responses shows that these items were easy to conquer, implying that students passed the translation course well. In contrast, the jumbled word items coded with JWs were difficult to manage, as seen in the analyzed responses. The items range between moderate (JW30) and difficult (JW27, JW29, JW28, and JW26). It implies that the students need to become more familiar with grammar tests or improve their grammar. These assumptions are fundamental to improving their grammar proficiency, particularly on jumbled words.

The MFRS measurement on the raters shows that the students could not conquer items such as JW27, JW29, JW28, and JW26. Of the 55 students, seven (7) students corresponded well to the jumbled words, including NTP, ARS, Nd, Na, NMJ, NVS, and IS. They had the highest logits, meaning they managed the grammar. Table 2 Column 2 shows the students' logits. For instance, JW27 was about a defining clause using "who". Most of them seemed confused about rearranging the words into grammatically correct sentences in the past tense. They made mistakes when placing the noun phrases (subjects), verbs, and subordinator conjunction "who". In another, JW29 consisted of a complex sentence with the subordinator conjunction "even though". Most students ignored this conjunction in their sentences and disorganized the words. Another example involved JW28, a sentence in the past tense. Most students misplaced the article and were confused about noun phrases. Similarly, JW26 comprised a sentence in the present tense. They became confused about constructing grammatically correct and logical sentences. The above examples indicate students' weaknesses in managing grammar.

VI. DISCUSSION

The global Covid-19 outbreak forced students to study from home (Hasan et al., 2021) or do distance learning (Abuhammad, 2020; Acheampong & Agyemang, 2021; Arulogun et al., 2020; Markova et al., 2017; Pozdnyakova & Pozdnyakov, 2017). Studying from home for university students demands high motivation. Students in Southeast Asian countries such as Indonesia find it particularly challenging to adapt to distance learning. Adults with high motivation are likely to survive through diligence because they take responsibility for their education (Pozdnyakova & Pozdnyakov, 2017). In Indonesia, studying from home is not a habit; Covid-19 introduced the students to it. Online learning utilizes technology and is rapidly becoming a new habit. Therefore, students need more time to reserve conventional learning and accept this new habit (Urh & Jereb, 2014).

This study focuses on the distance learning abilities of the students through a grammar test. They were from the same department, class, and semester, taught by the same lecturer, and likely acquired similar learning experiences. Six (6) students coded with An, Nu, AOW, MN, AM, and JEP failed the following items: ten (10) easy, one (1) moderate, and four (4) difficult, as shown in Figure 1. It indicates that they have lower grammar ability. Three (3) students coded with GJM, NAS, and MBM managed eight (8) of ten (10) easy items - GM31, GM35, TS35, GM33, TS31, GM32, TS33, and TS32. In addition to the remaining two (2) easy items (GM34 and TS34), they failed one (1) moderate and four (4) difficult items. They have low grammar ability. The other fifteen (15) students coded with NAL, RKW, RA, IS, SDS, IWS, RARN, Ri, De, NKP, ZR, DK, NPN, TW, and GA managed all ten (10) easy items and failed one (1) moderate and four (4) difficult items. They have high grammar ability. Twenty-four (24) students coded with Ru, FS, FT, RTMH, NATE, SAF, AS, AK, NAP, DHK, TA, HM, RR, Sa, RAF, AW, AT, NK, RY, NDS, Ke, JF, MP, and RLNP managed the ten (10) easy items and one (1) moderate item as shown in Figure 1. They have higher grammar ability. The remaining seven (7) students coded with NTP, ARS, Nd, Na, NMJ, NVS, and IS managed fourteen (14) items - JW29, JW28, JW26, JW30, GM31, GM35, TS35, GM33, TS31, GM32, TS33, TS32, GM34, and TS34 but missed JW27, considered the most challenging item. They have the highest grammar ability. It indicates that grammar distancing results from different student abilities during distance learning. Students unfamiliar with distance learning find it challenging to adapt to it. Students with positive motivation toward distance learning still face challenges (Markova et al., 2017).

This study exposes grammar distancing among students with different abilities through logit values. The Ratee Measurement Report, through its Standard Deviation (SD), shows that the ratees' mean scores and separation values are 0.55 logit and 5.45, respectively. The ratees fall into five (5) categories viewed from their grammar distancing. The first category scales at > 0.55 logit, comprising students with the highest ability. The second category has a logit scale of 0.55 through 0.00, belonging to the higher-ability students. The third category consists of the high-ability students with a logit scale of 0.00 through -0.55. The fourth category with a logit scale of -0.55 through -1.10 classifies the low-ability students, while the fifth category with a logit scale < -1.10 is the lower-ability students. These results support Fisher (2007), who states that the SD and separation values indicate a good distribution of the item difficulty.

The MFRM analysis conveys that 46 of 55 or 83.64% of the students performed highly in grammar. They managed the jumbled words, grammar and mechanics, and sentence translations. Nine (9) or 16.36% of the students performed poorly, even failing the easy items. Both performances indicate that most students likely had good internet access and conducted serious learning from home. However, some probably needed more internet access, setting their cameras off and giving less attention to their studies. According to Hasan et al. (2021), Pakistani employees and students face similar problems when learning online and working remotely because they need more proficiency with the internet and its supporting technologies.

The MFRM analysis also indicates that the ratees have strengths and weaknesses in managing grammar. Of the 55 students, 46, or 83.64%, managed the jumbled words and sentence translations from Indonesian to English. They understand translation concepts and how to rearrange jumbled words into logical and grammatically correct sentences. The assessment comprised simple, complex, and compound-complex sentences with different tenses. This finding supports Demirezen (2015) from Turkey that 90% of respondents correctly recognized when to place breaks when faced with a compound-complex sentence but could not rearrange the sentence with a phrasal verb *ran after*, thinking that *after* was a subordinator conjunction. The finding also confirms the respondents' challenges when producing compound-complex sentences (Demirezen, 2015).

Three (3) students with a low ability (5.45%) managed the jumbled words and sentence translations from Indonesian to English correctly but needed some help. Although categorized as having low grammar ability, they performed well in some items, indicating that they understand utilizing the internet as a learning source. It is consistent with the findings of Lou et al. (2013), implying that blended learning and the use of the internet help students to construct English sentences and solve their learning problems. Another weakness emerged when the students failed to correctly answer the last sentence translation and jumbled words. They did not manage the two (2) items likely because they did not participate in the advanced grammar class, needed better internet access, were stressed about online learning, or were distracted by other internet applications. According to Tran et al. (2020), high-grade students spend little time on online studies because of their high tendency to access other applications.

VII. CONCLUSION

Studying from home or distance learning during the Covid-19 outbreak demands high motivation from students. It requires good internet access and technological devices for students and instructors. As facilitators, teachers must help students who need better internet access. They can use appropriate teaching methods, strategies, approaches, or media to teach the required materials through online learning. This study uses the MFRM Model to measure the students' grammar distancing, revealing the quality and severity of the grammar items and the ratees' abilities. A good percentage of the students highly perceive grammar items like simple, compound, complex, and compound-complex sentences. They need only to improve their understanding of phrasal verbs for rearrangement from jumbled words into acceptable and logical sentences. The Covid-19 pandemic will likely make students and instructors continue implementing online learning. Students can study from home, facilitated by their instructors a distance away. Those needing better internet access can acquire help from identified parties like their teachers, governments, and their agencies to ensure education for all students without exception.

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