RESEARCH ARTICLE

Comparison perceptions of secondary mathematics teachers between Korea and Indonesia in covid-19 era

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Abstract

This study compared the perceptions of 548 Korean and Indonesian secondary school teachers in the COVID-19 era and examined factors affecting their intention to continue online learning. Based on survey data, the two countries were compared on seven factors (teaching readiness, challenges and issues, competencies that require training, sources of support, types of support, and endurance). Furthermore, we examined what factors influence the intention to continue online learning. As a result, Korean teachers perceived their teaching readiness for online learning to be less than that of Indonesian teachers. Indonesian teachers perceived that they did not receive sufficient support. Additionally, factors affecting the intention to continue online learning differed depending on the country. Based on these results, we suggested implications for integrating online learning into mathematics education.

Keywords: Korea, Indonesia, compare countries, perception, COVID 19

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I. INTRODUCTION

The World Health Organization (WHO) declared COVID-19 a global emergency on January 30, 2020, and a global pandemic on March 11 of the same year. The COVID-19 virus pandemic rapidly disseminated the world into chaos. Rapid changes occurred in school operations and classroom instruction (Paudel, 2021). As schools closed, teachers were faced with the challenge of developing alternative teaching methods remotely using digital technologies. This caused teachers to find other ways (e.g., learning management platforms, e-learning, distance learning) to teach their students online with the help of additional digital media (Letzel-Alt et al., 2022). Online education became the standard for formal education in many countries during the COVID-19, as providing continuing education is essential for all students (Scherer et al., 2021).

Online learning is effective in teaching mathematics because it integrates students' multiple senses and promotes mathematical interaction (Hastie et al., 2007; Hui et al., 2014). However, implementing the teaching and learning of mathematics online was not always effective and smooth. Several researchers reported various difficulties in online learning courses such as identified gaps in terms of supporting and assessing student learning (Aldon et al., 2021), student-teacher interaction (Hodgen et al., 2020), access to technology (Nesta, 2020), and overall learning loss (Engzell et al., 2020). In this regard, recent policy documents highlighted the need for new teaching structures and practices in mathematics education (NCSM & NCTM, 2020).

Despite several studies during COVID-19, much remains unknown about mathematics teachers' perceptions and challenges (Drijvers et al., 2021). Even after the COVID-19 subsided, questions remained as to whether teachers should continue their online teaching methods or return to traditional teaching methods. To cope with the uncertainty of emergencies similar to COVID-19 in the future, it is important to predict teachers' needs, challenges, and actions. OECD (2020) suggested conducting cross-country comparative research exploring the different experiences and challenges faced by education stakeholders. Still, little research has been conducted exploring cross-country differences (Letzel-Alt et al., 2022).

In this context, this study investigated the perceptions of mathematics teachers in Korea and Indonesia during COVID-19. Although the two countries have different resources, they quickly adapted online classes in the COVID-19 situation. Research comparing the teacher's perceptions in the two countries may provide useful implications for supporting future online teaching and learning. This study provides information on teaching practices that can respond to future emergencies by examining factors that influence mathematics teachers' perceptions and intentions to continue online learning through a comparison between the two countries. The following two research questions guide this study.

First, are there differences in the perceptions of mathematics teachers in Korea and Indonesia for online teaching?

Second, what factors influence the intention of mathematics teachers in Korea and Indonesia to continue teaching online?

II. RELATED LITERATURE

Online Classes in Korea and Indonesia during Pandemic

In Korea, schools generally open and conduct educational activities on March 2nd. However, due to the COVID-19 pandemic, the Ministry of Education postponed the opening of schools four times. As COVID-19 spread rapidly, the Ministry of Education sequentially opened online classes on April 9, 2020 (Ministry of Education, 2020). Before conducting online classes, individual schools invited instructors to conduct online class training and made preliminary preparations for effective online teaching (Kim, 2021). Schools conducted video classes or real-time online classes through online education platforms such as Zoom, Google Meet, Google Classroom, and Educational Broadcasting System (EBS) online classes.

Indonesia has the fourth largest student population in the world, with 45.5 million students and 3.1 million teachers since Suryadarma & Jones (2013) reported. Indonesia temporarily closed all schools and higher education institutions on March 14, 2020, three days after WHO declared the outbreak a global pandemic on March 11, 2020. Schools quickly shifted to online learning using Information and Communications Technology (ICT) to cope with physical closure. Online learning was considered the best approach to sustain teaching and learning during the pandemic (Mailizar et al., 2020). In Indonesia, platforms for online learning include Rumah Belajar and SPAD. Rumah Belajar is a free online learning platform developed by the Indonesian Ministry of Education and Culture, and SPADA is an e-learning platform developed by the Ministry of Higher Education (Mailizar et al., 2020). For example, Rumah Belajar is a web-based learning portal for elementary, middle, and high school students and includes digital lessons, question banks, and content for sustainable professional development. A key feature of the program is to allow interaction between teachers, students, and learning resources (Utami & Dewi, 2020). In addition to these two platforms, the Indonesian government made partnerships with various online learning platforms to help students and teachers continue their learning.

Due to sudden changes in the educational environment, mathematics teachers in both countries faced a new educational environment called technology-based online learning. This served as an opportunity to dramatically expand the scope of online learning (Oh, 2023). Students took non-face-to-face classes using computers or smart devices, and teachers recorded videos or conducted interactive online classes. Nevertheless, teachers had difficulty identifying what difficulties students had during math classes, and student-teacher interaction was significantly weakened compared to face-to-face classes (Fakhrunisa & Prabawanto, 2020).

Online Classes during COVID-19

There is a progressively growing need to apply ICT in all areas of life, education stakeholders need to be able to teach students as potential experts (Bond et al., 2018; Sandkuhl & Lehmann, 2017). The COVID-19 pandemic triggered the transition of school education online, and as a result, issues that had not been agreed upon due to differences in beliefs and opinions were quickly converted (Adedoyin & Soykan, 2023). One of the

challenges that arose from this process was that it forced a change in the attitudes of educational administrators, teachers, and students toward the importance of online teaching and learning (Ribeiro, 2020). After the government announced the physical closure of schools as a means of preventing the rapid spread of the pandemic, online learning was the only option for schools to adopt. Online learning plays an important role in continuing learning by allowing students to attend classes from anywhere in the world. However, Pokhrel and Chhetri (2021) pointed out that there are various limitations to online teaching and learning, such as family circumstances, gaps in information accessibility, and teachers' technology abilities. Especially, challenges to online teaching and learning are related to state support and resources (Schleicher, 2020). Countries with resources for alternative learning provided students with continuous learning opportunities using computers, radio, and television. On the other hand, students in low-resource countries had no choice but to wait for schools to open after COVID-19 lockdowns were lifted (Schleicher, 2020). This study compared the perceptions of mathematics teachers in resource-rich Korea and Indonesia, a developing country during COVID-19. This may reveal differences in teachers' perceptions across countries and provide a starting point for future support of online teaching in developed and developing countries.

III. METHODS

Participants and Data Collection

The participants were 600 secondary mathematics teachers (Korea: 150, Indonesia: 450). An online survey tool was used for the study: Google Forms in Korea and WhatsApp in Indonesia. Participants were collected randomly, and their location and size of school where they worked were not taken into account. The survey was conducted in September-October 2021, and the response results of 548 teachers (Korea: 120, Indonesia: 428) were analyzed, excluding participants who answered the survey insincerely. Table 1 shows the results of analyzing the background of the participants used in the analysis.

Table 1. Background of participants

Background Factors		Korea	Indonesia
Gender	Male	41	97
	Female	79	331
Educational Experience	0-5 years	17	63
	6-10 years	22	66
	11-20 years	44	196
	Above 20 years	37	103
Degree	Bachelor	56	329
	Master	61	97
	Doctorate	3	2

Survey Tool

The survey tool was developed by adapting Teaching and Learning International Survey (TALIS) 2018 framework. TALIS is an international large-scale survey for teachers, school leaders, and learning environments that describes how effective teaching and institutional conditions (Ainley & Carstens, 2018). The TALIS 2018 framework addresses emerging policy and research concerns related to teachers' educational background and initial preparation, professional development, professional practice, and innovative teaching in a variety of settings. We collaborated with two mathematics education professors from Universitas Pendidikan Indonesia to construct seven factors to investigate teachers' perceptions in an online learning environment. Since the items in the TALIS 2018 framework do not match the COVID-19 context, detailed items were modified to fit COVID-19 situation. The 7 factors are 'teaching readiness (11 items)', 'challenges and issues (7 items)', 'change made in teaching (9 items)', 'competencies that require training (9 items)', and 'sources of support (7 items)', 'types of support (5 items)', and 'sustainability (3 items)', consisting of a total of 51 items. The specific items included in each factor are described in Appendix. The survey tool is a 5-point Likert scale (1: strongly disagree, 5: strongly agree) to maintain a consistent scale. The developed survey tool was conducted pilot test with 109 Korean and Indonesian teachers to verify reliability and refine the sentences. Table 2 shows the factors, items, and Cronbach's α of the survey tool. When Cronbach's is .6 or higher, it is considered reliable and all items can be analyzed by synthesizing them into one scale. As a result of the reliability analysis, all Cronbach's values were above .6, so all items were used in the analysis without removing them.

Table 2. Contents of survey tool

Factors	Description	Items	Sample	Cronbach's α
Teaching readiness	Degree of preparation for online teaching	11	Content of the subject I teach	.915
Challenges and issues	Difficulties during online teaching	7	Maintaining students' motivation	.839
Change made in teaching	What has changed in online teaching	9	Adjust my teaching strategy	.923
Competencies that require training	Competencies considered necessary for online teaching	9	I need more training on making use technology	.922
Sources of support	Sources of support received during online teaching	7	Peers	.846
Types of support	Types of support received during online teaching	5	Financial	.887
Sustainability	Whether to continue teaching online	3	Keep the new practiced learned during the pandemic	.812

Analysis

Based on the collected data, this study conducted t-test to compare the perceptions of mathematics teachers in Korea and Indonesia. Since the sample sizes of Korean and Indonesian teachers were different, we performed Welch's t-test to minimize errors due to sample sizes. Welch's t-test performs better than Student's t-test and provides identical results when sample sizes and variances are not equal across groups (Delacre et al., 2017). We also conducted a multiple regression analysis to determine what factors influenced sustainability, which is a measure of whether mathematics teachers would continue with online learning or return to their previous teaching practices. The dependent variable was set as endurance, the independent variables were set as the remaining six factors, and the impact of each factor on endurance was analyzed. All analysis procedures were performed using the R (ver 4.3.2) program.

IV. RESULTS

Comparison of Mathematics Teachers' Perceptions of Online Learning in Korea and Indonesia

Teaching Readiness. Teaching readiness refers to the degree of preparedness of mathematics teachers for online learning. Table 3 shows the result of an independent samples t-test comparing Korean and Indonesian mathematics teachers' perceptions of teaching readiness. Korean teachers perceived that the readiness for 'content of the subject I teach' and 'pedagogy of the subject I teach' was the best. The scores for the remaining items were less than 3 points, and among them, readiness for 'monitoring students' development and learning' was perceived as lacking the most. Indonesian teachers scored higher on readiness for 'content of the subject I teach' and 'classroom practice in the subject I teach' than other factors, while 'teaching in a multicultural setting' was the factor with the lowest score.

The independent samples t-test result shows that Indonesian teachers perceive teaching readiness to be better than Korean teachers. Indonesian teachers had significantly higher scores than Korean teachers in eight items (p<.05): (a) classroom practice in the subject I teach, (b) teaching in a mixed ability setting, (c) teaching in a multicultural setting, (d) teaching general cognitive skills such as creativity, critical thinking, problem-solving, (e) use of ICT for teaching, (f) student behavior and classroom management, (g) monitoring students' development and learning, (h) facilitating students' transitions to the next level of education.

Table 3. The independent samples t-test result on the perception of 'teaching readiness' between Indonesian and Korean mathematics teachers

Items	Mean (SD)		t value	p
	Korea	Indonesia		
Content of the subject I teach	3.50 (.757)	3.38 (.576)	1.566	.119
Pedagogy of the subject I teach	3.19 (.845)	3.19 (.614)	.103	.918
General pedagogy	2.97 (.866)	3.14 (.639)	-1.754	.082
Classroom practice in the subject I teach	2.90 (.954)	3.28 (.639)	-4.061	$< .001**$
Teaching in a mixed ability setting	2.42 (1.042)	3.17 (.659)	-7.338	$< .001**$
Teaching in a multicultural setting	2.37 (.987)	2.95 (.767)	-12.351	$< .001**$
Teaching general cognitive skills such as creativity, critical thinking, problem solving	2.35 (1.004)	3.05 (.627)	-6.390	$< .001**$
Use of ICT for teaching	2.48 (1.026)	2.97 (.702)	-6.055	$< .001**$
Student behavior and classroom management	2.24 (.950)	3.16 (.656)	-6.228	$< .001**$
Monitoring students' development and learning	1.73 (.904)	3.21 (.629)	-9.234	$< .001**$
Facilitating students' transitions to the next level of education	2.34 (1.023)	3.09 (.723)	-6.430	$< .001**$

$** p < .01$

Challenges and Issues. Challenges and issues represent the challenges and difficulties experienced by teachers during online learning, with higher scores indicating more challenges and difficulties experienced. Table 4 shows the result of an independent samples t-test comparing Korean and Indonesian mathematics teachers' perceptions of challenges and issues. Korean teachers had higher averages for 'maintaining students' motivation' and 'preparing students' mental readiness' compared to other items. This result indicates that Korean teachers had difficulty managing the emotional aspects of their students during online learning. Indonesian teachers experienced the greatest difficulties in managing 'maintaining students' motivation' and 'assessing students' learning'. Teachers in both countries had the lowest scores for 'managing asynchronous lesson'. This item refers to lessons that present pre-made videos, and teachers in both countries perceived video lessons to be easier than interactive lessons.

The independent samples t-test result shows that Korean teachers did not experience challenges and issues compared to Indonesian teachers. Indonesian teachers had significantly higher scores than Korean teachers in five items (p<.05): (a) managing synchronous lesson, (b) managing asynchronous lesson, (c) preparing students' technology literacy, (d) overcoming learning facilities, and (e) assessing students' learning. Indonesian teachers faced more challenges than their Korean counterparts in managing online learning, preparing students for access to technology, and assessing students.

Table 4. The independent samples t-test result on the perception of 'challenges and issues' between Indonesian and Korean mathematics teachers

Items	Mean (SD)		t value	p
	Korea	Indonesia		
Maintaining students' motivation	3.54 (.744)	3.45 (.638)	1.047	.295
Managing synchronous lesson	2.72 (1.078)	3.15 (.694)	-4.207	$< .001$**
Managing asynchronous lesson	2.31 (1.067)	2.74 (.895)	-4.077	$< .001$**
Preparing students' mental readiness	3.22 (.891)	3.30 (.674)	-.941	.348
Preparing students' technology literacy	2.88 (.927)	3.17 (.735)	-3.128	.002**
Overcoming learning facilities (internet access, technology)	2.67 (1.007)	3.18 (.771)	-5.198	$< .001$**
Assessing students' learning	2.95 (.887)	3.34 (.646)	-4.505	$< .001$**

** $p < .01$

Competencies that Require Training. Competencies that require training indicate competencies that teachers perceived as requiring training during online learning. Table 5 shows the result of an independent samples t-test comparing Korean and Indonesian mathematics teachers' perceptions of competencies that require training. Korean teachers had the highest scores for 'I need training in strategy to motivate and manage students' engagement' and 'I need training in using new assessment techniques and technology'. Korean teachers perceived their greatest need for training in strategies for engaging and managing student participation and in how to use new assessment techniques and technologies. On the other hand, Indonesian teachers' scores for all items were similar, and they recognized that training for all items was necessary.

The independent samples t-test result showed that Indonesian teachers had significantly higher scores than Korean teachers in all items. This result indicates that Indonesian teachers are more perceive of the need for training in online learning than Korean teachers.

Sources of Support. Sources of support indicate the sources of support teachers received during online learning. Table 6 shows the results of an independent samples t-test result comparing Korean and Indonesian mathematics teachers' perceptions of sources of support. Korean teachers perceived that they received the most support from 'peers' and 'school' compared to other sources. 'Teacher association' and 'government' were scored at about 2 (disagree), and 'university', 'parents', and 'community' were scored at about 1. This result indicates teachers perceived that almost no support at all from these sources. Indonesian teachers also responded that they received the greatest support from 'peers', but they perceived that they received support from a variety of sources compared to Korean teachers.

The independent samples t-test result shows that Indonesian teachers had significantly higher scores than Korean teachers in all items. This result means that Indonesian teachers perceived that they more received support from a variety of sources in online learning compared to Korean teachers.

Table 5. The independent samples t-test result on the perception of 'competencies that require training' between Indonesian and Korean mathematics teachers

Items	Mean (SD)		t value	*p*
	Korea	Indonesia		
I need more training on making use technology	2.82 (.953)	3.53 (.675)	-7.659	< .001**
I need more opportunities to develop my collaboration skills	2.87 (.970)	3.47 (.654)	-6.416	< .001**
I need to improve my professional learning skills	2.85 (.941)	3.56 (.611)	-7.775	< .001**
I need training on reconstructing curriculum	2.78 (.965)	3.37 (.733)	-6.254	< .001**
I need training in designing flexible lessons based on the situation	2.84 (.979)	3.57 (.609)	-7.793	< .001**
I need training in delivering lessons by using varieties of technology and teaching strategy	2.96 (.947)	3.54 (.639)	-6.383	< .001**
I need training in developing teaching materials	2.98 (.965)	3.52 (.647)	-5.864	< .001**
I need training in using new assessment techniques and technology	3.03 (.930)	3.55 (.638)	-5.828	< .001**
I need training in strategy to motivate and manage students' engagement	3.26 (.825)	3.56 (.611)	-3.767	< .001**

** $p < .01$

Table 6. The independent samples t-test result on the perception of 'sources of support' between Indonesian and Korean mathematics teachers

Items	Mean (SD)		t value	*p*
	Korea	Indonesia		
Peers	3.07 (.950)	3.31 (.709)	-2.566	.011*
Teacher Association	2.04 (.947)	3.09 (.807)	-11.014	< .001**
Government	2.03 (.849)	2.88 (.752)	-10.564	< .001**
Your school	2.66 (.983)	3.30 (.689)	-6.743	< .001**
University	1.19 (.539)	2.33 (.899)	-17.399	< .001**
Parents	1.22 (.553)	2.71 (.867)	-22.699	< .001**
Community	1.26 (.642)	2.48 (.853)	-17.072	< .001**

* $p < .05$, ** $p < .01$

Types of Support. Types of support indicate what types of support the teacher was provided during online learning. Table 7 shows the result of an independent samples t-test comparing the perceptions of types of support between Korean and Indonesian mathematics teachers. Korean teachers perceived that they received the most support for

'facilities and materials' and the least for 'psychological support'. Indonesian teachers scored less than 3 for all items, showing that they perceived that they did not receive support overall.

As a result of the independent samples t-test, Korean teachers had significantly higher scores for 'financial', 'facilities and materials', 'knowledge and skills', and 'policy' than Indonesian teachers. This shows that Korean teachers perceived that they received more support for online learning than Indonesian teachers.

Table 7. The independent samples t-test result on the perception of 'types of support' between Indonesian and Korean mathematics teachers

Items	Mean (SD)		t value	p
	Korea	Indonesia		
Financial	2.94 (.964)	2.50 (.862)	4.883	< .001**
Facilities and Materials	3.46 (.777)	2.84 (.779)	7.674	< .001**
Knowledge and skills	3.19 (.882)	2.96 (.707)	2.618	.010*
Psychological support	2.92 (.992)	2.84 (.760)	.749	.455
Policy	3.17 (.911)	2.89 (.736)	3.032	.003**

$* p < .05, ** p < .01$

Endurance. Endurance indicates the teacher's perception of whether to continue online learning or maintain or improve existing practices. Table 8 shows the result of an independent samples t-test comparing Korean and Indonesian mathematics teachers' perceptions of endurance. Both Korean and Indonesian teachers had higher scores for 'improving the old teaching practice' than other items, and the lowest scores for 'back to old teaching practice'. This result indicates that teachers in both countries had the highest intention to improve their existing teaching practices based on their online learning experiences during COVID-19.

The independent samples t-test result shows that Indonesian teachers had significantly higher scores on 'improving the old teaching practice' than Korean teachers. Other items did not show statistical differences.

Table 8. The independent samples t-test result on the perception of 'endurance' between Indonesian and Korean mathematics teachers

Items	Mean (SD)		t value	p
	Korea	Indonesia		
Keep the new practiced learned during the pandemic	2.89 (.924)	2.99 (.721)	-1.033	.303
Back to old teaching practice	2.41 (1.000)	2.48 (.828)	-.732	.465
Improving the old teaching practice	3.28 (.812)	3.49 (.618)	-2.537	.012*

$* p < .05$

Analysis of Factors Influencing Intention to Continue Online Learning

Multiple regression analysis was performed to identify factors influencing intention to continue online learning. Table 9 shows the results of multiple regression analyses conducted based on data from Korean and Indonesian teachers.

Table 9. The result of multiple regression analysis

Model		B	SE	β	t value	p
Constant	Korea	1.57	.273		5.760	$< .001$**
	Indonesia	.815	.165		4.951	$< .001$**
Teaching readiness	Korea	-.015	.058	-0.23	-.252	.802
	Indonesia	.083	.042	.094	1.986	.048*
Challenges and issues	Korea	.074	.064	.109	1.163	.247
	Indonesia	.067	.044	.079	1.530	.127
Change made in teaching	Korea	.097	.074	.122	1.304	.195
	Indonesia	.071	.042	.088	1.690	.092
Competencies that require training	Korea	.184	.063	.291	2.937	.004**
	Indonesia	.217	.037	.259	5.905	$< .001$**
Sources of support	Korea	.078	.092	.078	.844	.400
	Indonesia	.093	.039	.115	2.406	.017*
Types of support	Korea	.059	.060	.089	.985	.327
	Indonesia	.161	.034	.222	4.695	$< .001$**

$* p < .05, ** p < .01$

In Korea, the F value in the statistical significance test was 5.374 (p < .01), and the six factors included in the model were able to explain 22.4% of the intention to continue online learning. Among the six factors, only 'competencies that require training' was significant (β=.291, t=2.937), and the remaining factors did not appear to have a significant effect. This means that the competencies that Korean teachers perceive as requiring training in online learning affect their intention to continue online learning.

In Indonesia, the F value in the statistical significance test was 32.579 (p < .01), and the six factors included in the model were able to explain 31.7% of the intention to continue online learning. Among the factors, 'teaching readiness (β=.094, t=1.986)', 'competencies that require training (β=.259, t=5.905)', 'sources of support (β=.115, t=2.406)', and 'types of support (β=.222, t=4.695)' were significant. Based on the standardized coefficient β value, 'competencies that require training' was the most influential predictor, followed by 'types of support', 'sources of support', and 'teaching readiness'.

IV. DISCISSION

This study examined the perceptions of Korean and Indonesian mathematics teachers during covid 19 and revealed factors that influenced their intention to continue

online learning. We conducted a survey targeting mathematics teachers in Korea and Indonesia using a survey tool developed based on the TALIS 2018 framework. We also compared the perceptions of Korean and Indonesian mathematics teachers and identified factors that influenced their intention to continue online learning.

Korean teachers perceived that teaching readiness for online learning was not sufficient. They perceived to be ready to teach in the content and pedagogy being taught, but their scores were in the 1-2 range for classroom practice, mixed ability setting, higher-order thinking (i.e., critical thinking, creativity), use of ICT, and student management (see Table 3). This result indicates that although Korean teachers perceived that they had mathematical and pedagogical knowledge, they felt pressured to use it in online learning. In particular, it is noteworthy that 'monitoring students' development and learning' was the lowest at 1.73 points. Korean teachers perceived themselves as having the greatest lack of ability to manage students in online learning. These results are also followed in the analysis of the two factors: challenges and issues and competencies that require training (see Tables 4 and 5). Korean teachers experienced the greatest challenges in student management, such as maintaining student motivation and preparing students' mental readiness. The ability to manage students' mental readiness is important for teachers in all countries. However, when online learning will be integrated into mathematics education in the future, especially Korean teachers need to focus on cultivating their competencies in handling and managing students' emotions and learning online.

Indonesian teachers show higher scores than Korean teachers in almost all items of teaching readiness. In the suddenly changed educational environment due to COVID-19, Indonesian teachers perceived their teaching readiness to be better than Korean teachers. The independent samples t-test results for 'challenges and issues' and 'competencies that require training' suggest interesting points. Korean teachers perceived that their teaching readiness was not sufficient, but they did not feel any challenges or the need for training during online learning (see Tables 4 and 5). Although they experienced difficulties in maintaining student motivation and preparing students' mental readiness, they perceived the remaining factors as less difficult than Indonesian teachers. Additionally, the demand for competencies required for online learning was lower than that of Indonesian teachers. Although Indonesian teachers perceived that they had higher teaching readiness than Korean teachers, they felt more difficulty and need for competencies that require training in actual online learning. Additional research needs to be conducted to reveal the negative relationship between teaching readiness and challenges among Indonesian teachers.

As the analysis result of sources of support (see Table 6), Korean teachers perceived that they received a lot of support from peers and school. They responded that they received little support from teacher associations, government, universities, parents, and community. In comparison, Indonesian teachers responded that they received support from a variety of sources, and showed significantly higher scores from all sources compared to Korean teachers. Despite efforts by the government and the Office of Education, Korean teachers perceived limited support from outside the school. Additional research is needed to better understand the relationship between external support and Korean teachers' perceptions.

In terms of types of support, Korean teachers responded that they had the most support for 'facilities and materials.' In Korea, webcams and related software licenses were provided to teachers to operate an online learning platform. However, they perceived that psychological support was the least. Online learning processes involve different aspects of interaction than face-to-face learning (Aldon et al., 2021). Support for facilities and materials is important, but there is a need to find ways to provide psychological support for teachers in online learning. In comparison, Indonesian teachers showed low scores of around 2 for all items and perceived the most support for Knowledge and skills and the least support for Finance. Although Indonesian teachers reported receiving support from a variety of sources, this support does not appear to be sufficient.

Korean and Indonesian teachers showed similar trends in endurance (see Table 8). Teachers in both countries scored highest on improving the old teaching practice based on their experience in online learning, and lowest on returning to old teaching practice. However, Indonesian teachers showed significantly higher scores than Korean teachers in improving the old teaching practice. This shows that Indonesian teachers have a higher intention to improve existing teaching practices than Korean teachers.

We found that mathematics teachers in Korea and Indonesia differed in the factors that influenced their endurance (see Table 9). For Korean teachers, only 'competencies that require training' was significant, and for Indonesian teachers, the four factors of 'teaching readiness', 'competencies that require training', 'sources of support', and 'types of support' were significant in their intention to continue online learning. Korean teachers may decide whether to continue online learning or not, depending on the competencies required for online learning. In comparison, Indonesian teachers appear to be influenced by teaching readiness and availability of support in addition to the competencies required for online learning. This may stem from differences between countries (Schleicher, 2020). South Korea and Indonesia have both made rapid shifts to online learning. However, due to differences in support provided by the government, Indonesian teachers may need to consider a variety of factors if they are to continue online learning.

V. CONCLUSION

This study revealed differences in the perceptions of mathematics teachers in Korea and Indonesia during COVID-19 and the factors that influenced their intention to continue online learning. Sociocultural and economic differences between countries may influence teachers' perceptions during online learning. Our findings suggest that integrating online learning into mathematics education requires an understanding of the differences and needs of teachers across and within countries. There are the following limitations of this study: First, since the sample size for Korean and Indonesian teachers is different, the possibility of sample bias must be considered. Even reflecting differences in population size, sample sizes were quite different in the two countries. A second limitation is that both countries are located in East Asia. In other parts of the world, the picture may be different. Third, since the collected data is from 2021, it is necessary to update the latest data to further investigate changes in current teachers' perceptions. Fourth, we focused on

teacher perceptions in the context of COVID-19. Therefore, the impact of teachers' perceptions of traditional teaching, and their perceptions and sustainability of online platforms used differently across countries, require further research.

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Appendix.

Teacher perception survey questionnaire on online mathematics classes in the
Corona 19 era

This questionnaire is aimed at investigating teacher perceptions of online math classes in
the Corona era. Please note that the submitted questionnaire will not be used for any
purpose other than research purposes.

1. Gender: Male/Female

2. Educational experience: years

3. Final degree
① Bachelor's degree ② Master's degree ③ Doctorate

4. Please look at the survey below and place a √ in the appropriate box.

Factors	Items	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
Teaching readiness	Content of the subject I teach					
	Pedagogy of the subject I teach					
	General pedagogy					
	Classroom practice in the subject I teach					
	Teaching in a mixed ability setting					
	Teaching in a multicultural setting					
	Teaching general cognitive skills such as creativity, critical thinking, problem solving					
	Use of ICT for teaching					
	Student behavior and classroom management					
	Monitoring students' development and learning					
	Facilitating students' transitions to the next level of education					
Challenges and Issues	Maintaining students' motivation					
	Managing synchronous lesson					
	Managing asynchronous lesson					
	Preparing students' mental readiness					
	Preparing students' technology literacy					
	Overcoming learning facilities (internet access, technology)					
	Assessing students' learning					

Change Made in Teaching	Content (reduction)					
	Content (selecting the essential concepts)					
	Content(integrating the content to other school subject)					
	Adjust my teaching strategy					
	Adjust my teaching materials					
	Adjust my teaching media					
	Adjust my classroom management by using LMS					
	Adjust my classroom management by organizing group works					
	Adjust my classroom management by providing more motivational support and engagement					
Competencies that require training	I need more training on making use technology					
	I need more opportunities to develop my collaboration skills					
	I need to improve my English competency					
	I need to improve my professional learning skills (e.g. searching, managing information, updating, adopting and adapting knowledge and skills)					
	I need training on reconstructing curriculum					
	I need training in designing flexible lessons based on the situation					
	I need training in delivering lessons by using varieties of technology and teaching strategy					
	I need training in developing teaching materials					
	I need training in using new assessment techniques and technology					
	I need training in strategy to motivate and manage students' engagement					
Sources of Support	Peers					
	Teacher Association					
	Government					
	Your school					
	University					
	Parents					
	Community					
Types of Support	Financial					
	Facilities and Materials					
	Knowledge and skills					
	Psychological support					
	Policy					
Endurance	Keep the new practiced learned during the pandemic					
	Back to old teaching practice					
	Improving the old teaching practice					