How Do Malaysian and South Korean Mathematics Teachers Encourage Collaboration among Students in Mathematics Classroom?

Abdul Halim Abdullah, Bomi Shin

ABSTRACT---Collaboration activities in mathematics classes are activities that actively involve students. Collaborative learning is one of the features in the 21st-century pedagogical framework. Many studies have shown the positive impact of the activities collaboration in groups of students on various aspects such as mathematics achievement, concept understanding, attitude, motivation and so on. Malaysia and South Korea are two countries that promote cooperative and collaborative learning as suggested in their mathematics curriculum. In this regard, the study compares how secondary school mathematics teachers in Malaysia and South Korea carry out collaborative activities among students in mathematics classes. Furthermore, this study may help explain why mathematics achievements of South Korean students are outstanding in international assessments compared to Malaysian students, especially in terms of collaborative activities in mathematics classes. This study adopted a survey design using questionnaires followed by interviews with mathematics teachers to obtain more in-depth information on the aspects of interest. A total of 71 respondents from Malaysia and 51 respondents from South Korea were involved in this study. Three mathematics teachers from each country were interviewed. The questionnaire consists of 12 items. The reliability of the questionnaire using Cronbach's alpha was 0.94. The results showed that mathematics teachers in both countries do not use educational technology such as dynamic geometry software and the internet to promote collaboration in mathematics classes. Nevertheless, group discussion, problem-solving and group assignments are carried out in mathematics classes in both countries. All in all, this study found similarities in the aspects of collaborative activities in mathematics classes. Further studies have to be carried out on the types of tasks given, the difficulty level of mathematical problems that need to be solved in the group, learning aids other than the ICT being used and other relevant aspects.

Index Terms: Collaboration, Malaysia, Mathematics Classroom, South Korea

I. INTRODUCTION

One of the ways to actively involve students in the mathematics classroom is to create cooperation and collaboration among students in performing tasks or solving mathematics problems. Collaborative learning approaches are associated with Vygotskian ideas such as cognition, scaffolding, and zone of proximal development [1].

Vygotski found that what was given to students and what was happening in social environments such as conversation, behaviour and daily activities helped students to learn and develop. In this social-constructivism theory, Vygostky says that social interaction is an important way for students to learn something new knowledge. In addition to social-constructivism theory, another theory that supports collaborative learning in mathematics is social interdependence theory. Social interdependence means when the given assignment or task for each individual can be solved with the result of cooperation between each individual [2]. This situation requires each individual in the group to identify and understand the importance of each member of the group and care for the members of the group and the group itself [3]. [4] stated four key features of collaboration in learning:

i. Knowledge shared between teacher and student. Knowledge is shared in many ways in the traditional classroom, where teachers are informants, but they also include inputs from students, where students share their experiences or knowledge.
ii. Shared authority between teacher and student. Here teachers share the goals of a topic with students. This allows students to carry out the given tasks in their way.
iii. Teachers as mediators. Teachers encourage students to learn how to learn, and
iv. Heterogeneous student groups. This characteristic teaches all students to respect and appreciate the contributions made by all members of the group.

II. THE ADVANTAGES OF COLLABORATIVE ACTIVITIES IN MATHEMATICS CLASSROOMS

[2] conducted a study demonstrating the advantages of collaborative activities rather than competitive and individualistic activities, where students are able to gain better results and productivity, create better student-to-student relationships, and improve socio-psychological competencies and better psychological health. [5] summarise the advantages of collaborative class activities into four major categories which are social, psychological, academic and evaluation aspects. In terms of social, collaborative learning can be a social support system for students, creating a diversity understanding between students and teachers, creating a positive atmosphere for

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students to work with each other, and collaborative activities to create community learning. From the psychological aspect, student-centred learning improves student confidence, reduces fear and creates a positive attitude towards their teachers. From the academic aspect, it enhances critical thinking skills, involves students actively in the learning process, becomes an appropriate model of problem-solving and is very useful in motivating students in a particular curriculum. Whereas in terms of assessment, collaborative classroom activities can be used as an alternative form of assessment. According to [6], collaboration activities have become increasingly important as a strategy to strengthen active learning methods and to encourage active student engagement. Therefore, cooperative learning is a method of teaching that is strongly encouraged by the Ministry of Education (MOE) to be applied in teaching and learning process as well as active participation in activities; students will enjoy, more fun, active and achieve academic success. According to [7], students provide assistance to each other, provide support, provide ideas and information in solving learning problems together. [8] also stated that, through cooperative learning, pupils would be able to enhance collaborative skills as students need to interact with each other to complete the assignment given.

III. TECHNOLOGY AS A TOOL TO PROMOTE COLLABORATION IN MATHEMATICS CLASSES

Various teaching aids can be used to promote collaboration in mathematics classes. Among them are dynamic geometry software and other educational technologies. Collaborative learning supported by computers helps students collectively build knowledge and share knowledge when using a technology-supported tool [9]. Researchers in mathematics education have used dynamic mathematical software with pedagogical orientation in mathematics classes, where it works to create a collaborative learning environment and to promote student exploration activities. Among them are [10] who used Computer Algebra Systems as a collaborative tool in mathematics classes and [11] that use dynamic geometry software as a potentially important and effective tool in collaborative mathematics learning. [12] showed that from teachers' perspective, learning collaboration using smartphones has a positive effect on students' motivation towards mathematics. There is also a positive and significant relationship between the use of learning using smartphones and the active involvement of students in mathematics classes. [13] make graphing calculators a collaborative tool for actively engaging students in mathematics classes. The [14] sets out the competencies required to effectively teach ICT and emphasises that it is not enough for teachers to have ICT skills and use them to teach their students. Teachers should be able to help students become collaborative learners, proficient in problem-solving, and creative through the use of ICT to become effective citizens and members of the workforce.

IV. THE IMPLEMENTATION OF LEARNING STRATEGY IN MATHEMATICS CLASSROOMS IN MALAYSIA AND SOUTH KOREA

South Korea is one of the top countries in mathematics achievement. Korea has maintained the highest ranking in PISA since 2000, and its scores have continued to improve from year to year. TIMSS results also prove that South Korean 8th-grade students show tremendous achievements in each cycle of TIMSS. This is not the case for Malaysian students. At TIMSS 2015, the average Malaysian students score is only 465 compared to the average score of South Korean students of 606. Table 1 shows the Malaysian students score gap with South Korea in both assessments. The international assessment results have different implications for both countries.

Table 1. TIMSS and PISA Results in Mathematics for Malaysia and South Korea

TIMSS	Malaysia	South Korea	PISA	Malaysia	South Korea
1995	-	607	2009	404	546
1999	519	587	2012	421	554
2003	508	589	2015	446	524
2007	474	597			
2011	440	613			
2015	465	606			

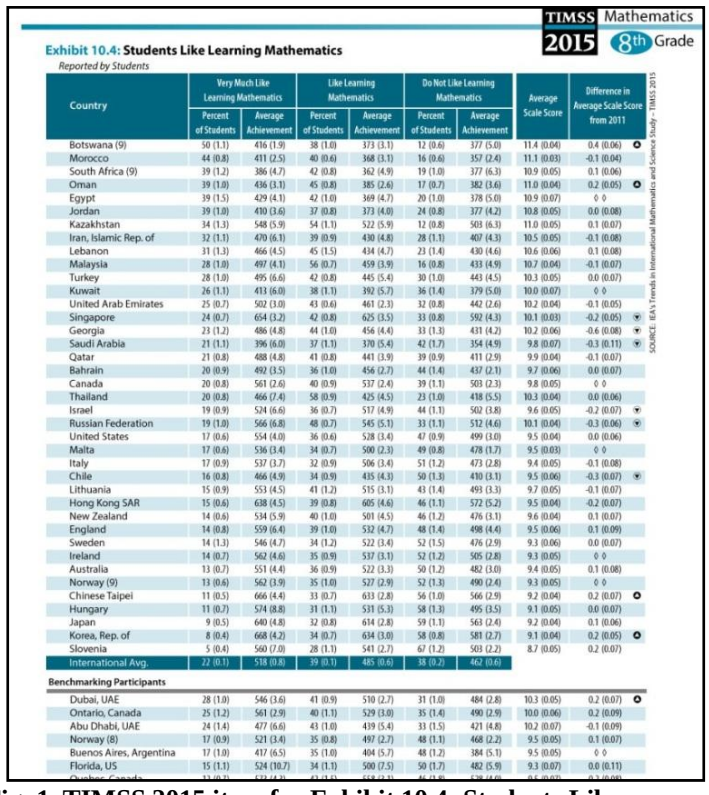

Fig. 1. TIMSS 2015 item for Exhibit 10.4: Students Like Learning Mathematics

Source: [15]

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Based on the Figure 1, although South Korean students showed impressive achievements in TIMSS, for items related to whether they like math, the score of South Korean students is ranked second from the bottom. These international assessments results suggest that South Korean students are less motivated despite their high academic performance. According to the [16], these international assessment results in the modification of curriculum framework in South Korea. In the 2007 Mathematics Curriculum Revision, the two additional objectives were mathematical communication and positive attitude. The new objectives added in 2011 Mathematics Curriculum Revision are mathematical creativity and character building. To achieve these objectives, the emphasis is given to contextual learning, manipulative activities, reasoning, reform of textbooks and classroom environment, and the professionalism of mathematics teachers.

Documents produced by the South Korea Ministry of Education recommended teachers to diversify teaching and learning methods in mathematics classes. While in Malaysia, one of the implications of the TIMSS and PISA assessment is the introduction of the Higher Order Thinking Skills (HOTS) concept. HOTS are explicitly stated in the curriculum so that teachers are able to translate into their teaching and learning of mathematics. The concept of HOTS is important to produce students who have the ability to apply knowledge, skills and values in reasoning to solve problems, make decisions, innovate and create something. Besides that, in the current Secondary School Standard Curriculum (KSSM), one of its aims is to produce students who possess 21st-century skills by focusing on thinking skills, living skills and career guided by the practice of good moral values. 21st-century skills aim to produce pupils who are resilient, competent communicator, thinker, teamwork, inquisitive and informed. Therefore, the study aims to see how mathematics teachers in Malaysia and South Korea promote collaboration among students in mathematics classes.

V. METHODOLOGY

This study adopts a survey to compare the collaborative learning practices implemented by lower secondary mathematics teachers in mathematics classes in Malaysia and South Korea. To obtain in-depth information on quantitative findings, we interviewed lower secondary school mathematics teachers from both countries. The participants for this study comprised 71 lower secondary school mathematics teachers from Malaysia and 51 lower secondary school mathematics teachers from South Korea. They were selected using simple random sampling. Of the total number of Malaysian respondents, 88.7% were female, and 11.3% were male, and of the total number of South Korean respondents, 76.5% were female, and 23.5% were male. All respondents have at least a bachelor degree. For Malaysia, 12.7% aged less than 30, 53.5% aged between 30-39, 26.8% aged between 40-50 and 7.0% aged more than 50 years. In the meanwhile, 11.8% aged less than 30, 43.1% aged between 30-39, 39.2% aged between 40-50 and 5.9 aged more than 50. In terms of years of experience in teaching mathematics, 29.6%, 29.6%, 25.4%, 7.0% and 8.5% Malaysian respondents have been mathematics teachers respectively for less than 5 years, 5-10 years, 11-15 years, 16-20 years and more than 20 years, while for South Korean respondents, 23.5%, 25.5%, 15.7%, 23.5% and 11.8% have been mathematics teachers respectively for less than 5 years, 5-10 years, 11-15 years, 16-20 years and more than 20 years. For interviews, three lower secondary school mathematics teachers from Malaysia and South Korea each were involved in this study. All of them are female teachers. For Malaysia, the first and third interviewees have 14 years of experience in teaching mathematics, and one of them has 5 years experience. For South Korea, the first, second and third interviewees have 12 years, 6 years and 8 years of experience as mathematics teachers respectively. A questionnaire was developed based on the 21st-century pedagogy framework by [17]. There were 12 items in the questionnaire and items were scored on a scale of (1) = Never, (2) = Seldom, (3) = Sometimes, (4) = Often, and (5) = Always. The questionnaire developed and used in this study was divided into two main sections Section A contains seven items relating to the respondents' demographic information, while Section B consists of 12 items. The reliability of the questionnaire using Cronbach's alpha was 94%.Items from the questionnaire were analysed using descriptive statistics, which refers to frequency and percentage values.

VI. FINDINGS AND DISCUSSIONS

The relevant quantitative data and excerpts in each construct will now be discussed. Based on Table 2, for the context of lower secondary school mathematics education in Malaysia, most Malaysian respondents do not use dynamic geometry software such as Geogebra or other media in promoting collaboration among students in mathematics classes. 97.2%, 90.1% and 81.8% of the respondents from Malaysia answered either "never" or "sometimes" for items 1, 2 and 3, respectively. This finding shows that the Ministry of Education's aim for the Standard Document Curriculum and Assessment (DSKP) [18] has not yet been materialised; effective teachers will maximise the use of technology in order to enhance students' interests and proficiency in mathematics. Teachers are encouraged to use computer software such as Geometer's Sketchpad (GSP), Geogebra, internet and so on. Many past studies have shown that Malaysian teachers recognise the benefits of using technology in the classroom [19][20]. Furthermore, [21] claim that the level of teachers' knowledge and skills in ICT is encouraging. However, there are constraints that limit the use of such ICT skills in the classroom, especially in mathematics classes. Among the constraints are limited access and network, limited technical support, lack of effective training, limited time, and lack of teacher competence [22]. In addition, [23] highlight three reasons why Malaysian teachers do not use technology in mathematics classes: (i) time constraint; (ii) lack of facilities and resources; and (iii) lack of programmes and trainings. In the interview session, a mathematics teacher acknowledged such constraints, as shown in the following excerpt:

"In my school, honestly, the application of technology in mathematics classes is limited. This is because the teachers are restricted to the syllabus. So, most of them focus on mastering basic concepts. Usually, teachers use technology in the initial stage such as displaying pictures, videos, and things like that. Students use technology to explore, create, or answer questions. The direct use of technology in the classroom is limited because technology takes time. So, teachers choose to teach in class rather than using technology". [TM1: A]

The significant finding for the first construct of mathematics teachers in Malaysia is that they encourage group discussion and oral presentation in the classroom. 97.1%, 76.1%, 90.1%, 78.9% and 95.7% of the Malaysian respondents answered either "often" or "always" for items 5, 6, 7, 8 and 9, respectively. This finding is consistent with the qualitative findings of a teacher, as shown in the following excerpt:

"For mathematics, we usually collaborate while students answer questions and solve problems. We arrange the class according to groups. Students will be assigned to a group. Usually, for each group, we provide questions. They will discuss. The collaboration requires them to share with another group. There are a few models that we practise. The most frequent is Learning Walks or presentation. The students will explain to their own friends and the teacher will back up if the students explain less or more". [TM1: A]

Research on cooperative learning at schools has been conducted by researchers in Malaysia since the 1990s [24]. Since then, many studies related to mathematical learning in cooperative environments have been conducted at primary and secondary levels; the findings have shown that learning methods can significantly improve students' achievements. Cooperative and collaborative learning studies have been recognised in Malaysia's mathematical research. Cooperative learning is carried out by taking into account students' abilities, learning styles, and sociological backgrounds that influence students' academic achievements and skills [25]. Most Malaysian respondents chose either "often" or "always" for items 9 and 10, i.e., "I ensure all students to be active in my mathematics class" and "I ensure that every group should consist of students with different levels of mathematics abilities". This finding is parallel to the explanation by one of the Malaysian mathematics teachers, as shown in the following excerpt:

"I create collaboration among my students in mathematics class by asking them to complete their assignments in groups. I prefer to assign jobs in groups in order to create collaboration among them. Looking at the current situation, the students in this school are all mixed. There are moderate-level, low-level, and high-level students. So, by doing assignments in groups, we will see collaboration among them". [TM2: A]

These quantitative and qualitative findings are in line with the goal of the Ministry of Education Malaysia [18] that aims at encouraging teachers to use diverse teaching and learning strategies such as cooperative learning, mastering learning, contextual learning, constructivism and so on. Responding to item 10 that asked if teachers would ensure that every group should consist of students with different mathematical abilities, 76% of the respondents answered either "often" or "always". Teachers also need to diversify learning and teaching strategies in order to meet the needs of students who have diverse abilities, tendencies and interests. In this regard, teachers should be careful in providing ecosystem learning and intellectual discussions that require students to collaborate in completing meaningful and challenging tasks [18].

As observed in Table 2, the South Korean lower secondary mathematics teachers were found to have cooperative learning and discussion in mathematics classes. 70.6%, 90.2%, 74.5%, 90.2%, 74.5%, 72.6% and 62.7% of the respondents answered either "often" or "always" for Items 5, 7, 8, 9, 10, 11 and 12, respectively. These quantitative findings are in line with the interview data. Two South Korean mathematics teachers are quoted, as follows:

"I present tasks that need cooperation. Cooperation among students is unnecessary for simple calculation questions or simple quizzes. When a task requires students to explain and infer reasons rather than requiring an accurate answer, they feel the need for cooperation. Students often cooperate with each other because they are curious about each other's thoughts. In order to do this, students' ideas should be actively shown in the classroom, and teachers should lead the class discourse by connecting the ideas together. In other words, cooperation focuses on the role of teachers who lead the discourse and develop an appropriate task that creates a discourse-friendly class atmosphere". [TK1: A]

"I present to students a slightly difficult task (an idea that is not so easy to think about, but a thought-provoking task) and allow students to think for themselves. As students solve the assignment, teachers observe the students' interaction and set the order of presentation. A group of presentations will be checked on that day and reflected in the presentation score later". [TK3: A]

The South Korean Ministry of Education has suggested the use of collaborative activities in mathematics classes. A document issued by the Ministry of Education of South Korea and the Korean Foundation for the Advancement of Science & Creativity (KOFAC) in Section 4 of the Guidelines for Teaching and Learning, and Assessment, for Methods of teaching and learning, states that cooperative learning helps students to achieve common learning goals through interaction, communication, and participation in small groups. This method encourages students to respect and consider the views of others, to understand their role in a group, and to create a sense of responsibility. There are several studies conducted in South Korea on the effectiveness of cooperative learning. [26]found that cooperative learning using the STAD (Student teams-

achievement divisions) model promotes interaction among students. [27] examined the impact of group work on students' learning by comparing two cooperative learning techniques, i.e., Heading Numbered Together (NHT) and Think-Pair-Share (TPS). The results showed that the TPS group contained more balanced involvement among group members than the NHT group.

[28] states that cooperative learning is used effectively in all classes in South Korea. According to [28], through cooperative learning, students can study in groups of four in which a classroom can be equipped with small tables and chairs can be rearranged to facilitate group learning. In this environment, students will be actively involved throughout the learning period. Teachers are encouraged to incorporate activity-based learning before introducing new topics. For example, before introducing isosceles triangles, teachers can ask students to explore the triangular equation. [29] claim that the majority of South Korean teachers have a high level of understanding on the main concepts of cooperative learning regardless of their level of teaching experiences. But, there are also teachers who are not quite ready to use the cooperative learning strategies. [30], however, shows a contradictory trend; cooperative learning methods could not be adapted by South Korean students. One of the reasons is that the South Korean students are traditionally taught not to doubt the teachings of their ancestors or past generations. On the other hand, western students have been trained at an earlier age to actively engage in cooperative learning. Small-group activities are still new to students in South Korea as they have never received this type of training.

Allthough previous studies [31]; [28]; [32] have shown that schools in South Korea are equipped with advanced technology tools, in reality, most mathematics teachers have not used them for the purpose of promoting collaboration among students in mathematics classes. This can be seen in Table 2 for Items 1, 2, 3 and 4 in which 96.2%, 80.4%, 80.4% and 94.1% of the respondents answered "never", "seldom" or "sometimes". [33] have identified several factors that influence the decision among South Korean teachers in using technology in the classroom. However, the factors identified are not in line with the teaching and learning theory. Among the factors include meeting external expectations and seeking for attention. [34] argue that students' experiences in using technology in mathematics are greatly influenced by their teachers' experiences with technology. One of the South Korean mathematics teachers interviewed said the following when asked about the use of technology in mathematics classes:

"It seems difficult to set up this kind of environment in Korean schools. It is certainly necessary to draw dynamic situations using technology such as GeoGebra. However, if technology gives students easy answers, they do not feel the need for justification by themselves anymore. So, I do not make full use of the technology". [TK1: A]

According to [35], South Korean secondary school students face difficult college entrance examinations. Moreover, it is difficult for teachers to incorporate technology into secondary school subjects in which students need to solve many problems in writing to get a high score. As shown in Table 2 for Item 6, the percentage of the South Korean teachers who provide mathematical activities in mathematics classes is lower than that of the Malaysian teachers for the same item. According to [36], in South Korea, mathematical activities and questions are treated as supplementary to textbooks.

	Item	Malaysia										South Korea									
		Never		Seldom		Sometimes		Often		Always		Never		Seldom		Sometimes		Often		Always	
		n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
1	I use dynamic software (such as Geogebra, Geometer's Sketchpad) in my mathematics class to encourage collaboration among students.	38	53.5	22	31.0	9	12.7	1	1.4	1	1.4	14	27.5	19	37.3	16	31.4	0	0	2	3.9
2	I optimize internet usage in mathematics class to encourage collaboration among students.	10	14.1	26	36.6	28	39.4	4	5.6	2	2.8	12	23.5	10	19.6	19	37.3	7	13.7	3	5.9
3	My students deliver their ideas using a medium other than writing in my mathematics class.	7	9.9	18	25.4	33	46.5	9	12.7	4	5.6	9	17.6	19	37.3	13	25.5	6	11.8	4	7.8
4	I lead the students to discuss a mathematical concept in online forums.	18	25.4	17	23.9	19	26.8	13	18.3	4	5.6	26	51.0	15	29.4	7	13.7	3	5.9	0	0
5	I encourage students to discuss among themselves in my mathematics class.	0	0	0	0	2	2.8	29	40.8	40	56.3	1	2.0	3	5.9	11	21.6	20	39.2	16	31.4

6	I prepare mathematics activities that are conducted in groups.	0	0	0	0	17	23.9	31	43.7	23	32.4	1	2.0	7	13.7	15	29.4	18	35.3	10	19.6
7	I give students the opportunity to voice out their own ideas in my mathematics class.	0	0	0	0	7	9.9	25	35.2	39	54.9	1	2.0	1	2.0	3	5.9	18	35.3	28	54.9
8	I ask students to present the results of their mathematics assignments in front of their friends.	0	0	2	2.8	12	16.9	34	47.9	22	31.0	0	0	4	7.8	9	17.6	18	35.3	20	39.2
9	I ensure all students to be active in my mathematics class.	0	0	0	0	2	2.8	28	39.4	40	56.3	0	0	0	0	5	9.8	22	43.1	24	47.1
10	I ensure that every group should consist of students with different levels of mathematics abilities.	0	0	1	1.4	15	21.1	25	35.2	29	40.8	4	7.8	2	3.9	7	13.7	17	33.3	21	41.2
11	I ensure that every group should consist of students from a different gender group.	0	0	8	11.3	12	16.9	22	31.0	28	39.4	4	7.8	2	3.9	8	15.7	14	27.5	23	45.1
12	I give mathematical problems that require cooperation among students.	0	0	1	1.4	8	11.3	38	53.5	23	32.4	0	0	7	13.7	12	23.5	20	39.2	12	23.5

Table 2. Construct A: Encouraging collaboration through the use of appropriate technology, effective communication, team skill and field-crossing

VII. CONCLUSION

In conclusion, mathematics teachers in both countries do not use dynamic geometry software and the internet to promote collaboration between students. In Malaysia, teachers noted that in addition to the lack of ICT equipment in the classroom, they need to cover the syllabus as quickly as possible to prepare students for the final year examinations or public examinations. The preparation and utilisation of ICT takes time. Moreover, they are not provided for training or courses for the use of certain ICT software and equipment. The South Korean-oriented education system causes mathematics teachers to use less dynamic geometry software or other ICT equipment in mathematics classes. This is because of the year-end examination or the public examination only takes into account the answers written in writing and because of that, the use of computers is less relevant. However, lower secondary mathematics teachers in both countries carry out group activities or cooperative learning in mathematics classes to promote collaboration among students. Students discuss with each other in groups and teachers ensure that every student is actively involved in the group. South Korean mathematics teachers are prepared to provide questions or assignments as they are supplementary to mathematics textbooks. From these findings, it can be concluded that there are similarities in mathematics practice in promoting collaboration among students. In this regard, further studies have to be carried out to explain why South Korean students' mathematics achievement is better than the achievement of Malaysian students. In the context of this study, some aspects that can be studied include the type of assignment given, the level of difficulty in mathematics problems that need to be solved in the group, and the type of assessment performed by the teacher, among others.

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REFERENCES

1. Forman, E. A. & Cazden, C. B. (1985). Exploring Vygotskian perspectives in education: The cognitive value of peer interaction. In J. Wertsch (Ed.), *Culture, communication, and cognition: Vygotskian perspectives*. Cambridge: Cambridge University Press.
2. Johnson, D.W. & Johnson, R.T. (2009). An Educational Psychology Success Story: Social Interdependence Theory and Cooperative Learning. *Journal of Educational researcher*, 38(5),365-379.
3. Slavin, R. E. (2011). Instruction Based on Cooperative Learning. In R. E. Mayer & P. A. Alexander (Eds.), *Handbook of Research on Learning and Instruction* (pp. 344-360). New York: Taylor & Francis.
4. Tinzmann, M. B., Jones, B. F., Fennimore, T. F., Bakker, J., Fine, C., & Pierce, J. (1990). What is the collaborative classroom? Retrieved on July 24, 2003 from the North Central Regional Educational Laboratory
5. Laal, M. & Ghodsi, S.M. (2012). Benefits of collaborative learning. *Procedia - Social and Behavioral Sciences 31*, (2012), 486 – 490.
6. Esa, A. & Mahbib, U.K. (2014). Pembelajaran Koperatif Di Malaysia: Pembangunan Profesional Dalam Meningkatkan Pendidikan Sekolah Rendah. *Prosiding Persidangan Antarabangsa Kelestarian Insan 2014 (INSAN2014)* Batu Pahat, Johor, 9 – 10 April 2014
7. Gillies, R.M. (2003). The Behaviors, Interactions, AndPerceptions Of Junior High School Students DuringSmall-Group Learning. Journal of Educational Psychology, 95(1), 134-147.

8. Dyson, B. (2002). The Implementation Of Cooperative Learning In An Elementary Physical Education Program. Journal Of Teaching In Physical Education, 22(1), 69-68.
9. Stahl, G. (2006). *Group cognition: Computer support for building collaborative knowledge*. Cambridge: MIT Press.
10. Artigue, M. (2002). Learning mathematics in a CAS environment: The genesis of a reflection about instrumentation and the dialectics between technical and conceptual work. *International Journal of Computers for Mathematical Learning*, 7(3), 254 – 274.
11. Laborde, C. (2001). Integration of technology in the design of geometry tasks with Cabri-Geometry. *International Journal of Computers for Mathematical Learning*, 6, 283 — 317.
12. Taleb, Z., Ahmadi, A. & Musavi, M. (2015). The effect of m-learning on mathematics learning. *Procedia - Social and Behavioral Sciences 171*, (2015), 83 – 89.
13. Hegedus, S. J., & Moreno-Armella, L. (2009). Intersecting representation and communicationinfrastructures. *ZDM-The International Journal on Mathematics Education*, 41(4), 399–412.
14. UNESCO ICT Competency Framework for Teachers. (2011). Paris: United Nations Educational, Scientific and Cultural Organization.
15. Mullis, I.V.S., Martin, M.O., Foy, P., & Hooper, M. (2017). TIMSS 2015 International Results in Mathematics. Boston: TIMSS & PIRLS International Study Center, Lynch School of Education, Boston College
16. National Academies of Sciences, Engineering, and Medicine. (2015). *Mathematics Curriculum, Teacher Professionalism, and Supporting Policies in Korea and the United States: Summary of a Workshop*. Washington, DC: The National Academies Press. doi.org/10.17226/21753.
17. Beetham, H.& Sharpe, R. (2013). *Rethinking pedagogy for a digital age: Designing for 21st century learning*. New York: Routledge.
18. Bahagian Pembangunan Kurikulum (BPK). (2017). *Dokumen Standard Kurikulum dan Pentaksiran Matematik*. Putrajaya:Kementerian Pendidikan Malaysia.
19. Nikian, S., Nor, F.M. & Aziz, M.A. (2013). Malaysian Teachers' Perception of Applying Technology in the Classroom. *Procedia - Social and Behavioral Sciences*, 103 (2013), 621 – 627.
20. Kaur, T., Singh, R. & Chan, S. (2014). Teacher readiness on ICT integration in teaching-learning: a Malaysian case study. *International Journal of Asian Social Science*, 2014, 4(7), 874-885.
21. Kamaruddin, K., Abdullah, C.A.C., Idris, M.N.& Nawi, M.N.M. (2017). Teachers' level of ICT integration in teaching and learning: A survey in Malaysian private preschool. AIP Conference Proceedings 1891, 020075 (2017); https://doi.org/10.1063/1.5005408.
22. Ghavifekr, S., Kunjappan, T., Ramasamy, L. & Anthony, A. (2016). Teaching and learning with ICT tools: issues and challenges from teachers' perceptions. *Malaysian Online Journal of Educational Technology*, 4(2), 38-57.
23. Abdullah, A.H., Mokhtar, M., Kiong, J.C.C., Ali, M., Ibrahim, N. H., & Surif, J. (2016). Factors preventing Malaysian teachers from using Information and Communication Technology (ICT) in teaching mathematics. In Information and Communication Technology (ICoICT), 2016 4th International Conference on (pp. 1- 6). IEEE.
24. Seameo Recsam. (1997). Cooperative learning and constructivism in science and Mathematics Education. International Conference Proceeding, RECSAM, Malaysia.
25. Hossain, M.A., Tarmizi, R.A. & Ayub, A.F.M. (2012). Collaborative and Cooperative Learning in Malaysian Mathematics Education. *IndoMS. J.M.E*, 3(2),103-114.
26. Kim, D. (2018). A study on the influence of Korean Middle School students' relationship through Science class applying STAD cooperative learning. *Journal of Technology and Science Education*, 8(4), 291-309.
27. Lange, C., Costley, J. &Han, S.L. (2016). Informal cooperative learning in small groups: The effect of scaffolding on participation. *Issues in Educational Research*, 26(2), 260-279.
28. Sami, F. (2013). South Korea: A success story in mathematics education. *Math Amatyc Educator*, 4(2): 22-28.
29. Hahn, J-W & Jeon, I-J. (2005). Korean EFL teachers' beliefs of cooperative learning: With a focus on classroom practice. *English Teaching*, 60(4), 87-108.
30. Paik, S. (2004). Mathematics Curriculum in Korea. In H. Lew (Chair), The Report on mathematics education in Korea. The national presentation at the meeting of the 10th International Conference of Mathematics Education, Copenhagen, Denmark.
31. Bermeo, E. (2014). South Korea's successful education system: lessons and policy implications for Peru. *Korean Soc Sci J (2014)*, 41, 135–151.
32. Son, H.C. (2015). Use of Technology in Secondary Mathematics Education in Korea. In J. Kim, I. Han, M. Park & J. Lee (Eds.). *Mathematics Education in Korea Volume 2: Contemporary Trends in Researches in Korea* (pp. 121-131). Danvers:World Scientific Publishing Co. Pte. Ltd.
33. Baek, Y., Jung, J. &Kim, B. (2008). What makes teachers use technology in the classroom? Exploring the factors affecting facilitation of technology with a Korean sample. *Computers & Education*, 50 (2008), 224–234.
34. Dunham, P., & Hennessy, S. (2008). Equity and use of educational technology in mathematics. In M. K. Heid & G. Blume (Eds.), *Research on technologyand the teaching and learning of mathematics: Volume 1. Research syntheses* (pp.345-418), Charlotte, NC: Information Age.
35. Park, K., Jung, Y., Kim, W., Kim, D., Choi, S. & Choi, J. (2010). Park, K., Jung, Y., Kim, W., Kim, D., Choi, S. & Choi, J. (2010). *A research on the developmental plan for mathematics education in elementary and secondary school*. Seoul: Ministry of Education, Science and Technology & Korea Foundation for the Sciences and Creativity
36. Han, I. & Kim, Y. (2013). Assessment in Korean Mathematics Classroom. In Mogens, N., Lee, P.N., & Jeremy, K. (Eds.), *Mathematics Education In Korea: Curricular and Teaching and Learning Practices* (pp. 253-288). Singapore: World Scientific.

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