Meta-Analysis Study: Implementation of Rapport Element in Mathematics Education

Kajian Meta Analisis: Penerapan Elemen Membina Hubungan dalam Pendidikan Matematik

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Abstract

Rapport is one of the elements that can be implemented among the students which aims to help them in enhancing their motivation and achievement during their conducted lessons in mathematics. Furthermore, it is needed to analyse critically and synthesize the trend of research and the method used in researching before implementing the rapport element in mathematics subjects in Malaysia. This research has analysed upon four articles related to implementation of rapport element which have been randomly picked from other researchers in Malaysia within a timeframe of 2016 to 2021. The results found that most of the previous researchers tend to choose the quantitative research method which adapted surveys design on collecting data over their research. The samples involved secondary school and high-level education students. Based on the 4 articles that were selected, it was found that there was a study on the effectiveness of the rapport elements in the process of teaching and learning as well as studies related to the significant relationship between the rapport element and other variables such as attitude, parents' involvement and peers' supports and also mathematics performance amounting to three researches. Overall, the research conducted by Malaysian researchers proved that the rapport element is suitable to be implemented among the students that help to result in better achievement besides providing motivational support for them. The rapport element will also help the students to have a better experience of learning mathematics in class.

Keywords: rapport element, mathematics education, teaching and learning

Abstrak

Elemen membina hubungan ini boleh diterapkan kepada pelajar yang mampu menyumbang kepada peningkatan motivasi dan pencapaian pelajar dalam pelaksanaan proses pembelajaran matematik. Justeru itu, objektif kajian ini adalah untuk meninjau atau menganalisis secara kritikal dan mensintesis trend penyelidikan dan kaedah yang digunakan dalam kajian sebelum ini berkaitan penerapan elemen membina hubungan dalam kursus matematik di Malaysia. Kajian ini telah menganalisis 4 artikel yang berkaitan penerapan elemen membina hubungan yang dipilih secara rawak yang dilaksanakan oleh pengkaji di Malaysia dari tahun 2016-2021. Hasil penemuan ini telah menunjukkan bahawa penyelidik lepas lebih cenderung memilih pendekatan penyelidikan kuantitatif yang menggunakan reka bentuk tinjauan dalam kajian yang dijalankan. Sampel yang digunakan pula melibatkan pelajar di sekolah menengah dan di institusi pengajian tinggi. Berdasarkan 4 artikel yang telah dipilih, didapati bahawa terdapat satu kajian yang berkaitan dengan keberkesanan penerapan elemen membina hubungan dalam proses

pengajaran dan juga kajian berkaitan hubungan yang signifikan di antara penerapan elemen membina hubungan dengan pemboleh ubah lain seperti sikap, penglibatan ibu bapa dan sokongan rakan sebaya serta pencapaian matematik sebanyak 3 kajian. Secara keseluruhannya kajian yang telah dilaksanakan oleh penyelidik di Malaysia ini membuktikan bahawa elemen membina hubungan ini sesuai untuk diterapkan dalam kalangan pelajar yang dapat membantu ke arah pencapaian yang lebih baik selain dapat menyediakan sokongan motivasi kepada mereka. Elemen membina hubungan juga turut membantu pelajar untuk memperoleh pengalaman pembelajaran matematik yang lebih bermakna di dalam bilik darjah.

Kata kunci: elemen membina hubungan, pendidikan matematik, pengajaran dan pembelajaran

INTRODUCTION

In today's world, education has become one of the main pillars in realizing the aspiration towards the country's development. Changes and reformation in Malaysian educational system has been aligned with the current globalization (UNESCO, 2015). Malaysian educational system through the Pelan Pembangunan Pendidikan Malaysia (PPPM) have revolved gradually through three waves that started since 2013 until 2015 for the first wave, 2016 until 2020 for the second wave, and as for the last wave takes place in between of 2021 until 2025 which has been planned aligned with the globalization (KPM, 2016). The changing process in the world's economy that is based on the knowledge and digital revolution has driven structural changes in today's educational system to eradicate the incompetence of the students in meeting the globalization needs in the 21st century.

The teachers need to have the pedagogical teaching knowledge specifically in the process of planning the teaching of STEM in the classroom in order to implement the rapport element (Chantell, 2015). However, through the research done by Muhammad Abd Hadi (2015), it was found out that the pedagogical knowledge about 21st century and the process of teaching and learning of STEM are not widely known by the teachers which caused them to have no knowledge regarding to the changes of the pedagogy. This happens due to the conventional approach which focuses on the knowledge and teaching skills that gives less attention towards the pedagogy practise about 21st century. Furthermore, the pedagogy knowledge related to the process of teaching and learning of STEM by implementing the rapport element is needed to complement the teachers' competency. This can enhance students' motivation and performances in the process of teaching and learning (Bond et al., 2020).

The research findings by Abdul Rasid dan Nurfatin Nabihah (2018) showed that the teachers were so focused on completing the course syllabus such that they overlooked the differences of students' capabilities during the teaching and learning process. Lacking in the implementation of rapport element during the conducted process of teaching and learning need to be taken into account. Most of the students learn mathematics with lack motivational support which resulted from not implementing the rapport element beforehand the conducted teaching process (Ahmad Fauzi, Aida Suraya, Rosnaini, Nur Raidah and Tajularipin, 2017).

Aligned with the changes, rapport element in affective, cognitive as well as behaviour has become one of the main elements that are needed to be implemented among the students for them to experience better learning of mathematics subject in today's world (Subramainan & Mahmoud, 2020). Researchers have been reporting for almost two decades about the importance of rapport among students that has become one of the most crucial factors in enhancing their academic achievement specifically on the mathematics subject which may also influence their emotional development (Fredricks, Filsecker, & Lawson, 2016). This proves that rapport is an important matter to be implemented among the students during their conducted lessons which may also help to resolve the motivation or achievement-related problems of one's students. Institutions or schools are commonly known for having the capacity to flourish or instilling skills and knowledge among the students (Watt, Caemichael,

& Callingham, 2017). Thus, it has resulted in the betterment of our educational system by incorporating the cognitive as well as other areas involving the affective and the behaviours of the students in reinforcing their skills to meet the needs of the 21st century.

There are three main domains of the rapport element that may be implemented during the conducted lessons which incorporate the aspects of cognitive, affective, and behaviour (Eccles, 2016). The cognitive element which is one of the elements in rapport indicate the mental capacity; to memorize, and perform their related tasks diligently as well as the learning and communication strategy during the conducted lessons for mathematics in the classroom (Fredrick et al., 2016). On the other hand, an effective rapport refers to the insights and thoughts of the students upon the learning process as well as their behaviours and responses during their mathematics lesson in the classroom (Lee, Lee & Bong, 2014). According to Fung, Cheng dan Gaowei (2018), a behaviour rapport refers to the positive or negative acts of the students which incorporate attention, effort, perseverance, and contribution during their discussion in class. Not to be forgotten, the student's determination in finishing their assigned tasks during the conducted lessons is also one of the matters to be considered.

The research that encompasses the rapport's elements during the conducted lessons of mathematics has brought the attention of many researchers around the world (Subramainan & Mahmoud, 2020). However, there are still some flaws in the related research that has been conducted before. Therefore, there is a need to critically analyse and synthesize the education's trends as well as the method used in executing the rapport element in the context of mathematics in Malaysia.

The main purpose of the conducted research is to investigate the trend on the research related to the implementation of rapport elements for mathematics subjects through reviewing the collected empirical research. Therefore, the research is conducted to respond to the questions as below:

1. What is the research method adopted in investigating the research about rapport elements for mathematics education in Malaysia?
2. What is the main data collected in incorporating the rapport elements for mathematics subjects in Malaysia?

METHODOLOGY

The research used a meta-analysis design to implement the rapport elements for mathematics subjects in Malaysia, which has been critically analysed. In short, according to Cohen, Manion dan Morrison (2018), a meta-analysis is an analysis that incorporates the reviewing in detail of an issue that has been chosen and analysed. It involved the aggregation of the compatible research outcomes that would lead to a focal end result. The suggested method by Webster and Watson (2002) which adapted the process of collecting and selecting the related article to be analysed. A few databases which have been subscribed by the university's library such as EBSCOHost, Science Direct, Proquest, and Sage were being used to search for the related articles. Other than that, the search engine like Google Scholar and Google Search was also being used to assure a diverse search was able to be made. The implementation of rapport elements-related articles within the timeframe of 2016 until 2021 was being downloaded to be analysed. The keywords that have been used to search for the articles are, *"membina hubungan", "membina hubungan dalam matematik",* "rapport", "engagement", "student engagement" and "student engagement in mathematic". Among the criteria that have been set out beforehand in order to pick the analysed articles, were research on the implementation of rapport elements for mathematics subjects in Malaysia. Last but not least, four articles have

been identified after they have fulfilled the criteria as set as in Table 1, which refers to the article on the implementation of the rapport elements for mathematics subjects in Malaysia. The articles have been systematically analysed in order to respond to a set of research questions.

Table 1: The list of the articles related to the implementation of the rapport's elements in mathematics education in Malaysia.

The Researchers (Year)	Sampling Types	Sampling Size	Journals/ proceedings
Ahmad Fauzi, Aida Suraya, Rosnaini, Nur Raidah & Tajularipin (2017)	School's students	387 people	AIP Conference Proceedings 1795
Nur Raidah & Ahmad Fauzi (2017)	Higher Education's students	293 people	AIP Conference Proceedings 1795
Norakusuma, Ahmad Fauzi & Rohani (2016)	School's students	313 people	Malaysian Journal of Mathematical Sciences
Nora'asikin, Ahmad Fauzi, Nor Aniza, & Sharifah Intan Sharina (2021)	Higher Education's students	284 people	International Journal of Academic Research in Business & Social Sciences

RESULTS AND DISCUSSIONS

The results are divided into two main elements. The first element discussed the research method that was adopted in conducting the research related to the implementation of the rapport elements for mathematics subjects in Malaysia. This element focused on the methods and designs of the research, the research sampling profile, and the instruments used in collecting data. As for the second method, it discussed the main outcomes from the related research done on the implementation of the rapport elements for mathematics subjects in Malaysia.

RQ 1: What is the research method adopted in investigating the research about rapport elements for mathematics subjects in Malaysia?

Method and design of the research. Some related articles on the implementation of the rapport elements for the mathematics subjects in Malaysia has been analysed, and showed that most of the researchers adopted one familiar method, which is the quantitative method. On the other hand, in the context of research design, it was found out that it consisted of research on correlation and survey. Table 2 showed the method and design of the research that has been adopted by the previous researchers which are related to the implementation of rapport elements for mathematics subjects in Malaysia.

Table 2: Method and design of the research that has been adopted

Method	Designs	*f*	Research (Years)
Quantitative	Correlation	3	Nur Raidah & Ahmad Fauzi (2017); Norakusuma et al. (2016); Nora'asikin et al. (2021
	Survey	1	Ahmad Fauzi et al. (2017)

Based on the analysis that has been done, it was found that all these researches adopted a quantitative method. Most of the previous researchers adopted correlation on the research designs for the implementation of rapport element in mathematics subject in Malaysia. The results are aligned with the research made by Krauss, Kornbluh dan Zeldin (2017) which showed that most of the west researchers also adopted correlation on the research designs for the research related to the implementation of the rapport elements.

Research sampling profile. Based on the analysis done on the implementation of the rapport elements for mathematics subject in Malaysia of the previous research in the context of sampling profile has showed that there are two sampling categories, which are the secondary and the high-level education students. The secondary school students comprised those from the boarding school as well as from the day school. While the samples are collected from the high-level education consist of the students from the private and the public institutions. Table 3 showed the previous research sampling profile that related to the implementation of the rapport element in Malaysia.

Table 3: Research sampling profile that has been used

Sampling Profile	Types	f	Research (Years)
Secondary School Students	Day School	1	Ahmad Fauzi et al. (2017)
	Boarding School	1	Norakusuma et al. (2016)
High-Level Education Students	Public	1	Nur Raidah & Ahmad Fauzi (2017)
	Private	1	Nora'asikin et al. (2021)

Based on the analysis that has been made, the frequency of the previous research adopted research sampling among the secondary and high-level education students is the same. However, the results are not coordinated with the research done by Subramainan and Mahmoud (2020) and Bond, Buntins, Bedenlier, Zawacki-Richter dan Kerres (2020), who found out that the research related to the implementation of the rapport element are more focused on the high-level education students. This condition has conveyed a wide discrepancy in the conducted research related to the implementation of the rapport element in mathematics subject in Malaysia regarding the primary school students.

Method for collecting data. Other than the designs and the research sampling profile, the previous research method has been analyzed as well as regards the collection of data methods. The results from the conducted analysis had found out that only one method has been adopted for the data collection which is through a questionnaire. Table 4 showed the results of the collection of data methods that have been adopted.

Table 4: Collection of data method that has been used

Method	*f*	Research (Years)
Questionnaire	4	Ahmad Fauzi et al. (2017); Nur Raidah & Ahmad Fauzi (2017); Norakusuma et al. (2016); Nora'asikin et al. (2021)

Based on the conducted analysis, it is found that the previous research related to the implementation of the rapport elements in mathematics subjects in Malaysia have adopted only one method for the data collection process. The questionnaire method was commonly used by the previous researchers as a medium to collect the data from the respondents. Besides that, it is showed that most of the previous research done on the implementation of the rapport elements for mathematics in Malaysia adopted the correlational research designs. Furthermore, questionnaire is a suitable method for collecting data for the respective research designs. The research done by Bond et al. (2020) had also found out that the data collection method on the quantitative approach has been commonly used for the research on the implementation of rapport elements.

RQ 2: What is the main data collected in incorporating the rapport elements for mathematics subjects in Malaysia?

The main results of the research related to the implementation of rapport elements for mathematics subjects in Malaysia are based on the research objective are shown in Table 5.

Table 5: The results on the implementation of the rapport elements for mathematics subjects in Malaysia

Researchers (Years)	Objectives	Results
Ahmad Fauzi et al. (2017)	To evaluate the effectiveness of the implementation of the rapport elements for mathematics that involves the affective domain, behaviours and cognitive among the secondary school students consisting of those in rural and urban areas.	The mean score for the secondary school students in the urban area is higher in the implementation of the rapport elements for mathematics than those in the rural area as regards of the three main aspects, which are cognitive, behaviour and affective.
Nur Raidah & Ahmad Fauzi (2017)	To evaluate the rapport elements between the mathematics statistics and the conduct of the mathematics statistics.	There was a positive relationship between the rapport elements in mathematics statistics (aspects of affective, behaviour and cognitive) along with conduct of mathematical and statistical analysis.
Norakusuma et al. (2016)	To identify the relationship between the parents' involvement and the peers' support on the rapport elements for mathematics among the boarding school students in Malaysia.	The results showed that there was a positive relationship between the parents' involvement and the peers' support with the rapport elements in mathematics regarding the boarding school students in Malaysia.

Nora'asikin et al. (2021)	To identify the relationship between the parents' involvement and the peers' support on the rapport elements in mathematics among the high-level education students.	The mathematics achievement has a positive relationship with the rapport elements for both cognitive and affective aspects. On the other hand, the parents' involvement and the peers' support showed a negative relationship for the implementation of rapport elements in Malaysia.

Based on the analysis of the research results that were related to the implementation of the rapport elements for mathematics in Malaysia had found out that it can be divided into few themes. Firstly, the theme on the identification of the effectiveness of the implementation for the rapport elements in the process of teaching and learning had found out that the highest mean score value showed by the cognitive, behaviour, and affective domain (Ahmad Fauzi et al., 2017). Secondly, the theme on the test for the implementation of the rapport with other variables had found out that there is a significant relationship between the rapport element with the behaviour (Nur Raidah & Ahmad Fauzi, 2017), the parents' involvement and peers support (Norakusuma et al., 2016), and the mathematics achievement (Nora'asikin et al., 2021).

CONCLUSIONS

In producing a student that has upgraded skills that are aligned with the development of the 21st century, the teaching and learning process for mathematics the rapport elements should be implemented (Gray & DiLoreto, 2016). The teachers should be the ones who should be in-charged in implementing the rapport elements during the teaching and learning process for mathematics subjects. This helps to create an effective lesson along with an increase in the students' achievements (Eccles, 2016).

The results from the conducted analysis have shown that most of the previous research only showed their concern on the impacts and effects of the implementation of the rapport elements for mathematics specifically for the students. However, the research on the teachers' perspective and implementation during the teaching and learning process for mathematics has not been widely done. Other than that, the sampling research that has been used encompassing the students, teachers, and lecturers only. Besides, the research related to the expert consensus upon the importance and the needs of the rapport elements during the teaching and learning process for mathematics has not yet been pinned point. According to Nurulrabihah (2020) and Muhammad Ridhuan Tony Lim Abdullah (2014), if the involvement of experts is considered in the research have been done, it can enhance the process of generating the ideas and opinions productively. In addition, it was able to create a significant impact on our educational system.

Thus, a study related to the development of STEM teaching model with the implementation of rapport elements is needed for future research so that a guideline can be provided for mathematics teachers to ensure that the teaching and learning process in mathematics can be implemented efficiently. In addition, it can also meet the learning needs of the 21st century. According to Gullapyan (2020), there is a need for the teachers to comprehend various learning strategies focused on student centred that is flexible to evolve with the world globalization. Gullapyan (2020) also suggested a guideline for the teachers in planning their lesson of mathematics to implement rapport elements towards an effective learning.

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