HOW PRIMARY SCHOOL TEACHERS SOLVE HANDSHAKE PROBLEM?

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ABSTRACT

The goal of the mathematics curriculum in Malaysia is to develop individuals who are able to think mathematically and can apply mathematical knowledge effectively and responsibly in solving problems and making decision (Ministry of Education Malaysia, 2003). Problem solving is the primary focus of the teaching and learning activities of school mathematics. The purpose of this article was to identify problem solving strategies among primary school teachers. Survey research design was adopted to identify their problem solving strategies. The participants of this study encompassed 120 primary school teachers from a public university in Peninsula Malaysia who enrolled in a 4-year Graduating Teachers Program (Program Pensiswazahan Guru) majored in mathematics. The researchers employed purposive sampling technique to select these participants. This article presents the analysis of the responses of the participants related to a particular problem, namely handshake problem. Result of the study shows that 74.2% of the participants have successfully solved the handshake problem. They employed various problem solving strategies: (i) making tables, charts or systematic list, (ii) drawing diagrams, (iii) simulation, (iv) trial-and-error (also known as guess-and-check), (v) using algebra, (vi) identifying pattern, and (vii) trying simpler cases. Result of the study also shows that 60% of the participants used same strategy to check their solutions for the handshake problem without being probed.

Keywords: handshake problem, problem solving strategies, primary school teachers, survey research design.

INTRODUCTION

The goal of the mathematics curriculum in Malaysia is to develop individuals who are able to think mathematically and can apply mathematical knowledge effectively and responsibly in solving problems and making decision (Ministry of Education Malaysia, 2003). Problem solving is the primary focus of the teaching and learning activities of school mathematics. Similarly, problem solving must also be the main focus of the teaching and learning activities of mathematics teachers education program.

Various strategies can be used to solve problems. Among the strategies recommended by the Ministry of Education Malaysia (2003) to be introduced in the school mathematics curriculum are as follow: "trying a simple case; trial-and-error (also known as guess-and-check); drawing diagrams; identifying patterns; making a table, chart, or systematic list; simulation; using analogies; working backward; logical reasoning; and using algebra" (p. 4).

Similarly, in this article, the handshake problem can be solved using various strategies (e.g., making a chart, looking for a pattern, trial-and-error etc). Nik Azis (1996) demonstrated how this problem can be solved using various strategies such as simulation, drawing diagrams, making a table, and using formula. Noor Shah and Sazelli (2008) also demonstrated how this problem can be solved using various strategies such as drawing diagrams and trying simpler cases.

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The finding of Wun and Sharifah Norul Akmar (2012) revealed that three types of strategies were employed by the preservice teachers in their study to solve the fencing problem, namely looking for a pattern, trial-and-error, and differentiation method. The finding of Wun, Sharifah Norul Akmar, and Lim (2013) showed that Beng (a pseudonym) has successfully solved the fencing problem using the looking for a pattern strategy. She used the same strategy, namely the looking for a pattern strategy, to check her solution for the fencing problem without being probed. The finding of Wun, Lim, and Chew (2015) indicated that Suria (a pseudonym) has successfully solved the fencing problem using trial-and-error (also known as guess-and-check) strategy. She used alternative strategy, namely differentiation method, to check her solution for the fencing problem without being probed. The finding of Wun, Lim, and Chew (2017) depicted that various problem solving strategies were employed by primary school teachers to solve fencing problem: (i) trial-and-error (also known as guess-and-check), (ii) using algebra, (iii) making tables, charts or systematic list, (iv) drawing diagrams, (v) identifying pattern, and (vi) logical reasoning.

The purpose of this article was to identify problem solving strategies among primary school teachers. Specifically, this article attempted to answer the following research questions: (a) What strategies do primary school teachers used to solve handshake problem?, and (b) What strategies do primary school teachers employed to check their solutions for the handshake problem?

METHODOLOGY

Survey research design was adopted to identify problem solving strategies among primary school teachers. The participants of this study encompassed 120 primary school teachers from a public university in Peninsula Malaysia who enrolled in a 4-year Graduating Teachers Program (Program Pensiswazahan Guru) majored in mathematics. The researchers employed purposive sampling technique to select these participants. This article presents the analysis of the responses of the participants related to a particular problem, namely handshake problem.

The task was adapted from Nik Azis (1996) (see Appendix A). In this task, participants were required to solve the handshake problem. The objective of this task was to identify strategies used by primary school teachers to solve the handshake problem. This task was also employed to identify strategies used by primary school teachers to check their solutions for the handshake problem.

RESULTS

Basic Demographic Information

Table 1 shows the distribution of the participants by gender. 90 (75%) of the 120 participants were primary school female teachers. The remaining 30 (25%) participants were primary school male teachers (Wun, Lim, & Chew, 2017).

Table 1. Gender

Gender	*Frequency*	*Percent*
Male	30	25.0
Female	90	75.0
Total	120	100.0

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Table 2 shows the distribution of the participants by age. 44 (36.7%) and 43 (35.8%) of the participants were from the age groups of 26-30 and 31-35 years respectively. 22 (18.3%) and 10 (8.35) of the participants were from the age groups of 36-40 and 41-45 years respectively. The remaining one (0.8%) participant was from the age group of 46-50 years (Wun, Lim, & Chew, 2017).

Table 2. Age

Age	*Frequency*	*Percent*
26-30	44	36.7
31-35	43	35.8
36-40	22	18.3
41-45	10	8.3
46-50	1	.8
Total	120	100.0

Successful and Unsuccessful Problem Solvers

Table 3 shows the distribution of the successful and unsuccessful problem solvers for the handshake problem. Result of the study shows that 89 (74.2%) of the participants have successfully solved the handshake problem. The remaining 31 (25.8%) participants were unsuccessful problem solvers for the handshake problem.

Table 3. Successful and unsuccessful problem solvers

Handshake problem	*Frequency*	*Percent*
Successful	89	74.2
Unsuccessful	31	25.8
Total	120	100.0

Problem Solving Strategies

Table 4 shows the problem solving strategies used by the participants to solve handshake problem. They used various problem solving strategies: (i) making tables, charts or systematic list, (ii) drawing diagrams, (iii) simulation, (iv) trial-and-error (also known as guess-and-check), (v) using algebra, (vi) identifying pattern, and (vii) trying simpler cases.

Result of the study suggests that making tables, charts or systematic list, and drawing diagrams was the dominant problem solving strategies used by the participants to solve handshake problem. Specifically, 48 (40.0%) and 33 (27.5%) of the participants used making tables, charts or systematic list, and drawing diagrams to solve handshake problem respectively. Subsequently, 12 (10.0%) and 11 (9.2%) of the participants employed simulation and trial-and-error (also known as guess-and-check) to solve handshake problem respectively. They were 10 (8.3%) and four (3.3%) participants who employed using algebra and identifying pattern to solve handshake problem respectively. There were only two (1.7%) participants who used trying simpler cases to solve handshake problem respectively.

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Table 4. Problem solving strategies

Problem solving strategies	*Frequency*	*Percent*
Drawing diagrams	33	27.5
Identifying pattern	4	3.3
Making tables, charts or systematic list	48	40.0
Using algebra	10	8.3
Trying simpler cases	2	1.7
Trial and error	11	9.2
Simulation	12	10.0
Total	120	100.0

Strategies for Checking Solutions

Table 5 shows the problem solving strategies used by the participants to check their solutions for the handshake problem. Result of the study shows that 72 (60.0%) of the participants used same strategy to check their solutions for the handshake problem without being probed. The remaining 48 (40.0%) participants employed alternative strategy to check their solutions.

Table 5. Strategies for checking solutions

Strategies for checking solutions	Frequency	Percent
Same strategy	172	60.0
Alternative strategy	48	40.0
Total	120	100.0

DISCUSSION AND CONCLUSIONS

In summary, 74.2% of the 120 primary school teachers have successfully solved the handshake problem. They used various problem solving strategies: (i) making tables, charts or systematic list, (ii) drawing diagrams, (iii) simulation, (iv) trial-and-error (also known as guess-and-check), (v) using algebra, (vi) identifying pattern, and (vii) trying simpler cases. The result of this study is in accordance with the results of previous studies (Nik Azis, 1996; Noor Shah & Sazelli, 2008; Wun & Sharifah Norul Akmar, 2012; Wun, Lim, & Chew, 2017).

Result of the study suggests that 85% of the participants used same strategy to check their solutions for the handshake problem without being probed. The result of this study is consistent with the result of previous study (Wun, Sharifah Norul Akmar,, & Lim, 2013; Wun, Lim, & Chew, 2017) which found that the participants used the same strategy to check their solution for the fencing problem without being probed.

However, this is only a survey that involved 120 primary school teachers from a public university in Peninsula Malaysia who enrolled in a 4-year Graduating Teachers Program (*Program Pensiswazahan Guru*) majored in mathematics. Furthermore, the researchers

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employed purposive sampling technique to select these participants. Therefore, the results of this study could not be generalized to other primary school teachers enrolled in the 4-year Graduating Teachers Program (*Program Pensiswazahan Guru*) in this public university, in other programs, or attending other universities and teacher training institutes.

The implication of this study is that mathematics teacher educators need to organize teaching and learning activities that provide opportunity for the preservice and in-service mathematics teachers to solve different types of mathematical problems. Through such activities, preservice and in-service mathematics teachers would be provided opportunity to develop their mathematical problem solving ability. This is in line with the goal of the mathematics curriculum in Malaysia, namely to develop individuals who are able to think mathematically and can apply mathematical knowledge effectively and responsibly in solving problems and making decision (Ministry of Education Malaysia, 2003).

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REFERENCES

[1] Ministry of Education Malaysia. (2003). *Integrated curriculum for secondary school: Curriculum specification Mathematics form 1*. Kuala Lumpur: Curriculum Development Centre.

[2] Nik, A. N. P. (1996). *Penghayatan matematik KBSR dan KBSM: Perkembangan professional* [*Appreciation of the integrated curriculum of primary and secondary school mathematics: Professional development*]. Kuala Lumpur: Dewan Bahasa dan Pustaka.

[3] Noor, S., & Sazelli, A. G. (2008). *Teaching mathematics in secondary schools: Theories and practice.* Tanjong Malim: Uviversiti Pendidikan Sultan Idris Press.

[4] Wun, T. Y., Sharifah, N., & Akmar, S. Z. (2012). *Mathematical problem solving ability of preservice secondary school mathematics teachers*. Kuala Lumpur: University of Malaya.

[5] Wun, T. Y., Sharifah, N., Akmar, S. Z., & Lim, H. L. (2013). *Assessing pre-service teachers' problem solving abilities: A case study*. Gombak, Selangor: Universiti Islam Antarabangsa Malaysia (UIAM).

[6] Wun, T. Y., Lim, H. L., & Chew, C. M. (2015). *Assessing primary school teachers' mathematical problem solving ability: A case study.* Johor: Fakulti Pendidikan Teknikal dan Vokasional, Universiti Tun Hussein Onn Malaysia.

[7] Wun, T. Y., Lim, H. L., & Chew, C. M. (2017). Problem solving strategies among primary school teachers. *Journal of Education and Practice* (In Press).

APPENDIX A

Handshake problem (adapted from Nik Azis, 1996, p. 123):
There are eight people in a meeting room. How many handshakes occur if each person shakes hands with each other person once?

[*Terdapat lapan orang dalam sebuah bilik mesyuarat. Jika setiap orang berjabat tangan dengan setiap orang lain sekali sahaja, berapakah bilangan berjabat tangan yang berlaku?*]

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