



Problem posing ability among prospective mathematics teachers

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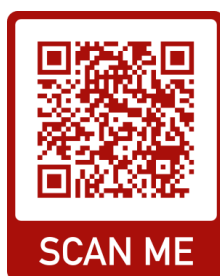
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ABSTRACT

Posing mathematics problem is perceived as one of the learning strategies to promote students' skills in mathematics problem-solving as well as one of the crucial competencies that should be mastered by prospective mathematics teachers. Some people argued that for prospective mathematics teachers, posing mathematics problem itself is as important as solving mathematics problem because when they become mathematics teachers, there exist necessity for them to pose mathematics problem as a means for assessing students' understanding or achievement. The aim of this article, therefore, was to focus on the investigation into the prospective mathematics teachers' ability in posing mathematics problems. Relevant literature from several electronic databases such as SpringerLink, ScienceDirect, ResearchGate, and Google Scholar was searched based on the following keywords: 'pre-service mathematics teacher', 'problem-posing', 'prospective mathematics teacher problem-posing', and 'posing mathematics problem'. There was a total of 16 articles which were included into this review according to the determined inclusion criteria as follow: an empirical study that was published in journal or conference proceeding with the publication date from years of 2009 to 2019, written in English, full text, and discussing about prospective mathematics teachers' ability in posing problem related to mathematics. There were as many as three themes that deal with the prospective mathematics teachers' ability to pose the mathematics problem, i.e. type of posed problem, ability in posing mathematics problem, and the difficulty which was experienced by prospective mathematics teacher in posing mathematics problem. These three themes and their implications are discussed in this article.

Pengajuan masalah matematika dapat dianggap sebagai salah satu strategi pembelajaran untuk mengembangkan keterampilan siswa dalam memecahkan masalah matematika serta sebagai salah satu kompetensi yang penting yang seharusnya dikuasai oleh calon guru matematika. Beberapa orang berpendapat bahwa untuk calon guru matematika, mengajukan masalah matematika itu sama pentingnya dengan memecahkan masalah matematika karena ketika mereka menjadi guru matematika, ada suatu keharusan bagi mereka untuk mengajukan masalah matematika sebagai saran untuk menilai pemahaman atau pencapaian siswa. Tujuan artikel ini, oleh karena itu, adalah untuk fokus pada penyelidikan kemampuan calon guru matematika dalam mengajukan masalah matematika. Literatur yang relevan dari beberapa basis data elektronik seperti SpringerLink, ScienceDirect, ResearchGate, dan Google Scholar dicari berdasarkan kata kunci berikut: 'pre-service mathematics teacher', 'problem-posing', 'prospective mathematics teacher problem-posing', dan 'posing mathematics problem'. Ada total 16 artikel yang dimasukkan ke dalam tinjauan ini sesuai dengan kriteria inklusi yang ditentukan sebagai berikut: studi empiris yang diterbitkan dalam jurnal atau prosiding seminar dengan tanggal publikasi dari tahun 2009 hingga 2019, ditulis dalam bahasa Inggris, teks lengkap, dan membahas tentang kemampuan calon guru matematika dalam mengajukan masalah yang berkaitan dengan matematika. Ada tiga tema yang berhubungan dengan kemampuan calon guru matematika untuk mengajukan masalah matematika, yaitu jenis masalah yang diajukan, kemampuan dalam mengajukan masalah matematika, dan kesulitan yang dialami oleh calon guru matematika dalam mengajukan masalah matematika. Ketiga tema dan implikasinya dibahas dalam artikel ini



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INTRODUCTION

Teachers as educators are expected to have and master any kind of required competencies to face the complex demands and challenges of today's world. A teacher who has and master those required competencies then can be said as a competent teacher. Competency itself can be understood as knowledge, skills, abilities, and attitudes which are observable and measurable as well as used to perform a given job or role (Nessipbayeva, 2012). Teacher's competency then can be understood as the competency in terms of knowledge, skills, attitudes, and self-development that should be mastered and possessed by the teacher in performing his role as a teacher (Linda, 2017). According to the President of the Republic of Indonesia (2005) through the Law of the Republic of Indonesia No.14/2005 on Teacher and Lecturer, the teachers in Indonesia are supposed to master four competencies that comprised of pedagogical competency, professional competency, social competency, and personality competency. The pedagogical competency deals with the competency of the teacher in managing the students' learning. The competency of the teacher in mastering the content of subject matter broadly and deeply, on the other hand, is called as the professional competency. Social competency is about the competency of the teacher to engage in good communication and also to have interaction with the students, students' parents, other teachers, and local communities. The last, personality competency means the competency of the teacher to have a good personality and also be able to be a role model for the students. Particularly, the Ministry of Education and Culture of Republic of Indonesia (2012) through the Regulation No. 57/2012 on Teacher Competency Test has provided detailed aspects of competency in pedagogy and professional domain as listed in Tabel 1.

Table 1. Detailed Aspects of Competency of Pedagogy and Professional Domain

Competency in pedagogy domain	Knowing the characteristics and potentials of students Mastering the concept and implementation of effective learning principles Mastering the curriculum planning and development Mastering the effective steps of learning Mastering the system, mechanism, and procedure of assessment
Competency in the professional domain	Understanding towards the content, construction, concepts, and scientific paradigm that promote the content or subject matter taught by the teacher Mastering scientific methodology in accordance with the field of the task (expertise) Mastering the nature of teacher profession

There is another view of what competencies that should be mastered by the teachers. This view is more emphasized on the teacher's knowledge. In 1986, the term of pedagogical content knowledge (PCK) was introduced by Shulman (1986) as one of the three categories of knowledge of content and as the integrated form of two pieces of knowledge, namely pedagogical knowledge and content knowledge. The knowledge about how students learn, classroom management, the development and implementation of lesson plan, and how to do assessment and evaluation towards students' achievement is considered as pedagogical knowledge; while content knowledge deals with the understanding of the teachers towards facts, concepts, principles, and structures of the content that should be learned by their students in mathematics learning environment (Mishra & Koehler, 2006). When these two aspects are integrated as PCK, Mishra and Koehler (2006) then mentioned it as the completed understanding towards (1) effective models, methods, strategies, or approaches of teaching and learning which is fit with the substance of learning materials; (2) the difficulties or misconceptions that may be experienced by students; and (3) ways that foster meaningful learning for students.

From explained two concepts of the competency or knowledge that should be mastered by the teacher, we can say that professional competency can be aligned with knowledge of content that deals with the comprehensive understanding of the teacher towards the content or learning material that is needed to be learned by students or taught by the teacher itself. In order to become a competent teacher, the teacher should at least master PCK first. As a consequence, as mathematics teachers, they are expected to hold PCK for facilitating their students in learning mathematics. This PCK must also include the understanding of assessment and evaluation towards understanding or achievement of students in mathematics. Moreover, in order to assess the mathematical understanding or achievement of their students, teachers need to know how to pose a good mathematics problem.

More specifically, mathematics teachers need to master the knowledge of problem-solving for teaching mathematics because basically problem-solving itself is the core of teaching and learning mathematics. Such

knowledge is required by mathematics teachers as problem solvers as well as to facilitate their students in attempting to be a better mathematics problem solver (Chapman, 2015). Furthermore, this knowledge is actually comprised of three classes, namely content knowledge of problem-solving, pedagogical knowledge of problem-solving, and beliefs and factors in the affective domain that may influence problem-solving. These three classes then are summarized in detail in Tabel 2 (Chapman, 2015, p. 31).

Table 2. The Component of Knowledge of Problem-Solving for Teaching Mathematics

Class	Knowledge of	Description
Content knowledge of problem-solving	Proficiency of mathematical problem-solving	Understanding of what should be comprehended in order to be successful in mathematical problem-solving.
	Problem of mathematics	Understanding about nature, structure, type, purpose, and impact of mathematical problems.
	Problem-solving in mathematics	Being good in solving mathematics problem. Knowledge of mathematical problem-solving as a way of thinking, meaning and model of problem-solving in mathematics and the use of heuristics method in problem-solving, and understanding about how to interpret the uncommon solution to the mathematics problem of students.
	Problem posing	Understanding about problem posing prior to problem-solving, after solving the problem, or during problem-solving.
Pedagogical knowledge of problem-solving	Viewing students as a mathematics problem solver	Realizing about the difficulties and thinking of students in mathematical problem-solving as well as the characteristics of successful problem solvers.
	Teaching and learning practices for problem-solving	Knowledge about how to give a proper scaffolding and facilitation to the students in order to make them be successful in solving mathematics problem.
Affective factors and beliefs	Affective factors and beliefs	Mastering about the core and the role of beliefs and many factors in the affective domain in influencing students' ability in solving mathematics problem.

In truth, the knowledge deals with problem-posing is one of the knowledge that is required to teach about mathematics problem-solving that should be mastered by mathematics teachers besides knowledge of problem-solving in mathematics itself. Knowledge of problem-posing needs to be mastered by mathematics teachers because through this knowledge, they are expected to have a capability in promoting problem-solving proficiency of their students by giving facilitation for students to construct the diverse and meaningful mathematics problems (Chapman, 2015). Moreover, Ellerton (2013) suggested that young teachers should be given a chance to acquire problem-posing skills and believe in their self-ability in posing mathematics problems as an effort to make themselves become capable in mathematics problem-posing and also to assist their students during the problem-posing activity in mathematics learning. Hence, posing mathematics problems actually is not merely the activity that is just intended for students as a means for enhancing their problem-solving skills, instead, it also should become the activity that should be done and experienced by mathematics teachers. This statement is supported by Singer, Ellerton, and Cai (2013) who argued that prospective teachers and teachers in the mathematics field should be given a sufficient opportunity to pose their own mathematics problem.

As mentioned earlier, teachers need to pose a mathematics problem to their students to facilitate students in improving their ability in mathematics problem-solving and assess students' understanding or comprehension toward particular content of mathematics they have learned. Posing mathematics problem is also important for prospective mathematics teacher as mentioned by Crespo and Sinclair (2008) that generate or pose a good problem of mathematics is as a means to give students' opportunity to work in mathematics. Furthermore, Sugiman (2013) also stated that both competencies in solving and posing mathematics problems must be

possessed by prospective mathematics teacher. Therefore, my aim in this article was to emphasize on portraying the ability of prospective mathematics teachers in posing mathematics problems.

METHOD

This article is the result of a literature review which was aimed at investigating the ability of prospective teacher in the mathematics field when experiencing with posing mathematics problem. This literature review, however, was conducted by following the method to conduct a literature review offered by Cronin, Ryan, and Coughlan (2008). Based on this method of literature review, the study was begun by choosing the topic which was going to be reviewed, then collected the necessary literature based on the topic, analyzed and synthesized the appropriate literature, and the last wrote the review. Literature that was reviewed to attain this aim were searched from several databases (SpringerLink, ScienceDirect, ResearchGate, and Google Scholar). In searching for the needed literature, the following keywords were used: 'prospective mathematics teacher', 'problem-posing', 'prospective mathematics teacher problem-posing', and 'posing mathematics problem'. The inclusion criteria were also set in order to gain the required literature. The inclusion criteria consisted of four criteria, namely: an empirical study that was published in journal or conference proceeding with a publication date from years of 2009 to 2019, written in English, available in full-text version, and discussing the ability of prospective mathematics in posing mathematics problem. There were 16 articles included in this review. From these 16 articles, then, we identified, analyzed, and described the themes contained in those articles carefully.

RESULTS AND DISCUSSION

After conducting a thematic analysis of the articles that were included in this review, we obtained three themes related to the prospective teachers in the mathematics field's ability in developing or posing problems of mathematics. These three themes comprised of the kind or category of mathematics problem posed by prospective teachers in the mathematics field, the prospective teachers in mathematics field's ability to pose problems of mathematics, and the difficulties experienced by prospective teachers in mathematics field during mathematics problem-posing.

The category of problems generated by prospective teachers in the mathematics field

Some empirical studies had already determined the kind or category of mathematics problems posed by prospective teachers in the mathematics field. This review, therefore, found some categories of problems generated by prospective teachers in the mathematics field. Table 3 presents the categories of the problem generated by prospective teachers in the mathematics field. From Table 3, in some studies, prospective teachers in the mathematics field were required to pose an open-ended problem (e.g. Kar *et al.*, 2010; Nicol & Bragg, 2009). Sullivan, Warren, and White (2000) mentioned that a problem could be categorized into the open-ended problem when the problem has many ways to be solved or when the problem has more than one possible result or solution. Moreover, there is a possibility that the open-ended problem only has one solution but to obtain that solution, several or many different ways could be employed by problem solver (Becker & Epstein, 2006).

In some other studies (e.g., Şengül & Katranci, 2012, 2014, 2015a), prospective teachers in the mathematics field were given an opportunity in posing mathematics problems through three different conditions, namely problem-posing with a free condition, semi-structured condition, and structured condition. In a problem-posing under free condition, they were required to pose a mathematics problem related to real-life situations and without providing them any data (El Sayed, 2002; Şengül & Katranci, 2015a). Then, when problem-posing under semi-structured condition was applied, they were required to construct a mathematics problem based on the given open-ended condition by applying knowledge that they have before (Şengül & Katranci, 2014). The problem that can be generated through this semi-structured problem situation can be in form of open-ended problems, a problem corresponding to the presented problem, the problem with a similar context, a problem that deals with particular theorem, problems generated from the given pictures, or words problem. The last, when problem posing under structured condition was implemented, prospective mathematics teachers were demanded to develop a new mathematics problem by changing the known or keeping the data and changing the required (unknown).

Table 3. The Type of Mathematics Problem that Posed by a Prospective Mathematics Teacher

Author(s)	Country	Participants	Category of Problem	Content
Nicol and Bragg (2009)	Australia, Canada	176 prospective mathematics teacher from Australia and Canada	Open-ended problem	Not specific
Kar, Özdemir, Ipek, and Albayrak (2010)	Turkey	As many as 76 students who were studying in the faculty of education	Open-ended problem	Series and sequences
Işık, Kar, Yalçın, and Zehir (2011)	Turkey	As many as 80 fourth-year students who were studying at the primary education department in mathematics filed	Modified problem	Fraction
Şengül and Katrancı (2012)	Turkey	As many as 56 second-year students of mathematics for primary school	Free problem posing	Set
Işık and Kar (2012)	Turkey	As many as 20 students of mathematics for primary school	Problem with specific requirements	First-degree equation
Chapman (2012)	Canada	As many as 40 second-year students of elementary education	Contextual mathematical problem with nine specific requirements	Mathematics content in elementary school
Ellerton (2013)	USA	As many as 154 students of mathematics education class	Routine and project problem posing	Algebra
Kiliç (2013)	Turkey	As many as 98 students of primary education program	Free problem posing	Fraction
Şengül and Katrancı (2014)	Turkey	As many as 42 second-year students of mathematics for elementary school level	Structured problem posing	Ratio and proportion
Şengül and Katrancı (2015a)	Turkey	As many as 114 junior students of mathematics for the elementary school program	Free problem posing	Ratio and proportion
Şengül and Katrancı (2015b)	Turkey	As many as 45 junior students of mathematics for the elementary school program	Free, semi-structured, structured problem posing	Ratio and proportion
Xie and Masingila (2017)	USA	As many as 10 prospective teachers of primary school who were studying mathematics through the problem-solving method	Solvable, unsolvable, and not a mathematics problem	Fraction
Prayitno and Budiyo (2018)	Indonesia	46 prospective primary teachers	Mathematics and non-mathematics question	Fraction
Masriyah, Kurniasari, and Palupi (2018)	Indonesia	As many as 34 prospective teachers in mathematics	Free essays, structured essays, and open-ended problem	Not specific
Fardah (2018)	Indonesia	29 prospective who had done an internship program	Modified, reformulated or substituted problem	Number and pattern, trigonometry, and chance
Mallart, Font, and Diez (2018)	Spain	10 prospective teachers who were successful in problem-solving	Problem with specific requirements	Geometry

The prospective teachers in the mathematics field's ability to generate a mathematics problem

To know the prospective teachers in the mathematics field's ability to pose mathematics problems, we need to give an opportunity for them to pose various types of problems. After conducting a careful analysis, we gathered some information about prospective mathematics teachers' ability to pose various types of mathematics problems (see Table 4).

Table 4. Prospective Mathematics Teachers' Ability in Posing Problem

Author(s)	The Ability of Prospective Mathematics Teachers in Posing Problem
Nicol and Bragg (2009)	Most of the problems posed by participants in this study could be categorized into an open-ended problem. It means that even though posing open-ended problems were perceived as an intriguing task, participants in that study were successful to develop such a problem. This study also found that the participants in this study tend to choose to pose interactive problem although this kind of problem was enormously intriguing over the illustrative problem (59% vs. 41%)
Kar, Özdemir, Ipek, and Albayrak (2010)	This study found that participants in this study had a low ability when they were required to pose a problem under the provided condition
Işık, Kar, Yalçın, and Zehir (2011)	This study uncovered the result that, in general, the participants had a low ability to pose a problem, especially when they were required to develop a mathematics problem that contains equation or operation of mathematics
Şengül and Katrancı (2012)	Generally, this study revealed that the participants had a good ability in displaying problem under free condition even though this problem could not be solved by them because of their insufficient knowledge of problem-solving and problem-posing
Chapman (2012)	In general, the participants in this study could be said that they were capable of creating a problem with an interesting context. However, they frequently exclude their sense towards word problem when posing the problem
Kiliç (2013)	The participants in this study were able to produce word and non-word problem that deals with the topic of the fraction by using the operator of mathematics
Şengül and Katrancı (2014)	This study found that the problem posed by the participants under structured condition was clear and can be solved
Şengül and Katrancı (2015a)	A clear, solvable, and understandable problem was posed by participants in this study successfully
Şengül and Katrancı (2015b)	The participants in this study were able to create a clear and understandable problem under problem-posing with free
Masriyah, Kurniasari, and Palupi (2018)	The participants in this study tend to choose to create free word problems over the structured and open-ended problem. The problem which is posed by the participant in this study was solvable. Furthermore, the highest and the lowest ability of the participants in the posing problem occurred in the type of within-solution and post-solution consecutively.

From **Tabel 4**, we can obtain information that the ability of prospective teachers in the field of mathematics in creating mathematics may vary depending on the type of problem that they should pose. For instance, **Masriyah et al. (2018)** uncovered the finding that prospective mathematics teachers tend to choose to make free essay problems that they perceived easier than structured and open problems. This finding is corresponding with the finding in the study done by **Kar et al. (2010)** that prospective teachers in the mathematics field's ability in posing mathematics problems were low when the problem that they should pose had to satisfy the specific situations.

The difficulty of prospective teachers in the field of mathematics to pose the problem of mathematics

When prospective teachers in the field of mathematics are struggling to develop problems of mathematics, they may face some difficulties. Through this study, we found some difficulties that are experienced by prospective teachers in the mathematics field in posing mathematics problems (see **Table 5**). In general, the difficulties experienced by prospective teachers in the mathematics field covered the subject matter comprehension and knowledge or understanding about problem posing itself.

Discussion

The mathematics learning which is facilitated by mathematics teachers basically is aimed to develop students' problem-solving skills. In that learning, mathematics teachers are expected to be capable in providing a good mathematics problem to be solved by their students. According to **Sullivan and Lilburn (2002, p. 3)**, a mathematics problem is said to be good if the following criteria are satisfied: it demanded more than just recalling a factual knowledge or reproducing procedural understanding, it promotes the reciprocal relationship between students and teachers in which both students and teacher can learn from problem-solving of the problem of mathematics, and it produces more than one acceptable answer or solution. There are two ways that can be carried out by ma-

Table 5. Prospective Mathematics Teachers' Difficulty in Posing Mathematics Problem

Author(s)	The Difficulty of Prospective Mathematics Teachers in Posing Mathematics Problem
Şengül and Katranci (2012)	The difficulties experienced by participants in this study include difficulty in aligning the degree of difficulty of the problem which was going to be posed and insufficient knowledge of the related subject matter
Işık and Kar (2012)	Translating from the notations of mathematics to the problem statement, assigning the solutions of the variable, changing the structure of the equation became the difficulties experienced by the subject involved in this study
Chapman (2012)	The subject involved in this study experienced by difficulty in constructing an open-ended problem, constructing a problem based on the given concept of mathematics, and developing problem of mathematics based on the concept of mathematics which was presented in form of a figure
Kiliç (2013)	When the subject of this study was given a facilitation to pose a problem about fraction under free condition, they challenged in selecting the relevant data and selecting the right number in the form of a fraction
Şengül and Katranci (2014)	This study uncovered the fact that composing problem statement, choosing numeric expression, producing various type of problem, understanding the students' cognitive level, and constructing problem with real-life context were considered as the difficulties experienced by the subject of this study
Şengül and Katranci (2015a)	The subject in this study had difficulty in constructing problem statement because of the insufficient knowledge in curriculum, subject matter, and students' cognitive level
Şengül and Katranci (2015b)	The participants in this study tend to confuse in developing problem that meets with the students' cognitive level
Prayitno and Budiyo (2018)	The participants in this study had difficulty in creating a problem that deals with the concept of fraction in a real-life context
Masriyah, Kurniasari, and Palupi (2018)	Generating an analytical problem was the highest level of difficulty experienced by the subject of this study

thematics teachers to provide a good mathematics problem to their students. The first way is by retrieving a mathematics problem which is available in mathematics textbook or the internet. Then the second way is posing mathematics problems by themselves. In reality, most of the mathematics problems that are assigned for students to solve come from mathematics textbooks (Crespo & Sinclair, 2008). This reality is supported by Ellerton (2013) who argued that although some mathematics teachers will create their own mathematics problems and assign them for students to solve, most of the mathematics teachers have an inclination to depend on the outside sources to gather problems of mathematics that they will give to their students as practice or as an instrument to assess the achievement of the students.

The existed tendency to rely on the outside sources in attempting to provide mathematics problems to students should be balanced with the consciousness that posing or creating a mathematics problem is actually the business of mathematics teacher itself, not someone else's business. Therefore, problem-posing is perceived as a crucial thing for teachers in the in-service period and hence teachers should be given a huge opportunity to experience in posing the problem of mathematics frequently during the pre-service period (Kar *et al.*, 2010). During the pre-service period, posing the mathematics problem is very beneficial for mathematics teachers as it could be an opportunity for them to enhance their competency and to know the quality of their abilities in thinking creatively, understanding the content and concept of mathematics, and communicating clearly (Amiluddin & Sugiman, 2016). In addition, posing mathematics problem is also crucial for mathematics teachers during the pre-service period because it can be used as an opportunity to prepare themselves in providing meaningful mathematics learning for their future students.

In attempting to prepare themselves in providing their students with a meaningful mathematics learning experience, prospective teachers in the mathematics field are expected to be accustomed to posing various types of mathematics problems. Previous studies (e.g. Chapman, 2012; Kar *et al.*, 2010; Nicol & Bragg, 2009; Şengül & Katranci, 2012) have been conducted to explore prospective mathematics teachers in posing various types of mathematics problem. One of the types of mathematics problems generated by prospective mathematics teachers is an open-ended problem. According to the previous studies, presenting open-ended mathematics problem to students is very beneficial in terms of promoting students' mathematical creativity (Fatah, Suryadi, Sabandar, &

Turmudi, 2016; Sariningsih & Herdiman, 2017; Soeyono, 2014; Wijaya, 2018), improving the achievement of students in mathematics (Al-Absi, 2013), and promoting students' self-esteem in mathematics (Fatah *et al.*, 2016). Thus, prospective mathematics teachers are supposed to develop their ability in posing open-ended mathematics problems. Moreover, Chapman (2012) stated that the ability to create diverse problems is critical for teachers in accordance with the attempt to facilitate diverse and creative thinking for students.

Prospective mathematics teachers' ability in posing mathematics problems may be contingent upon the possible reasons as follow; such as the type of problem, prospective mathematics teachers' learning experience, the skills of prospective mathematics teachers in solving the problem of mathematics, and prospective mathematics teachers understanding toward problem-posing itself. Some studies found that prospective mathematics teachers are more successful in posing the free or simple mathematics problem than in posing the complex one (see Kar *et al.*, 2010; Masriyah *et al.*, 2018). Furthermore, Xie and Masingila (2017) revealed that there exists a connection between problem-solving and problem-posing; i.e. the effectiveness of problem-solving could be influenced by the contribution of problem-posing and the reverse when students have a good ability in problem-solving in mathematics, it tends to support them to pose a more reasonable mathematics problem. It implies the prospective mathematics teachers' problem solving affects the ability of prospective mathematics teachers in problem-posing. Therefore, in order to be successful in problem-posing, prospective mathematics teachers should be facilitated to promote their skills in problem-solving.

As we can see in Table 4 dan Table 5, prospective mathematics teachers' still struggle when they were asked to pose some type of problem of mathematics, for instance, semi-structured problems and structured problems. Moreover, they also still face some difficulties in posing mathematics problems. Şengül and Katranci (2014) suggested some possible solutions to minimize the difficulties experienced by prospective teachers in the mathematics field when generating the problem of mathematics. These possible solutions comprised of: (a) engaging students in problem-solving activity first before encourage them to pose a problem of mathematics, using real-life context as a means for constructing a problem of mathematics, posing problem of mathematics by analyzing either the existed example of mathematics problem or the problem that is considered as the similar problem with the problem which is going to be posed, facilitating students to engage in such activities that may enable them to construct a meaningful mathematics problem. In addition, another possible solutions proposed by Şengül & Katranci (2015a), i.e. facilitating students to have a huge opportunity to study about posing and solving problem of mathematics as well, conducting an analysis into the existed curriculum thoroughly and deeply, teaching a particular or innovative methods of teaching thoroughly and providing useful resources for students during problem-posing activity.

Nowadays, the opportunity to pose a mathematics problem which is supposed to be given to prospective mathematics teachers should not be limited to the types of mathematics problem that are found in this review. Previous study conducted by Hadi, Retnawati, Munadi, Apino, and Wulandari (2018) found that senior high school students had difficulties in solving higher-order thinking skills problems because they were not facilitated maximally yet to solve such problems. Providing or accustoming students with such problems is one of the strategies to minimize students' difficulty in solving such problems as well as developing students' higher order thinking skills as proposed by the teachers who participated in the study conducted by Retnawati, Djidu, Kartianom, Apino, and Anazifa (2018). Therefore, it can be argued that there is a need for mathematics teachers to enhance their skills in posing problems that can improve students' higher-order thinking skills (Apino & Retnawati, 2017). Mathematics problem that can promote students' higher-order thinking is a non-algorithmic mathematics problem that requires the skills of the students in thinking creatively and critically, analyzing, synthesizing, and evaluating (Apino & Retnawati, 2017) and also requires students to link and apply the knowledge that they have constructed before (Jailani, Sugiman, & Apino, 2017) to obtain the solution to the problem. By considering the characteristics of mathematics problem that can promote students' higher-order thinking skills, it may be challenging for prospective mathematics teachers even for mathematics teachers to pose such problem. Accordingly, it can be said that not only mathematics teachers but also prospective mathematics teachers should also be facilitated frequently to pose a mathematics problem that can promote students' higher-order thinking skills.

CONCLUSION

Both posing and solving problems of mathematics in mathematics learning is critical for students and mathematics teachers. Posing problems of mathematics is one of the competencies that should be mastered by

teachers of mathematics and also prospective mathematics teachers in order to promote students' diverse and flexible thinking. Prospective mathematics teachers' ability in posing problem of mathematics, however, need to be investigated as well as the difficulties that they experienced during problem-posing. This review provides insights that prospective mathematics teachers still have to struggle in posing some types of mathematics problems. To overcome this problem, a proper educational policy is needed.

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