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## INVESTIGATING PROSPECTIVE TEACHERS' MATHEMATICAL KNOWLEDGE FOR TEACHING IN QUADRILATERAL OF SKILL DIFFERENCES

Latief Sahidin<sup>1\*</sup>

<sup>1\*</sup> Universitas Halu Oleo, Kendari, Indonesia

\*Corresponding author. Jl. HEA Mokodompit, 93231, Kendari, Indonesia

E-mail: [latief.sahidin@uho.ac.id](mailto:latief.sahidin@uho.ac.id)<sup>1\*)</sup>

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### Abstract

Mathematical knowledge for teaching (MKT) is one of the factors that affect the competence of prospective teachers in learning. This study aims to describe the MKT of prospective teachers in terms of differences in ability levels in the scope of quadrilateral. The MKT studied in this study includes common content knowledge, and knowledge of the mathematical horizon. The research subjects consisted of three prospective math teachers, namely high-skill, intermediate-skill and low-skill. This research is qualitative research using vignettes. Data in this study was collected through vignettes and interviews. Validity of data using time triangulation. The results of this study showed that the ability of prospective teachers of intermediate-skilled and low-skill teachers still have difficulty regarding quadrilateral convex and quadrilateral concaves and still have difficulty understanding the relationships of squares, rectangles, rhombus and parallelogram. The MKT of intermediate and low-skill subjects of being produced is still limited compared to high-skill subjects. This difference occurs because it has not been able to eliminate the rectangular prototype image. To develop their abilities, prospective teachers need to be equipped with quadrilateral exploration tasks in education and training.

**Keywords:** Mathematical knowledge for teaching; prospective teacher; quadrilateral

### Abstrak

Mathematical knowledge for teaching (MKT) merupakan salah satu faktor yang mempengaruhi kompetensi calon guru dalam pembelajaran. Penelitian ini bertujuan mendeskripsikan MKT calon guru ditinjau dari perbedaan tingkat kemampuan dalam lingkup materi segiempat. MKT yang dikaji dalam penelitian ini mencakup pengetahuan materi umum untuk mengajar dan pengetahuan konten wawasan matematika untuk mengajar. Subjek penelitian terdiri dari tiga calon guru matematika yaitu satu calon guru kemampuan tinggi, satu orang calon guru kemampuan sedang dan satu orang guru kemampuan rendah. Penelitian ini merupakan penelitian kualitatif menggunakan vignette. Data dalam penelitian ini dikumpulkan melalui pemberian vignette dan wawancara. Keabsahan data menggunakan triangulasi waktu. Hasil penelitian ini menunjukkan bahwa kemampuan calon guru matematika berkemampuan sedang dan berkemampuan rendah masih kesulitan mengenai segiempat konveks dan segiempat konkaf serta masih kesulitan memahami hubungan persegi, persegipanjang, belahketupat dan jajargenjang. MKT subjek berkemampuan sedang dan rendah yang mampu dihasilkan masih terbatas dibandingkan dengan subjek berkemampuan tinggi. Perbedaan tersebut terjadi karena belum mampu menghilangkan gambar prototype segiempat. Untuk mengembangkan kemampuannya, calon guru perlu dibekali tugas-tugas eksplorasi segiempat dalam pendidikan maupun pelatihan.

**Kata kunci:** Calon guru; mathematical knowledge for teaching; segiempat



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## INTRODUCTION

Quadrilateral material is a school math material taught in both elementary and secondary schools. Quadrilateral learning in the school not only provides the main means to develop spatial thinking and visualization skills to learners but also provides a wide opportunity to develop its capabilities in deductive reasoning and proof (Ngirishi & Bansilal, 2019; Jones & Tzekaki, 2016; Brunheira & da Ponte, 2015; Soine et al., 2015). In line with this, the quadrilateral material is a fundamental and essential material that needs to be mastered by learners.

Several studies have been conducted on quadrilaterals showing that learners have problems (Nur & Türnüklü, 2014). Learners often have difficulty with formal definitions and are often influenced by visualizing their mental images of rectangles. Therefore, teachers as the main actors of learning must have a qualified provision related to mathematical knowledge to teach.

Teaching is a profession that requires a long-term commitment to apply all abilities to help students develop in terms of intellectual, emotional and attitude (Amini & Pane, 2021; Oviyanti, 2016). The prominent teacher was not born but developed. Every prospective teacher is able to become a better teacher and with sufficient determination and hard work, perhaps every teacher is able to become a successful teacher.

To become a professional math teacher, the development of mathematical knowledge to teach is also developed through pre-employment teacher professional education (PeTPE) for two semesters. The first semester was focused on strengthening pedagogic competencies, professionals and learning device development

workshops. While in the second semester focused on the practice of field experience in schools. PeTPE Halu Oleo University is one of the organizing institutions appointed by the directorate of teachers and educational personnel aimed at producing prospective teachers who have competence in planning, implementing, and assessing learning, following up on assessment results, conducting mentoring, and training students as well as conducting research, and able to develop professionalism in a sustainable manner.

The importance of this research to be done because the mathematical knowledge to teach is the knowledge to develop the skills and skills of a teacher or prospective teacher in teaching (Abdullah, 2015; Purwoko, 2017). Mathematical knowledge to teach from teachers and prospective teachers is needed as a provision to become a teacher in school (Khaerunnisa & Novaliyosi, 2018). Thus, efforts to produce math teachers with good competencies in mathematical knowledge to teach can be done effectively by preparing them since becoming students of prospective teachers.

The experts who developed the theory relating to MKT were initiated by Shulman. MKT from teachers and prospective teachers has become getting a lot of attention in recent decades (Reid & Reid, 2017). MKT is an important construction that can support or hinder the progress of learning towards an exemplary class. MKT is a knowledge of mathematics and skills used to teach (Nolan et al., 2015).

However, differences in ability are factors that can affect the teaching knowledge of teachers and prospective teachers. Teachers who do not know a material well most likely do not have

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the knowledge they need to help students learn this content. This underlines the need for MKT for prospective teachers so that they are better prepared to meet the needs of students through effective mathematics learning. MKT is indispensable for prospective teachers to successfully teach mathematics in the classroom. Therefore, this study examines how MKT ability of prospective teachers to quadrilateral material.

### RESEARCH METHOD

This research is qualitative descriptive research. Qualitative method is a research procedure that produces descriptive data in the form of written or spoken words from people and observable behavior (Merriam & Tisdell, 2015). The basis of researchers using qualitative approach is that researchers want to know in depth about MKT from prospective teachers. The subject of the study was a student of prospective teachers from the professional education program of Halu Oleo University of 29 people. The average participant was 25 years old, the lowest was 23 years old until the highest was 28 years old. By gender, 21 people (72.4%) women and 8 people (27.6%) men. While reviewed from graduates, 25 people (86.2%) bachelor of mathematics education and 4 people (13.8%) bachelor of mathematics.

Data collection is done through four stages. Phase 1: the administration of vignettes that have been validated

and declared eligible for use. Validation is done by three experts each one expert in the field of geometry Surabaya State University and two experts in the field of mathematics education Halu Oleo University, Kendari. Vignette consists of two topics: (1) definition of quadrilateral, parallelogram, rectangular, rhombus, square, trapezoid and kite; and (2) relationship of parallelogram, rectangles, close splits, squares, trapezoids, and kites. The time to work on the vignette is a maximum of 90 minutes.

Phase 2: Grouping MKT of prospective teachers is based on the vignette results of converted teacher candidates in high, intermediate and low categories, as stated in Table 1.

Table 1. Grouping MKT level of prospective teachers

No	Score (x)	Group
1	$x \geq 80$	High
2	$60 < x < 80$	Intermediate
3	$x \leq 60$	Low

Phase 3: Each group is selected one subject purposively. The selection of subjects takes into account the ability to communicate and express arguments verbally as well as the willingness of prospective teachers. Phase 4: in-depth interview of selected subjects. The interview was conducted to explore the MKT capability of the subject in detail and systematically refer to the MKT indicators (Table 2).

Table 2. Grouping MKT level of prospective teachers

MKT	Indicators
CCK	Mentioning the elements in the rectangle Identify the characteristics of parallelogram, rectangular, rhombus, square, trapezoid and kite
KMH	Getting to know the convex quadrilateral Getting to know the concave quadrilateral Explaining convex and concave quadrilateral relationships

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Examination of the validity of the data in this study was conducted by triangulation. In this study obtained valid data then used time triangulation. Data analysis used for qualitative data analysis includes: data reduction, data presentation and conclusion drawing (Alhojailan & Ibrahim, 2012). The data reduction process is done by collecting the results of the subject's work, examining and studying the vignette results. Then make a transcript of the data in the form of explanation of prospective teachers to vignette given in written form and study the results of the interview recording. Then compile the transcripts of the interview results and play the recordings over and over again so that researchers can write down

exactly what the subject has revealed in the interview and listen back to the interview results with the relevant subjects in order to re-examine the results of the transcripts and reduce the data by summarizing the core of the interview and discarding unnecessary data.

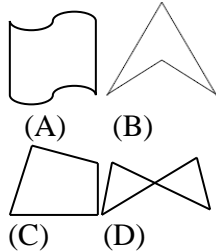
## RESULTS AND DISCUSSION

The data was analyzed from vignette-based interview results. Vignettes were given to 29 prospective teachers as many as two items each one item for CCK, and one item for KMH. Based on the results of vignette obtained MKT ability prospective teachers.

Table 3. Item Vignette MKT-C prospective teacher

Item vignette	Answers	Percentage
<p><b>CCK</b> In the study of quadrilateral materials, you as a junior high school math teacher teach about the elements of the quadrilateral. At the end of the lesson, you provide an assignment to measure the level of understanding of the students you teach about the characteristics of parallels, rectangles, dividedups, squares, trapezoids and kites based on rectangular elements</p> <p><b>Questions</b> According to the knowledge you have, write down the elements of the rectangle! According to your knowledge, write down the characteristics of parallelogram, rectangle, rhomus, square, trapezoid, kite!</p>	<p>Quadrilateral elements, namely: sides, diagonals, angles and corner points parallelogram features: The opposite angles are equally large; Each of the two sides facing is equally long; The two diagonals divide each other in length; A large number of adjacent angles <math>180^0</math>.</p> <p>The characteristics that parallelogram has are owned by rectangular. In addition, the rectangle also has a characteristic: The four corners are equally large and in the form of right angles; The diagonals of the rectangle are equal in length.</p> <p>The characteristics that parallelogram has are owned by a tight split. In addition, the tight split also has a feature: All sides of the split are equallylong; The diagonals of the halves are tightly intertwined; The diagonals of the close split divide in two equally large angles of the divided up</p> <p>The characteristics of the parallelogram, rectangular and divided are owned by squares</p> <p>Characteristics of the trapezoid: Each pair of adjacent angles between the two parallel sides of a trapezoid aligns with each other; The angle pair of the base of a trapezoid</p>	<p>high = 58.6% medium = 41.3% low = 0%</p>

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Item vignette	Answers	Percentage
<p><b>KMH</b>                      From the reference books can be found images of geometric builds asbelow.</p>  <p>(A) (B) (C) (D)</p> <p>Check each of the images above, which one belongs to the rectangle?                      Do you know convex quadrilateral?                      Do you know the concave quadrilateral?                      Explain the difference between a convex and a concave quadrilateral!</p>	<p>equals the same leg as large; The diagonals of the trapezoid are equally long legs.                      Features that kites have: Each pair of sides is equally long; A pair of opposite angles are equally large; One of the diagonals is the axis of symmetry; One of the diagonals of the kite divides the other diagonal into two equally long sections and the two diagonals are straight to each other.                      Convex quadrilateral is a simple closed curve consisting of four lines, if each takes two points on the curve then the entire segment of the line connecting it is located inside the curve.                      Concave quadrilateral is a simple closed curve consisting of four lines, if each takes two points on the curve then there is a section of the line located outside the curve.                      Differences:                      Convex quadrilateral, if each take two points on the rectangle then the entire segment of the line connecting it is located inside the rectangle while on the concave quadrilateral, if each take two points on the rectangle then there is a section of the line located outside the rectangle; Each angle of the convex rectangle is between 0 and 180° in size. While the concave quadrilateral has an angle greater than 180°.</p>	<p>high = 0%                      medium = 0%                      low = 0%</p>

From twenty nine prospective teachers are divided into three groups, namely (1) a group of prospective teachers with a high MKT level consisting of two people; a group of prospective teachers with a moderate MKT level consisting of twenty two people; a group of prospective teachers with a low MKT level consisting of five people. Based on the steps of subject selection, three subjects are determined, namely S8 with high MKT level, S10 with medium MKT level and S15 with low MKT level.

The results of data analysis of MKT ability of prospective teachers in identifying quadrilateral elements and defining quadrilateral can be summarized as follows. CCK prospective teachers on the characteristics of quadrilateral build. Square characteristics are more dominantly mastered by prospective teachers, complete (72.4%) incomplete (27.6%); the four sides are equal in length; the corners are right. Rectangular, complete features (65.5%) incomplete (34.5): two pairs of equally



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long and parallel sides; the corners are right. Features of the tight, complete (58.6%) incomplete (41.4%): all four sides are equal in length. Features of jajargenjang, complete (44.8%) incomplete 55.2%): has two pairs of parallel and equally long sides. Trapezoid features, complete (44.8%) incomplete (55.2%): has a pair of aligned sides. The characteristics of kites that are more difficult to master by prospective teachers than other rectangular builds are complete (41.4%) incomplete (58.6%): has two diagonals that are straight to each other. KMH prospective teachers on convex and concave quadrilateral. The definition of a dominant convex rectangle is controlled by teachers, economically (72.4%), uneconomic (27.6%).

### **MKT of High Skill Subject (HSS)**

The subject's response to the vignette (Appendix 1, aspect of CCK) indicates that HSS meets the CCK indicator. This is also supported by the results of interviews regarding the characteristics of quadrilaterals (transcript 1, line 2). HSS stated that of the quadrilaterals, the square is the most typical. Because there are many examples related to squares. Its character is also more complete, already fulfilling the character of all other figures: it has two pairs of parallel sides, all sides are the same length. Almost all the other quadrilateral characters belong to the same square. HSS was also able to reconstruct quadrilaterals, which can be shown from the interview results (Transcript 1, lines 4, 8, 10, 12, 14, 16, 18). A rectangle is a parallelogram, because a rectangle has the properties of a parallelogram, that is, it has two pairs of parallel sides and the same length. A square is a trapezoid, because a square is a trapezoid because it has a pair of

parallel sides. Actually I'm still unsure, whether the right one or not. But what I understand is that it has one pair of parallel sides, so if I usually tell students that this square can actually be a trapezoid because it has a pair of parallel sides. Even though there are two, we can choose only one parallel side as a trapezoid. A parallelogram is a trapezoid because it also has a pair of parallel sides. Not all parallelograms have right angles. Because a rectangle has all its angles equal and right angles. Meanwhile, parallelograms do not have to be right-angled. In a parallelogram, only two pairs of opposite angles are equal, not all of which are equal. Not all rectangles have all sides the same length as a square. A trapezoid does not have all sides the same length and not all angles have the same measure. A trapezoid doesn't always have two pairs of parallel sides.

In aspect of CCK, the subject writes down the rectangular elements of the sides, angles, and corner points. The subject conveys that in recognizing the types of rectangles, squares are the most distinctive geometric buildings. The characteristics and characteristics of the square are more complete than other rectangular builds. Subject knowledge of existing vignettes, squares are considered to have fulfilled the characteristics of all other rectangular builds e.g. have two pairs of parallel sides, all sides are equal in length and hamper all other rectangular characteristics are owned by squares.

The breadth of general knowledge used to teach the subject will affect his or her abilities. Subjects are selective on the characteristics that get attention i.e. parallel sides and equally long sides. The subject recognizes several types of rectangles in the vignette given from distinctive square features. The subject

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gives a square explanation is a rectangle that is the same length and width. But on the contrary belum of course, because not all rectangles have all the same long sides as those owned by squares. The subject also explains about the rectangle and jajargenjang i.e. the rectangle has the properties of parallelogram which has two pairs of parallel and equally long sides. According to the subject's knowledge, not all of them have a right angle. Because the rectangle has all the corners equally large and right. While parallelogram does not have to be elbow-to-elbow. Parallelogram are just two pairs of equally large opposite angles instead of all of them being equally large. The subject is less convinced by suggesting that the square is a trapezoid because it has a pair of parallel sides. Because the subject understands that trapezoids have one pair of parallel sides. Squares also according to him can be referred to as trapezoids because squares have a pair of parallel sides. Although there are two but we can choose just one side that is aligned as a trapezoid.

The subject's response to the vignette (Appendix 1, aspect of KMH) indicates that HSS meets the KMH indicator. It is also supported by the results of interviews mengenai quadrilateral convex and concave (Transkrip 2, line 2, 4). A convex quadrilateral is a quadrilateral whose four interior angles are less than 180 degrees. A concave quadrilateral is a quadrilateral in which one angle is more than 180 degrees.

Aspects of the content knowledge of advanced mathematical insights (KMH), high-skill subjects (HSS) know well the type of quadrilateral convex and quadrilateral concave that is quadrilateral convex is a rectangle

whose four inner corners (interior) are less than 180 degrees in size. While the concave rectangle is a quadrilateral that is one of the corners more than 180 degrees.

### **MKT of Intermediate Skill Subject (ISS)**

The subject's response to the vignette (Appendix 1, aspect of CCK) shows that ISS meets some CCK indicators. Hasil interview shows that ISS used the characteristics of the rectangle (transcript 3, line 2), but has not been entirely able to reconstruct the rectangle of its properties (Transkrip 3, lines 4, 6, 8, 10, 12, 14, 16, 18). All the characteristics of a quadrilateral are known. According to the ISS, a rectangle is not a parallelogram. If it is a rectangle, the four corners are right angles, while a parallelogram has four angles that are not right angled. Angles opposite each other in a parallelogram are equal. A square is not a rectangle because if it is a square the condition is that all four sides must be the same length. While the rectangle is not, there are only two pairs of the same length. A square is not a trapezoid, because according to the ISS the four sides of a square are the same length and the angles that have the same measure are the same. While the trapezoid is indeed a quadrilateral, there are only one pair of parallel sides and the other pair of non-parallel sides. A parallelogram is not a trapezoid because a parallelogram has two pairs of parallel sides. Meanwhile, a trapezoid only has a pair of parallel sides and a pair of non-parallel sides.

In the aspect of CCK in identifying quadrilateral characteristics, ISS is less complete in recognizing the characteristics of rectangles, among others, that rectangular instead of

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parallel. The rectangle is the fourth corner is right while the fourth corner is not right. The angles facing each other on the jajargenjang are equally large. A rectangle is not a rectangle because the condition square of the four sides must be the same length of all. While the rectangle is not, there are only two pairs of the same length. Rectangles are not a parallelogram. Because a parallelogram condition that the two pairs of sides facing each other has the same magnitude. While on the build of the rectangle the four corners should be the same 90 degrees. Parallelogram does not include trapezoids. Because the parallelogram two pairs of sides are parallel. While trapezoids only have a pair of sides that are parallelogram to each other and the other pair of sides are not aligned.

The subject's response to the vignette (Appendix 1, aspect of KMH) indicates that ISS does not meet the KMH indicator. It is also supported by the results of the interview obtained that ISS does not know the type of quadrilateral convex or quadrilateral concave (Transkrip 4, line 2, 4). ISS does not recognize convex and concave quadrilaterals.

This suggests that the breadth of general knowledge used to teach the subject is still lacking. The incomplete subject recognizes several types of rectangles on the vignette. Aspects of the KMH, intermediate skill subjects (ISS) do not know well the type of quadrilateral convex and quadrilateral concave.

### **MKT of Low Skill Subject (LSS)**

The subject's response to the vignette (Appendix 1, aspect of CCK) indicates that LSS meets some CCK indicators. The results of the interview showed that LSS recognizes the

characteristics of the rectangle (transcript 3, line 2), but has not been entirely able to reconstruct the rectangle of its properties (transcript 1, line 4, 6, 8, 10, 12, 14, 16, 18). Of all the quadrilaterals, the square is the shape with the best known characteristics, followed by rectangles, parallelograms, rhombuses, trapezoids and kites. Squares and rectangles are both similar, a parallelogram has 2 pairs of parallel sides. A rectangle also has two pairs of parallel sides. A trapezoid has only one pair of parallel sides.

In the aspect of CCK from low-skill subject explains that the easily recognizable type of rectangle is square. But others are also known for their features whether rectangle, parallelogram, trapezoid or kites. LSS misconceptions on some things namely rectangle it is not parallelogram. Both are similar, the parallels have two pairs of parallel sides, the rectangles are also the same have two pairs of parallel sides as well. A rectangle is not a rectangle. If the squares of the four sides are the same length, the four corners are the same. Squares are not trapeziums. If the trapezoid has only one pair of parallel sides. Whereas if the square has two pairs of parallel sides. Parallelogram can be said to be a trapezoid.

This suggests that the general knowledge for teaching that the subject has is still very limited. The subject has not been able to eliminate the prototype of the rectangular inter-building image. The knowledge of the subject is still on the figural concept and has not been able to reconstruct the quadrilateral concept. This is in line with that put forward (Ulger et al., 2017), teachers sometimes unable to eliminate these prototype images internalized in the learning lives of previous teachers.



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The subject's response to the vignette (Appendix 1, aspect of KMH) indicates that the LSS does not meet the KMH indicator. It is also supported by the results of the interview obtained that SKR does not know the type of quadrilateral convex or quadrilateral

concave (transcript 6, line 2, 4). LSS does not recognize convex and concave quadrilaterals.

Aspects of the KMH, intermediate-skill subjects (ISS) do not know well the type of quadrilateral convex and quadrilateral concaves.

Table 4. MKT differences from high-skill subjects, intermediate-skill subjects and low-skill subjects

<b>High-skill subjects (HSS)</b>	<b>Intermediate-skill subject (ISS)</b>	<b>Low-skill subjects (LSS)</b>
<b>CCK</b>		
HSS mentions the elements in the rectangle, by writing down the elements: side, angle, and corner point, diagonal	ISS mentions the elements in the rectangle by writing down the elements: sides, angles, diagonals	LSS mentions the elements in the rectangle by writing down the elements of the rectangle: side, angle, diagonal
HSS identifies the characteristics of parallelogram, rectangle, rhombus, square, trapezoid and kite	ISS identifies the characteristics of parallel, rectangle, rhombus, square, trapezoid and kite	LSS identifies the characteristics of parallelogram, rectangle, rhombus, square, trapezoid and kite
The knowledge that the subject has is able to reconstruct the concept from a quadrilateral	The knowledge that the subject has is able to reconstruct the concept from a quadrilateral	The knowledge that the subject has is only able to use figural concepts from a quadrilateral
<b>KMH</b>		
HSS recognizes quadrilateral convex	ISS does not recognize quadrilateral convex	LSS does not recognize quadrilateral convex
HSS recognizes concave rectangles	ISS does not recognize concave rectangles	LSS does not recognize quadrilateral concave
HSS describes the relationship of convex quadrilateral and concave quadrilateral. The subject has the knowledge that the convex quadrilateral is a quadrilateral whose four inner corners (interior) are less than 180 degrees in size. While the quadrilateral concave is a quadrilateral that one of the corners is more than 180 degrees.	ISS is unable to explain the relationship of convex quadrilateral and concave quadrilateral.	LSS is unable to explain the relationship of convex quadrilateral and concave quadrilateral

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CCK is a basic mathematical knowledge and general nature. This CCK is required to complete the tasks given to students. Mathematical knowledge is the purpose of learning to be mastered by students so that teachers who teach this mathematical knowledge need to master it. KMH is a knowledge of the content and relationships of each material in mathematical insights. While KMH knowledge is needed because prospective teachers are in desperate need of further mathematical knowledge of the materials taught. The KMH results in teachers having: (1) an understanding of the role of a topic in the broader scientific discipline, (2) intuitive application of concepts and (3) the resulting resources to recognize mathematical knowledge to teach.

The results of the HSS interview showed that of all the rectangular builds, squares are the most recognizable buildings. The results of the interview showed that the subjects of highly capable teachers were able to explain the convex rectangles and the concave quadrilateral well. It is, (Sahidin, 2019) categorized that HSS includes mature-conceptual. HSS is a great teacher candidate, other prospective teachers can learn a lot from HSS. [Susilawati \(2020\)](#) explained that a good teacher can certainly master the content and master the science of teaching (pedagogy). Furthermore, Ruslan et al. (2022) revealed that: the reality in the field shows that math teachers in general can be categorized into four groups, namely: (1) teachers with good content knowledge and pedagogical knowledge; (2) teachers with good content knowledge, but have less pedagogical knowledge; (3) teachers with less content knowledge, but have good pedagogical knowledge; and (4) teachers with less knowledge of

content and pedagogical knowledge. Ideally a teacher should belong to a group (1), but in reality many cannot yet be categorized into that group.

LSS and ISS in recognizing the characteristics of rectangle build is incomplete. ISS and LSS are unable to explain convex quadrilateral and concave quadrilateral. SKS and SKR are among the prospective teachers who still have to fight, it is not too late to find help in an effort to improve their knowledge. The results of this study raise concerns about the quality and skills of math teachers in the future. For example, based on result this research shows that teachers' understanding of the economic definition of a rectangle still needs serious attention: quadrilateral (65.5%), kite (79.3%), square (69%), rhombus (62.1%), rectangular (75.9%) and parallelogram (82.8). This makes the pedagogic situation complex. How will prospective teachers develop effective conceptual understanding for students if they are unable to master the definition of an economical rectangle? How would they classify between quadrilateral builds if they were unable to identify the properties between quadrilateral builds correctly?

The quality and expertise of a teacher refers to professionalism, which is why it takes a professional teacher to improve the quality of education. In the Government Regulation of the Republic of Indonesia No.74 of 2008 article 3 paragraph (2) has been applied four competencies that must be owned by teachers, namely professional competence, pedagogy competency, personality competency, and social competence. Furthermore, qualified teachers have always been a demand at various levels and types of educational institutions, both educational

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institutions and educational personnel and user institutions/schools.

To recognize and assess the development of MKT, especially quadrilateral material, a prospective teacher needs a rich conceptual understanding combined with expertise in using quadrilateral learning procedures, as well as strategies and approaches used in the classroom. This research has provided information on how MKT prospective teachers with quadrilateral content that they will teach if in the dating period become teachers. It is expected to educators and educational personnel in order to design and implement appropriate interventions that can be used to improve the MKT of prospective teachers, especially quadrilateral material.

#### CONCLUSION AND SUGGESTION

MKT's ability from high skill, intermediate and low skill prospective teachers categories about quadrilateral is unique. This is based on prospective teachers' ability to recognize the characteristics of quadrilaterals, definitions of quadrilaterals, and types of quadrilaterals. High-skill subjects fully understand the concept of quadrilaterals and classify the relationship between quadrilaterals buildings completely. The subject of ability is understanding the concept of quadrilaterals less fully, as well as how the relationship between quadrilaterals buildings. Low-skill subjects understand incomplete quadrilaterals concept. Based on the findings in this study shows that the knowledge of mathematics to teach prospective teachers to quadrilaterals material can develop. So the researchers recommend that low-skill teachers need to be equipped with quadrilaterals exploration

tasks in order to be able to understand the algorithms and concept of quadrilaterals completely, as well as explain the relationship between quadrilaterals concept.

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