

## Utilization of Android-Based ToSM (Test of Second Mathematics) Instrument for Mapping Intuitive Basic Calculation Competencies (IBCC) in Students

Ade Machnun Saputra<sup>1</sup>, Rini Sugiarti<sup>2</sup>

<sup>1,2</sup>Universitas Semarang, Indonesia

*ademachnun@gmail.com, riendoe@usm.ac.id*

### ABSTRACT

This research aims to find out the usefulness of an android-based ToSM (test of second mathematics) instrument for mapping the competency of intuitive basic calculation (CIBC) in students. ToSM (Test of Second Mathematics) is the standard instrument of Mathematics Seconds to measure IBCC (Intuitive Basic Calculation Competencies). ToSM only covers arithmetic operations (addition, subtraction, multiplication, and division), most essential. ToSM measures the number of operation counts per minute (OPM), time per operation category completion. The method used in writing review literature begins with the selection of topics. It then determines the keywords for the search for journals so that several journals are selected to be analyzed. Searches for the journal through google scholar are limited from 2015 to 2021. Meanwhile, the keyword used is "ToSM Seconds Mathematics." This research was conducted by reviewing journals or literature related to this study plus statistical data and scientific works related to ToSM, which the Center for The Development of Mathematics Seconds (CDMS) team updates. Mapping essential calculation competencies among students are no less critical because ToSM has other uses, namely as an instrument to train concentration and resilience in learning.

**Keywords:** ToSM; intuitive basic calculation competency

## INTRODUCTION

Minister of Education and Culture (Mendikbud) Nadiem Anwar Makarim said that the Programme for International Student Assessment (PISA) 2018 study released simultaneously on Tuesday, December 3, 2019, is a good perspective Indonesia. From a different perspective, Indonesia is invited to see how other countries know the education system in Indonesia and provide objective input on the improvements that need to be made in the future (Kemendikbud, 2019). The 2018 study assessed 600,000 15-year-olds from 79 countries every three years. This study compares each child's math, reading, and science performance skills. Reading ability category, Indonesia is ranked 6th out of the bottom-ranked 74. Indonesia's average score is 371. Indonesia is ranked 7th out of the base (73) for the math category, with an average score of 379. Then, for science performance, Indonesia is ranked 9th from the bottom (71), with an average score of 396. It is above Saudi Arabia, which has an average score of 386 (Tohir, 2019).

Based on the latest report, Indonesia's performance appears to be declining compared to the PISA 2015 report. The information can be seen from the three aspects assessed. Here's how it compares:

**Table 1**

PISA report 2015 – 2018

Year	Reading ability	Math skills	Science performance capabilities
PISA 2015	397	371	379
PISA 2018	371	379	396

For us to know, the indicators and methods used for the PISA 2015 and 2018 surveys are the same. What distinguishes, if in 2015 there are 70 countries surveyed, then in 2018 increased to 79 countries? How is the Ministry of Education's efforts to resolve a deep enough gap concerning the PISA results? Minister of Education and Culture Nadiem Makarim prepared five strategies to carry out holistic learning. PISA is an international assessment method that measures the competence of Indonesian students at the global level. "According to the President's Direction, the

development of Indonesia's superior human resources (HR) must be holistic. Not only literacy and numeration, but character education has the same level of importance" (Medcom. id, 2020).

Five strategies to improve Indonesia's PISA scores are as follows: 1. Transformation of school leadership, 2. Transformation of teacher education and training, 3. Teaching according to student ability level, 4. Global assessment standards, 5. Regional and civil society partnerships. In addition, it mobilizes tens of thousands of students from the best campuses to teach children throughout Indonesia as part of the Kampus Merdeka policy. These strategies are expected by Indonesian students to be lifelong students who have global competence and behave according to the values of Pancasila, namely noble character, independence, global diversity, mutual assistance, creativity, and critical reasoning (Medcom.id, 2020).

Through the Ministry of Education, the government has also made maximum efforts by forming a team to present the 2013 curriculum (Soekardjo & Sugiyanta, 2018), reporting that if the 2013 curriculum target is matched with PISA questions, then between the two is appropriate/supportive. Thus, if the design of Mathematics lessons in the 2013 Curriculum is following the type of PISA Maths problem, then with the average value of PISA Mathematics that has not been maximized, aspects that need to be considered not in the mathematics material, but rather the implementation of Mathematics learning in the field (school/home). The report also suggests that students need to be trained to have high resilience (not to give up quickly).

Nata mentioned in (Soekardjo & Sugiyanta, 2018) that in general, the quality of education is colored by four criteria, namely: 1) the initial quality of learners, 2) the use and selection of quality learning resources, 3) the learning process, and 4) the output of education. The quality of the learning process or the success of learning is a positive change. In this case, ToSM can be an instrument to know the initial quality of learners reviewed from the comprehension (skills) IBC (intuitive basic calculation).

Since its discovery and development in 2007, the ToSM of Mathematics Seconds seems to provide a spacey way to uncover basic skills in calculating basic operations where research conducted by CDMS (Center for The Development of Mathematics Seconds) in 2017 proves that grade 5 and 6 students are not able to calculate the basis of common patterns intuitively, this incompetence is caused by among the reasons for neglect and habit factors. Massive research of CDMS for five years (2014-2019) in Tegal, Lombok island, and Palembang revealed that stuttering count is an outbreak. About 90 percent of grade 5-6 elementary school students are shown not to master basic counting operations (*addition, subtraction, multiplication, division*) intuitively. The impact of math learning is just frustrating and destroys confidence. Math is intimidating and traumatizing early on. The findings have been presented at the Ministry of Education (April 2 and July 28, 2019) and the Ministry of Religious Affairs (May 2, 2019).

## METHODS

The method used in writing review literature begins with the selection of topics. It then determines the keywords for the search for journals so that several journals are selected to be analyzed. Searches for the journal through google scholar are limited from 2015 to 2021. Meanwhile, the keyword used is "ToSM Math Seconds". This research was conducted by reviewing journals or literature related to this study plus statistical data and scientific works related to ToSM, which is updated by the team (Center for Second Mathematics Research).

The table below will explain a summary of the various research and implementation of ToSM, which includes the title of the study, the year, and the conclusion of each study.

**Table 2**

List of Research Titles and Implementation of ToSM

Researchers	Research Titles
Intan Khairunisa (2017)	"EFFECTIVENESS OF RECREATIONAL MATHEMATICS SECONDS TO TOSM SCORE LEVEL A1 AND RESULTS OF LEARNING MATERIAL MULTIPLICATION AND

	DIVISION OF FRACTIONS OF GRADE V STUDENTS SD NEGERI KEPANDEAN 3"
Desi Dwi J, Eleonora Dwi W, Wikan Budi U (2018)	"EFFECTIVENESS OF RECREATIONAL METHODS OF MATHEMATICS SECONDS WITH A2 LEVEL TO THE LEVEL OF STUDENT LEARNING READINESS"
Ariela Estiana (2019)	"FOCUS TOSM APP AS ONE OF THE ANDROID-BASED SECONDS MATH INSTRUMENTS"
Mir'atin Nisa (2018)	EFFECTIVENESS OF RECREATIONAL MATHEMATICS SECONDS WITH TOSM (TEST OF SECOND MATHEMATICS) ON MATHEMATICAL CONNECTION ABILITY OF GRADE VII STUDENTS OF SOCIAL ARITHMETIC MATERIAL
Robby Hardian (2019)	DEVELOPMENT OF MOBILE EDU-GAME MATHEMATICS TO IMPROVE BASIC ARITHMETIC SKILLS OF ELEMENTARY SCHOOL STUDENTS IN GRADES 4 AND 5
Indriana Eko Armaidi (2020)	IMPLEMENTATION OF PROBLEM-BASED LEARNING ASSISTED BY RECREATIONAL MATHEMATICS SECONDS TO IMPROVE PROBLEM-SOLVING SKILLS
Ade Machnun Saputra, Tantri Ida Nursanti, Rini Sugiarti, Fendy Suhariadi (2021)	EFFECTIVENESS OF DIAGNOSIS AND HABITUATION OF TOSM A1 TO INTUITIVE BASIC CALCULATION COMPETENCY IN FINAL YEAR STUDENTS
Ade Machnun Saputra, Rini Sugiarti (2021)	CORRELATION ADVERSITY QUOTIENT WITH ACHIEVEMENT OF TOSM SCORE IN SMK STUDENT COUNCIL MANAGEMENT

**Table 3**

Scope and Results of research

Scope and Results of research
Research Subject: Grade V Elementary School Students
Research type: Quasi-experimental form nonequivalent control group design. The result: Effective ToSM module on improving A1 level TOSM score and grade V

---

student learning outcomes at SDN Kepandean 3 on mathematics learning multiplication material and fraction division (Khairunisa, 2017).

---

Research Subject: Grade XI MIA high school student al-Irsyad Tegal City. Research Type: Quantitative Experimental. The result: ToSM level A2 EFFECTIVE to improve the learning readiness of grade XI MIA students of SMA Al-Irsyad Tegal city on mathematics polynomial subject matter learning (Desi Dwi J, Eleonora Dwi W, 2018).

---

Research Subject: Smp Grade VII Negeri 1 Slawi. Research Type: RnD. Research results: level of focus or associated with short-term memory. Results are mixed. Some are a high focus, some are a medium focus, and some are the soft focus (Estiana & Mulwinda, 2019).

---

Research Subject: grade VII students of SMP Ma'arif NU Paguyangan. Type of research: experiment with a posttest research design- Only Control Design. Results of the study: The test results of the mathematical connection ability of experimental grade students are better than the average mathematical connection ability of the control class students (Nisa, 2018).

---

Research Subjects: Grade 4 and 5 elementary school students. Type of research: RnD. Results of Edu-game mobile design show that students feel more comfortable and relaxed when working on ToSM in Edu-game form. The adoption of ToSM into Edu-game provides entertainment aspects without abandoning the original purpose of Edu-game design, namely as a medium of learning basic arithmetic intuitively (Hardian, 2019).

---

Research Subjects: Grade V SDN Wangandawa 02 and SDN Cangkring 02 Tegal Regency. Type of research: mix method with sequential explanatory type. The math problem-solving skills of experimental graders are better than the control classes. There is an influence between the application of the pbl model of recreationally assisted mathematics seconds to the ability to solve student math problems with a significant result is 36.8%., and the model PBL influences the problem-solving

---

ability of mathematics students assisted recreational mathematics seconds (Armaidi, 2020).

---

Research Subject: final semester student. Type of research: quasi-experimental. Result: ToSM, A1 level method, is effective as an intuitive primary calculation diagnosis tool in this research subject with evidence that there are still students who do not have intuitive essential calculation competencies that are less than 30 OPM, as well as effective against the improvement of intuitive basic calculation competencies (Saputra et al., 2021).

---

Research Subject: student of vocational school. Research type: Quantitative correlational. Result: that there is no correlation between the variables studied, this finding can also be interpreted that to improve the competence of intuitive basic calculation (KHDI) is not enough just by relying on adversity intelligence and internal motivation alone need another effort that is exercise and habituation as early as possible (Saputra & Sugiarti, 2021).

---

## RESULTS AND DISCUSSION

### *Introduction of math seconds and ToSM math seconds*

The inventor of Mathematics Seconds, Ahmad Thoha Faz, explained in an interview (S.Mu'min, 2017) that Mathematics Seconds was born departing from two problems. The first is the assumption that it is spread in the general public that mathematics is complicated. We know that mathematics students have been given from elementary school even to college, but in fact, few can understand it, and fewer who manage to apply it in terms of daily thinking. The second problem is the assumption that mathematics is opposite to creativity. The mathematical premise is the left brain while the imagination of the right part of the brain.

The spirit and spirit carried out from Mathematics Seconds is to restore some nature of human thought activities, namely quick thinking. In research (Kahneman & Klein, 2009), The way humans think with their brains is two conditions: thinking fast and thinking slowly. Quick thinking is represented by intuition, while slow



thinking is operated by logic. Departing from this theory, Maths Seconds basic level takes the theme: "Hone intuition, manage the first two seconds" (Faz, 2019).

Seconds Mathematics is briefly defined by Hadi Susanto as Professor of Mathematics Khalifa University, the United Arab Emirates, is mathematics that activates intuition that occurs in seconds (Saputra et al., 2021). Math seconds after the primary level has four other levels: first, read the numbers as fast as you can read the word. The second level of the brain is not a calculator, the third level of thinking before the speech, the fourth level of motivator mindset. From the first level, the ToSM (test of second mathematics) instrument was born as operational detail on how to hone the ability to read numbers as quickly as reading words.

**Table 4**  
**Math Seconds**

Math Seconds			
Level A	Level B	Level C	Level D
Reading Numbers	Brain Not	Thinking	Innovator
As Fast as Reading	Calculator	Before You	Mindset
Words.		Talk	
Instruments :			
ToSM A1, A2, A3			
& HINT			

### ***ToSM (Test of Second Mathematics)***

ToSM (Test of Second Mathematics) is the standard instrument of Mathematics Seconds to train spontaneous basic numeracy and identification and stuttering therapy calculations. ToSM, along with HINT (Intuitive Calculation), is part of The A-Level Second Math (Reading Numbers As Fast as Reading Words). ToSM on Android is a digital version of ToSM that can be run on android-based devices (smartphones). Via ToSM on Android (Aswin, 2020), we test result data, then we collect and present the results through this site. Hopefully, with ToSM on Android, it can be easy to map the speed of counting primary users from all regions



in Indonesia, especially students in elementary and secondary schools (Tim PPMD, 2021).

The problem in the ToSM test is a series of numbers arranged vertically without symbols (+, -, x, :). In addition, the answers are written in full according to the correct answer. For example, in ToSM, 7 + 6 answers are written as is, i.e., 13. ToSM material does not involve complicated calculations because not all mathematical counting operations can be used as intuitive knowledge. Just like TOEFL, ToSM focus leads to achieving a minimum score. If the minimum ToSM score of 30 OPM is exceeded, it is complete. In ToSM, the amount of calculated speed using OPM units stands for operation per minute (Hardian, 2019).

**Table 5**

Conventional ToSM Sheet

**Lembar Diagnosis (+) #1**

• Nama :	(+)	Operasi _____, Tanggal: __/__/__
----------	-----	----------------------------------

A	B	C	D	E	F	G	H	I	J	K	L	M
6	7	3	4	7	2	6	2	3	8	5	2	5
1	7	9	6	4	3	8	5	7	6	9	6	7
9	6	2	6	9	3	3	8	5	5	7	7	8
5	8	7	7	5	5	7	6	5	7	5	5	3
4	6	5	9	7	1	4	7	6	5	6	9	9
7	7	3	5	5	4	5	6	3	7	5	2	1

The ability to operate the basic calculation is the requirement of all elementary, middle, and upper students. The assessment results of Indonesian

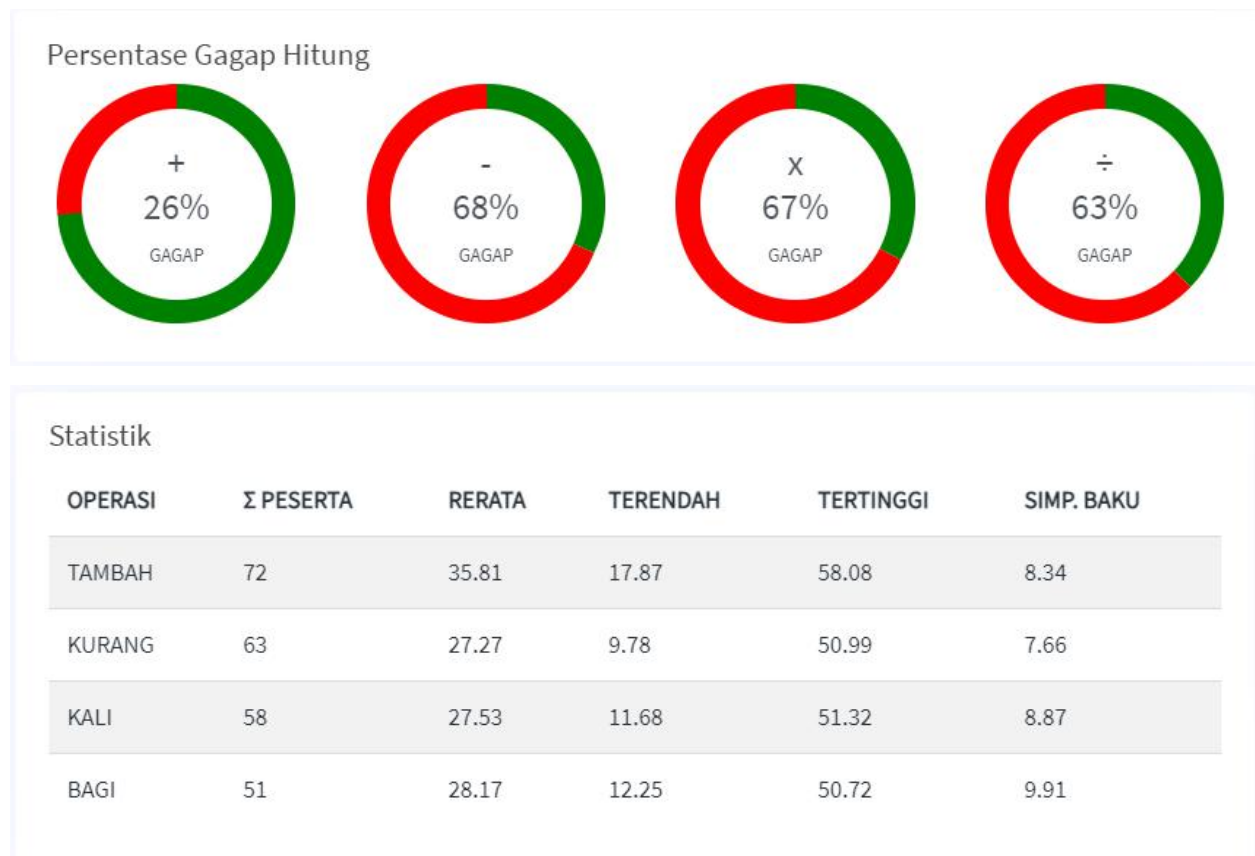
students from PISA programs in the field of numeration, in particular, have a positive relationship with the findings of research related to essential calculation competencies, low PISA results in line with the low ToSM score. To improve ToSM score, habit and speed therapy that has been carefully designed by the CDMS team is effective to improve some aspects of numeration as shown by research that has been done (Khairunisa, 2017) EFFECTIVE ToSM Module on increasing TOSM level A1 score and learning outcomes of grade V students of SDN Kepandean 3 on mathematics learning multiplication material and fraction division. Similarly, creativity(Armaidi, 2020) examines elementary school students' ability to solve math problems where the capacity can be improved after being influenced by the PBL model assisted by the ToSM module. So that elementary school students are not saturated with basic calculation practice (Hardian, 2019), develop a mathematical Edu-game model designed with the principles of The ToSM module where the results of the study are the design of mobile Edu-game shows that students feel more comfortable and relaxed when working on ToSM in the form of Edu-game. The adoption of ToSM into Edu-game provides entertainment aspects without abandoning the original purpose of Edu-game design, namely as a medium of learning basic arithmetic intuitively.

What about junior high school students, the finding (Nisa, 2018) is that the test results of the mathematical connection ability of experimental class students are better than the average mathematical connection ability of control class students where practical classes are introduced to ToSM modules to improve mathematical connection skills. ToSM also used to increase learning concentration by (Ariela Estiana, 2019) tried to design a product with the research subject of junior high school students "Focus Tosm Application As One of The Android-Based Seconds Math Instruments" results in diverse student focus levels associated with short-term memory. Some are a high focus, some are a medium focus, and some are the soft focus. ToSM can also improve the learning readiness of high school students (Desi Dwi J, Eleonora Dwi W, 2018) where ToSM level A2 EFFECTIVE improves the learning readiness of grade XI MIA students of SMA Al-Irsyad Tegal city on the learning of mathematics polynomial subject matter.

Based on six scientific papers that use ToSM as research materials, no one has taken the subject from among students. This condition can be understood because basic counting competencies are no longer the primary material on campus, basic counting skills should be completed when students graduate from elementary school despite the reality according to CDMS team research is still many among students who are not capable of performing subtraction, multiplication, and division as shown in the table below a study at one of the universities in Central Java. (Tim PPMD, 2021)

**Table 6**

Mapping Results among students one of the universities in Central Java



From the average mapping results above, we can see many incompetent students in intuitive basic calculations, significantly fewer operations, times, and the percentage of incapable students reaching more than 50%. More detailed in the descriptive statistical data of the three processes, on average, has not reached 30

OPM. This result can indicate that the learning period of students from elementary education to college cannot guarantee to improve the competence of intuitive basic calculations. There needs to be a systematic effort to measure and map these competencies and a means of therapy to enhance the competency of intuitive basic calculations. The ToSM module has a great chance of becoming one of the alternatives.

According to the CDMS team explanation from the interview, the researchers conducted that mapping the competency of intuitive basic calculation among students is easier when compared to students, especially elementary and secondary students, because of their maturity and psychological maturity so that they can follow the training and instruction independently.

### CONCLUSIONS

From the explanation and exposure above, the researchers concluded that the Study of ToSM to improve the competence of intuitive basic calculations had been limited to students in elementary, middle, and upper schools because of its strong relevance if applied among students. In contrast, although significant, its significance in daily learning on campus is much reduced. However, mapping the basic calculation competency among students is no less essential, considering ToSM has other uses, namely as an instrument to train concentration and resilience in learning (Faz, 2020)

### ACKNOWLEDGMENTS

All praise to Allah Almighty who has given researchers the ability to continue master's school, not forgetting the researchers thanked the father of mother, wife, and children - my beloved for all his understanding and support.

In terms of the spirit of writing and learning, researchers want to thank Prof. Fendy Suhariadi and Dr. Rini Sugiarti, what you do for education in Indonesia has inspired me. Not forget I thank Dr. Jumintono, who always encourages me to work. So my friend in the master of psychology college Semarang University, you guys are amazing. The beloved teachers at PPMI Assalaam Surakarta have guided the researcher tirelessly. May Allah Almighty reward the good, Amen.

## REFERENCES

- Armaidi, I. E. (2020). *Implementasi problem based learning berbantuan rekreasi Matematika Detik untuk meningkatkan kemampuan pemecahan masalah*. Universitas Negeri Semarang.
- Aswin. (2020). ToSM Android. [https://play.google.com/store/apps/details?id=com.matematikadetik.tosm&hl=en\\_US&gl=US](https://play.google.com/store/apps/details?id=com.matematikadetik.tosm&hl=en_US&gl=US).
- Estiana, A. (2019). *Aplikasi focus ToSM sebagai salah satu instrumen Matematika Detik berbasis android*. Universitas Negeri Semarang.
- Estiana, A., & Mulwinda, A. (2019). Aplikasi Focus ToSM sebagai salah satu instrumen Matematika Detik berbasis android. *Teknologi dan Kejuruan: Jurnal Teknologi, Kejuruan, dan Pengajarannya*, Vol. 42, Issue 2. <http://dx.doi.org/10.17977/um031v42i22019p107-112>.
- Faz, A. T. (2019). *Matematika Detik, inspirasi, fondasi dan garis besar* (2<sup>nd</sup> ed). PT. Aksarra Sinergi Media.
- Faz, A. T. (2020). *Modul instruktur ToSM (Test of second Mathematics)*. AKDI Ibadurrahman.
- Hardian, R. (2019). Pengembangan mobile edugame Matematika untuk meningkatkan kemampuan aritmatika dasar siswa SD kelas 4 dan 5. *Jurnal Bahasa Rupa*, 2(2), 98–108. <https://doi.org/10.31598/bahasarupa.v2i2.311>.
- Jayanti, D.D., Dwi, E., & Budi, W. (2018). Efektivitas metode rekreasi Matematika Detik dengan level A2 terhadap tingkat kesiapan belajar siswa. *Jurnal Dialektika Program Studi Pendidikan Matematika*, 5(2), 35–50. <https://journal.peradaban.ac.id/index.php/jdpmat/article/view/338/271>.
- Kahneman, D., & Klein, G. (2009). Conditions for intuitive expertise: A failure to disagree. *American Psychologist*, 64(6), 515–526. <https://doi.org/10.1037/a0016755>.
- Kemendikbud. (2019). *Kementerian Pendidikan dan Kebudayaan Republik Indonesia*. <https://www.kemdikbud.go.id/main/blog/2019/12/hasil-pisa-indonesia-2018-akses-makin-meluas-saatnya-tingkatkan-kualitas>.

- Khairunisa, I. (2017). *Keefektifan rekreasi Matematika Detik terhadap skor ToSM level A1 dan hasil belajar materi perkalian dan pembagian pecahan siswa kelas V SD Negeri Kepandean 3* (Thesis document). <http://lib.unnes.ac.id/31235/>
- Medcom.id. (2020). *Lima strategi Nadiem dongkrak skor PISA*. <https://www.medcom.id/pendidikan/news-pendidikan/5b2XqevK-lima-strategi-nadiem-dongkrak-skor-pisa>.
- Nisa, M. (2018). *Keefektifan rekreasi Matematika Detik dengan ToSM (test of second Mathematics) terhadap kemampuan koneksi Matematis siswa kelas VII materi aritmetika sosial*. Universitas Peradaban.
- S.Mu'min. (2017). *Baca angka secepat baca kata melalui Matematika Detik*. <http://wartabahari.com/3270/baca-angka-secepat-baca-kata-melalui-matematika-detik/>
- Saputra, A. M., Nursanti, T. I., Sugiarti, R., & Suhariadi, F. (2021). Efektivitas diagnosis dan habituasi ToSM A1 terhadap kompetensi hitung dasar intuitif pada mahasiswa tingkat akhir. *Philanthropy Journal of Psychology*, 5, 190–205. <https://doi.org/http://dx.doi.org/10.26623/philanthropy.v5i1.3010>
- Saputra, A. M., & Sugiarti, R. (2021). *Korelasi adversity quotient dengan prestasi nilai*. Universitas Semarang
- Soekardjo, M., & Sugiyanta, L. (2018). Analisis strategi pembelajaran Matematika kurikulum 2013 dalam rangka meningkatkan nilai PISA Matematika. *JKKP (Jurnal Kesejahteraan Keluarga Dan Pendidikan)*, 5(1), 42–64. <https://doi.org/10.21009/jkkp.051.05>
- Tim PPMD. (2021). *Overview, Statistik ToSM - Matematika Detik*. <https://tosm.matematikadetik.com/app/overview>
- Tohir, M. (2019). *Hasil PISA Indonesia tahun 2018 turun dibanding tahun 2015*. <https://doi.org/10.17605/OSF.IO/8Q9VY>.