

Jurnal SERAMBI ILMU



Journal of Scientific Information and Educational Creativity

VOLUME 23

NOMOR 1

EDISI MARET 2022

Contents

- Socio-Economic Impact Of Integrated Pest Management Field School Implementation On Coffee Farmers In Panditan Village
Muqtafiah, Luchman Hakim, Aminudin Afandhi 1-11
- The Correlation Between Students' Formal Thinking Skills And The Capability To Solve Chemistry Olympiad Problems
Said Ali Akbar, Muhammad Hasan, Syahril 12-23
- Duties and Functions of the Bone Resort Police in Overcoming Narcotics Abuse as a Rescue Effort Bone's Young Generation
Mukhawwas Rasyid, Faisal, Sutri Helfianti, Muhammad Ridhwan, Gunawan, T. Makmur 24-35
- High Order Thinking Skills (HOTS) Of Ibtidaiyah Madrasah Teacher Education Program (PGMI) Study Program Students During **The Covid-19 Pandemic**
Siti Sarah 36-47
- Effects Of Youtube Tutorial On Mental Computation Competency Of Pre-Service Teachers
Zulkifli, Yuhasriati, Nida Jarmita, Zaid Zainal, Jasmaniah, Samsul Bahri 48-58
- Analisis Penggunaan Bentuk Deiksis Dalam Novel Api Tauhid Karya Habiburrahman El Shirazy
Emilda, Masithah Mahsa, Siti Husnul Khairani 59-77
- Model Concept Attainment To Enriching Students' Vocabulary Mastery By Using Integrated Reading Book As A Learning Media During The Covid-19 Pandemic
Wawat Srinawati, Meita Lesmiaty Khasyar 78-89
- Improving Mathematical Reasoning Ability Students Through Strategy Learning Genius
Rifaatul Mahmuzah, Muhamad Saleh, Rahmawati, Kairul Asri, Nur Ainun, 90-99
- Penetapan Kadar Pengawet Natrium Benzoat pada Mayonaise Kemasan Secara Spektrofotometri UV-Vis sebagai Upaya Peningkatan Pengalaman Praktek Mahasiswa Mata Kuliah Kimia Dasar
Lidyawati, Muhammad Nazar, Fadli Syahputra 100-112
- Hubungan Antara Kepemimpinan Transformasional Kepala Sekolah Dengan Kinerja Guru
Anwar, Yenni Agustina, Ahmad Yani 113-130

Diterbitkan Oleh
FKIP Universitas Serambi Mekkah Banda Aceh

Jurnal
Serambi Ilmu

Volume 23

Nomor 1

Hal.
1 - 130

Banda Aceh
Maret 2022



Effects Of Youtube Tutorial On Mental Computation Competency Of Pre-Service Teachers

Zulkifli¹, Yuhasriati², Nida Jarmita³, Zaid Zainal⁴, Jasmaniah⁵, Samsul Bahri⁶

¹Zulkifli is a Lecturer at Universitas Islam Negeri Ar-Raniry Banda Aceh, Indonesia
Email: zulkifli@ar-raniry.ac.id

²Yuhasriati is a Lecturer at Universitas Syiah Kuala, Banda Aceh, Indonesia
Email: yuhasriati@unyiah.ac.id

³Nida Jarmita is a Lecturer at Universitas Islam Negeri Ar-Raniry Banda Aceh,
Indonesia
Email: nida.jarmita@ar-raniry.ac.id

⁴Zaid Zainal is a Lecturer at Universitas Negeri Makassar, Makassar, Indonesia
Email: zaid.zainal@gmail.com

⁵Jasmaniah is a Lecturer at Universitas Almuslim, Bireuen, Aceh, Indonesia
Email: jasmaniah64@gmail.com

⁶Samsul Bahri is a Lecturer at Institut Agama Islam Negeri Lhokseumawe, Indonesia
Email: email : sison.bahri@gmail.com

Abstract

This study aims at investigating the effect of youtube tutorials on mental computation competency among pre-service teachers. Mental computation might be viewed as a relatively new term among students and teachers. Therefore, introducing it to them need various methods and approaches. This study provided extra online material posted on youtube as a learning resource for pre-service teachers. The method used in this study was pre-experimental research with the type of one-group pretest-posttest design. The population of this study was Indonesian pre-service teachers and the sample was chosen by the technique of purposive sampling. The sample was from four universities in Indonesian, three public universities and one private university. The data were collected and analyzed both quantitatively and qualitatively. The quantitative approaches used in this study were the wilcoxon test and N-gain value. The result of the study showed that youtube tutorials have a significant impact on the improvement of pre-service teachers' competency of mental computation.

Keywords: youtube tutorial, mental computation, pre-service teacher

Introduction

World Economic Forum (2016) decided that numeracy (mental computation is a small part of numeracy) is one of 16 skills students need to have to be able to succeed in the 21st century. Numeracy is classified as one of the six foundational literacy. Numeracy has some components viewed from a content viewpoint. They are number sense, pattern, function and algebra; measurement and shapes geometry, data, statistics, and probability (Ginsburg, Manly, and Schmitt, 2006). As an integral part of number

sense, mental computation is an important indicator that a student or teacher has a robust number sense or not.

Unfortunately, consistent research reports that the proficiency of number sense in general and of mental computation in particular is still at a low level for both pre-service and in-service teachers worldwide (Şengül, 2013; Yang, 2009; Kaminski, 2002).

Mental computation can be defined as the ability to perform arithmetic operations in mind without relying on external tools like paper and pencil (Varol and Farran, 2007). Students with good mental computation can be easily spotted what strategies they will use when they are asked to perform a calculation.

Even though the story has happened a long time ago in a mathematics class in Australia, let us see a real story of what mental computation is. It was about how a student felt so fearful of his teacher when he worked on a problem $37 + 25$ and got the answer 62 by the way of mental computation and did not follow the procedures taught by his teacher. He worried so much if his teacher would not give him a mark if his teacher knew how he got the answer (McIntosh, Reys, and Reys 2005). It can be seen that the student fear in this context is triggered by the low level of teachers' number sense competency. The story of illustration has happened long time ago, but the same phenomena of teachers' number sense competency are always appeared in many countries around the world (Sengul, 2013; Lin 2010; Yang, 2007). In another viewpoint, number sense is vital to mathematics development (Yang, 2005; Ghazali et al. 2010). A good teachers' understanding of mental computation must be ensured to expect students to perform it well.

Moyo & Samson (2014) provided the most commonly used mental computation strategies for all four arithmetic operations. They are counting on and counting back, partitioning one number into tens and units, partitioning into tens and units, adding and subtracting stages, near doubles, bridging to 10 and compensating, conveniently adjusting both numbers, grouping compatible numbers, multiplication in stages, halving and doubling, doubling, mental image of pen-and-paper algorithm.

As in this paper we only discuss the multiplication only, not all strategies above are suitable for mental computation of multiplication. Some of the strategies above that are suitable are bridging to 10 and compensating, grouping compatible numbers, multiplication in stages, halving and doubling, mental image of pen-and-paper algorithm.

Bridging to ten means making the multiplication with 10 for the purpose of easy computing and then it should be adjusted to compensate the bridging. To calculate 8×15 , it can be easily performed by multiplying 10×15 which gives result 150, and then subtracting two multiples of 15 (30) to get 120. Calculating 75×11 can be solved easily by multiplying 75×10 which gives us 750 and then adding one multiple of 75 to the product 825.

Grouping compatible numbers mean arranging two numbers which makes calculating easier and simpler. The compute $8 \times 23 \times 125$ we can easily rearrange (regroup) the numbers order so that the calculation can be executed by heart. As the arithmetic associative law applies to the multiplication, the form of the multiplication will be $(8 \times 125) \times 23 = 1000 \times 23 = 23000$.

Multiplication in stages may commonly be used for multiplication which have the possibility of doubling. 4×17 can be considered as $2 \times 2 \times 17$. The stages that could be followed is $2 \times (2 \times 17) = 2 \times 34 = 68$. This means that doubling 17 to get 34, and doubling 34 to get 68.

Halving and doubling is a mental strategy where one number in a multiplication is doubled and the other is halved for the purpose of transforming a more demanding problem to a less demanding one. The problem likes 5×34 can be doubled and halved to be 10×68 . The problem 10×68 looks like an effortless problem to solve where the result is 680.

The strategy of mental image of pen-and-paper algorithm means that one calculate a multiplication by mentally putting a paper and pencil and then follow the standard algorithm like visualizing the two number being calculated written one below another then the prescribed rules followed one by one until the final result obtained. The calculation likes 24×36 will figure out in the mind with a paper written as

$$\begin{array}{r} 24 \times 36 \\ \hline 144 \\ 72 \\ \hline 864 \end{array} +$$

Numerous research reports showed that youtube tutorials have shown significant positive impacts as well as competency improvement in various subject (Insorio & Macandong, 2022; Iftikar et al., 2019; Sari et al. 2020 ; Styati 2016). This study aims at investigating as well as trying to improve a small part of number sense, mental and flexible computation, to a better level of competency. The process of improving of pre-service teachers' competency is performed by encouraging pre-service teachers to explore the prepared materials and the evaluating its effectiveness before and after the exploration of youtube tutorials.

METHODS

This study is conducted by using both quantitative and qualitative approaches. The quantitative approach we use in this study is pre-experimental design (one-group pretest-posttest design). The participants were given both pretest and posttest to assess the competency of mental computation they have. The qualitative data were obtained by arranging in-depth interviews on initial test and also on the their viewpoint of youtube tutorial related to this study.

Participants

Participants of this study are 106 pre-services teachers from four universities in Indonesia. They are Universitas Islam Negeri Ar-raniry (Aceh Province), Universitas Negeri Makassar (Sulawesi Selatan Province), Universitas Almuslim (Aceh Province), and Universitas Syiah Kuala (Aceh Province). Among the four universities, only Universitas Islam Negeri Ar-raniry which is managed by the Indonesian Ministry of

Religious Affairs, while the other three are managed by the Indonesian Ministry of Education and Culture. Three of them are public universities and one of them is private university (Universitas Almuslim). Universitas Almuslim is one of the top ranks of private universities in Aceh.

The participants come from different characteristics based on the university status and department. The participants from universitas Islam Negeri Ar-raniry are prepared to teach at Islamic primary schools as classroom teachers. Participants from Univesitas Negeri Makassar and Universitas Almuslim are prepared to teach at primary schools as classroom teachers. Lastly, the participants from Universitas Syiah Kuala are prepared to teach at secondary schools as mathematics teachers.

Instruments

The instruments used in this study include paper-based tests and interviews guideline. The paper-based tests contain items that are related to simple multiplications of two-digit numbers ranging from zero to hundred. Before the pre-service teachers encouraged to study and understand the prepared youtube-tutorials, they are asked to sit for pre-tests to see their capability on computing mentally and reasoning appropriately.

The instrument contains simple multiplications in one hand (the items prepared for this test were equivalent to the items of multiplication for the fourth grade of primary school), but on the other hand it is difficult for majority participants due to the new way for them to write the answers. The difficulty lies on the novelty ways expected from the participants to answer the problems.

Youtube tutorials

The materials intended for the participants of this study were posting on youtube channel *Hitung Bermakna*. The participants were advised to learn the material relating to the flexibly multiplications (they are given all the links of the related flexible multiplication materials). The materials are the basic definition of multiplication, the addition/subtraction-multiplication relationships, multiplication-division relationships, fraction-multiplication relationships.

The basic definition of multiplication explains what a multiplication expression means. In this tutorial referred to the basic concept of multiplication as a repeated addition. The multiplication 4×6 and 6×4 is the same in term of the product, both 4×6 and 6×4 have the same product 24. They will be different when each of them is interpreted in the basic meaning of multiplication. The 4×6 means 4 times 6 ($6 + 6 + 6 + 6$) whereas 6×4 means 6 times 4 ($4 + 4 + 4 + 4 + 4 + 4$).

Understanding addition/subtraction-multiplication relationship will be very helpful to multiply an expression involved bigger numbers like 99×84 or 110×75 . The multiplication 99×84 can be considered as $8400 - 84 = 8316$. This simple way is obtained by transforming 99×84 into $(100 \times 84) - (1 \times 84)$ because 99 times 84 means 100 times 84 minus 1 times 84. We can also multiply easily 110×75 by changing the expression into $(100 \times 75) + (10 \times 75)$ and will give us $7500 + 750 = 8250$.

Multiplication and division have a strong relationship and understanding this relationship will give us much benefit in performing computation intuitively and flexibly. The multiplication 15×160 and 44×21 are two multiplication expressions

that can be solved easily when we apply multiplication-division relationship. The multiplication 15×160 can be answered easily by multiplying the multiplier by 4 and by dividing the multiplicand by 4. Therefore, expression 15×160 will become 60×40 which give us the same product 240. The activity of multiplying the multiplier of a multiplication by a number and dividing its multiplicand by the same number will not change the product. The case is also the same for the expression 44×21 that can be changed into another expression that will give the same product. One of the possibility is by multiplying the multiplier by 4 and dividing the multiplicand by 4. The expression 44×21 will become 11×84 . the multiplication by 11 is the lightning-speed multiplication, it can be done just by adding its ones and tens. Therefore the product of 44×21 is the same as $11 \times 84 = 934$.

Even though it is still rarely exposed, exploring the relationship between multiplications and special fractions will open many other flexible ways in answering multiplication problems. The special fraction we mean here such as $\frac{1}{4}$, $\frac{1}{2}$, and $\frac{3}{4}$. The multiplication likes 25×62 and 50×35 can be connected to usefulness of the fraction above to multiply easily. The multiplication 25×62 can be seen as $\frac{1}{4}$ (100×62) because 25 is $\frac{1}{4}$ of 100. Without using paper and pencil or calculator, getting the product of 25×62 can be done easily by taking $\frac{1}{4}$ from 6.200. This means that $\frac{1}{2}$ of 6200 is 3.100 and $\frac{1}{4}$ of 6.200 is $\frac{1}{2}$ of ($\frac{1}{2}$ of 6.200) or $\frac{1}{2}$ of 3200 which is equal to 1.550. Therefore 25×62 is equal to $\frac{1}{4}$ (6.200) or 1.550.

By using the help of fraction we discussed above, 50×35 can be translated into into $(\frac{1}{2} \times 100) \times 35$. According to the associative rule of multiplication, it can be written as $\frac{1}{2} \times (100 \times 35)$ or $\frac{1}{2} \times (3.500)$ so that 50×35 is equal to $\frac{1}{2} \times (3.500)$ or 1.750.

Data collection processes

The processes of data collection in this study from the beginning to the end can be written as follow: Pre-test and scoring, interviews on the pre-test result, studying youtube tutorials (seven to eight weeks), Post-test and scoring, interview on the youtube tutorials.

Before the youtube-tutorial materials of multiplication flexibility were introduced to pre-service teachers, they were given a set of 20-item test to answer based on the flexible approaches (mentally calculated). They were explicitly instructed not to calculate the multiplication of two-digit number by applying the common algorithms (standard procedures) or using calculators or any other computing machines.

After completing the test, some of them are selected to participate in a small interview based on the answer they gave on their answer sheets. The selected participants are considered based on their performance on the written test. Three categories of them are chosen, i.e. the high, middle, and low achiever, but these categories are not informed to the participants to avoid the lower achiever from their negative thought of their capability.

The next process is to encourage the pre-service teachers to study the prepared youtube-tutorial materials on youtube channel of *Hitung Bermakna*. They were advised that they might study alone, with friend (cooperative learning) or in the whole-class discussion guided by lecturers. The post-test is then held after seven to eight weeks of exploring the materials available online on youtube channel. The post-test items were the same as those in the pre-test.

Data Analysis

The collected data in this study were analyzed both quantitatively and qualitatively. The quantitative analysis is intended to see the significant difference of the youtube tutorials by comparing the result of pre-test and post-test. The scores of pretest and posttest were given according the answered given by the participants. The scores for each item are 0, 1, and 2. Score 0 will be given to unanswered item, 1 for the answered item performed in a standarad procedural ways without any reasons and 2 is given for the item that is answered flexibly and intuitively in mental computation perspectives.

Wilcoxon is used to test the difference between pre-test and post-test and N-Gain value is found to see the level (category) of difference.

In addition, the qualitative one is intended to explore deeply the participants' understanding of multiplication concepts and participants' viewpoint of the materials on the youtube channel.

Research Results and Discussion

All the quantitative data collected in this study are then analyzed and simplified for the purpose of easy interpretation. The holistic quantitative results of this study can be seen in the table 1 below.

Table 1
Descriptive statistics of pretest and posttest result

	N	Mean	SD	Min	Max
Pretest	106	57.02	18.26	15	100
Posttest	106	87.03	13.38	60	100

Source: scores summary obtained from pretest and posttest

The table 1 above shows that the mean of the pretest and posttest scores respectively are 57.02 and 87.03 with standard deviation 18.26 and 13.38, the minimum are 15 and 60, and the maximum is 100 for both pretest and posttest.

For the purpose of further analysis, it needs to know the data distribution properties. The summary of normality test can be seen in the table 2.

Table 2
Statistical analysis for normality test

	Kolmogorov-Smirnov ^a			Shapiro-Wilk		
	Statistic	Df	Sig.	Statistic	df	Sig.
Pretest	0.243	106	<0.001	0.863	106	<0.001
Posttest	0.192	106	<0.001	0.847	106	<0.001

a. Lilliefors Significance Correction

Based on the table 2 above, the data distribution of the pretest and posttest results are not normally distributed (the significant values are less than 0.05 for both pretest and posttest). The consequence of the non-normally distributed data is the inability to use the parametric test in finding the significance difference of pretest and post test. Therefore the non-parametric test (wilcoxon test) should be used to determine the difference between pretest and posttest of a single sample.

Table 3
Wilcoxon signed ranks test

Ranks				
		N	Mean Rank	Sum of Ranks
Posttest - Pretest	Negative ranks	0 ^a	0.00	0.00
	Positive ranks	98 ^b	49.50	4851.00
	Ties	8 ^c		
	Total	106		

a. Posttest < Pretest, b. Posttest > Pretest, c. Posttest = Pretest

Table 4
Statistical result of wilcoxon non-parametric test

	Posttest – Pretest
Z	-8.602
Asymp. Sig. (2-tailed)	<0.001

Table 4 shows that the significant value of wilcoxon test is 0.001 which is less than 0.05 and this means that the pretest and posttest results are significantly difference. In other words, it can be said that youtube tutorials have a significant impact on the pre-service teachers' mental computation competencies.

To see the improvement the pre-service teachers' mental calculation make, the scores gained by the participants both from pretest and posttest are analyzed and compared. The pretest and posttest are used to get N-gain scores. Based on the average (mean) scores of pretest and posttest as shown in Table 1, the obtained gain and N-gain score respectively are 30.01 and 0.71 (see table 6)

Table 5
N-Gain score categories

Gain score	Category
$g > 0.7$	High
$0.3 \leq g \leq 0.7$	Medium
$g < 0.3$	Low

Source: Hake (1999)

Based on the table 5 that shows the N-gain categories and table 6 shows about the summary of N-gain, the impact of the youtube tutorial on the pre-service teacher is at high category (see Table 5). This means that the pre-service teachers benefit much of youtube tutorials for the purpose of the improvement of their competency.

Table 6
N-Gain Interpretation

Pretest	Posttest	Gain	N-Gain	Interpretation
57.02	87.03	30.01	0.71	high

This high impact of youtube tutorials on the performance of the preservice teachers can be described as the materials of mental computation is basically not so difficult if they were introduced gradually and meaningfully, but what the preservice teachers found was that they never experienced before the way they are asked to answer the mental computation. All they know is the standard procedure that is usually known as algorithm. Therefore, asking new ways they never experienced before to find answers of computation may make them surprised and confused (Yang, 2007; Yang et al., 2009).

The findings in this study corroborate the findings of many previous studies that using youtube tutorials may increase the user's understanding of the materials studied (Ruqoyyah, Arga, and Wulandari 2021 ;Insorio, 2022;). In some cases, students are more reliant on youtube tutorials rather than books or any other written materials in seeking help to find the solution of mathematical problems (Aguilar and Puga 2020 ; Esparza Puga and Aguilar 2021)

Interview Results

Based the result of the pre-test conducted in the universities and institutions mentioned above, majority of the students showed the same patterns in answerd the problem given to them. The pre-service teachers answered the 20-item multiplication administered to them by standard algorithms they were taught when they were at primary and secondary schools. Only a few of them answer a few items in flexible ways and using their intuition, but they cannot provided further explanations. The following area few samples of participants' pre-test answer sheet



Figure 1. Pre-test answer sheets

Eventhough all the four answers above are correct, we can see from the answer in the picture above that only one participant who look likes that she understood the basic concept of multiplication as a repeated addition. She showed in the answer by writing the multiplication of 11 as the multiplication by 10 along with 1 extra ($11 \times 34 = 10 \times 34 + 34$). Although she did not write the bracket like $(10 \times 34) + 34$, but she means like that based on her writing in the following line $(340 + 34)$.

Based on the majority of the pre-service teachers answered the pretest by standards procedures (algorithm), they are not proceeded to in-depth interview due to the same or similar answer will be given by them. Almost of the pre-service teacher admitted that the only way they knew to execute a multiplication is by following step by step the procedure they are taught at primary schools or secondary schools. There is no any others ways the can use to multiply two numbers beside the taught procedures. This findings is in line or relevant to the previous reports (Yang, 2007; Yang et al., 2009; Sengul. 2013)

After the posttest administered to them, some of participants are chosen for the purpose of getting opinion of their viewpoint on the materials or the tutorials in youtube channel of *hitung bermakna*. When they are asked about the easiness and usefulness of the materials, all of them said that the materials were easy to understand. Besides that they also told that these materials will help them to improve their mental computation competency specially and numeracy generally.

When they were asked about the relationship between mental computation and numeracy, majority of them admitted that they were new to the term of numeracy. They said that the term of numeracy for them is still just the at information level. It is difficult for them to explain deeply of what numeracy is. This phenomena give us the valuable information that equipping preservice teachers, particularly preservice primary teacher the foundation of numeracy is a must if we want the future students familiar with this one of the 21st century skills.

CONCLUSIONS

As the main purpose of this study was to find the impact of youtube tutorials on the pre-service teachers competency of mental computation, the results have shown that there is a significance difference of the pre-service teachers competency on mental computation before and after they use and explore the materials posed on a youtube channel. The low scores the the pre-service teachers at pretest is due to the unfamiliar of the way they are asked to answer. It is quite new for most of them. All they know about multiplication is to follow the standard procedures or ruled-based methods that is usually called as algorithms. They felt somewhat difficult to give reasons intuitively to get the answers.

Based on the opinions given by some chosen participants about the novelty of the materials and the usefulness of the youtube tutorials, it can be concluded that almost all the participants felt that the materials of the way solve multiplication problems were quite new and they never found such the questions and instruction before. They all agree that the materials posted on the youtube channel a very useful for them to improve their competency in mental computation as a small part of number sense (numeracy).

Due to mental computation is a part of numeracy and numeracy is one of the foundational skills required to succed in the 21st century, it deserves special attention

from mathematics curriculum developers, mathematics educators, and mathematics teachers for a better competency owned by students and teachers in the future.

The process of introducing this important materials, before they are massively introduced to primary school students, might be started by integrating them inclusively into the mathematics syllabus of preservice primary teachers. Mathematics lecturers need to study, discuss, research, and disseminate this crucial materials in this digital era.

Based the findings of this study, we suggest that there are a socializing process of introducing mental computation to all mathematics lecturers at preservice primary school departments. From this stage, the process of introducing are continued to the students of at preservice primary school departments. The students will expand the socialization process to schools when they are put at school for teaching practice. At the end all primary school students will be familiar with the mental computation ideas.

REFERENCES

- Aguilar, Mario Sánchez, and Danelly Susana Esparza Puga. 2020. "Mathematical Help-Seeking: Observing How Undergraduate Students Use the Internet to Cope with a Mathematical Task." *ZDM - Mathematics Education*. doi: 10.1007/s11858-019-01120-1.
- Esparza Puga, Danelly Susana, and Mario Sánchez Aguilar. 2021. "Students' Perspectives on Using YouTube as a Source of Mathematical Help: The Case of 'Julioprofe.'" *International Journal of Mathematical Education in Science and Technology*. doi: 10.1080/0020739X.2021.1988165.
- Ghazali, Munirah, Abdul Razak Othman, Rohana Alias, and Fatimah Saleh. 2010. "Development of Teaching Models for Effective Teaching of Number Sense in the Malaysian Primary Schools." in *Procedia - Social and Behavioral Sciences*.
- Ginsburg, Lynda, Myrna Manly, and Mary Jane Schmitt. 2006. "The Components of Numeracy." *National Center for the Study of Adult Learning and Literacy*.
- Iftikar, M., Riaz, S., Yousaf, Z. (2019). Impact of Youtube Tutorials in Skill Development among University Students of Lahore. *Pakistan Journal of Distance & Online Learning*. V(II), 125-138.
- Insorio, A. O., & Macandog, D. M. (2022). Video Lessons via YouTube Channel as Mathematics Interventions in Modular Distance Learning. *Contemporary Mathematics and Science Education*, 3(1), ep22001. <https://doi.org/10.30935/conmaths/11468>
- Kaminski, Eugene. 2002. "Promoting Mathematical Understanding: Number Sense in Action." *Mathematics Education Research Journal*. doi: 10.1007/BF03217358.
- McIntosh, Alistair, Barbara J. Reys, and Robert E. Reys. 2005. "A Proposed Framework for Examining Basic Number Sense." in *Subject Learning in the Primary Curriculum: Issues in English, Science and Mathematics*.
- Ruqoyyah, Siti, Hana Sakura Putu Arga, and Medita Ayu Wulandari. 2021. "THE EFFECT OF UTILIZING YOUTUBE VIDEO IN IMPROVING MATHEMATIC COMMUNICATION SKILLS IN BASIC TEACHER EDUCATION." *Primary: Jurnal Pendidikan Guru Sekolah Dasar*. doi: 10.33578/jpfkip.v10i3.8192.
- Sari, W. N., B. S. Samosir, N. Sahara, L. Agustina, and Y. Anita. 2020. "Learning

Mathematics ‘Asyik’ with Youtube Educative Media.” in *Journal of Physics: Conference Series*.

- Şengül, Sare. 2013. “Identification of Number Sense Strategies Used by Pre-Service Elementary Teachers.” *Kuram ve Uygulamada Eğitim Bilimleri*. doi: 10.12738/estp.2013.3.1365.
- Styati, Erlik Widiyani. 2016. “Effect of YouTube Videos and Pictures on EFL Students’ Writing Performance.” *DINAMIKA ILMU*. doi: 10.21093/di.v16i2.534.
- Varol, Filiz, and Dale Farran. 2007. “Elementary School Students’ Mental Computation Proficiencies.” *Early Childhood Education Journal*. doi: 10.1007/s10643-007-0173-8.
- World Economic Forum. 2016. “The Global Risks Report 2016 | World Economic Forum.” *Journal of Sustainable Finance & Investment*.
- Yang, D.C. (2007). Investigating the Strategies Used by Preservice Teacher in Taiwan When Responding to Number Sense Questions. *School Science and Mathematics*, 107(7), 293 – 301.
- Yang, D.C., Reys, R.E., & Reys, B.J. (2009). Number Sense Strategies Used by Preservice Teachers in Taiwan. *International Journal of Science and Mathematics Education*, 7, 383-403.