Effectiveness of Video Lessons in Improving the Numeracy Level of Grade 7 Students Amidst Pandemic

Klief F. Gratela[1] and Susan S. Janer[2]

[1]Sorsogon State University, Sorsogon City, Philippines
[2]Department of Education, Philippines
Email: [1]gratelaklief@gmail.com and [2]sihjaner@sorsu.edu.ph

Abstract— The complexity in the teaching and learning of mathematics were increased by several concerns in the education sector brought by the Corona Virus disease 2019 (COVID-19) pandemic. This pre-experimental research design with one-group pretest-posttest design examined the effectiveness of video lessons in improving the numeracy level of grade 7 students. The teacher-made video lessons used were validated and passed the evaluation of experts. The sample of this study was 37 grade 7 students of San Francisco National High School, Bulan, Sorsogon who were identified as non-numerates taken from the result of the numeracy test. The instruments used were the numeracy tool for grade 7 and 11 video lessons covering 28 most essential learning competencies. Based on the z-test result, the computed value of 7.67 is greater than the tabular value which is 1.96 (2-tailed) at 5% significance level. The result showed that there is a significant difference between the pre-test and posttest scores of the students. Moreover, the Cohen's d effect size of 1.99 indicates that there is a large effect in the increase of test scores of the respondents. It implied that video lessons as a supplementary learning material to Learning Activity Sheets (LAS) improves the numeracy level of student. This study recommends the use of teacher-made video lesson as a supplementary learning material to the learning activity sheets in the distance learning modality of new normal education.

Keywords— New Normal Education, Numeracy Level, Video Lessons.

I. INTRODUCTION

The period of 21st century is often considered as a period of technology where its impact can be seen in every field especially in the field of Education. Technology has been a great asset in education especially to every educator where they can customize learning by improving instructions in the teaching learning process using varied forms of tools. Hence, educators need to renovate teaching-learning activities through technology to improve their level of digital competence and to meet the demands of society in the 21st century (Jimenez, Vico, & Rebollo, 2017)**.**

Technology has been a great asset in education in improving students' learning in Mathematics and reduced the achievement gap between struggling students and typical students. Technological tools such as 3D geometric software, graphing calculators, mathematical apps, and video lessons had its impact towards student's attitude and problem-solving skills and help teachers to address the diverse needs of their students (Zhang, Trussell, & Gallegos, 2015; Vincent & Stacey, 2017; Parrot & Leong, 2018). However, among the enumerated educational tools, video lessons were seen as a very promising and very useful innovation in the teaching and learning of Mathematics for both teacher and students. As defined by Bhatia (2015), video lesson is a video which shows educational material for a topic in a particular subject which is to be learned by the students. In the study of Star and Strickland (2007), video lesson improves teacher's observation skills to notice features of the classroom environment, mathematical content of lesson, and communication during the lesson. Moreover, Alsawaie and Alghazo (2010) in their study found out that student's ability to analyze Mathematics teaching had significantly improved.

Prior to the emergence of COVID 19, Mathematics Education in the Philippines already facing major challenges. In the 2018 Programme for International Student Assessment (PISA), Philippines ranked among the lowest in reading comprehension, and ends up in the low 70's in Mathematics and Science across 79 countries in a study done by the Organization for Economic Cooperation and Development (OECD) (Paris, 2019). The deteriorating performance of Filipino students in Mathematics has become a major challenge to Philippine education.

Mathematics is often associated as a difficult and tedious subject to learn and students do not find it fun, motivating and engaging (Sedig, 2008). In some cases, it is often considered complex subject due to its abstract and cumulative nature, and it requires learners a firm foundation since they may not be able to learn new things without previous knowledge. Furthermore, there

were many factors that affect the performance and numeracy level of students toward Mathematics. These factors affecting learning apparently led to the increase or decrease of students' performance toward the subject. The following are some of the factors that greatly affect students' performance: Language used in teaching the subject, learners' low Mathematics self-concept and instructional strategy (Bernard, 2013); Mathematical anxiety (Estonanto, 2018); instructional/classroom characteristics, societal factors and school factors (Aloraini, 2012); teachers' characteristics as the problem (Okpala and Onocha, 1998); the essence of using assessment and other evaluation instrument during instructional process (Ajogbeje, 2013); and technological pedagogical content knowledge of Mathematics teacher (Boris, Campbell, Cavanagh, Petocz, & Kelly, 2013).

Moreover, with the dawn of COVID 19 pandemic, the complexity of teaching and learning Mathematics had been intensified. With this, the Bureau of Curriculum Development of the Department of Education (DepEd) in the Philippines accelerated the identification of essential learning competencies and rationalized this into the Most Essential Learning Competencies (MELC) extracted from the K to 10 Mathematics Curriculum. In addition, the Undersecretary for Curriculum and Instruction, Diosdado M. San Antinio of the DepEd issued a memorandum suggesting the strategies in implementing Distance Learning Delivery Modalities (DLDM) for School year 2020-2021. The four modalities were identified such as Modular Distance Learning (MDL), Online Distance Learning (ODL), T-Video/Radio-Based Instruction (TV-Video/RBI) and the Blended Distance Learning (BDL) (San Antonio, 2020). Thus, lead to the so-called term New Normal of Education as mentioned by Secretary Leonor Briones in the press released (Department of Education, 2020).

Given the suggested Distance Learning Delivery Modalities (DLDM), the Schools Division of Sorsogon in Bicol Region implemented the Modular Distance Learning Modality (MDLM) as a result on the Learners Enrollment and Survey Form (LESF).

Self-learning Modules (SLM) from the Department of Education Regional Office was the primary learning material used in delivering instruction. It was then later converted into Learning Activity Sheets (LAS) mandated by the Regional Office to be prepared by every teacher and then changed to Simplified Module Intended for Learning Encounters (SMILE) pioneered by the regional writers distributed to every public-school teacher.

However, in San Francisco National High School of San Francisco, Bulan, Sorsogon, Grade 7 students were struggling in answering Learning Activity Sheets (LAS) in Mathematics as reflected in the performance level of their first summative test for the school year 2021-2022. The overall performance level of four classes handled by the researcher in the first summative test was 38%. While the overall pretest result of the numeracy tool in grade 7 were the following: 58% non-numerates; 20% beginning numerates; 15% developing numerates; and 7% numerates. Based on the feedback came from parent/parent leaders, students with the guidance of their parents or guardians were having difficulty learning grade 7 Mathematics. One of the problems in the school was the unavailability of books since there was no books designated for grade 7 Mathematics even before pandemic.

II. OBJECTIVES OF THE STUDY

The main purpose of this study was to determine the effectiveness of video lessons in improving the numeracy level of grade 7 students amidst pandemic School Year 2021-2022. This study dealt with developing video lessons from the existing learning materials and determine the numeracy level of the students before and after using the video lessons made.

III. MATERIALS AND METHODS

This study utilized a pre-experimental research design particularly the one-group pretest-posttest design. It is a form of pre-experimental design which have no comparison groups and the pretest and posttest used are the same to reflect the effectiveness of the intervention (Frey, 2018). This design was appropriate as it is constructed to determine the effectiveness of the intervention materials made for grade 7 Mathematics with the idea that all respondents will benefit. The design followed basic research steps adapted from the study of Mendina & Gigantone (2020).
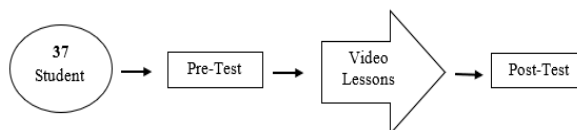

Figure 1: Research Design of the Study

In this study, purposive sampling was used in the sense that grade 7 students were the main respondents of the study. Purposive sampling is used when respondents are chosen based on their knowledge of the information desired (Calderon & Gonzales, 2015). Student-respondents were composed of 37 students who were currently enrolled in San Francisco National High

School for the School Year 2021-2022. They were the students of the researcher who were identified as *non-numerates* (scores 0-4) taken from the pre-tests result conducted using the Division Numeracy Tool for Grade 7 Mathematics. Grade 7 students who were *Beginning Numerates* (score 5-10), *Developing Numerates* (scores 11-15), *Proficient* (scores 16-20) and other grade levels are excluded in the study. The respondents as well as their parents were notified through an informed consent requesting their students to take part in the research process.

The video lessons were one of the instruments used in this study. The video lessons were originally made by the researcher validated by experts which contains the discussion of the contents in the Learning Activity Sheets given every distribution. It serves as a supplementary to the Printed Modular Distance Learning Modality (PMDLM). The discussion involves the following parts: Preliminary Activities (e.g., Greetings, reminders, introduction of topic, puzzle/math challenge); Learning Objectives; Lesson proper; Working Exercises; and Quiz. The medium of instruction used was a combination of English and Tagalog so that all types of learners may cope-up with the lesson. The video lesson per LAS created were distributed to every parent/parent leader device during LAS distribution. It was also uploaded in the Facebook Group created for students who have an access with the internet.

Numeracy tool in grade 7 Mathematics from the Curriculum Implementation Division (CID) of Schools Division of Sorsogon was adapted. It was used as an instrument for pretest and posttest in providing a standard numeracy tool in assessing the numeracy level of learners in Sorsogon province (Division Memorandum No. 176, s. 2019). It was composed of 20-item open-ended questions which covered the least learned competencies in Grade 7 Mathematics made and validated by the experts in the Division of Sorsogon.

The researcher submitted communication letter to the Principal and Head Teacher requesting permission and help in the conduct of the study since the school is involved. The researcher's intervention which is making video lesson has started since the first quarter of the school year with permission of the school authorities until this study is put into realization. Video lessons were validated by 3 experts using the validation tool adapted from the Department of Education. Permission from the Schools Division of Sorsogon was made or requested. With the permission granted, the researcher began the research work. Parents of the respondents were also notified through an inform consent. Professional etiquette and utmost confidentiality were strictly observed while conducting the study.

The Division Numeracy Tool was administered in the first quarter of the school year before the intervention began. The researcher then employed documentary analysis by getting copy of the pre-test result to the Mathematics Coordinator of the school. A posttest was given in the second week of the fourth quarter after the intervention was conducted. This was administered through face-to-face manner since the school was approved for limited face-to-face class. This was to determine the effectiveness of video lessons in increasing the numeracy level of the grade 7 student. Likewise, all related literatures and studies used to substantiate this research work will also be acknowledged. The data acquired from different instruments were collated and e analyzed using appropriate statistical tools.

The pre-test and post-test results from the numeracy assessment tools were treated statistically by getting the frequency count and percentage to determine the numeracy level of the student-respondents. The scale below was used to determine the numeracy level of students adapted from the Curriculum Implementation Division of Schools Division of Sorsogon ((Division Memorandum No. 176, s. 2019).

Scores	Numeracy Level
0-4	Non-numerates
5-10	Beginning Numerates
11-15	Developing Numerates
16-20	Proficient/Numerates

To answer how effective are video lessons in improving the numeracy level of students, by determining the difference between the pre-test and post-test results of the students, z-test with 5% level of significance was used. To determine the effect size of the pretest and posttest results of students, the formula for Cohen's d effect size adapted in Sloan (2018) was used.

$$Effect\ Size = \frac{(Mean\ of\ Posttest) - (Mean\ of\ Pretest)}{Average\ Standard\ Deviation}$$

Meanwhile, to interpret Cohen's d effect sizes, the scale based on Rubin and Babble (2005) was used.

Effect Size Range	Levels of Effect Size
≥ 0.8	Large Effect
$0.5 - .79$	Medium Effect
$0.21 - 0.49$	Moderate Effect
≤ 0.20	Small Effect

IV. RESULTS AND DISCUSSION

The video lessons made by the researcher contains the discussion of the topic from the Learning Activity Sheet given every distribution. It was made using Microsoft PowerPoint and edited using Movie Maker. The medium of instruction used were in the manner of Tagalog-English code-switching mode. This was supported in the study of Yusob, Nassir, & Tarmuji (2018) who concluded that student's preferences in using code-switching and their learning satisfaction in mathematics subject have significant relationship. The discussion involves the following parts: (1) Preliminary activities (Greetings, reminders, introduction of topic); (2) Learning Objectives; (3) Lesson proper; (4) Practice Task; and (5) Quiz. A total of 11 video lessons covering 28 Most Essential Learning Competencies (MELC) were made and evaluated by experts using the validation tool adapted from the Department of Education (*Guidelines and Processes for LRMDS Assessment and Evaluation, page 67-70).* Reflected in table 1 is the summary of experts' validation of video lessons per topics.

Table 1. Summary of Experts' Validation

Video Lesson Title	Factors				Description
	Content quality (Required points 30-40)	Instructional Quality (Required points 30-40)	Technical Quality (Required points 39-52)	Mechanics (Required points 16)	
Operations in Integers	40	40	50	16	Passed
Properties of Operations on integers	38	40	51	16	Passed
Perform operations on Rational Numbers	39	37	47	16	Passed
Square root of A Number	37	38	46	16	Passed
The Real Number System	40	36	50	16	Passed
Scientific Notation	37	38	50	16	Passed
Approximating Measures of Quantities	38	38	47	16	Passed
Translating English Phrases to Mathematical Phrases and vice versa; Basic Terms in Algebra	38	40	50	16	Passed
Evaluating Algebraic Expressions; Addition and Subtraction of Polynomials	38	39	39	16	Passed
Laws of Exponent	36	40	50	16	Passed
Special Products	38	38	50	16	Passed

The table also presents the evaluation results made by the experts as to the validity of the material with respect to the listed topic above in grade 7 mathematics. It can be observed from all the topics that the ratings in terms of content, instructional, technical qualities and mechanics were described as passed. It implies that these results were accepted, and the materials made met all evaluation criterion. The video lessons were finalized and administered to the students without further validation.

The findings are strongly supported in the study of Robles and Acedo (2019) in their findings that the educational video tutorials validated by experts are highly acceptable and highly relevant. They concluded that the content of the educational video tutorials is highly valid. According to them as rated by the Master teachers, the video tutorials possessed a high extent of applicability since the developed videos were highly usable and highly appropriate. Further they asserted that the videos are highly useful in enhancing the 21st-century skills of the students at the same time, increase students' retention. Furthermore, they recommended that the developed videos were appropriate to assist both the teachers and students in improving the teaching-learning process.

In this study, numeracy level refers to the category of learners in mathematics stipulated in the Division Memorandum no. 176 series of 2019 in the Schools Division of Sorsogon. The descriptions were as follows: non-numerate scores 0-4; beginning numerates scire 5-10; developing numerates scores 11-14; and proficient/ numerate scores 15-20. Table 2 shows the numeracy level of student-respondents before and after using the video lessons. It can be observed from table that in the pre-test result, the identified respondents were all non-numerates. This was because respondents who were non-numerates were purposively chosen for this study. However, in the posttest result, it shows that there was a notable change in the distribution of scores from 37 down to 6. Moreover, among 37 respondents, 18 among

them became *beginning numerates*, 7 became *developing numerates,* and 6 became *proficient or numerates*. It implies that video lessons were seen as a useful innovation not just in enhancing the teaching and learning of Mathematics but also in improving the numeracy level of student. This was supported by the study of Alsawaie and Alghazo (2010) who expounded that student's ability to analyze Mathematics teaching had significantly improved when exposed to video lessons.

Table 2. *Numeracy Level of Students Before and After Using Video Lessons*

Test	Numeracy Level				Total
	Non-numerates	Beginning numerates	Developing numerates	Proficient/ numerates	
Pretest result	37	0	0	0	37
Posttest result	6	18	7	6	37

Moreover, the table above shows that there were 6 respondents who remain non-numerates despite having experienced video lessons as their supplementary learning materials. This explains that video lessons were not most of the time effective in improving the numeracy level of the students. It also revealed that not all validated video lessons in mathematics significantly improved students' performance. This finding bears connection in the study of Jeremias (2022) who concluded that the students' performance level after employing video lesson in a certain topic in grade 8 mathematics were described as *fairly satisfactory (75-79 grading scale)*. Moreover, feedback from one of the respondents in an unstructured interview when asked what hinders them in studying using video lesson, stated that "*Poor internet connection and eagerness to play online/ offline games hinder me from watching video lessons*". This was supported by the study of Anwar, Syam, Pratama, and Side (2021*)* who emphasized that online game addiction is one of the main problems of mathematics student.

Table 3. *Effectiveness of Video Lessons in Improving the Numeracy Level of grade 7 Students*

Statistical Bases				Cohen's d	
Level of Significance	Tabular value	Computed z-value	Decision on Ho	Effect Size	Description
.05	1.96	7.67	Rejected	1.99	Large Effect

Table 3 presents how effective the video lessons are in improving the numeracy level of the students. Shown in the table that the computed z-value of 7.67 is greater than the tabular value of 1.96 with 5% level of significance. Thus, the null hypothesis of no significant difference between the pre-tests and posttests are

rejected. Moreover, the effect size of 1.99 between the pretest and posttest is described as large effect. These findings implied that there is a significant difference in the pre-test and posttest result of the students in the numeracy tool for grade 7 using video lessons. It implied that the video lessons are effective tools in improving the numeracy levels of the students.

When the teachers show resourcefulness in preparing instructional materials and by using them appropriately, there could be a more meaningful teaching and learning process. The lessons are being reinforced and emphasis is on what are being delivered. This implies that integrating video lessons in mathematics will result to a better performance among the students. The results are also clearly mentioned by Darling-Hammond, Zielezinski, & Goldman (2017) which revealed that when mathematics teachers practice technology strategically, more students especially those students who struggle are provided with opportunity to learn mathematics skills more effectively, close their achievement gaps, and have a better chance for a productive future.

V. CONCLUSION

The teacher-made video lessons were validated and passed the evaluation of experts. A total of 11 video lessons covering 28 Most Essential Learning Competencies were used as a supplementary learning material to the Learning Activity Sheets (LAS) given during the distance learning modality. The 37 non-numerate respondents after video lessons were implemented, produced the following results: *6 non-numerates*; 18 *beginning numerates*; 7 *developing numerates*; and 6 *proficient/numerates*.

Moreover, the study concluded that there is a significant difference between pretest and posttest result using z-test with 5% level of significance having the computed value of 7.67 and tabular value of 1.96. Cohen's d effect size of 1.99 indicated that there was a large effect in the test scores of the student. In general, video lessons were seen as effective tools in improving the numeracy level of students. This paper recommends mathematics teachers and other curriculum implementers to consider the use of video lessons as a supplementary material in the distance learning modality of new normal education. Video lessons that were developed by the researcher may be adopted and utilized by other mathematics teachers to improve the performance of the students. Researchers may conduct another study tantamount to the present study which may also develop other kinds of instructional materials to improve the numeracy level of the students.

REFERENCES

[1] Acedo, E., & Robles, A. C. M. O. (2019). Development and Validation of Educational Video Tutorials for 21st Century Secondary Learners. *Asian Journal of Multidisciplinary Studies*, *2*(2), 42-49.

[2] Ajogbeje, O. (2013). Effect of formative testing with feedback on students' achievement in junior secondary school Mathematics in Ondo State Nigeria. *International Journal of Education Research*. Vol. 2 (2013), 8-20.

[3] Aloraini, S. (2010). The impact of using multimedia on students' academic achievement in the College of Education at King Saud University: *Journal of King Saud University- Language and Translation.* Vol.8, No.6. (2012) 24, 75-82.

[4] Alsawaie, O., & Alghazo , I. (2009). The Effect of Video-based Approach on Prospective teachers' Ability to Analyze Mathematics teaching. *Journal of Mathematics Teacher Education, 1*(13), pages223–241. Retrieved from https://link.springer.com/article/10.1007/s10857-009-9138-8.

[5] Anwar, A., Syam, R., Pratama, M., & Side, S. (2021). SEIRS model analysis for online game addiction problem of mathematics students. *Journal of Physics: Conference Series*. doi:doi:10.1088/1742-6596/1918/4/042024

[6] Bernard, N.G. (2013). Secondary school students' perceptions of Mathematics formative evaluation and the perceptions' relationship to their motivation to learn the subject by gender in Nairobi and Rift Valley Provinces, Kenya. *Asian Journal of Social Sciences & Humanities. 2*.(1)..174-183.

[7] Bhatia, J. (2015, February 23). *Video lessons OR video lectures.* Retrieved from Slideshare a Scribd Company: https://www.slideshare.net/MOTORANI/video-lessons-or-video-lectures

[8] Boris, H., Campbell, C., Cavanagh, M., Petocz, P. & Kelly, N. (2013). Technological Pedagogical Content Knowledge of Secondary Mathematics Teachers. *Contemporary Issues in Technology and Teacher Education, 13*(1), 22-40. Waynesville, NC USA: Society for Information Technology & Teacher Education. Retrieved from: https://www.learntechlib.org/primary/p/40713/

[9] Calderon, J.F. & Gonzales, E.C. (2015). Methods of Research and Thesis Writing. National Book Store. Mandaluyong City, Philippines.

[10] Darling-Hammond, Zielezinski, & Goldman, (2014). The Comparative Instructional Effectiveness of Print- based and Video-based Instructional Materials for Teaching Practical Skills at a Distance. 96-116. International Review of Research in Open and Distributed Learning.

[11] Department of Education. (2020, June 19). *Briones, education ministers unite to ensure learning continuity amid COVID-19.* Retrieved from GOVPH: https://www.deped.gov.ph/2020/06/24/briones-education-ministers-unite-to-ensure-

[12] Estonanto, A. J.(2018). *Mathematical anxiety as determinant of performance in calculus of senior high school students in Sorsogon City.* Unpublished Master's Thesis. School of Graduate Studies, Sorsogon State College, Sorsogon City.

[13] Frey, B. (2018). *The SAGE encyclopedia of educational research, measurement, and evaluation* (Vols. 1-4). Thousand Oaks, CA: SAGE Publications, Inc. doi: 10.4135/9781506326139

[14] Guidelines and Processes for LRMDS Assessment & Evaluation Version: Final Draft 1.0 Date: March, 2009. Retrieved on February 15, 2020 from https://lrmds.deped.gov.ph/docs/LRMDSFramework.pdf

[15] Jeremias, J. D. (2022). *Effectiveness of Video Lessons in Improving the Performance of Students in Mathematics 8.* Sorsogon State University, Sorsogon City: Unpublished Thesis.Page 76.

[16] Jimenez, R., Vico, A., & Rebollo, A. (2017, April 03). Female university student's ICT learning strategies and their influence on digital competence. *International Journal of Educational Technology in Higher Education, 14*(10). Retrieved from https://educationaltechnologyjournal.springeropen.com/articles/10.1186/s41239-017-0040-7

[17] McLeod, S. (2020). *Simply Psychology*. Retrieved from Vygotsky's Sociocultural Theory of Cognitive Development: https://www.simplypsychology.org/vygotsky.html

[18] Mendina, L. A & Gigantone, M.(2020). Use Of Heal Mi (Home-Based Earth and Life Science Materials For Intervention) Worksheets In

Addressing The Least Learned Competencies In Earth And Life Science. Unpublished Action Research. Schools Division of Sorsogon.

[19] Okpala, P.N. & Onocha, C.O. (1988). *Measurement and Evaluation in Education*. Jattu-Uzairue: Sterling – Harden Publishers.

[20] Paris, J. (2019), December Philippines ranks among lowest in reading, math and science in 2018 study). Retrieved from Rappler.com: http://www.google.com/amp/s/amp.rappler.com/nation/pisastudy2018

[21] Parrot, M., & Leong, K. (2018). Impact of Using Graphing Calculator in Problem Solving. *International Electronic Journal of Mathematics Education, 13*(3), 139-148. Retrieved from https://eric.ed.gov/?id=EJ1227509

[22] Rubin, A. and Babbie, E.(2005). Standard for Interpreting Cohen's d Effect Sizes. Retrieved from: https://www.researchgate.net

[23] San Antonio, D. M. (2020, July 21). Suggested Strategies In Implementing Distance Learning Delivery Modalities (Dldm) For School Year 2020-2021. *Memorandum DM-CI-2020-00162*, pp. 1-32.

[24] Sedig, K. (2008). From play to thoughtful learning: A Design Strategy to Engage Children with Mathematical Representations. *Journal of Computers in Mathematics and Science Teaching, 27*(1), 65-101. Waynesville, NC USA: Association for the Advancement of Computing in Education (AACE). Retrieved from https://www.learntechlib.org/primary/p/23627/.

[25] Schools Division of Sorsogon. (2019, September 2). *Division Memorandum No. 176 s. 2019.* Guidelines on the Utilization of the Numeracy Level for Elementary

[26] Star, J., & Strickland , S. (2007). Learning to observe: using video to improve preservice mathematics teachers' ability to notice. *Journal of Mathematics Teacher Education volume, 11*, 107–125. Retrieved from https://link.springer.com/article/10.1007/s10857-007-9063-7

[27] Yusob, K., Nassir, A., & Tarmuji, N. (2018). Code-Switching in Mathematics Classroom: Relationship between Students' Attention and Attitude and their Learning Success. *LSP International Journal*. doi:https://doi.org/10.11113/lspi.v5n1.64

[28] Vincent, J., & Stacey , K. (2017). Do mathematics textbooks cultivate shallow teaching? Applying the TIMSS Video Study criteria to Australian eighth-grade mathematics textbooks. *Mathematics Education Research Journal volume, 20*, 82–107. doi:https://doi.org/10.1007/BF03217470