Vol. 33 · July 2018
DOI: https://doi.org/10.7719/jpair.v33i1.606

Print ISSN 2012-3981
Online ISSN 2244-0445

Teacher-Made Comic Strip: A Strategic Intervention Material in Teaching Fundamental Operations on Integers

EDISON L. UY
http://orcid.org 0000-0002-9154-1317
edisonuy23@gmail.com
DepEd-Catbalogan City Division
Pangdan National High School
Catbalogan City, Philippines

99% • Grammar Check: 95% • Plagiarism: 1%

ABSTRACT

A relatively large share of students often struggles in learning fundamental operations on integers because they express general dislike to its context for it has numerous rules that lead to confusion. In this perspective, the study proposed a teacher-made comic strip entitled Numerolandia: The Chosen One as an alternative way to increase and strengthen students' knowledge and understanding of the fundamental operations on integers. It aimed to investigate its effectiveness to the identified bottom 20 students (based on the latest average in mathematics) of Grade Seven section Amethyst of Pangdan National High School, Catbalogan City during S.Y. 2017-2018. Quasi-experimental research design with one group pre-test post-test design was used. Thus, the comic strip was given to the student-participants for them to read and answer all the activities provided in it, and two questionnaires were served: one was about the assessment on fundamental operations on integers, and another was about the extent of acceptance on the comic strip. Thus, it was found out that the comic strip was an effective way of improving students' knowledge and skills as it showed

a notable positive 7.7 increase in their scores when they were exposed to this intervention and as to the degree of acceptance, based on the given indicators the student participants agreed to accept it strongly. Therefore, it is recommended that Mathematics teachers should innovate their teaching styles and strategies to fortify the students' learning process like the use of a comic strip.

Keywords **–** Mathematics Education, teacher-made, comic strip, quasi-experimental design, strategic intervention material

INTRODUCTION

Animated novel cartoons and comic strips have conventionally been seen as "rivals" of the teachers for students most often caught reading these materials in schools during their class hours which were likely to be disciplined (Cleaver, 2008). Nevertheless, nowadays, some teachers are starting to view comic strip as potential educational tools, as a way to arouse students' interest in academic subjects (Cleaver, 2008), and also it is a positive avenue to improve students' academic performance (Tilley, 2008).

Learning is important because no one is born with the ability to function competently as an adult in society (Bransford, Brown, & Cocking 2000). It is why, comics have been used as a pedagogical tool to motivate students to read, help them remember the content, and make the whole learning process fun (Muzumdar, 2016). Moreover, comic strips or comics in short appeals to a broader audience across all age and ethnic groups because they employ an everyday language that is almost universally understood and can be concurrently instructive and entertaining. Such sophisticated yet simple use of visuals and text in comic books in generating a clear narrative for the information to be presented gives comics the potential to go beyond the traditional textbook for teaching and learning (Muzumdar, 2016). Thus, students became more motivated to learn the subject through the use of cartoons and comics in teaching Mathematics lessons especially the students who are having struggles in learning specific concepts (Toh, 2009). Also, reading of comics is a move beyond debased or simplified word-based literacy it is a complex and multimodal literacy. In this note, using comics in classrooms can help students develop as critical and engaged themselves with multimodal texts and imagine things beyond words (Jacobs, 2007).

Mathematics education, in particular, have always faced and will continue to meet challenges for students complained of the hardships of the learning, and teachers complained of students' laziness (Karp, 2016). It can be hard for children

to see how functions, equations or geometric shapes can help them in everyday life (Legner, 2013). Like in PNHS, the first quarter mean of grade seven section amethyst students were only 22.15 out of 50 with an MPS value of 55.36 which was far from the standard requirement of Department of Education (DepEd). Thus, basic operation on integers was on the top of the least learned skills in grade seven in PNHS, so, it is a vital reform for a teacher to have an intervention that could upsurge student's interest in dealing with this topic. Hence, it is for this reason why the researcher came up with Numerolandia: The Chosen One, a comic book which aims to strengthen and increase students' knowledge and understand in fundamental operations on integers.

OBJECTIVES

This study chiefly attempted to improve and strengthen students' knowledge and attitude in dealing fundamental operations on integers by the use of comic strip entitled Numerolandia: The Chosen One to the bottom 20 students of grade seven Amethyst section of Pangdan National High School during the school year 2017-2018. Moreover, it also aimed to increase the mean and mean percentage scores of the school in Mathematics.

Specifically, this study sought answers to the following questions: (1) What is the academic performance of the student-participants' before (1st grading) and after (2nd grading) the intervention?; (2) What are the pre-test and post-test scores of the student-participants on the fundamental operations on integers?; (3) What are the pre-test and post-test proficiency levels of student-participants on the necessary action on integers?; (4) Is there a significant difference between the academic performance of the student-participants before (1st grading) and after (2nd grading) the intervention?; (5) Is there a substantial difference between the pre-test and post-test scores on the assessment relative to the fundamental operations on integers?, and (6) What is the extent of acceptance of student-participants on Numerolandia: The Chosen One?

Hypotheses

Based on the statement of the problem, the study tested the following explanation: There is no significant difference between the academic performance of the student-participants before (1st grading) and after (2nd grading) the intervention. Also, there is no significant difference between the pre-test and post-test scores on the assessment relative to the fundamental operations on integers.

CONCEPTUAL FRAMEWORK

The figure below is the illustration of the conceptual schema of the study. It shows the entirety of the research process.

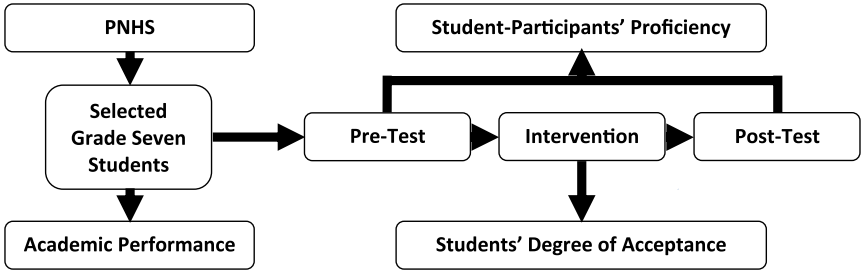


Figure 1. The Conceptual Framework

This section discusses the different intervention acquired in this study, the response used and the strategy that was applied.

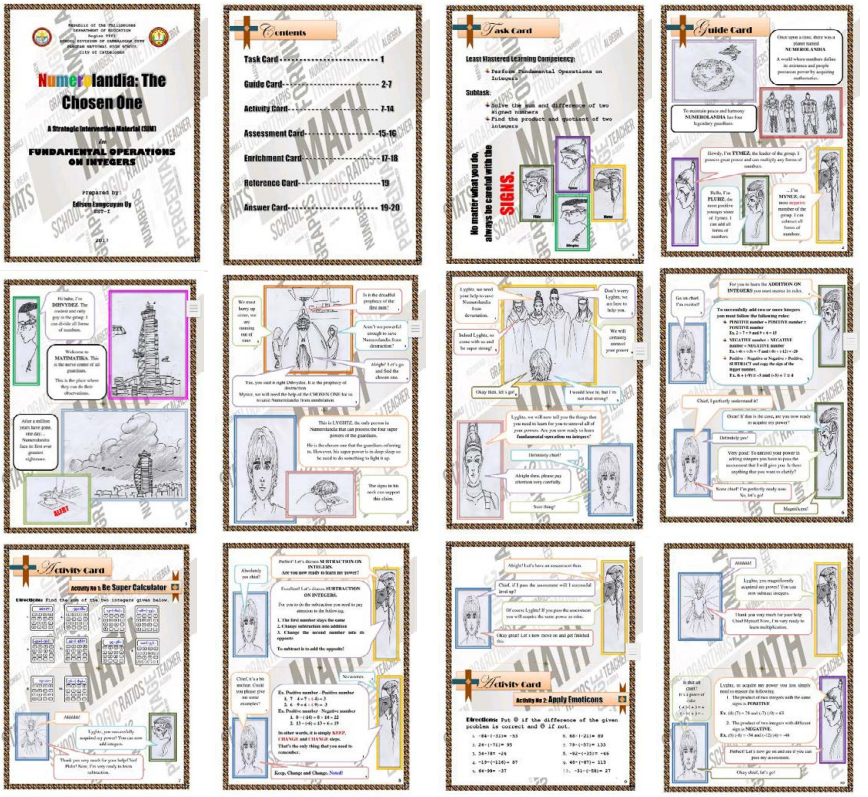
Innovation. The research instrument used by the researcher in this study was a 40-item test covering the four fundamental operations on integers. Its reliability was tested using Kuder-Richardson 20 (KR-20) using ten (10) identified students from grade seven section amethyst. After the calculations, the researcher obtained a 0.86 alpha value which means the research instrument is good. Thus, this study used descriptive ratings and numerical ratings of the students' proficiency level on the fundamental operation on integers which were based on the following:

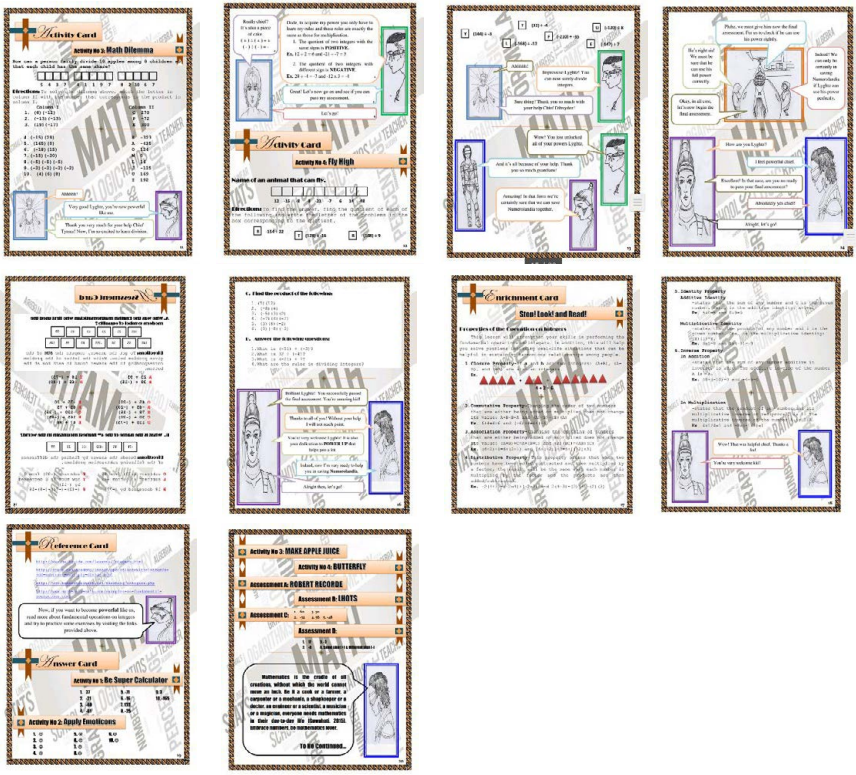
Table 1. Numerical and Descriptive Rating

Numerical Rating	Descriptive Rating	Scores
1-50%	Beginning	1-20
51-74%	Developing	21-29
75-88%	Proficient	30-35
89% and above	Advanced	36-40

Moreover, this questionnaire includes a 13-item indicator to assess the student-respondents' degree of acceptance on the intervention material used in teaching the fundamental operation on integers that is the Numerolandia: The Chosen One.

Intervention. The intervention material used in this study was a comic strip entitled Numerolandia: The Chosen One. An adventure type comics that tells the story of a young man (chosen one) who possess the power of four operations who lives in Numerolandia where numbers defined by its existence and being protected by the four legendary guardians named; Pluhz: guardian who can add all forms of numbers, Mynuz: guardian who can subtract all types of numbers, Tymez: guardian who can multiply any types of numbers and Dihvydez: guardian who has the ability to divide all forms of numbers which later on task to find the chosen one to save Numerolandia from destruction.





Strategy. Using Quasi-experimental research design with one sample pre-test post-test design, the 20 student-participants took the research assessment for one hour. After receiving the pre-assessment, the intervention material (Numerolandia: The Chosen One) was given to student-participants and ask to read the comic strip and be able to answer all the different activities in it within two days. After two days, the researcher and the student-participants gathered once more to check and discuss the various events on the intervention materials. On the next day, the post-assessment was conducted using the same research instrument at the same time. Afterward, the researcher surveyed to what extent of acceptance does the student-participants like the intervention material used provided with some indicators.

METHODOLOGY

This part presents the methods and procedures that were used in this study. It explicitly discusses the research design, sampling procedure, data collection, ethical issues, and plan for data analysis.

Research Design

The study utilized the Quasi-Experimental Research Design using one group pre-test post-test design.

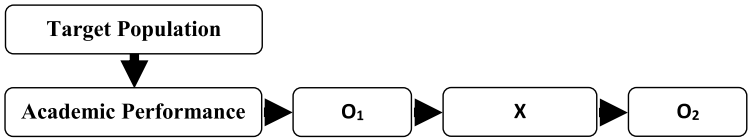


Figure 2. The Research Design

O_1 means the pre-test while O_2 implies the post-test. Moreover, X indicates the intervention used in this study, the comic strip entitled Numerolandia: The Chosen One.

Sampling Procedure

In this research, the researcher used purposive sampling technique and simple random sampling technique. Purposive sampling technique for the official student-participants that was the bottom 20 of grade seven Amethyst section (out of 55) which was done by getting their average grade during the first grading period in mathematics subject. The researcher used the sample random sampling technique for the ten (10) student-participants that served as the official students-participants for the validation of THE research instrument.

Instrumentation

To have the content of Numerolandia checked, the researcher asked the aid of three Mathematics teachers of PNHS. With an open conference, they scrutinized the material. Afterward, the comments and suggestions were incorporated.

Aside from Numerolandia, the researcher also used a 40-item research instrument which the reliability was measured using KR-20. Randomly selected ten (10) students from the remaining 35grade seven amethyst, the researcher lets these students answered the assessment tool. After the assessment being

done, based on their scores the researcher computed the alpha value, and that is 0.86this means that the instrument used has good internal consistency.

Participants

The participants of this research are the bottom 20 students of grade seven section amethyst based on their grades during the first grading period in Mathematics subject last School Year 2017-2018.

Data Gathering Procedure

A letter requesting permission to conduct the study among the objectively selected bottom 20 students of grade seven Amethyst section was secured from the secondary school head of Pangdan National High School. The letter mentioned above, upon approval, was attached to the letters requesting permission from the section advisers of the student participants. Upon their support, the intervention and survey were conducted using the intervention material used and the questionnaire for this study.

After all the data has been collected, the tabulation, computation, analyses and, interpretation proceeded.

Ethical Issues

To make this research possible, the researcher asked permissions from the school head of Pangdan National High School in the person of Mr. Rolex S. Jakosalemas well as from the grade seven-amethyst adviser. After the authorization, the researcher immediately conducted the research process.

This intervention was conducted during the mathematics class hour of grade seven-amethyst that is 3:00-4:00 P.M. last August28-31, 2017.

RESULTS AND DISCUSSION

The proceeding tables show student-participants personal data regarding academic performance during first and second grading periods and the results in the implementation of intervention material.

The Academic Performance of Student-Participants

Table 2 shows the first grading academic performance of the student participants. This was the grades of the student-participants before the intervention which serve as the baseline for choosing these students to be the official participants of this study.

Table 2. First Grading Academic Performance of Student-Participants (Before the Intervention)

Academic Performance	f	%
75	2	10
76	1	5
77	2	10
78	1	5
79	2	10
80	7	35
81	5	25
Total	20	100
Mean	79.05	-
SD	2.01	-

Based on table 2, the majority of the student participants have an 80 percent grade in Mathematics during the first grading period that is seven or 35 percent of the total sample. Thus, the mean of the student-respondents' academic performance was 79.05 with a 2.01 SD value. This means that the academic performance of the student participants was reasonably satisfactory; this is based on the descriptors provided by DepEd for grading scale.

Table 3 shows the second grading academic performance of the student participants. This was the grades of the student participants after the intervention.

Table 3. Second Grading Academic Performance of Student-Participants (After the Intervention)

Academic Performance	f	%
77	2	10
78	2	10
79	3	15
80	2	10
81	3	15
82	3	15
83	2	10
84	2	10
85	1	5
Total	20	100
Mean	80.75	-
SD	2.38	-

Based on Table 3, after the intervention, the highest grade of the student participants became 85 from 81, and the lowest grew 77 from 75. Thus, the mean of the student-participants' academic performance was 80.75 with a 2.38 SD value. This means that the academic achievement of the student-participants moved up to satisfactory from reasonably satisfactory, this is based on the descriptors provided by DepEd for grading scale. Furthermore, there is a positive 1.7 significant mean difference between the first and second grading grades of the student participants.

The Student-Participants' Pre-Test and Post-Test Scores

Table 4 shows the result of pre-test and post-test of the student-participants using the validated test questionnaire for the study.

Table 4. Pre-Test and Post-Test Scores of Student-Participants

	Student-Respondents		Pre-Test	Post-Test
MALE	1		25	27
	2		15	20
	3		18	24
	4		15	30
	5		12	23
	6		21	23
	7		10	19
	8		24	32
	9		12	23
	10		15	26
FEMALE	11		22	27
	12		13	15
	13		31	33
	14		24	31
	15		15	26
	16		17	29
	17		27	28
	18		24	39
	19		14	22
	20		21	32
		Mean	18.75	26.45
		SD	5.82	5.60

The table 4.0 shows the summary of scores of pre-assessments and the post-assessment of the student participants in this study. The pre-test score obtained an 18.75 average with 5.82 SD value while the post-test scores attained a 26.45 mean value with a 5.60 SD value. This means that there was a positive 7.7 increase in the score of the student-participants when they were exposed to the intervention made by the researcher.

The Student-Participants' Pre-Test and Post-Test Proficiency Level on the Fundamental Operations on Integers

Table 5 and 6 represents the pre and post assessment proficiency level of student-respondents respectively on the fundamental operations on integers.

Table 5. Pre-Test Proficiency Level of Student-Participants on Fundamental Operations on Integers

Descriptive Rating	Student-Participants		Total	Percentage
	M	F		
Beginning	9	2	11	55%
Developing	5	3	8	40%
Proficient	1	0	1	5%
Advanced	0	0	0	0%
Total	15	5	20	100%

Based on the data-driven, out of 20 student-participants 11 or 55 percent fell under beginning level, 8 or 40 percent of student-participants fell under developing level, 1 or 5 percent fell under Proficient level. This means that the majority of the student-participant fell under the beginning level. This means that the student-participants don't have much knowledge on the fundamental operations on integers for most of them have just reached the beginning level.

Table 6. Post-Test Proficiency Level of Student-Participants on Fundamental Operations on Integers

Descriptive Rating	Student-Participants		Total	Percentage
	M	F		
Beginning	3	0	3	15%
Developing	8	3	11	55%
Proficient	3	2	5	25%
Advanced	1	0	1	5%
Total	15	5	20	100%

Based on the data above, out of 20 student-participants 3 or 15 percent of them fell under beginning level, 11 or 55 percent of fell under developing level, 5 or 25 percent fell under a proficient standard, and a 1 or 25 percent only reached an advanced level. This means that there is significant learning from the student-participants after the intervention. This says that the majority of the student-respondent has already sufficient knowledge of the fundamental operations on integers for most of them have reached the developing level.

The Relationship between Student-Participants' Academic Performance Before and after the Intervention

Table 7 shows the relationship between the student-participants pre-test and post-test scores.

Table 7. The Relationship between Student-Participants' First and Second Quarter Grades

Variable	r-value	p-value	Interpretation/Decision
First vs. Second Quarter Grades	0.80	0.000	Significant/Reject the null hypothesis

Table 7 depicts a 0.80R-value and a 0.000 p-value that leads to the decision of rejecting the null hypothesis because the p-value is less than 0.05 which means that there is a significant relationship between the pre and post assessment conducted by the researcher. This means that the hypothesis which states that "There is no significant difference between the academic performance of the student-participants 1st grading and 2nd grading grades the intervention" is said to be rejected. Thus, the academic performance of the student-participants was significantly increased.

The Relationship between Student-Participants' Pre-Test and Post-Test Scores

Table 7 shows the relationship between the student-participants pre-test and post-test scores.

Table 8. T-Test for Dependent Samples (Two-tailed)

Variable	SD	t-value	p-value	Interpretation/Decision
Pre and Post Test Scores	4.44	-7.76	0.000	Significant/Reject the null hypothesis

Table 8 depicts -7.76 t-values, a 0.000 p-value that leads to the decision of rejecting the null hypothesis because the p-value is less than 0.05 which means that there is a significant relationship between the pre and post assessment conducted by the researcher. This means that the hypothesis which states that "There is no significant difference between student-respondents' proficiency level before and after the intervention" is said to be rejected. Thus, the post-test scores of the student-participants were significantly increased.

The Student-Participants' Extent of Acceptance on Numerolandia: The Chosen One

Table 9 shows the student-participants' degree of acceptance on Numerolandia: The Chosen One.

Table 9. Degree of Acceptance of Student-Participants on Numerolandia: The Chose One

Indicators	Mean	SD	Interpretation
1. Layout/Design	4.50	0.95	Very Acceptable
2. Font Style	4.30	1.03	Acceptable
3. Font Size	4.70	0.73	Very Acceptable
4. Background	4.40	1.10	Acceptable
5. Borderline	4.60	0.68	Very Acceptable
6. Characters	4.85	0.37	Very Acceptable
7. Name of the Characters	4.80	0.41	Very Acceptable
8. Activities	4.40	0.94	Acceptable
9. Color Combinations	4.25	1.21	Acceptable
10.Colorless Characters	4.55	0.96	Very Acceptable
11.The facial expression of the Characters	4.25	1.02	Acceptable
12. Title of the Story	5	0.00	Very Acceptable
13. Nature of the Story	4.85	0.37	Very Acceptable
Grand Mean	4.57	0.25	Very Acceptable

Legend: 5-Very Acceptable, **4**-Acceptable, **3**-Somewhat Acceptable/Unacceptable, **2**-Unacceptable and **1**-Strongly unacceptable.

Table 8 shows the student-participants' extent of acceptance on Numerolandia: The Chosen One based on the given indicators which obtained

a grand mean of 4.57 with SD value of 0.25. This means that based on the given indicators the student-respondents agreed to accept those indicators strongly.

CONCLUSION

Based on the data gathered, this study found out that the teacher-made comic strip entitled Numerolandia: The Chosen One was an effective intervention to strengthen the learning attitude of the student-participants on fundamental operations on integers it is also positive to say that it increased the knowledge and skills of the student-participants in dealing with integers for the student-participants obtained a positive 7.7 mean increase on their scores on the assessment relative to integers. Moreover, the academic performance of student-participants had also a significant increase of 1.7 mean value which moved up their academic level from fairly satisfactory to satisfactory.

Thus, construction of comic strip to increase and strengthen students learning attitude towards certain topics could be one of the best ways to improve students' academic performance in Mathematics and also, it could increase students' interest in learning the subject area because it encourages the students to appreciate Mathematics creatively and imaginatively.

TRANSLATIONAL RESEARCH

With the findings of the study, this comic strip will be submitted to the division office to evaluate further the content and design of the material for production. If logistics permit, this will be distributed to all the schools under DepEd-Catbalogan City Division to serve as recommending strategic intervention material in teaching fundamental operations on integers. This is to increase and strengthen students' skills and knowledge towards this concept and improve schools' performance regarding Mean and Mean Percentage Score.

ACKNOWLEDGMENT

This paper would not be possible without the undeniable help and support of the following: Our Lord God for the strength, grace, and wisdom that inspired me to do a better research study, my gratitude to our school head, research coordinator and of course to our supervisor, my everlasting appreciations to all the PNHS teachers for their undisputable efforts and assistance to make this

research possible especially to Ms. Ma. Sharmaine Solis, Mr. Reymart Abarracoso, Mr. Alexis Solis, Ms. Rizame Silawan and Mr. Gibbs Apollo Caro in helping me gather all the data needed to put this research into a meaningful reality, my exceptional thanks to my family for the unquestionable moral support and genuine backing and my special appreciations to all the students and student-participants who were involved in this research study. Also, I would like to give thanks to all the people who I wasn't able to mention above which extended a genuine help to make this research a full success.

LITERATURE CITED

Bransford, J., Brown, A., & Cocking, R. (2000). How people learn: Brain, mind, experience and school. Washington, DC: Commission on Behavioral and Social Sciences and Education, National Research Council. Retrieved from https://scholar.google.com.ph/scholar?hl=en&as_sdt=0%2C5&q=Bransford%2C+J.+et+al.+%282000%29.+How+People+Learn%3A+Brain%2C+Mind%2C+Experience%2C+and+School.+Washington+D.C.%3A+National+Academy+Press.+p.+3-23&btnG=

Cleaver, S. (2008). Comics & Graphic Novels. *Instructor*, *117*(6), 28. Retrieved from https://eric.ed.gov/?id=EJ792963

Jacobs, D. (2007). More than words: Comics as a means of teaching multiple literacies. *English Journal*, 19-25. Retrieved from DOI: 10.2307/30047289 https://www.jstor.org/stable/30047289

Karp, A., (2016). Current Issues in Mathematics Education. Moscow State Pedagogical University Teachers College, Columbia University. Retrieved from http://www.comap.com/Free/C_I_IN_MAT_ED/PDF/CURRENT_ISSUES_IN_MAT_EDUCATION.pdf

Legner, P. (2013). The Value of Teaching Mathematics. Retrieved from https://mathigon.org/downloads/value-of-mathematics.pdf

Muzumdar, J. (2016). An overview of comic books as an educational tool and implications for pharmacy. *INNOVATIONS in pharmacy*, *7*(4). Retrieved from DOI: https://doi.org/10.24926/iip.v7i4.463

Tilley, C. (2008). Reading Comics. ERIC Institute of Education Sciences. School Library Media Activities Monthly, 24 (9), 23 - 26. Retrieved from https://eric.ed.gov/?id=EJ790403

Toh, T. L. (2009). Use of cartoons and comics to teach algebra in mathematics classrooms. MATHEMATICS OF PRIME IMPORTANCE-MAV, *1*, 230-239. Retrieved from http://w.mav.vic.edu.au/files/conferences/2009/12Toh.pdf