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Research Article

Effectiveness of Using Manga (Japanese Style Comics) as a Study Guide in Enhancing Conceptual Understanding on Covalent Bonding

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ABSTRACT

Today's students face unique challenges as they are exposed to various reading resources. Modules that are time-consuming and difficult to complete. Sometimes the reading materials are devoid of elements that will keep the learner's attention. Thus, resulting in decreasing academic performance. The love of graphic novels is one of today's generation's most frequent interests. After noticing this commonality among students, the teacher-researcher came up with the idea of creating Japanese-style comics, or "manga," as supplementary material. This study is a descriptive survey and one group pre-test – a post-test design which is an experimental design. The developed supplementary material includes topics in General Chemistry, such as covalent bonding. Before using the supplementary material, the learners' performance improved. The computed t-value of 4.37, greater than the tabulated t-value of 2.032, confirms this. The following WAM was computed after analyzing the student respondents' level of acceptability of the generated additional material in terms of the material, usage, and presentation aspects: 3.66 for the material aspect, 3.57 for the usage aspect, and 3.72 for the presentation aspect. This strongly shows that the student respondents well received the developed supplementary material. Based on the study's findings, the researcher concluded that the Manga-style supplementary material could interest learners in learning challenging concepts of covalent bonding. The results show a considerable improvement in the learners' scores before and after using the developed supplementary material. As a result, this method of presenting lessons to today's generation of learners can be considered effective.

INTRODUCTION

Students learn things in many ways, and visuals and texts are the two commonly used types of presenting information to them. According to Mayer, as cited by Muzumdar (2016), there is no problem with using this type of instructional aid because presenting visuals and text together positively affects student learning. Combining visual information with verbal explanation has been demonstrated to improve students' reading performance, information retention capacity, and creative problem-solving abilities compared to material delivered in a non-illustrated format.

Using the appropriate learning media when delivering lessons positively affects the student's learning. Learning media can increase student retention of information and his attention to the learning process, increasing learning motivation. According to Sardiman (2011), Learning Motivation is a stimulant in students that creates, ensures continuity, and provides direction on learning activities to achieve learning purposes.

The deadly disease COVID 19 has changed people's lives. The effects have impacted every aspect of

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Scholarum: Journal of Education
www.scholarum.dlsl.edu.ph
Vol. 2, No. 1, August 2022

our society; even the education sector has seen significant setbacks. Despite the pandemic, it is crucial to continue education. One solution is to use a method called distance learning. This can be in the form of online teaching, Radio, TV Education Broadcasting, Modular, or a combination of any of the three. A modular approach is implemented for the school where the proponent of this research is teaching. Still, technology can be utilized to monitor learners' progress in accomplishing their tasks.

In modular distance learning, students will read a variety of reading materials. Based on the interview made by the teacher-researcher, he realized that as the new normal in education pursued, students tend to lose focus on reading their modules because of the length and difficulty. According to Vito (2003), as cited by Mcbride, student's choice in learning enhances determination, ownership, motivation, and involvement. What if the students are given a choice to work for their field of interest? This would bring a favorable effect on their learning. One of the advantages of technology in modern life is that we have an easy way of communicating with others. Easy communication with the students can also be provided. Teachers need to know the students' interests to cope with their needs. Based on the researcher's informal talk with the students in Grade 12 STEM, they are so much into watching and reading stuff like anime or Japanese animation. Another observation of the teacher-researcher is that the scores in in the performance on the students' written works in the first week of the second quarter tend to decrease. The teacher-researcher realized the need to combine the learners' interests with their academic difficulties.

Teachers use different techniques to ensure the success of the learning process. One of which is using different instructional materials that will help them to achieve their goals. In creating an effective instructional aide, teachers ensure that it is aligned with the learning competencies and learners' interests. According to Hidi & Renninger, as cited by Keefe and Garcia (2014), interest has primarily differentiated between two main forms: individual and situational. Individual interest also refers to personal interest that resides within the individual and is relatively stable. It involves a deep personal connection to the domain, activity, or content and an eagerness to reengage in the object of interest over time. Situational interest emerges from and is supported by environmental qualities. In this work, the researcher focused on individual interests. The teacher can create different instructional material based on learners' interests and personal connections to what they do outside the school.

Different learning media can increase learners' attention toward difficult topics. According to Rosi and Breidle in Sanjaya (2011), learning media are instruments and elements that can be used to achieve the purpose of education, such as radio, television, books, newspaper, magazine, etc. In addition, Daryanto (2013) explained that the media is one component of communication, especially as messages are agents from communicators to communicants.

According to Muzumdar (2016), "one of the most popular, yet underused, forms of media combining visual images with text is comics", yet the simplicity of the presentation of visuals and text generates a clear narration of information that goes beyond on the

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www.scholarum.dlsl.edu.ph
Vol. 2, No. 1, August 2022

use of traditional books in teaching and learning. In addition, Dr. Kaikalos, in his book "Science in Comic Books," used comic books as a part of a module of an undergraduate physics course. He reported that the students' preferred comic book problems to over-simplified, out-of-context problems presented in traditional physics textbooks. Through comic books, difficult topics in physics became relatable and engaging to students resulting in good academic performance. Furthermore, the study conducted by Nagata, as cited in the study of Bolton (2012), found that using Manga (Japanese comics and cartoons) helped students in biochemistry "use additional information and provide cognitive-psychological and pedagogical-technical effects: They give students clues to remember what they have learned and make biochemistry lectures exciting."

Moreover, as stated by Grant as cited in the study of Jaya (2017), reading is, in fact, a procedure for testing hypotheses, in which the reader chooses cues and bases his or her predictions about the discourse on those choices. Therefore, Manga can be used as a teaching and learning resource to stimulate students' interest during the learning process since it is a more comprehensible, accessible, communicative, and popular visual genre. In other words, Manga will be an effective teaching and learning tool.

Today's learners are greatly exposed to interactive visual media filled with graphics, iPhones, campaign ads, and video games. Learners might find non-illustrated, text-heavy lengthy reading materials less appealing. The visual representation of narratives is the advantage of using comics as instructional material. Its aesthetic appeal, which is greatly in pictures, might bridge the gap between students' ongoing life activities and school matters and motivate them to learn more about the information presented by their teachers. There is a significant decrease in students' academic performance taking General Chemistry I, which leads the teacher-researcher to take necessary measures.

METHODOLOGY

This study aims to enhance students' performance on General Chemistry I. Specifically, it answered the following questions:

1. What is the average performance of Grade 12 STEM students in General Chemistry I for the previous weeks before using the Manga-style supplementary material?

2. What is the average performance of Grade 12 STEM students in General Chemistry I using the Manga-style supplementary material?

3. Is there a significant difference between the performance of Grade 12 STEM students in General Chemistry before and after using the Manga-style supplementary material?

4. What is the level of acceptability of Grade 12 STEM Students on the developed comics (Japanese Manga) as supplementary material in General Chemistry I according to Material aspects, Usage aspects, and Presentation aspects?

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Scholarum: Journal of Education
www.scholarum.dlsl.edu.ph
Vol. 2, No. 1, August 2022

This study used descriptive-survey and one-group pretest This study used a descriptive survey and a one-group pretest-posttest design. This study was conducted in the second quarter of the First Semester Week 2 on the topic of Covalent bonding and structure, which are considered difficult among chemistry concepts because they involve the interaction of atoms and molecules at the microscopic level. Difficulties may arise when discussing this concept without proper intervention that will clear learners' misconceptions.

The research study was conducted at Sta. Catalina National High School, located at Sta. Catalina Sur Candelaria Quezon. It is a DepEd-managed rural secondary public school that offers Junior and Senior High School. The Senior High School Department offers the Academic and Technical Vocational tracks. Under the Academic Track are ABM (Accountancy, Business, and Management), HUMSS (Humanities and Social Science), and STEM (Science, Technology, Engineering, and Mathematics). The Teacher-researcher is currently working in Sta. Catalina National High School as an Arts and Science teacher in the Senior High School Department. He is also the designated adviser of the school Art club.

The teacher-researcher chose Grade 12 STEM students as respondents for this study as he is currently teaching General Chemistry on this strand. Grade 12 STEM strand consists of thirty-five (35) active students, which comprises eighteen (18) male students and seventeen (17) female students. Additionally, the teacher-researcher found that most of the students in this group are interested in art, especially in contemporary Japanese animation, while some, though less inclined, know what it is and could be developed interests in it. Moreover, students on this strand are inclined to Chemistry but have difficulties understanding concepts due to the current educational setup due to the pandemic.

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Vol. 2, No. 1, August 2022

without affecting their status.

To solve the problems presented, various treatments on the collected data were used. For problems 1 and 2, the respondents' scores on the activities presented before and during the use of the developed supplementary material were collected. The average scores of the respondents were tabulated to determine their performance before and after using the developed supplementary material. To answer the third problem, the significant difference between the performances of the student-respondents before and after using the developed supplementary material was measured through a t-test for the dependent sample. To answer the fourth problem, this study used a weighted arithmetic mean.

The Manga supplementary material was made following the competencies mandated by the Department of Education. The topic covered in the study was Covalent bonding. The teacher-researcher has been a fanatic of Japanese animation since he was a kid that developed his skills as a visual artist. The Manga supplementary material was written in twenty-six (26) pages. The first four (4) pages were colored to give students a glimpse of the characters' appearance when they are in full hue. Then to make them feel that they are reading a Japanese-style comic, the succeeding pages turned black and white. The reading orientation of this Manga supplementary material was from left to right, unlike the Japanese style that is read from right to left. This was done to adapt how Filipino read. The main language in these comics is Filipino, but English has also been used. Likewise, some translations use the Japanese language, particularly the names of the elements in the periodic table. This is done so that children can better remember the name of the elements in an interesting way. To ensure that the Filipino language used for this supplementary material is understandable and acceptable, the researcher asked two (2) Filipino subject teachers to validate it.

In contrast, the content was validated by the Science subject group head and by the Headteacher of the Science Department. Every second week of the month is the scheduled date for retrieving and distributing modules among the learners of the school where the teacher-researcher is teaching. This was also when the teacher-researcher distributed the Manga supplementary material to his STEM learners. If students did not retrieve their module for acceptable reasons, an Ebook copy of the manga was sent to them through personal messages. Also, it was sent to the group chat to provide the students with a backup copy.

RESULTS AND DISCUSSION

By the end of the First (1st) quarter of the School Year 2020-2021, during weeks 7 and 8, there is a significant decrease in the performance of G12 STEM students in General Chemistry, and the same result occurred during the administration of Week 1 of the second (2nd) Quarter.

Table 1. Average Performance of Grade 12 STEM Students Before and After Using the Manga Style Japanese Comics Supplementary Material

	Before			After
	1st Qtr Week 7	1st Qtr Week 8	2nd Qtr Week 1	2nd Qtr Week 2
Average Performance of Students Before Using Manga Supplementary Material	31.9	22.2	20.4	27.7

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Vol. 2, No. 1, August 2022

Table 1 shows the students' average performance during weeks 7 and 8 of the first (1st) quarter and week 1 of the second quarter before using the supplementary material of the manga (Japanese style comics). The same number of items (10 items) was administered in each activity during these weeks. As the figure suggests, there is a significant decrease in students' performance during the last week of the first quarter and the first week of the second quarter. Due to this drastic decrease in the students' performance in General Chemistry, there is a need to apply necessary interventions. It is worth noting that there was an increase in student performance during the administration of the second week of the second quarter, and this was when Manga-style Japanese comics were utilized.

Table 2. Significant Difference on the Performance of G12 STEM Students before and after the Use of the Manga Style Japanese Comics as a Supplementary Material

Period	N	Mean	df	t-value		Decision
				Tabulated (α =0.05, two-tailed)	Computed	
Before	35	5.83	34	2.032	4.37	Reject H_o
After	35	7.91				

Table 2 presents the scores of G12 STEM students before and after using the Manga (Japanese Style Comics) as supplementary material. A significant difference was noted in the scores of STEM students on the activities before and after using the developed supplementary material.

These findings were firmly justified by the absolute computed t-value of 4.37. The computed value is greater than the corresponding critical t-value of 2.032. Therefore, the hypothesis that states "there is no significant difference in the performance of the student-respondents before and after the utilization of the developed supplementary material" was rejected because, as the figure suggests, there was an increase in the score of the students after the use of the developed supplementary material.

The result conveyed that learner performed better with the aid of the developed supplementary material in the form of manga. The increase in the students' mean score indicates that they understand the lesson's concepts very well. The result was supported by the ideas of Mallia (2007) and Ozdemir (2010) that comics promote productive classroom engagements and shows a cognitive potential for students' motivation and retention purposes, as cited in the study of Enteria, O.C. (2019).

Table 3. Weighted Average Mean (WAM) of Level of Acceptability on Manga (Japanese Style Comics) as Supplementary Material in Terms of the Material Aspect (Note: WAM: Weighted Arithnetic Mean, HA: Highly Acceptable, A: Acceptable, SA: Slightly Acceptable, NA: Not Acceptable)

Material Aspects	4	3	2	1	WAM	Verbal Description
1. The contents of the learning media are in accordance with the topic of the covered lesson on general chemistry I.	23	7	0	0	3.77	HA
2. Completeness of lesson are covered in the material in learning media	20	9	1	0	3.63	HA
3. The use of language in the presentation of the material	23	6	1	0	3.73	HA
4. Text and writing in the media are easy to read	18	12	0	0	3.60	HA
5. The presentation of examples in the media is easy to understand	18	11	1	0	3.57	HA
Average Weighted Mean					**3.66**	**HA**

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Vol. 2, No. 1, August 2022

Table 3 shows the respondents' level of acceptability of Manga as supplementary material in General Chemistry in terms of the material aspect. The student-respondents evaluated it as highly acceptable, evidenced by the weighted average mean (WAM) of 3.66. Although the entire category under this aspect all acquired highly acceptable responses, it is worthwhile to note categories 2 and 3; Completeness of lesson is covered in the material in learning media, WAM of 3.63, and the use of language in the presentation of the material with WAM of 3.73. Two (2) of the respondents ranked their perception 2; this only proves that there is still a need for improvement. The results agreed with the assertions of Larking and Simon (1987) that the ability to process information is enhanced when text is augmented with pictures.

Table 4. Weighted Average Mean (WAM) of Level of Acceptability on Manga (Japanese Style Comics) as Supplementary Material in Terms of the Usage Aspects

Usage Aspects						
1. The use of educational comics learning media "GenChem Adventure" makes it easier to understand the concepts on Chemistry.	19	10	0	1	3.57	HA
2. The use of educational comics learning media " GenChem Adventure " can provide motivation to focus on learning	20	8	1	1	3.57	HA
Average Weighted Mean					**3.57**	**HA**

Table 4 presents respondents' level of acceptability of Manga as supplementary material in General Chemistry in terms of the usage aspects. The student-respondents evaluated it as highly acceptable, evidenced by the weighted average mean (WAM) of 3.57. The result agreed with Lin et al. (2015), as mentioned by Ozdemir, E. and Eryilmaz, A. (2019), that science comic books could increase students' interest and learning enjoyment more than text-only booklets. Teachers can stimulate the learners' attention and interest through comic books by presenting their lessons creatively and interactively to the students.

Table 5. Weighted Average Mean (WAM) of Level of Acceptability on Manga (Japanese Style Comics) as Supplementary Material of G12 STEM Students with its Corresponding Verbal Description

Presentation Aspects						
1. The selection of the character is accurate.	23	7	0	0	3.77	HA
2. The match of the picture with the story is appropriate.	23	6	1	0	3.73	HA
3. The storyline catches my interest	19	10	1	0	3.60	HA
4. Illustrations have suitable elements such as proportion of body features, facial expressions, and correct gestures.	19	10	1	0	3.60	HA
5. Character presentation is charming in a way it catches my attention to read the supplementary material.	23	3	0	0	3.90	HA
Average Weighted Mean					**3.72**	**HA**

Table 5 presents the Weighted Arithmetic Mean of the level of acceptability of G12 students to the developed supplementary material in terms of it presentation aspects. It was evaluated as Highly acceptable with WAM of 3.72 by the respondents.

Table 5 presents the Weighted Arithmetic Mean of the level of acceptability of G12 students to the developed supplementary material in terms of its presentation aspects. The respondents evaluated it as Highly acceptable, with a WAM of 3.72. In the study of Taltovic (2009), as cited by Shu, F.L. et al. (2015), comics and book illustrations are similar in the combination of text and images; text and images in comics are more closely associated and connected than those in books. This is because comics or Manga in Japanese

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Vol. 2, No. 1, August 2022

provide a wide variety of visual representations such as body language, facial expression, and gestures; this also uses speech bubbles that focus on the one who is speaking, making it easier to understand by the reader. When comics or Manga is used as an educational medium, the creator should consider the quality of its art to capture learners' interest in learning difficult concepts.

CONCLUSION AND RECOMMENDATIONS

Based on the study's findings, the researcher concluded that the developed supplementary material in Manga or Japanese Comics Style form could potentially engage learners in learning difficult concepts in General Chemistry I. Student-respondents highly accepted this as a contemporary way of learning. It is evident by the results that there is a significant increase in the learners' scores before and after using the developed supplementary material. Thus, it can be said that this way of presenting lessons for today's learners is effective.

Back to basic approaches such as providing hard copies of reading materials to students who do not have access to the internet and other platforms can greatly help the continuity of learning during the pandemic. Providing learners with interesting reading materials related to the subject matters they need to know can make them feel like they are not isolated while in distance learning.

Given the study's findings, the researcher recommends that the utilization of Manga as a supplementary material in General Chemistry I may be considered by science teachers to engage and captivate learners' interest in learning the difficult concept of the subject to enhance their academic performance. The school administrator may send teachers with potential or a passion for arts to training to collaborate with teacher-writers to further improve the content of Manga supplementary material. Other schools may also develop their manga-style supplementary material to test its effectiveness. Future researchers may develop a similar material with different topics or content on General Chemistry or other subjects.

REFERENCES

Bryce, M. (2014). Manga as an Educational Medium, 7(10):47-55, doi: 10.18848/1447-9508/CGP/v07i10/42761

Enteria,O.C (2019). Effectiveness of Developed Comic Strips as Instructional Material in Teaching Specific Science Concept, doi: 10.31686/ijier.

Keefe, P. O., Garcia, L.L. (2014). The Role of Interest in Optimizing Perfor mance and Self-Regulation, 58:70-78, doi: 10.1016/j. jesp.2014.02.004

Maharani, FIJRI, I.D.(2018). Development of Educational Comics "Accounting Days" As Accounting Learning Media to Improve Students Learning Motivation of Class XII Social SMA Negeri 5 Yogyakarta Academic Year of 2017-2018, 16(2), doi: 10.21831/jpai.v16i2.22051

Mallia, G. (2007). Learning from the Sequence from the Sequence: The Use of Comics in Instruction:Retrieved from http://www.english.ufl.edu/ image/etext/archieves/v33_/mallia/.Florida,USA

Muzumdar,J.(2016). An Overview of Comic Books as an Educational Tool and Implications for Pharmacy, 7(4), doi: 10.24926/iip.v7i4.463

Ozdemir, E., Eryilmaz, A. (2019). Comics in Science Teaching: A Case of Speech Balloon Completing Activity for Heat Related Concepts, 9(1) 37-51, Retrieved from https://files.eric.ed.gov/fulltext/ ED595642.pdf

Shu, F.L (2015). Are Science Comics a Good Medium for Science Commu nication? The Case for Public Learning of Nanotechnology, 5(3):1-19, doi: 10.1080/21548455.2014.941040

Tatalovic, M. (2009). Science Comics as a Tools for Science Education and Communication: A Brief, Exploratory Study, 8(4), doi: 10.22323/2.08040202

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