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Enhancing Physics Education Through Comic Strips: A Development Research Study

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This study's primary purpose is to venture into developing and evaluating the effectiveness of comic-based materials for teaching physics in junior high school. A sequential developmental and evaluation design was employed, with 15 grade 10 students from Visayas State University Integrated High School participating. Bloom's taxonomy guided the creation of open-ended pre-test and post-test questions. The comic strips were developed, evaluated, and tested. Results indicated substantial inter-rater agreement on the comic strips' effectiveness in learning (74%) and entertainment (77.14%). Statistical analysis revealed a significant difference between the performance of grade 10 students before and after exposure to the materials, demonstrating the effectiveness of the developed comic strips in enhancing student learning. Additionally, the study found that the developed comic strips are acceptable and can serve as an impactful teaching tool in physics education. The findings contribute to the evolving landscape of innovative instructional methods and hold implications for enhancing physics education.

Keywords: instructional plans, comic strips, teaching physics, junior high school, sequential developmental, evaluation, physics learning

INTRODUCTION

Persistent difficulties in the classroom impede the teaching and learning processes. These issues stem from several things, such as low student engagement, learning obstacles, and the shortcomings of conventional or boring teaching methods. Traditional teaching methods often fail to engage students with diverse preferences (Hu, 2024). Unengaging teaching styles contribute to student disengagement, highlighting the need for interactive and student-centered methods to foster better engagement (Urias, 2022). Such issues are particularly evident in science education, where subjects like physics often pose significant difficulties for learners.

Physics is one of the most fundamental scientific disciplines, yet students often find its topic challenging (Corpuz, 2017). This might be because most students consider physics difficult (Erinosho, 2013; Baran, M. 2016). Students emphasize that the course content

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itself is a major source of difficulty in learning physics (Ekici, 2016). Topics such as work, energy, and power are challenging, prompting educators to explore innovative teaching strategies to enhance learning outcomes. Difficulty understanding physics often stems from abstract concepts, curriculum content, and problem-solving emphasis (Camarao & Nava, 2017; Roresh, 2021). Educators have explored various innovative teaching strategies to address these challenges, among which comics are emerging as a promising tool.

Nowadays, comics and cartoons are utilized as instructional materials in science classrooms. Studies have shown that comics can make abstract concepts more accessible and engaging, leading to improved understanding and retention (Setyowati & Rochmat, 2023). This study claims that the developed comic-based instructional material will help improve students' academic performance in physics.

Educators agree that meaningful and engaging instruction is pivotal in improving student performance. Active teaching strategies can enhance student engagement, and these are particularly beneficial for non-traditional student groups who may feel isolated in conventional classroom settings (Arjomandi et al., 2018). Various instructional strategies (constructivist-based approaches, integrated approaches, dynamic visualizations, experiential learning, and interactive tools like puzzles) have been employed to make learning more effective and engaging (Kurnaz & Calik, 2009; Ryoo & Linn, 2012; Raja, 2018; Adeyemo et al., 2013). Among these, the use of comics as instructional materials is gaining recognition for its potential to motivate and engage students. Comics also effectively stimulate critical thinking and creativity (Cheesman, 2006; Erinosho, 2013). Studies have demonstrated that comics can improve learning in subjects like English, Social Science, and Anatomy (Megawati & Anugerahwati, 2012; Park et al., 2011; Ravelo, 2013; Rokhayani & Utari, 2014) even teaching students how to gain 21st-century skills (Afrilyasanti, R., Basthomi, Y., 2011). Comics has also been used in science education. Tatalovic (2009) wrote an article that gives us information about the comics available in science education. He provided evidence that comics can be efficiently used for scientific literacy. Students can also build up their knowledge while demonstrating creativity in creating comics. (Albrecht E. and Voelzke M.R., 2012). Gonzalez-Espada (2003) also states that comic strips are an innovative way to promote Higher-Order Thinking Skills (HOTS). Setyowati and Rochmat (2023) found that using historical comics makes reading material enjoyable, adds intrigue to stories, and improves students' attention. Educators must emphasize engaging, interactive, and appropriate learning media to maximize critical thinking skills.

In physics education, however, the use of comics is relatively underexplored. This study addresses this gap by developing and evaluating instructional material that employs comic strips as a primary source of information for independent learning, unlike other studies where comics were used as supplementary tools or attention-getters. The developed comics encourage students to actively discover and engage with the material by narrating physics concepts through sequential frames, making abstract topics more accessible and enjoyable. Engaging students with hands-on concept cartoons and guided activities can prompt them to predict outcomes, observe results, and explain their observations (Nalkiran & Karamustafaoğlu, 2020). Ritter et al. (2020) emphasized that a creative learning environment fosters creativity while enhancing students' cognitive skills.

Student learning experiences with comic-based modules showed improved understanding of physics topics and increased motivation to learn (Badeo et al., 2021). This aligns with the rationale for choosing comics, as their characteristics resonate with today's students, often described as digital natives. Their familiarity with visual and interactive media makes comics ideal for delivering content that resonates with their preferences and learning styles. While the use of comics in education has shown promise, further evidence is needed to understand how they enhance learning and align with different types of student intelligence.

This study ventures into developing and evaluating comic-based instructional materials aimed at improving learners' academic performance in physics. Specifically, it seeks to: 1) Develop instructional material using comic strips in teaching physics. 2) Evaluate the quality of the developed material in terms of learning and entertainment value, and 3) Assess the effectiveness of the material in improving students' academic performance in physics. This study's findings will benefit both the scientific community and the field of education. Physics educators can benefit from insights and recommendations for enhancing student engagement and performance. The goal is to create instructional tools that make physics more approachable, encourage analytical thinking, and foster a love for learning among students.

METHOD

Research Design

This study employed a sequential developmental and evaluation design, following a one-group pre-test-post-test research approach. This design involves a systematic, staged process, where each phase builds upon the previous one to gather sufficient data for testing the hypothesis. The study also adopted principles from the research and development (R&D) model, explicitly aligning with Borg and Gall's methodology, emphasizing iterative development, evaluation, and refinement.

In this design, a single group of participants was assessed using the same dependent variable (academic performance in physics) before (pre-test) and after (post-test) the intervention. The intervention involved using comic strips as the primary instructional material for independent learning. The design aimed to measure the effectiveness of the developed material in improving students’ understanding of specific physics concepts.

Behavioral researchers often use this design to evaluate the impact of interventions on a target population (Allen, 2017). The key features of this approach include 1) the use of a single group of participants and 2) sequential assessment of the dependent variable before and after administering the treatment. The difference between pre-test and post-test scores served as the basis for determining the intervention's effectiveness.

Research Environment

This study was conducted virtually using Google Meet, Google Forms, and Facebook Messenger to accommodate the constraints of the pandemic. The participants were Grade 10 students of Visayas State University Integrated High School (VSUIHS), formerly Visayas State University Laboratory High School (VSULHS), located at Brgy. Pangasugan, Baybay City, Leyte. These tools were chosen due to their accessibility, cost-effectiveness, and user-friendliness for both the researcher and the participants.

- Google Meet – Facilitated real-time online sessions to introduce the comic strips and monitor the learning process.
- Google Forms – Used to administer surveys, pre-tests, and post-tests.
- Facebook Messenger – Enabled seamless communication and submission of responses for solution-based questions.

Research Respondents and Sampling Procedure

The participants were 15 randomly selected Grade 10 students of VSUIHS. These students were enrolled in the physics course, a required subject for Grade 10. Each of the three sections (Neptune, Uranus, and Saturn) contributed five students chosen through stratified random sampling. Due to the pandemic, five students in each section were randomly chosen to be the study participants. This ensured balanced representation across the sections despite the challenges, such as limited internet connectivity.

Research Instruments

The test instrument in this study was designed to measure students' knowledge and understanding of physics topics (Work, Kinetic Energy, Potential Energy, and Power) at different cognitive levels as outlined by Bloom's taxonomy. The questionnaire consists of 20 questions (five questions from each topic), which were validated by three experts with advanced degrees (Master's or Doctorate).

The instrument was pilot-tested with Caridad National High School students to verify its validity and reliability. Its quality was assessed by statistical analysis. Adjustments were made in response to the pilot test results.

Learning Process

This was designed to facilitate independent learning through the use of comic strips. Each session, lasting one hour, focused on a specific topic. Students were introduced to the material during a brief virtual meeting, followed by independent exploration of the comic strips. The comic strips presented physics concepts through engaging storylines and visual representations, encouraging students to discover and understand the ideas on their own.

Data Gathering Procedure

This study was conducted from January to July 2020.

- Development and Pre-Evaluation: The comic strips were designed based on the developed storylines for each topic and evaluated by the Department of Development Communication of Visayas State University, together with two physics instructors.
- Pilot Testing: The materials were pilot-tested in one of the public schools in the Baybay City Division to identify potential improvements.
- Implementation: The final version of the comic strips was presented to the selected participants upon the approval of their parents or guardians. Students participated in four online sessions (Work, Kinetic Energy, Potential Energy, Power), each covering one topic and lasting one hour.
- Assessment: Pre-tests and post-tests were administered during each session to measure the students' learning gains.

Data collection was done using Google Forms for long-answer questions and Facebook Messenger for problem-solving solutions. Responses were compiled, double-checked, and recorded for analysis.

Data Analysis Procedure

The data gathered was presented in tables and figures, which served as the basis for the discussion. The data were analyzed using appropriate tools. For descriptive statistics, mean scores were computed to provide an overview of the participants' performance. For inferential statistics, a Wilcoxon Signed-Rank Test was conducted to determine the significance of the difference between the pre-test and post-test scores, assessing the effectiveness of the intervention. After performing the normality test, this was chosen due to the data's non-normal distribution.

The data from the evaluation of comic strips were analyzed using inter-rater agreement (IRA) to evaluate the consistency among raters when assessing the quality of the comic strips. The inter-rater agreement ensures the reliability of ratings across multiple evaluators (Altman, 1991). The test data analysis results indicated that the instrument had high reliability and validity, demonstrating its suitability for assessing the students' learning.

FINDINGS

This chapter presents the data analyzed, with a discussion of the results and implications.

Developed instructional material using comic strips in teaching Physics

This study's developed instructional material consists of four lesson plans, each with a corresponding comic strip. These outputs are as follows: (1) Lesson Plan for work with comic strip titled Planet Physics, (2) Lesson Plan for potential energy with comic strip titled Starting Physics, (3) Lesson Plan for kinetic energy with comic strip titled Say No to Bullies, and (4) Lesson Plan for power with comic strip titled power within.

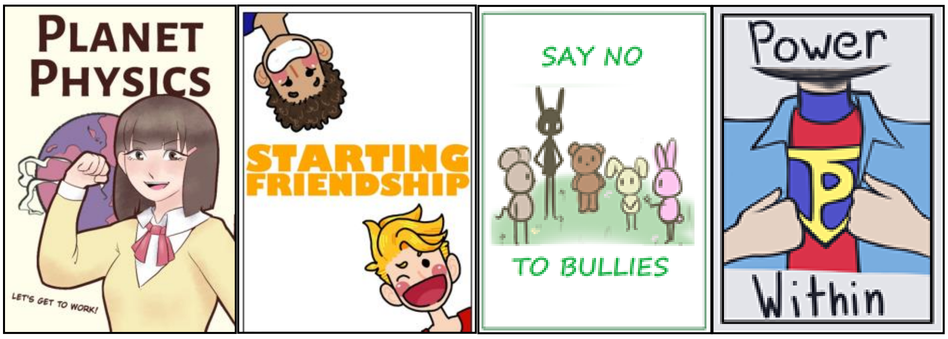

Figure 1
Cover pages of the four developed comic strip

Quality of the developed materials

The storyline was checked and corrected in terms of grammar and content before being given to the artists. The developed materials (comic strips) have undergone initial evaluation from a development communication expert. Upon the initial evaluation, the following suggestions/comments were given:

1. Changed the cover pages and title to a catchier design.
2. Panels on each page must be arranged horizontally.
3. Double-check the content concepts, given numbers and units.
4. Make the character livelier and student-friendly.
5. The storyline and plots were stimulating and attractive.

Using the educational comic assessment criteria adapted from Zaibon, Azman, and Shiratuddin's Instrument for evaluating digital educational comics, the materials were evaluated by at least five experts.

Their study focused on designing, developing, and validating an instrument that can be used to evaluate educational comics based on its two main aspects: learning and entertainment. Seventeen (17) items were adapted from their study, ten (10) for learning and seven (7) for entertainment.

The results were then evaluated using the inter-rater agreement (Altman, 1991). It is used to determine the degree to which evaluators give the same rating to an identical observable situation using the same rating scale.

In terms of learning

Table 1
Results from Inter-rater agreement in terms of learning

Statement	Number of Concordant Responses	Total Number of Responses	Percent Agreement	Interpretation
1. Goal Alignment: The comic's ideas/questions/facts/pieces of information are relevant to the topic	5	5	100	Perfect Agreement
2. Agility: The text element in the comic is presented in short, concise segments	2.5	5	50	Moderate
3. Typography: The font shapes, colors, and size facilitate and stimulate reading	3	5	60	Moderate
4. Consistency: The comic makes use of certain pictorial consistency, which adds significantly to the learning process.	3.5	5	70	Substantial
5. Recipient: The comic promotes a positive attitude toward the topic.	5	5	100	Perfect Agreement
6. Accuracy: The ideas/questions/ facts/ pieces of information in the comic are accurate and free of errors.	3	5	60	Moderate
7. Argumentation: The comic generates ideas/ questions/facts/pieces of information about the topic	5	5	100	Perfect Agreement
8. Thoroughness: The characters/personas' interaction with the educational content is meaningful and permits the reader to have a much greater understanding of the concept/topic.	3.5	5	70	Substantial
9. Emphasis of Key Concepts: The contents in the comic are easily balanced, distinguished, or discernible from fiction or fantasy. The comic emphasizes key concepts.	3.5	5	70	Substantial
10. Prospective: The story triggers further questions related to the educational topic.	3	5	60	Moderate
Average Domain Agreement			74.00	Substantial

Table 1 shows the result of the inter-rater agreement on evaluating the comic strips in terms of learning, wherein there are ten statements. The average domain agreement of 74 % is substantial. From the inter-rater agreement legend, 61% - 80% is considered substantial.

However, following the rule of thumb for determining whether the inter-rater agreement is sufficient, the average domain agreement is slightly below the 75% minimum. Some of the statements reveal that the agreement below 75% had levels that might cause the average domain to be slightly below the minimum of 75%. Ratings on these statements need further examination.

In terms of Entertainment

Table 2
Results from Inter-rater agreement in terms of entertainment

Statement	Number of Concordant Responses	Total Number of Responses	Percent Agreement	Interpretation
11. Layout: The pictorials and words complement one another. The contrast and effects are used effectively to aid focus.	3	5	60	Moderate
12. Clear instructions: The story's pace, shot, and direction are natural and make sense to the reader. The character's position is reasonably placed.	4	5	80	Substantial
13. Navigation: The comic panels, speech balloons, and captions placement ease the flow of the story.	3.5	5	70	Substantial
14. Organization: The comic has a well-described setting with a clear beginning, middle, and end.	5	5	100	Perfect Agreement
15. Plot: The plot exhibits good development, imagination, and continuity. The resolution brings the conflict to a satisfying end.	5	5	100	Perfect Agreement
16. Characters: The characters are believable and well-developed.	3	5	60	Moderate
17. Feedback: The plot and action necessarily give the user adequate direction and information for progressing.	3.5	5	70	Substantial
Average Domain Agreement			77.14	Substantial

Table 2 shows the result of the inter-rater agreement on evaluating the comic strips in terms of entertainment. The average domain agreement of 77.14 % is substantial. The rule of thumb suggested by various experts contends that values from 75% to 90% demonstrate an acceptable level of agreement when using the percentage of absolute agreement (Hartmann, 1977; Stemler, 2004); this means that evaluators do agree on the exact rating in terms of entertainment.

However, some of the statements reveal that they had levels of agreement slightly below the 75% rule of thumb, which means that these statements need further examination.

Developed material's effectiveness in improving learner's performance in Physics

The effectiveness of the developed comic strips in enhancing the performance of learners in physics was assessed using a pre-test and post-test design. Four topics – Work, Kinetic Energy, Potential Energy, and Power – were identified as the focus of the study. The results of the participants' performance before and after exposure to the material are presented in Figure 2.

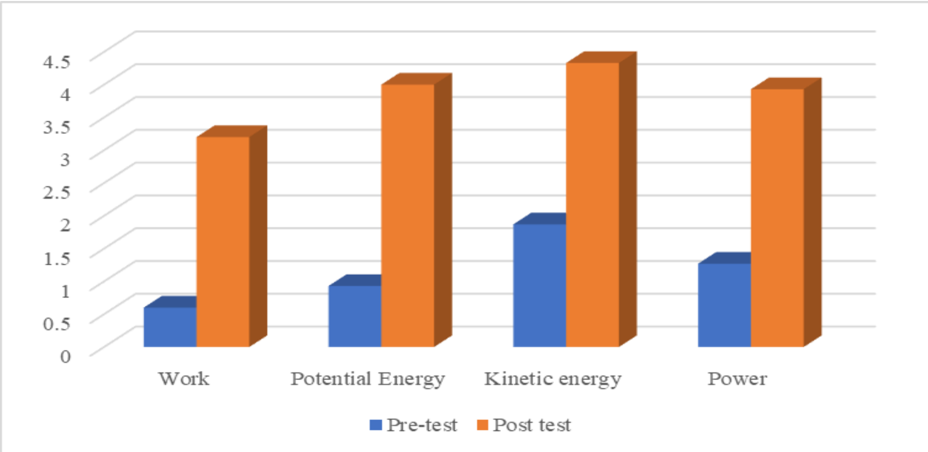

Figure 2
Comparison of pre-test and post-test mean scores

The figure illustrates the mean scores of students in the pre-test and post-test across the four physics topics. The highest possible score for each topic is 5. As seen in the graph, the participants have mean scores before exposure to the material of 0.6 (12 %) in Work, 0.93 (18.6%) in Potential energy, 1.87 (37.4%) in Kinetic Energy, and 1.27 (25.4%) in Power.

Despite having fewer items, it is evident that most of the participants did not pass the pre-test, and their mean scores were also low in all of the topics. The result tells us that the participants have less prior knowledge of the topics, especially on work. The participants performed poorly in the pre-test since the topics were new and they only had less knowledge. This result confirms the findings of Corpuz (2017) and Ekici (2016), wherein students found most of the physics topics difficult because of their poor background knowledge and content courses.

Meanwhile, the participants got the following mean scores after exposure to the material: 3.2 (64 %) in Work, 4 (80%) in Potential energy, 4.33 (86.6%) in Kinetic Energy, and 3.93 (78.6%) in Power. Based on the mean scores, students performed much better than in the pre-test. The majority of the participants passed the test, and some even got a perfect score. This means that their exposure to the material has helped them gain new knowledge about the topic they did not know before.

The comparison of pre-test and post-test results indicates that the developed comic strips are an effective tool for teaching physics, as they facilitated a marked increase in students' understanding of the topics. This suggests that incorporating innovative and visually appealing teaching methods, such as comic strips, can enhance learners' engagement and comprehension in science education.

A normality test was conducted prior to performing the Wilcoxon Signed-Rank Test to ensure the appropriateness of the statistical methods used.

Table 3
Shapiro-Wilk Normality Test Results

Variables	W-statistic	p-value	Interpretation
Pre-test Work	0.755	0.0010	Not Normally distributed
Post-test Work	0.838	0.0118	Not Normally distributed
Pre-test KE	0.861	0.0253	Not Normally distributed
Post-test KE	0.749	0.0009	Not Normally distributed
Pre-test PE	0.817	0.0061	Not Normally distributed
Post-test PE	0.862	0.0257	Not Normally distributed
Pre-test Power	0.880	0.0481	Not Normally distributed
Post-test Power	0.868	0.0320	Not Normally distributed

The p-values for all topics are less than 0.05, indicating that the data are not normally distributed. This suggests that the data does not follow a normal distribution. Given this, non-parametric tests like the Wilcoxon Signed-Rank Test are suitable for analyzing the data.

Table 4
Significant Differences Between the Pre-test and Post-test Mean scores of participants in all physics topics (Pre-test – Post-test)

Comparison	Statistic (W)	p-value	Interpretation
Pre-test Work vs Post-test Work	0.0	0.000870	Significant
Pre-test KE vs Post-test KE	0.0	0.000886	Significant
Pre-test PE vs Post-test PE	0.0	0.000061	Significant
Pre-test Power vs Post-test Power	0.0	0.000926	Significant
Pre-test Mean vs Post-test Mean	0.0	0.000061	Significant

Table 4 presents the consolidated results of the Wilcoxon Signed-Rank Test of significant differences between the students' performance in the pre-test and post-test.

The table revealed that using 5% level of significance, there is significant difference between the performance of students before exposure and after exposure to the material using the four physics topics: work (p= 0.000870); kinetic energy (p= 0. 000886); potential energy (p= 0.000061); and power (p= 0.000926). The significant p-values in all comparisons suggest that there are notable differences between pre-test and post-test scores, indicating that the instructional strategies have effectively improved student performance.

Based on the mean of p-value 0.000061, the data revealed a significant difference between the performance of grade 10 students exposed to the material (comic strips) since the p-value is lesser than the 0.05 significance level. This suggests that there is a statistically significant change in scores from the pre-test to the post-test. Hence, the test is significant, and therefore, the null hypothesis is rejected, which means that teaching Physics topics using comic strips can help improve students' academic performance.

DISCUSSION

This study aimed to evaluate the effectiveness of using comics as pedagogical materials in teaching physics concepts. The results demonstrate that comics significantly improved students' pre-test to post-test performance, indicating their effectiveness as instructional materials. This finding aligns with prior studies, such as those by Krishnan and Othman (2016), Koutnikova (2017), Casumpang and Enteria (2019), Mamolo (2019), and Maghfiroh and Kuswanto (2022), proving that comic is effective to be used as a pedagogical strategy or instructional materials. The use of comic strips motivates students' learning process (Cabrera, P. et al., 2018).

Jamal et al. (2018) conducted a systematic literature review on studies about concept cartoons used in problem-based learning. The findings show that using a cartoon concept teaching strategy to enhance creative thinking and cultivate interest in STEM is very effective.

Krishnan and Othman (2016) conducted a study about the effectiveness of using comics as a learning tool in teaching and learning science. Results showed a significant increase in the pupils' achievement, increasing the student's ability to remember facts and their higher-order thinking skills.

Koutnikova (2017) found out that using comics in science education can help make science concepts interesting and comprehensible. Her study was based on observations of changing perceptions of phenomena by children due to the use of comics.

On the other hand, Casumpang and Enteria (2019) concluded that comic strips were effective as instructional materials in teaching specific science concepts. Their study showed a significant difference between the respondents' pre-test and post-test performance when they were aided with the comic strips. Their developed comic strips also improved students' comprehension and enhanced science process skills.

Mamolo (2019) stated that students' positive experiences were because comics are unique and cater to the 21st-century learners who are the respondents of the study. These respondents are considered digital natives, so it helps in motivating them. Maghfiroh and Kuswanto's study (2022) shows the effectiveness of integrating comics to improve students' vector representation and critical thinking abilities.

The COVID-19 pandemic has brought unprecedented experiences to the learners. In a study by Alomyan (2021), results indicated that students feel anxious, restless, and even confused while learning in a distance learning setup. The use of comics as a pedagogical strategy and learner-centered instruction during the pandemic will help educators address this problem.

Using comics as a pedagogical strategy motivates students to learn physics concepts and contributes to the development of their creative thinking skills, higher-order skills, and visual perception skills. Akcanca (2020) presented in his review article the benefits of using comics in education. He stated that integrating comics with the teaching activities will open a new window to students' imagination and contribute to the stated skills.

Creative and higher-order skills can also be developed when using comics in teaching activities. This can be observed from the solutions made by students upon reading the material. Guided by Bloom's taxonomy, part of the test contains higher levels of cognitive thinking, which were problem-solving. The comic material did not show any formulas or solutions. Still, the students themselves were able to create the formula that they used in solving mathematical problems just by reading the comic strips.

Students' solutions to problem-solving questions in the post-test were gathered and analyzed. The following are the themes based on the solutions submitted by the students:

Students solve directly using the given in the problem.

Some students' solutions showed that they could identify the values of the given from the problem. They either multiply or divide the given they found in the problem and set it as the answer. Some students got the correct answer by doing this in some cases, but most students who got the wrong answers used this computing method for what was asked in the problem.

Students created a visual representation of the problem.

Solving mathematical problems also involves critical thinking. Data shows that students were able to draw schematic presentations of the problems/situations stated. The problems given to them did not include illustration or representation. It is helpful to illustrate a problem so it can be answered easily and quickly. Students who used schematic visual representations spontaneously were more successful problem solvers than those who represented problem elements pictorially, according to Edens and Potter (2008).

Students created formulas from the comic strips.

Improving students' critical thinking skills is vital. Students' solutions showed that they could create their own formula to solve for what is asked in the problem. They were able to analyze the problems critically. The materials were able to help them analyze the problem without giving solutions. Formulating a formula to solve a problem is not easy. Reddy and Panacharoensawad (2017) found that poor mathematical skills and a lack of understanding of the problem are the major obstacles to problem-solving skills in physics.

This study highlights the potential of comics as a learner-centered instructional material that fosters motivation, creativity and critical thinking. By incorporating comics into teaching strategies, educators can address the needs of the 21st-century learners, especially in challenging subjects like physics.

While the use of comics as a pedagogical tool yielded promising results, some weaknesses were observed. For example, a subset of students solved problems by directly manipulating the given data without fully understanding the problem context. The findings may not be universally applicable to all physics topics or diverse learning environments, as the study focuses on specific content areas and relies heavily on visual and textual learning materials.

CONCLUSION AND SUGGESTIONS

This study revealed that students performed poorly before exposure to the material, but their performance increased after exposure. This study also revealed that using the developed comic strips has shown a significant difference in the gain of the students exposed to them, and the developed comic strip is acceptable. Furthermore, the acceptability of the comic strips as a pedagogical material underscores their potential for broader implementation in physics instruction.

However, the scope of this study's findings is limited to the specific topic and educational institution under study. Thus, promising results should be interpreted cautiously and not generalized to all contexts without further research.

Given the findings and the limitations of this study, the following suggestions are proposed for consideration:

1. Subsequent studies can concentrate on using the created comic strips for additional physics-related themes or subjects. This would reveal more about their adaptability and success in the broader variety of learning environments.
2. Comparative studies could be conducted to evaluate the effectiveness of comic strips relative to traditional instructional methods. This would provide a more comprehensive understanding of their pedagogical value.
3. Further studies should delve deeper into the participants' reactions, feelings, and thoughts during the implementation of the intervention. Qualitative data could enrich the understanding of how comics influence motivation, engagement, and learning experiences.
4. Future studies should explore the most effective ways to design and present engaging comic strips.
5. Given the semi-quantitative nature of this study, further research is needed to explore how comic strips perform in diverse educational institutions and among students with different learning preferences.
6. Longitudinal studies could be conducted to determine the lasting effects of using comic strips on students' retention, problem-solving skills, and attitudes toward physics.

By tackling these topics, future studies can more significantly aid in the development of creative teaching methods and offer helpful advice on how to utilize comics in the classroom best.

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