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RESEARCH ARTICLE

Media Cartoons: Effects On Issue Resolution In Environmental Education

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Abstract

The study focused on media cartoons as a teaching strategy in Environmental Education. Specifically, it sought to determine the effects of media cartoons on the issue resolution skills of first year high school students. The study was conducted in La Salle Green Hills that had eleven sections in the first year high school level for the School Year 2009-2010. Two comparable sections being taught by the researcher were chosen as the groups for the study. Both classes met for 80 minutes per meeting, three times a week. The students were given a pretest and a posttest on both Issue Resolution Skills Test (IRST). The IRST measured the ability to provide solutions to various environmental issues and problems. A teaching strategy that included film showing, group dynamics, laboratory activities, and motivational games was utilized for the conventional group. Media cartoons that improve skills in issue resolution and conceptual understanding of topics on Environmental Education were introduced to the students in the experimental group.The scores in the pretest and posttest of the participants were tabulated and used to determine the significant difference of the students' mean performance in the media cartoons and conventional groups. The t-test was utilized in the treatment and analysis of data gathered. Findings reveal that exposure to media cartoons results to a significantly better issue resolution skills on environmental education topics than the conventional approach. The researcher observed that students actively engaged themselves in media cartoon activities that enabled them to make responsible actions and provide solutions to local and global environmental problems. Students had an active participation in sharing insights and opinions in evaluating the message of media cartoons.Based on the findings of this study, the researcher concludes that exposure to media cartoons significantly improves the issue resolution skills of students. The strategy provided a learning opportunity in a non-threatening setting that promotes students' skills of observation, formulation of hypothesis, and creativity. In this regard, the researcher encourages the use of media cartoons as an alternative teaching strategy as it improved the issue resolution skills of students. Learning activities in combination with environmental education methods can greatly enhance students' engagement with environmental and science issues.

***Keywords*:**

Introduction

"What do I teach in my science lesson and how should I teach it?" is a question asked regularly by science teachers. It is a query as to content and strategy that will equip students with the skills necessary in making informed and thoughtful decisions on myriads of science arguments and environmental issues.

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The researcher of this study believes that media in the form of cartoons and comics can play three basic roles in individualized instruction. First, it can be used as the actual medium of instruction in the form of structured notes and worksheets. It can also be used as a constructivist vehicle for structuring and controlling the process by which learners acquire information rather than as a means of conveying the information itself. This medium allows students to express their views and perspectives in an entertaining way. Then lastly, it can enhance the critical thinking skills of students through issue resolution by making responsible decisions on certain environmental issues. Media cartoons enable students to explore connections among different disciplines and present solutions on selected environmental issues through visual frameworks.

Teaching materials that are designed for both visual effectiveness and content, can improve significantly student motivation as well as comprehension. The activities of selecting and creating instructional materials convey an extensive process of designing a program of classroom interaction. Studies on the effectiveness of visual materials for teaching have been reported by several researchers including those of Kara (2008), Steel (2006), Villaruz (2005), and Reyes (2003). The researchers found that visual materials should be selected on the basis of how effective they will be in bringing total quality education, a desired learning outcome. Results can empower students in making decisions with accurate and comprehensive information and intellectual tools to apply scientific information to their lives.

The implementation of media cartoons combined with varied teaching creative strategies keeps the focus on the students, the learning process, and the continuous improvement of the process to achieve quality education. According to Ramirez (2002), instruction with creative activities improved the skills of students to evaluate information.

In the 2003 Trends in International Mathematics and Science Study, the Philippines ranked 42 out of 45 participants in the Science Achievement Test. This is a glaring evidence that underscores the need to improve the performance of high school students. With most schools implementing conventional teaching, they can optimize the utilization of media cartoons in creative activities that can develop critical thinking skills of high school students.

The 2008 National Achievement Test, revealed the low mastery percentage of students in the field of Science. Though the public school students had a mean percentage score of 57.90% in 2008 which is higher than that of 2007 (51.58%), this performance is still very far from the target passing percentage of 75%. This situation reveals the poor critical thinking skills among students.

Thus in this study, the researcher utilized media cartoons that could improve critical thinking skills anchored on issue resolution skills of students. Holliday and Grskovic (2002) claimed that the use of media cartoons can assure students in gaining some knowledge of current events and demonstrating understanding that can develop higher order thinking thereby maximizing the learning process.

The power and efficacy of cartoons has long been recognized because of their readability and visual appeal to the audience. It takes the essence of a particular situation or character and further condenses it into a single image, telling a clear story in a brief and influential way. They are readily accessible appearing in every major newspaper in the world and appeal to all levels of readers. Cartoons increase student's knowledge and understanding of science concepts, which are normally difficult to comprehend and often cause misconceptions (Dalacosta, *et al*., 1998).

Cartoonists incorporate caricatures, symbolisms, satire, and well-rounded understanding of the issues about which they draw. Daryl Cagle, a popular cartoonist, said “Editorial cartoons cover a lot of high-level concepts and things that are harder to convey in text. The ability to interpret an editorial cartoon is being considered as a basic skill, right along with map and graph reading.”

In dealing with environmental issues, students may have a weak grip of concepts, analysis and decision-making process. The use of media cartoons presents an opportunity for the students to a visual framework dealing with environmental issues and conceptual understanding in selected environmental education topics relating to different academic disciplines. Interdisciplinary learning provides experiences where students learn and use abilities or techniques to demonstrate a concept or idea.

The study determined the effects of media cartoons in the concept understanding and issue resolution skills of students towards Environmental Education. Specifically, the study sought answers to the research question: Do students exposed to media cartoons have a higher issue resolution skill than those who are not?

Media Cartoons and Comics in the Philippines

The word cartoon has various meanings, based on several different forms of visual art and illustration. The term has evolved over time. From humorous illustrations in magazines and newspapers, a cartoon can also be described as a creative visual work for print media, electronic media, and even animated film/digital media.

A cartoon applied to print media is a piece of art which most often refers to a humorous single-panel drawing or gag cartoon, most of which has a caption. Modern single-panel cartoons or gag cartoons, found in magazines and newspapers, generally consist of a single drawing with a caption immediately beneath or a speech balloon. Cartooning started during the Renaissance era, when popular art painting was at its peak. Derived from the Italian word 'cartone' it pertains to preliminary drawings that are made into fresco paintings.

Editorial cartoons are a type of gag cartoon in news publications and news websites. Although they also employ humor, they are more serious in tone that acts as a visual metaphor to illustrate a point of view on current social and/or political topics. Most use visual metaphors and caricatures to explain complicated situations and current events with a humorous or emotional picture. Their purpose is to bring across a message to people and try to make them think the same way.

In the Philippines, cartooning was informally introduced by Jose Rizal through his multi-panel illustrated stories of anecdotes and fables of which the most popular is the story "The Monkey and the Tortoise." But it was the emergence of a Philippine press during the American occupation that triggered thought-provoking cartoons that were regularly printed in newspapers and magazines (Manila Bulletin, 2000). Socio-political background has been the standard theme of Filipino comics as published in news magazines like “*Kiko and Angge*” written by Tagalog novelist Iñigo Ed Regalado and illustrated by Fernando Amorsolo that reflects the life of Filipinos when the Philippines was still occupied by Americans and Francisco Coching’s “*El Indio*,” “*Lapu-Lapu*,” and “*Condenado*” that define Philippine visual culture as what was known as The Golden Age of Komiks (komiklopedia.wordpress.com).

According to Virgilio Almario, executive director of the National Commission for Culture and Arts "It was through comics that I first learned how to read. Reading '*komiks*' was a favorite pastime among rural folks. I am one of the many who believe in the potency of the illustrated materials as an effective medium of communication and a good

vehicle to send a message," as interviewed by Manila Bulletin dated October 15, 2000.

The researcher acknowledges the fact that today's students are visual learners. As Peter Gannon reported "Teachers should provide learning experiences that can increase retention levels. To teach them is to get their attention and it can be done when technology is incorporated into the lessons." Regarded as key to any student's future success, technology has become an essential part of education.

Comic strips, also known as "cartoon strips", are found daily in newspapers worldwide, and are usually a short series of cartoon illustrations in sequence. The creators of comic strips, comic books, and graphic novels are referred to as "cartoonists". Although humor is the most prevalent subject matter, adventure and drama are also represented in this medium.

From national issues like election propaganda to illustration of local superheroes, comics have always been popular in the Philippines. They are illustrations of daily lives and fictional characters guided by a storyline. Comics in the Philippines is partially inspired by American mainstream comic strips and comic books during the early 20th century, particularly after World War II. The medium became widespread and popular throughout the country. Its popularity however, has subsided somewhat with the advent of other mass-media forms such as *telenovelas*.

Visual Learning through Media Cartoons

Visual learning is a teaching and learning style that enhances thinking skills. By representing information with images, students are able to focus on meaning and reorganize ideas easily through their visual memory.

Printed materials have been, and continue to be, the single, most common category of teaching support materials. With the currently spreading trend towards electronic communication, it has added several new media of transmission for printed messages and is thus contributing to the overall amount of reading and learning. In this study the researcher used cartoons from print and digital media incorporated with classroom activities.

Science teachers continually search for effective ways to help students make sense of science concepts and principles. For students to learn to think more, science teachers must decrease the number of lectures and increase the use of activities that incorporate student inquiry. The use of media cartoons can be used as an instructional tool that provides the structure necessary for students to engage in high-level inquiry.

Newspaper in Education (NIE) is an international program that advances the use of newspaper in schools. As stated by NIE, newspapers are considered the most up-to-date, inexpensive textbook that develops skills making each student a better learner, better problem solver, and better leader in a medium that bridges the gap between the classroom and the real world. As part of everyday newspaper, editorial cartoons can be utilized as an additional learning tool in educating students and providing motivation for discussion.

In a recent competition "Wordless Editorials: A Lesson Plan on Critical Reading" organized by Philippine Daily Inquirer last November 2008, teachers were encouraged to submit sample lesson plans that make use of clippings of editorial cartoons from the newspaper's Opinion section. As indicated in the competition's objective, newspapers can be an effective, valuable resource material for teaching and learning in the classroom. It is a permanent feature of the editorial page which expresses comments

on current issues and seeks to influence public opinion. The submitted lesson plans focused on the use of editorial cartoons in developing critical thinking skills among students. Through editorial cartoons, students evaluated information shown in the cartoons, reflected on the different viewpoints and analyzed as to the issue presented and symbols used, and voiced out their own opinion about the issue.

Leonila Liberato, a teacher in Talomo Central Elementary School and winner in the Lesson Plan Contest, commends the lessons and valuable information drawn from editorial cartoons and the accessibility of newspapers as a rich resource material in promoting higher order thinking and student awareness of current issues in the country (Philippine Daily Inquirer, February 23, 2010).

Cheesman (2006) described the use of comics and cartoons as a classroom strategy. The use of comics falls into two broad categories -- attention getters and critical thinking stimulants. Attention is one of the most important factors in learning, as students must first pay attention to something in order to remember it. Displaying comic strips at the start of the class helps focus students' attention and sets the tone for the lesson that follows. As a tool to concretize critical thinking, comic strips can be used as a starting point for discussion or a technique to probe understanding of a concept.

Cartoons combined with student-centered teaching strategies can produce powerful learning experiences in our classrooms. It helps teachers avoid talking too much and enables interaction among students in a more educationally meaningful way (Scanlan, 2000).

Ostrom (2004) developed an active learning strategy for integrating editorial cartoons as a teaching strategy. With the results of the study, students found the use of editorial cartoons as "intellectually satisfying" and extremely useful for stimulating enthusiastic classroom discussions and debates.

A number of educators have listed ways of how to utilize cartoons in classrooms. This includes:

- Pretest to assess knowledge about the subject matter
- Part of a short context-setting presentation (*i.e.,* "to set the learning atmosphere")
- Assessment to determine whether the students can apply a general concept to the specific examples presented by the cartoon
- Stimulus for the whole class discussion of a concept, issue, or event.

Morris, *et al.* (2007) described cartoons as a highly visual and stimulating approach to science teaching and learning. In their study "Cartoons in Teaching and Learning Science," they cited that cartoons provide an opportunity to explore a concept and provide stimulus for discussion without restricting the students' ideas to only those related in the cartoons. Moreover, teachers who used cartoons as an instructional strategy found that the use of common everyday experiences presented in the cartoons allowed the students to readily link them to their everyday life. Thus, the cartoons provided both a context and a purpose for discussion, which established a real need for investigation.

Furthermore, the use of media cartoons allows the integration of environmental education and art. As students grasp the meaning and symbolism of the cartoons, art can be thought of as a powerful tool in enhancing environmental education among

students. There is potential in the linkage between public environmental art and environmental education. It can help students develop awareness of the environment, create new conceptual patterns, and motivate students in resolving an issue (Young, 2008).

Both environment and art educators have developed approaches that unite these fields to foster powerful cognitive, personal, and moral development in exciting, innovative ways (Blandy *et al*., 1998).

Cartoons as a springboard for discussion can be guided with its elements and composition. Ostrom (2004) cited the following elements:

- The Issue-the main purpose is to offer an opinion or point of view about the problem in the news.
- Symbol-any object or design that stands for a person, thing or idea.
- Exaggeration and Distortion-features that appear much larger or smaller or a change that adds to the cartoon's point.
- Stereotypes-simplistic view of the issue or characters that is often insulting, but it can also help the cartoon make its point quickly.
- Caricature-portrayal of an individual's features in an exaggerated or distorted way.
- Humor and Irony-a viewpoint that is expressed in such an odd way as to make the view actually seem ridiculous.
- Background Knowledge-refers to certain things about an issue in order to understand an editorial cartoon of that issue.

Environmental education generates personal and intellectual growth allowing students to reevaluate their own beliefs about the environment. On the other hand, art encourages students to question conventional thinking and create new conceptual patterns.

Vogler (2004) claimed the improvement of verbal questioning through the use of editorial cartoons. As an aid in student learning, cartoons require students to use lower- and higher-level thinking skills such as identifying the subject or issue, explaining the use of images and interpreting the message or viewpoint. Moreover, he added that cartoons can also be a resource to enhance teachers' instructional practice. Teachers find that cartoons when combined with a specific taxonomy, questioning pattern, and sequence, help them develop and improve their verbal questioning.

In order to make education attractive, caricatures as part of editorial cartoons can teach important lessons in global environmental teaching process. Cartoon technique is said to be efficient in teaching environmental problem and improving the quality of learning about the environment in a constructive structural approach (Kabapinar, 2005).

McCammon, *et al*. (2007) described that concept of creativity plays a role in developing the student's capacity to learn in a wide range of educational subjects. Glynn and Muth (2008) emphasized that drawing activities in science help students conceptualize and reflect on their experiences. Drawing is inherently constructive and motivating because it is both a hands-on and minds-on activity.

Cartoonists also use the element of humor in every cartoon and comic strip. Humor in the classroom has been shown to have many positive effects on attention, attitude, and engagement in higher order thinking skills (Rule & Auge, 2005).

Snell (2000) observed that attention spans of today's students are shorter than previous generations, owing in part to long-term exposure to rapidly changing electronic media images. Education methods may also need to change to include new ways to engage students. With these findings, media cartoons can be used as a way to enhance positive attitude toward environmental education.

Cartoon strategies for assessment where students discuss, draw, and write their own cartoons provide science teachers with a more complete picture of how their students understand scientific ideas. It can function as a powerful tool for students to interpret and synthesize scientific knowledge (Krumenaker, 2008).

The digital age, where downloading, uploading, and streaming are part of our students' everyday conversation, implies that print media is just one of the many options in making appealing and interesting instructional materials. YouTube and other video sharing websites are good repositories of instructional cartoon videos that present science concepts in less than five minutes.

Issue Resolution Skills in Environmental Education

The question "How do we achieve the goal of facilitating more thoughtful resolutions and decisions?" is addressed to all environmental educators. According to Tsai and Huang (2001), through probing students' cognitive structures, educators can understand what students learn and how their knowledge may change during the learning process. This may include strategies that improve students' technical knowledge base (biology, ecology, chemistry) and the skill to critically analyze environmental issues that creates favorable attitudes toward the promotion of better environmental quality. At the end of the exercise, students work on the development of issue resolution action plans and then decide whether they want to actually implement the plan of action.

It is generally recognized that environmental educators must provide students with opportunities to acquire the knowledge, values, attitudes, commitment, and skills needed to protect and improve the environment (UNESCO, 1977). If one of the goals of environmental education is to improve the decision-making skills of students regarding the environment, then it is important that environmental educators understand not only the environmental issues, but also the resolution process.

The following are indicator guides in evaluating the issue resolution process as students accomplish the various class activities anchored on media cartoons (De Guzman & De Guzman, Environmental Education for Sustainable Development, 2000).

Knowledge of ecological concepts

- identify major ecological concepts focusing on energy crisis, land degradation, sustainable development, pollution, and population.
- relate knowledge of ecological concepts and principles in the evaluation of environmental issues.

Identification of local and global environmental issues

- communicate the impact of man on the environment.
- identify different local, national, and international environmental issues.
- identify viable alternative solutions to these environmental issues.
- understand the need for stewardship in the solution of environmental issues.

Analysis of environmental issues

- apply the knowledge and skills needed to identify and investigate environmental issues.
- demonstrate the ability to analyze environmental issues and value perspectives.

Application of action skills in resolving environmental issues

- demonstrate selected actions in lieu of ecological implications.
- apply one or more action skills for the purpose of resolving one or more environmental issues.

Ballantyne (1999) reiterated this belief in her study entitled "Teaching and Learning in Environmental Education: Developing Environmental Conceptions," emphasizing that group-learning and cognitive strategies provide a means of developing student's environmental conceptions using a knowledge-based approach. The educational value of these techniques was optimized as environmental educators guided their application with an awareness of students' current and alternative environmental conceptions.

UP-NISMED in the UNESCO-UNEP International Education Programme Environmental Education Series #15 stated the functionality of issue-resolution as an interdisciplinary educational method. Through action-oriented research, it facilitates the approaches made by students into the causes and consequences leading to actions in the form of solutions to the environmental problem. Presentations of students may include dissection of a particular environmental issue that includes the timeline of events, different viewpoints in the issue, brief summary of the topic and the opinion of students. Relevant teaching strategies are essential in achieving the objectives of Environmental Education.

Scenarios could be structured and designed to confront students with new knowledge that highlights the inconsistencies within and the consequences of their own and other's conceptions. Educators need to consider more carefully the tasks of helping students clarify attitudes and values and develop skills which will enable them to participate effectively in environmental problem solving. Thus students would be challenged to reevaluate their understanding of and response to environmental issues.

An important teaching strategy should be aimed at providing students with opportunities to make decisions about issues based upon their own attitudes and values. The basic assumption underlying this strategy is that few students are given opportunities to make decisions about environmental management and the more decision-making experience they have, the better they will be able to clarify their attitude and values. Teachers should help students examine many of the solutions and the consequences resulting from the different value positions (Knapp, 1983).

From "*The Active Learner: A Foxfire Journal for Teachers*," John Dewey dissected the decision-making process into four phases: the problem, criteria, solution, and implementation phase. Dewey believed that good learning was based on the ability of

the learner to discern problems, identify what would satisfy the problem, consider alternatives for meeting the criteria, and then implement the decision.

An environmental issue becomes more complex and challenging and the need to act becomes more urgent. *Teaching Students to Make Better Decisions about the Environment: Lessons from the Decision Sciences* by Arvai (2004) states that there are a number of common impediments to thoughtful decision making about environmental issues. The most effective way to help students become better decision makers and overcome their impediments is to make them aware of the many decision traps that they might face and teach them a sensible, structured decision-making process.

Differentiating means and ends is a process that involves students to think of all the things they'd like to see achieved with a decision. In the case of teaching students about global climate change, one of the central concepts is limiting the burning of fossil fuels because it leads to the emission of greenhouse gases and contributes to atmosphere warming. One of the possible ways to reduce these greenhouse gas emissions is to limit the use of conventional automobiles and encourage the use of hybrid cars. If asked why taking this action is important, students might reply that hybrid cars would reduce CO_2 emissions and slow the rate of global warming and improve the health of citizens. In this example, reducing the rate of global warming and improving the health of people are end objectives important in their own right, whereas reducing atmospheric CO_2 concentrations and investing in hybrid cars are means of achieving these ends (Campbell & Rivers, 2004).

Any curriculum that endeavors to improve students' decision-making capabilities should highlight the importance of carefully thinking about different frames on issue resolutions. Environmental education efforts must go beyond simply presenting students with detailed information about a given problem; students must be taught the skills that will help them apply the information in resolving an environmental issue (Simmons, 1991).

Environmental Education Framework

Responsible environmental behavior is the ultimate goal of environmental education. It aims toward the development of learners who are knowledgeable about environmental issues/problems and are willing and able to make necessary actions.

It is envisioned that environmental education will fulfill certain functions in certain niches. In the elementary and high school levels, environmental education aims to orient students to develop their perceptions and actions toward environmental protection and conservation.

The basic aim of environmental education is to provide different groups of people with the knowledge needed to develop a sense of responsibility towards the environment and the rational utilization of its riches. This education should inculcate the competencies needed for the correct solution of environmental problems. The urgency of protecting the environment needs to keep pace with the relentless advance of science and technology (De Guzman, 2000).

Since the concept of large scale problems is abstract and complex, learning about global issues has some difficulties. Students cannot relate their lives with the global environmental problems during the learning processes (Trisler, 1993). Taking this into account, educators should structure instructional materials that will cater to students' immediate needs in resolving environmental issues.

The study of Hungerford (1996) reports that effectiveness of environmental education through knowledge of an issue doesn't necessarily lead to behavioral change. Instead, for students to accept responsibility for the environment there is a need to take ownership of issues and feel empowered to do something about those issues. Science knowledge forms the basis for understanding environmental issues.

The study of environmental problems and their solutions is the most important component of any Environmental Education (EE) Curriculum. Different problems in the environment are not mutually exclusive and most are causally interrelated. Most teaching methodologies and strategies useful for teaching science are equally applicable to environmentally-based content (UP-NISMED, 1988).

According to "Characterization of Instructional Materials in Environmental Education for Preschool Children" by Galvez (2005), "the first characteristic to look for in an instructional material is the ability to draw children's attention. The fact that children are interested in an instructional material, it follows that the material has potential to change their attitude and behavior over time."

The knowledge and awareness stage of ecological principles and environmental issues provides the thrust for action. This includes investigation and analysis of issues, decision making, problem solving, and making action plans for the remediation of these issues. The framework also contends that environmental education should occur as a lifelong process, employing learning strategies that are effective in modifying attitudes and behavior that are needed in order to produce environmentally responsible students.

Environmental education further enhances the use of critical thinking, decision making, and problem solving as tools for analyzing environmental problems and arriving at possible options or solutions. Critical thinking skills are essential to analyzing a wide range of environmental problems, issues, and information.

Casipit (2001) described the utilization of local environmental issues in an environmental science class as a very effective methodology in developing critical thinking among her students. The intervention had affected and influenced students' analysis of local environmental issues in terms of the knowledge of the issue and critical thinking processes employed.

Critical thinking is a complex process. It is more integrative as it involves developing skills that enable one to dissect an issue and put it together so that interrelationships are established and clarified. Furthermore, it involves searching for assumptions, the basic ideas and concepts that guide our thoughts. Critical thinking also encourages an appreciation of our own and others point of view, an important ingredient in approaching solutions to complex environmental issues. This is imperative in recent research which indicates that predictors of critical thinking and responsible environmental behavior are skills in using environmental action strategies, knowledge of the strategies, and level of environmental sensitivity.

A study conducted by Heimlich (1993) emphasized that environmental value is one of the important key subjects for the solution of global environmental problems. Researchers claimed that including global environmental problems in the school curriculum will improve student behaviors about environmental issues (Godwa, *et al.* 1997).

Environmental education is considered among the more important strategies for sustainable development for it plays a crucial role in bringing about greater understanding and appreciation of the multifaceted character of environmental issues. By taking action on environmental issues, students can make connections between

what they learn in science and apply that knowledge to the world around them (Liebermann & Hoody, 1998).

As stated by UNESCO-UNEP Environmental Education Program, there are different goal levels in building concepts, skills, and attitudes to develop environmental literacy. The Ecological Foundation level provides the prerequisite scientific knowledge needed to understand and investigate the issues in question. The Conceptual Awareness level provides the conceptual knowledge associated with discrete issues. It involves understanding of issues including what separates problems and issues as well as the varying beliefs and values which impinge on the origin and resolution of issues. The Investigation and Evaluation level provides the knowledge and skills necessary to investigate, analyze issues, and evaluate alternative solution for resolving these issues. Lastly, Issue Resolution level are necessary for making responsible decisions concerning the resolution of environmental issues. It provides students an opportunity to prepare and evaluate action plans for issue resolution (De Guzman, 2000).

Global warming, acid rain, deforestation, and water quality are all examples of issues appearing in the media on a regular basis. Although students are aware of these issues, they frequently do not perceive themselves as having the skills to do anything about them. Increased knowledge of environmental problems leads to feelings of hopelessness rather than behavioral actions. Students need to learn how to connect the knowledge they have about an environmental issue to the development of skills that will lead to engagement.

The unifying environmental themes are core messages encouraged for teaching and dissemination because they promote values formation useful in dealing with any environmental problem. They are: interdependence/interconnectedness, diversity/stability, change, balance of nature, finiteness of resources, material cycles, population growth and carrying capacity, stewardship and sustainable development.

Cerovsky (1996) recognized Environmental education as critical for promoting sustainable development and improving the capacity of students to address environment and development issues. It has now become evident that we cannot preserve the world if we fail to change human attitudes and patterns of behavior. This change or conversion cannot be achieved at the purely intellectual level. The change must also spring out of our affective life. It is critical for the development of responsible environmental students.

Pedagogical methods to be used in teaching Environmental Education will vary according to the teacher's preference and the particular topics involved with the end in view that learning experiences are maximized.

Keeley (2008) emphasized the importance of critical reflection and transformative learning where teachers will be allowed to have insights in teaching and facilitating the learning process. Experiential education is an example of pedagogical method where a learner constructs knowledge, skill, and value from direct experiences. Experiential education can be viewed as both a process and method to deliver the ideas and skills associated with environmental education.

Another current trend within environmental education seeks to move from an approach of ideology and activism to one that allows students to make informed decisions and take action based on experience and evidences. Environmental education is intended to promote environmental sensitivity, awareness, understanding, and competence and in the process, help create a society that is environmentally literate and committed to do strategic actions for the environment.

Conceptual Framework

Today, perhaps more than ever, the field of education is in search of innovative teaching strategies that can develop rich thinking processes and observe positive results on learners.

In this study, the utilization of media cartoons was tested as an alternative teaching approach. The researcher hypothesized that the use of media cartoons in science instruction would significantly improve the issue resolution skills of first year high school students.

Several variables were examined in this study. The primary independent variable in the study was the utilization of media cartoons in the activities given to the students. The dependent variable was the students' issue resolution skills towards Environmental Education. The relationships existing among the said variables are best illustrated by the following diagram:

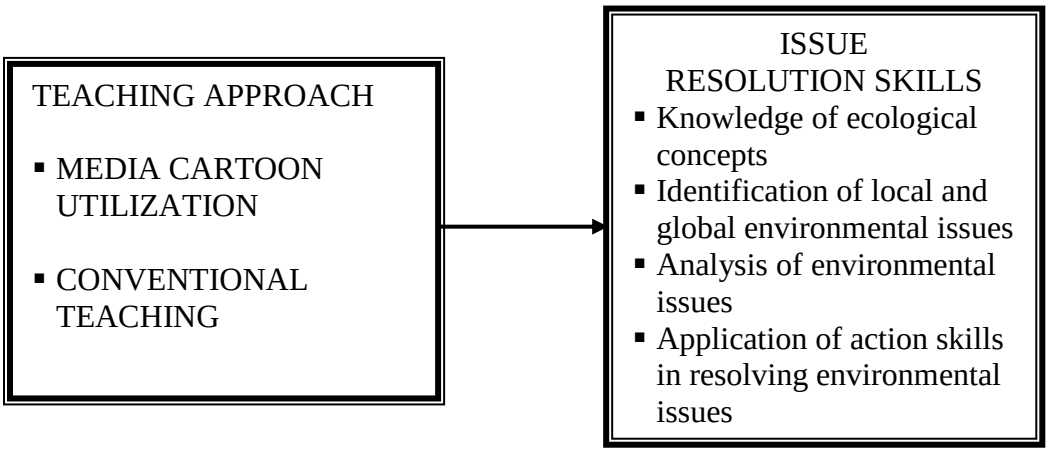


Figure 1. Conceptual Framework

The research determined the effects of the exposure to media cartoons on concept understanding of environmental topics/issues as well as student skills in providing solutions to these issues. Thirty-five media cartoons were incorporated in nine major topics in Earth Science and Environmental Education. The individual and group activities through worksheets, lesson motivation, and enrichments assessed students' learning outcomes and their ability to apply a science concept to everyday situations by providing solutions to environmental problems. To score the activities, the rubric Creative Problem-Solving Environmental Issue was used. A scoring range of 1-4 for the different activities assessed how students provided solutions to different environmental issues.

A study conducted by Scanlan (2000) proves that the use of media cartoons is an effective pedagogical tool for demonstrating concepts and fostering understanding of the subject content. He stresses that the utilization of media cartoons helps students grasp effectively the course material. This was further strengthened by Ostrom (2004) who is a believer of active learning strategy through the integration of cartoons. According to the results of the study, the use of cartoons combined with student-centered teaching strategies can produce powerful learning experiences in classrooms.

Before media cartoons were employed in the study, the researcher hypothesized that this could improve the concept understanding of students by enabling them to interact and express ideas in more educationally meaningful ways. The accompanying worksheets were designed for students to organize information involving an environmental issue, the rationales and beliefs they will use to support their stand/position on the particular issue, and the environmental values they will learn from each activity. Furthermore, an improvement of concept understanding can lead to the development of critical thinking in the form of issue resolution skills. The concepts grasped by students in Environmental Education can be applied in providing solutions to a particular environmental problem as they engage in exchange of information and discussions.

Finally, the study upholds the urgency for educators to create learning experiences for students that will enhance their appreciation for the natural world, strengthen their understanding of ecological concepts and bring to life their concern for global and individual environmental health impact.

Method

Research Hypotheses

The mean score in the Issue Resolution Test of students exposed to media cartoons is significantly higher than that of students exposed to the conventional teaching approach.

Research Design

The study was quasi-experimental with two-group pretest-posttest design. It was a quasi- experiment because it was not possible for the researcher to assign the samples randomly to any group since the groups were already formed and intact even before the treatment.

In this equivalent group design, one group was given the treatment (X_1) while another was not (X_2). Both treatment and conventional groups took the Issue Resolution Skills Test as pretest (0_1) and posttest (0_1^1). The differences in both groups were then compared to see if the treatment had an effect on the performance of the group that received it. The design can be represented as follows:

Media Cartoons Group: $0_1 \ X_1 \ 0_1^1$

Conventional Group: $0_1 \ X_2 \ 0_1^1$

where:

X_1 - Media Cartoon Approach

X_2 - Conventional Teaching

0_1 - Issue Resolution Skills Pretest

0_1^1 - Issue Resolution Skills Posttest

The Sample

The study was conducted in La Salle Green Hills, a Catholic institution run by the De La Salle Brothers that had eleven sections in the first year high school level for the School Year 2009-2010. Each class was composed of all boys within the 14 years age

group. The school had two honors classes and nine heterogeneous sections for the rest. Two comparable sections being taught by the researcher were chosen as the groups for the study. Both classes were conducted for 80 minutes per meeting, three times a week. The conventional group was composed of 38 students and the experimental group consisted of 40 students. Topics included in the study were from the 1st Trimester Period like fossil fuels, energy conservation, population growth, and types of pollution.

Each section was randomly assigned to either the experimental group or the control group. Students from the two sections participated in the study. A teaching strategy that included film showing, group dynamics, laboratory activities, motivational games was utilized for the conventional group. Media cartoons that are expected to improve skills in issue resolution and conceptual understanding of topics on Environmental Education were introduced to the students in the experimental group. The participants were informed that they were involved in a study.

Research Instrument

Issue Resolution Skills Test (IRST)

Students from the two sections prepared and evaluated “action plans” through the Issue Resolution Skills Test and various activities through role playing and comic strip analysis. This is a researcher-made test to assess student ideas, interpretation, and understanding of environmental concepts as well as their ability to suggest solutions to various environmental issues and problems. Please refer to Appendix C.

Students were asked to answer a 30-item set of questions that included the cause and effect factor, identify the ecological problem, and decide on the best solutions. To score the test, the following rubric was used to assess how students provided solutions to different environmental issues.

2 points: For choosing the correct option and giving a correct explanation or reason.

1 point: For choosing the correct option but failing to give the correct explanation or not giving an explanation and *vice-versa*.

0 point: For choosing the wrong option and giving an incorrect reason or not giving an explanation.

Use of media cartoons in class

As an instructional strategy, 35 media cartoons and comic strips from newspapers, magazines, and Internet were used to assess student understanding of concepts. The nine lesson plans utilized two to four media cartoons incorporated in different activities. In this study, media cartoons were used to introduce a new topic and stimulate critical thinking and intellectual discussions tied with various individualized and collaborative activities. In developing a concept through media cartoons, the teacher selected science concepts through the earth science lessons that were dealt with in depth. Then cartoons and comic strips related to the topics were used to evaluate students’ common conceptual difficulties or confusions.

Activities include picture analysis, cause and effect study, and prediction of consequential events where students identified symbolisms, science concepts, environmental education themes, and solutions to the problems depicted by the cartoons or comic strips. It was used in the beginning, middle, or the end of the class

period to assess students' prior knowledge and new learning. Studies from Pagsinohin (2009), Wright (2009), Gravasa and Pasa (2008), Ackerman (2008), and Vinson (2004) agreed that teaching strategies that are less student-centered and had less emphasis on process result to low interest and more negative attitudes in science, particularly in environmental issues.

Blank comic strips were also utilized in some of the topics as a wrap-up or closure of the lesson where it could be discussed in class. Kabapinar (2005), Keogh and Naylor (1999), and Wilson (1998) have revealed that cartoons are effective in engaging students in a scientific dialogue. Active dialogue facilitates student understanding of the scientific concepts and also provides a context for teachers to recognize progress and learning.

Data Collection Procedure

The experiment started in June 2009 and ended in September 2009. The sample included two sections of first year high school students.

The Issue Resolution Skills Test was administered as pretest to the two classes in science topics oriented to Environmental Education. It was done the day before the experiment began.

In the experimental group, media cartoons were utilized. The researcher used a wide variety of cartoons from newspapers, magazines, books, and Internet-based references.

No media cartoons were given to the conventional group. Instead the teacher used motivational techniques such as film showing and group activities. The lessons were implemented using the conventional teaching orientation.

The researcher experienced schedule setback in the implementation of the study due to the suspension of classes (AH_1N_1 outbreak and typhoons) and school activities. Despite the reduced number of academic days, the researcher was still able to cover the list of topics within the time frame.

The researcher had logs/journals to keep all the comments and feedbacks from students during the class discussions. Log entries involved in the study were used for analysis.

Data Analysis Procedure

All statistical manipulations were done using SPSS. The scores in the pretest and posttest of the respondents were tabulated and used to determine the significant difference of the student's performance in the media cartoons and conventional groups.

To determine whether the two classes were initially equivalent, the t-test (two-tailed) for independent samples was utilized. The same statistical test for independent samples was used to determine whether the mean posttest scores in the Issue Resolution Skills Test of the group taught using media cartoons differ significantly with those of the group using conventional method. The level of significance was set at 0.05.

Results and Discussion

The Issue Resolution Test was administered to assess if the students were able to demonstrate the sub-skills of knowledge of ecological concepts, identification of local and global environmental issues, analysis of environmental issues, and application of action skills in resolving environmental issues.

The comparison of the students' issue resolution skills on evaluating, analyzing, and providing solutions to environmental problems was established using their pretest mean scores.

Group	Mean	Std.dev	Std. Error Mean	df	t-value	Sig. (two-tailed)
Conventional N= 38	19.7895 (32.98%)	2.69291	.44878	36	-1.438	0.159
Experimental N= 40	20.5385 (34.23%)	1.55337	.25837			

Table 4. t-test of Pretest Mean Scores in the Issue Resolution Test

In Table 4, the Issue Resolution Test mean scores of the two groups differ by 0.159 in favor of the experimental group. During the IRST pretests, comments like "*Sir, kailangan ba ng explanation?*" (Sir, do we need an explanation?) , "*Ang haba naman ng test*." (The test takes so much time.) were heard throughout the testing.

Two-tailed t-test for both data established that the two groups were not significantly different in their issue resolution skills (sig. = .079) prior to the treatment. Thus, they can be considered as equivalent groups for the research study.

Group	**Test**	**Mean**	**Std. dev.**	**Std. error mean**	**df**	**Sig. (one-tailed)**
Conventional	Pretest N= 38	19.7895 (32.98%)	2.69291	.43685	37	.012
	Postest N= 37	21.5526 (35.92%)	4.79694	.77817		
Experimental	Pretest N= 39	20.5385 (34.23%)	1.55337	.25197	37	.000
	Posttest N= 39	27.7692 (46.28%)	4.11327	.63861		

Table 5. t-test of Pretest and Posttest Mean Scores in the Issue Resolution Test

The table above indicates that the Issue Resolution Posttest mean scores of both groups are significantly higher than their pretest mean scores similar to the Concept

Understanding Test data results. The great difference between the pretest and the posttest of both groups was due to the students' pretest incomplete responses and even absence of a response in the 30-item reasoning part where a two-point rubric was applied. However, the researcher stresses that the conventional group had a lower mean score in the posttest (21.5526) compared to that of the experimental group (27.7692). Weizman and Sutherland (2009) point out that science is a social process that involves analyzing, evaluating, observing, reasoning, and writing. It enables the construction of inquiry process as an important strategy for teaching science. Teachers then should pose questions that push students to think more deeply about what they have observed and experienced. Thus, the researcher found that exposure to media cartoons results to a significantly higher issue resolution skills by enabling student responsible actions and search for solutions to local and global environmental problems. The findings are consistent with the hypothesized relationships.

Group	Mean	Std.dev	Std. Error Mean	df	t-value	Sig. (one-tailed)
Conventional N= 37	21.5526 (35.92%)	4.79694	.77817	37	-6.226	.000
Experimental N= 40	27.9474 (46.58%)	4.11327	.65102			

Table 6. t-test of Posttest Mean Scores in the Issue Resolution Test

It could be seen from Table 6 the higher mean score of the experimental group (27.9474) over the conventional group mean score of (21.5526). This suggests that the prepared activities on the exposure of media cartoons on the experimental group resulted in a significantly higher performance at .000 level. For the qualitative aspect of this study, responses on the Issue Resolution Skills Test present improved reasoning and explanations provided by the experimental group students.

Much has been written about the effect of an alternative teaching strategy on the concept understanding of students. One study confirms the results consistent with earlier findings on the effect of media cartoons on school performance. Wood (1989) contended that media cartoons reflect the need for instructions rich in components such as challenge, hands-on active learning, social interaction and relevance as manifested by the activities in this study.

Galvez (2005) concluded that instructional materials that make use of many activities appeared to have a greater impact on children. Activities promote understanding of ideas and students who are exposed to a number of activities are likely to remember the idea or concept. Materials and activities that are carefully selected and used in a manner such that there is continuity of ideas seem to facilitate transfer of learning.

It is increasingly important for educators today to create learning experiences for students that enhance their appreciation for the natural world, strengthen their understanding of ecosystems, and bring to life the extent of human impact. The innovative student's thinking sets sail when the natural inquisitiveness it brings to the learning table is inspired and cultivated. When given the opportunity to openly ask and explore, students learn and thrive (Knodt, 2009).

During any scientific inquiry, discussions are powerful mechanisms to allow students to construct meaning out of abstract concepts, connect an activity to the learning goals, and reflect on their experiences. Brainstorming activities help students to develop analytic and argumentation skills as important components of the inquiry process.

Qualitative Analysis of Responses in the Issue Resolution Skills Test

The researcher-constructed 30-item Issue Resolution Test covered topics on Earth's resources, types of pollution, global warming, and population. In this test, students were asked to identify the cause and effects and provide solutions to environmental problems. Moreover, the students were asked to explain their answers.

In the Issue Resolution Pretest, the researcher noticed that the students answered the questions with a limited and even a no-explanation response. Two months after the treatment, the posttest was administered. Students, then, had better scores and most of them gave correct and partially correct responses. These responses were content analyzed and evaluated using a rubric system to assess how they provided solutions to different environmental issues. The researcher listed the following questions to emphasize the misconceptions and the difficulty of students in justifying their responses. The following tables show the unedited reasons of students from both conventional and experimental groups in their pretest and posttest. The individual students are represented as numbers 1, 2, 3, *etc*. The same number for the pretest and posttest of both groups means the same students gave the responses.

The researcher tabulated the incorrect and partially correct responses of some students for Item 1 that emphasize energy as one of the building blocks of sustainable development. An energy crisis is mainly due to an overdependence on fossil fuel energy for the increasing demand of modern industry and human comfort. In the identification of effects on utilization of alternative source of energy and improper disposal of garbage, students got a high percentage of correct answers and explanations. Student responses during the pretest in Item 1 are listed as follows. Notice that the correct answer for each question is marked with an asterisk.

1. One benefit of hydroelectric power plant is that it

A. depends on fossil fuels.

B. is inexpensive to build.

*C. does not cause air pollution.

Conventional Group	**Experimental Group**
1: It does not burn fossil fuels.	1: It doesn't emit dirty and harmful gas.
2: It does not emit pollution.	2: Because it uses water to provide energy and electricity.
3: Hydroelectric power plants depend on water.	3: It does not cause air pollution because it is natural and does not require any energy.

Table 7. Pretest Reasons of Conventional and Experimental Groups for Item 1

During the posttests, the researcher observed that there was an improvement in the explanation of responses as students will not just reword or copy the options in the

justification of their answers. Students have also shown the relationship on the impact of alternative forms of energy in our environment.

Conventional Group	**Experimental Group**
1: Dependence on fossil fuels threatens nature.	1: Moving water does not cause pollution unlike fossil fuels
2: There is less amount of pollutants produced by hydroelectric plants. It only uses water as in harnessing energy.	2: Hydroelectric power plants don't burn any fuel. Because of this, no pollution or harmful gases are released to the surroundings.
3: Hydroelectric plants use water and not fossil fuels.	3: The hydroelectric plant has a considerably lower production of carbon dioxide because it is powered by the force of water that causes the electrical generator to produce energy.

Table 8. Posttest Reasons of Conventional and Experimental Groups for Item 1

Using hydropower over the conventional types of energy resource has several advantages. Student responses suggest that dependence on fossil fuels should be reduced through the use of hydroelectric power which is a renewable form of energy that does not use natural gas or coal to generate power. Misconceptions on the environmental impact of hydroelectric plant were raised from the student explanations. It includes the impression that dams are "pro-environment" since they do not use fossil fuels. On the contrary, building hydroelectric plant affects biodiversity as habitats are displaced and the danger of flooding nearby towns during heavy rains increases.

Notice the more elaborate responses of the group exposed to media cartoons specifically in the posttest. They accurately relate hydroelectric power plants with fossil fuel and air pollution.

Item 4 below is an item that tests whether the students know about ways that lead to sustainable development.

4. The following activities promote sustainable use of resources EXCEPT:

A. recycling of materials.

B. conversion of mangrove areas into fishponds.

*C. draining a swamp and using the area for agricultural aspects.

Pretest and posttest reasons of both groups are presented in Tables 9 and 10.

Conventional Group	**Experimental Group**
1: You get to destroy natural habitat.	1: They alter the ecosystem.
2: Mangroves are nonrenewable resources.	2: It destroys the habitat of animals.
3: Converting mangroves will affect the ecosystem.	3: Removes the ecosystem that was living there.

Table 9. Pretest Reasons of Conventional and Experimental Groups for Item 4

Conventional Group	**Experimental Group**
1: Fishponds contain much less resources than mangroves.	1: Swamp draining doesn't help the resources.
2: Because many species benefit from mangroves and there are very little mangroves left compared to previous years.	2: When we recycle, we are helping Mother Nature.
3: It is a good way of saving more materials so that people will not get more things from the resources.	3: Fishponds increase the income of people.

Table 10. Posttest Reasons of Conventional and Experimental Groups for Item 4

Sustainable development upholds the preservation of the environment. It provides people with a better life without sacrificing or depleting resources or causing environmental impacts that will deprive future generations of their posterity.

Explanations of students from both groups to Item 4 answer show how they relate sustainable development to the richness of resources and destruction of the environment. In the pretest, students had a vague concept of sustainable development as shown in their responses as they provide a general answer on destruction of environment. Majority of the students answered the conversion of mangroves to fishponds as a way of promoting sustainable development. Moreover, their responses reveal a shallow and incomplete understanding of the concept of sustainable development. Since the question is negatively stated, a complete answer should indicate clearly why the last option (C) does not promote sustainable use of resources. Destroying and converting a natural ecosystem such as a swamp into an agricultural area threatens the natural resource. It should be noted that a swamp is an ecosystem that favors the growth of plants different from agricultural crops. Consequently, more problems could arise from such a conversion and this activity contradicts the concept of sustainable development.

Furthermore, the researcher observed the responses of the experimental group during the posttests. They are shorter compared to those of the conventional group but are stated in a more meaningful way.

Item 8 centers on garbage disposal and is stated as:

8. Throwing garbage in an open dump has a disadvantage because it

A. is more convenient for garbage collectors.

B. is more expensive for it needs a wider space.

*C. becomes the breeding place of disease-carrying organisms.

For Item 8, the pretest and posttest reasons of both conventional and experimental groups are presented in Tables 11 and 12.

Conventional Group	**Experimental Group**
4: This disease carries a lot of sickness.	4: This is an ideal breeding place because of the dirt.
5: Because of all the filthy stuff.	5: Because the violent smell of garbage attracts flies.
6: Because of the bad scent.	6: Wastes that rots get mixed up different kinds of wastes that cause disease.

Table 11. Pretest Reasons of Conventional and Experimental Groups for Item 8

Conventional Group	**Experimental Group**
4: Garbage breeds insects and microorganisms causing diseases.	4: An open dump can be an attraction to disease-carrying organisms because they eat the garbage in the dump and breed them.
5: Dirty place results to health problems in a community. Water related diseases may cause ailments among people.	5: When the garbage eventually stops and sometimes blocks the flow of water, this gives the dirty chemicals for the dangerous organisms.
6: Mosquitoes and flies live in these places as they pose health risks.	6: Disease carrying organisms such as flies breed in places where there are food, and flies would eat anything such as garbage

Table 12. Posttest Reasons of Conventional and Experimental Groups for Item 8

Most of the responses emphasized the condition of garbage and waste materials as breeding grounds of infectious diseases such as cholera, diarrhea, and respiratory ailments. Majority of the students considered garbage as a dirty place where

microorganisms thrive resulting in diseases. Some students even explained it by citing situations at their homes and in cafeteria where they see insects in garbage cans as proofs to their answer. Responses were all anchored in the concept that poor environmental sanitation causes epidemics of communicable diseases. In the posttest responses, more students were able to express judgments and made informed decisions based on ecological and health factors.

Again, the experimental group gave longer and more detailed reasons for their answers than the conventional group.

The environment is not a mere conglomeration of different physical and biological factors. It is a complex network of dynamic systems with causal relationships. Any disturbance in the natural ecosystem has multidirectional effects. Hazardous wastes present health and environmental threats ranging from injury to death through inhalation, skin absorption, or direct ingestion.

Items 13 and 23 identified how students can demonstrate their action skills in resolving a wide variety of environmental problems. Student responses on these items were listed.

13. Which of the following should be done to dispose used oils?

A. Dilute and spread it as a fertilizer.

B. Keep in the garage for 10 years before throwing it away in the trash.

*C. Collect it in a sealed container and take it to an oil changing business.

Tables 13 and 14 present the pretest and posttest reasons of the conventional and experimental groups for Item 13.

Conventional Group	**Experimental Group**
4: So that the company can make new products.	4: When it is brought to an oil changing business it can be used again and you earn cash.
5: The oil may be recycled and be put into good use.	5: You bring it to oil changing business, the oil is recycled to different products.
6: So it wouldn't be put into waste.	6: So that these would be used properly.

Table 13. Pretest Reasons of Conventional and Experimental Groups for Item 13

It was evident in the responses of students during the pretest their difficulty in making a viable suggestion on how to dispose used oils. Most of the responses include phrases such as "dispose properly", "source of cash," and "recycle it." However, during the posttest, students had a clear and workable solution as stated in the following responses:

Conventional Group	Experimental Group
4: Oils can just be disposed as it will just dry up eventually.	4: Oils may contain chemicals that can be dangerous for exposure.
5: Give it to companies that recycle used oil.	5: Used oils are not suitable fertilizers. Keeping them long will not help for they'll end up in trash as well.
6: After safely sealing the container with oil, it could be recycled and reused to avoid making it pollute the environment	6: If it is changed, it would be used to do something better.

Table 14. Posttest Reasons of Conventional and Experimental Groups for Item 13

Most of the responses categorized oil as a kind of pollutant with chemical content that probably persists or not materially broken down in the environment. Student misconceptions include the non-threatening environmental impact of oil when disposed as it will just evaporate like any other liquid and use of oil in agricultural lands as a potential fertilizer. However, it is noteworthy that majority of the responses from both groups include "pro-environment" solutions on the proper disposal of oil. Item 23 evaluates how students relate the reduced trash in preventing global warming.

23. How can you make sure that the purchases you make don't contribute to Global Warming?

A. *A. Buy products with less packaging.
B. Have the grocery store triple bag all purchases.
C. Don't buy products that emit heat like toasters and ovens.

The following tables show the responses of the students from both conventional and experimental groups with regards to Item 23.

Conventional Group	Experimental Group
7: Packages always get thrown away.	7: Because less packaging means less need for production of it.
8: The more packaging, the more waste of our resources. That's why we should lessen packaging.	8: Packaging especially plastic are made using fossil fuel as energy.
9: Because when they are thrown less plastic is wasted.	9: Since it shows that they are being conservative at what they do.

Table 15. Pretest Reasons of Conventional and Experimental Groups for Item 23

Conventional Group	Experimental Group
7: Additional materials are just additional wastes in the environment. When burned it produces additional greenhouse emissions in the atmosphere.	7: Packaging uses lots of energy, therefore this causes pollution. If you buy products that have less packaging, it will not contribute in the Global Warming.
8: Use recyclable materials to lessen the wastes in the environment.	8: By buying products with less packaging, you are eliminating the need for more plastic.
9: Products that are biodegradable are eco-friendly that will not contribute to Global Warming.	9: Plastic takes long to decay so you should use a little of it to slow down the Global Warming.

Table 16. Posttest Reasons of Conventional and Experimental Groups for Item 23

Recycling as a form of action skill contributes to the fight against global warming. Reducing trash by purchasing products with minimal packaging saves 1,000 lbs. of carbon dioxide entering the atmosphere (www.help-stop-global-warming.com). Student responses were aligned with the concept of less packaging leading to less wastes and energy usage to prevent global warming. Responses in the posttest implied that the students were able to apply problem-solving techniques relating to local and global environmental problem such as global warming.

The researcher also observed the improved reasoning skills of experimental group students as they established the relationship of increasing waste materials with global warming. It is shown in Table 16 the concise answers of the experimental group as they have evaluated how technology in the production of plastics increases the potential impact of people in the environment.

Student responses to the IRT suggest that they had difficulty in verbalizing the explanation that verifies their answer on the multiple choice question. Most of the students got a high score in the Earth's resources and global warming part while a low score in the air pollution part. Students also expressed the need for a longer time in answering the test.

Research into the effectiveness of environmental education has demonstrated that simply having knowledge of an issue doesn't result to behavioral change. Instead, for students to accept responsibility for the environment they need to take ownership of the issue and feel empowered to do something about those issues (Hungerford, 1996).

Science knowledge forms the basis for understanding most environmental issues. By taking action on current environmental issue, students are able to make connections between what they learn in science and how to apply that knowledge to the world around them (Lieberman & Hoody, 1998). In an attempt to address this rationale, teachers should use "environment" as a meaningful important context for learning science.

The results of the IRT indicate that there is an improvement in the students' issue resolution skills as they apply what they have learned from the discussion aided with media cartoons. However, the students' improved concept understanding does not necessarily result to the improvement of their issue resolution skills.

Summary and Discussions on the Media Cartoon Activities

Rogoff (1990) believes that captivating students is at the heart of teaching, making it fun and challenging. The researcher holds the same belief that through the activities that center on environmental education issues and topics, students were able to demonstrate issue resolution skills that include knowledge of ecological concepts, identification and analysis of local and global environmental issues and application of action skills in resolving environmental issues. As the media cartoon strategies have been implemented, the researcher was able to create a learning framework that is meaningful, relevant, and contextual.

The study began in July with the chapter on Earth's Resources. The researcher presented "Lumbered! Biodiversity vs Biofuel", a comic strip that features characters fighting over a land area. The strategy was used as a motivational strategy for the lesson where students analyze the storyline of the comic strip and answered guide questions. The following were the guide questions and selected responses of some students from the experimental group.

Question 1: As you read the story, on which side are you, the lumberjack or the fox?

Student 1: *I would go for the fox. Because as much as biofuel can make major contributions in stopping global warming, it also has its downsides. Cleaning up a vast part of the forest leads to an increase in the amount of carbon dioxide released into the atmosphere since there are trees to take them in. This might even worsen the situation. Also, deforestation leads to several animal species ending up with no habitat or source of food.*

Student 2: *The fox because he is right in saying that the destruction of their habitat disturbs our ecosystem. Although the lumberjack states that he needs to do so to provide a cleaner fuel for vehicles. He doesn't need to overdo the deforestation of trees.*

The responses made by the students clearly show their stand on the issue of environment over progress. Most of the students preferred to be Zorro, the fox, as the character shows the value for the environment and revealed a deeper understanding of each character in relation to the environment. However, a different response was made by one student on Question 1 where he said "*To be honest, I would be on the lumberjack's side. Who does not want money? I will take this issue seriously only when it personally affects me."* With this response, the core value of finiteness of resources and interconnectedness serves as a reflective tool for the students.

To determine on how the students will respond to the given environmental issue, the following guide questions was given.

Question 2: If you will be a character in the story, how would you provide solution to the environmental problem?

Student 1: *I would tell both of them that after using some space of their forest, avoiding too much deforestation, the people would plant other trees in place of the ones cut down.*

Student 2: *If I am part of the story, I will suggest a limitation for both of them. I will suggest 80% of the land be planted with fruit bearing trees and 20% for biofuel plants. In that way there will be balance of supply for man's needs.*

The ability of the “Lumbered! Biodiversity vs Biofuel” comic strip to question certain situations encouraged curiosity and clarified values in a favorable atmosphere as selected students were assigned to a character in the story for a role play. The group activity and a shared reflection in the end enabled students to enter into a transforming and creative relationship with their environment, having the idea of conservation constantly in mind.

The researcher also noticed the effectiveness of media cartoons as an opportunity for students to participate in activities and recitation as they express ideas and concepts built on prior knowledge. In the Hydrosphere lesson, book covers from *Pugad Baboy* and *Rustle the Leaf* were shown to students. The following were the responses made by the students on the messages the book covers convey.

Book Cover of Rustle the Leaf:

Student 1: *The characters were stuck and cant go down because of the polluted waters from the factory pipelines.*

Student 2: *The wastes came from the communities and families who don’t know how to dispose their wastes.*

Student 3: *Pictures show how man contributes to the destruction of the environment.*

Book Cover of Pugad Baboy:

Student 1: *It shows water as a very important resource that should be protected by man.*

Student 2: *Pugad baboy characters are enjoying the ocean in their recreational activities like fishing, scuba diving, snorkeling, etc. It shows how water should be conserved for future purposes.*

Student 3: *One Pugad Baboy character is urinating directly on the ocean which may harm the marine creatures.*

In addition, a *Pugad Baboy* comic strip “*Noon at Ngayon*” was given to students where there is a comparison of the environmental situation now and then. The comic strip was used in synthesizing the lessons on types of pollution. The students enjoyed reading the comic strip as they find it very humorous and interesting to read. Words like “fun” “cool” and “anima-zing” (animated and amazing) were common in the student talk. The researcher observed that students agreed on what the comic strip is trying to communicate from the reinforcing graphics and dialogues. Some students even asked the teacher on what was the environmental condition during his time that re-affirms the *Pugad Baboy* comic strip.

In a group activity on Global Warming, students were asked to explain the concept and rationalize if they agree with the message conveyed by the editorial cartoons. It is a strategy that will assess on how students construct their own meanings in relation to environmental issues, how they currently understand their relationship with the environment, and the range of alternative conceptions that they may be helped to explore. The researcher observed that students were interested in explaining their own ideas and immersing in brainstorming and debates in the interpretation and evaluation of the editorial cartoons. The findings were in coherence with the outcomes of previous researches on cartoons. Oluk and Ozalp (2007) identified a remarkable difference on

the cartoon teaching strategy between experimental and conventional groups. They stipulated that cartoons with humor when used effectively are important lesson materials in teaching global environmental problems.

Students in the experimental group were asked to interpret the cartoons about global warming found in the succeeding editorial cartoons. Their answers are found below the figure.

With the topic of Global Warming, the activity on editorial cartoons describes "comically" and "symbolically" the impacts of Global Warming. From the responses, it is evident that students learned environmental values like conservation of nature and the role of man in the preservation and destruction of environment. The researcher also observed the lengthy responses that indicate how students used their analytic skills in evaluating the message and interpreting the symbols and figures of the editorial cartoons. This teaching strategy of presenting global environmental issues confirm the need of students to connect the knowledge they have to the development of skills that will lead to engagement.

Another goal of this research study is to measure the issue resolution skills of the students. In the lesson on Types of Pollution, students were given a particular editorial cartoon and were asked to identify the problem, cause and effect of the problem and suggested solutions.

As students engaged in this brainstorming activity, the responses were listed on Table 18:

Student	**Environmental Problem**	**Cause**	**Effect**	**Resolution/s**
1	Climate Change	Excessive CO_2 in the atmosphere car fumes	Global warming Rise of sea levels	Find more renewable energy sources
2	Illegal logging	Greed of other people for more profit	Dangerous landslides Thinning of forests	Replace trees cut down with new ones Join tree planting programs
3	Lack of capacities of landfills	Mismanagement of waste materials	Erosion of landfill	Relocation of the landfill/Transforming old dumps into landfills
4	Garbage disposal	Carelessness of the residents and the government	Bad odor to the residents and lowering tourism, also pollutes the water system.	Try to solve your own garbage problems by proper waste segregation.
5	Nuclear wastes	Manufacturing of weapons; Nuclear power plants	Radioactive pollution and radiation diseases	Ban the use of nuclear weapons.

Table 18. Action Skills on Environmental Issues

Students were divided into groups with 4 members each in this table completion activity. Comments like *"I-analyze muna naten yung picture*," (Let's analyze the picture first.) *"Tingnan muna yung picture para makita yung cause at effect ng problem"* (Let's observe the picture so we can identify the cause and effects of the environmental problem.) were common in student talk. It only agrees with the early findings on the improvement of critical thinking skills.

The researcher found the use of media cartoons as highly visual and stimulating resource for science teaching and learning. It provided students an outlet for them to change and develop their ideas, be motivated in learning, and engaged easily in classroom discussions. The researcher also observed that students asked additional questions to further develop their scientific ideas. Furthermore, the use of common everyday experiences enabled the students to consider learning to be worthwhile and meaningful.

As students have engaged themselves in media cartoon activities, their creativity skill was also tapped by letting them make their own editorial cartoon with the theme on Global Warming.

Conclusion and Recommndationse

Based on the findings of this study, the researcher concludes that exposure to media cartoons significantly improves issue resolution skills of students.

From the findings and conclusions of this study, the following recommendations are hereby proposed.

For the teachers

1. Media cartoons have improved concept understanding and issue resolution skills of students. Thus, teachers are encouraged to adopt the strategy by applying the following:
    a. Use media cartoons as a pretest for students to assess prior knowledge on the subject matter and identify misconceptions. Valuable insights can provide the depths of student understanding of science concepts and issues.
    b. Use as an alternative assessment tool in knowing how the student can apply a general concept to a specific example presented by the cartoon. It will provide teachers the picture on how their students understand scientific ideas.
    c. Have the students identify environmental problems/issues in their local communities to make them more relevant. Strengthen their research skills by letting them locate information from media research and social institutions.
    d. It can be integrated in other teaching strategy like debates where students can decide and discuss their opposing views on given media cartoons.
    e. In the development of creativity, students can be given enrichment and individual activities where they will make their own cartoons

based from a given concept or a role play on the message of media cartoons.

f. The inclusion of a newspaper or magazine article that incorporates media cartoons to enable students to use a number of lower and higher order thinking skills.

For Future Researchers

2. The strategy can be used in other subjects, particularly editorial cartoons that convey encompassing messages from environment to social, political, and religious issues.
3. Environmental awareness and understanding can be generated in all sections of the community. Hence, the study can be conducted in a non-formal education setting to determine if media cartoons can really improve the concept understanding and issue resolution skills of students.
4. The effect of media cartoons on student attitude towards different subject areas can be explored.

For the curriculum planners

5. The results of the study can be used as a testimony on the need to shift from conventional teaching approach to the utilization of media cartoons in science teaching. Learning activities in combination with environmental education methods can greatly enhance students' engagement with environmental and science issues.
6. It is recommended that the plan of organizing and integrating media cartoons in instructional activities be considered. As this strategy is an exercise in visual literacy, it is a critically important skill as social interactions rely on symbolic representations.

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RESEARCH ARTICLE

Çizgi Filmler: Çevre Eğitiminde Sorun Çözme Becerileri Üzerine Etkisi

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Özet

Bu çalışma, çizgi filmlerin çevre eğitiminde öğretim stratejisi olarak kullanımına odaklanmaktadır. Özellikle lise birinci sınıf öğrencilerinin sorun çözme becerisinde çizgi filmlerin etkisini belirlemeyi amaçlamıştır. Araştırma La Salle Green Hills Lisesi'nde 2009-2010 eğitim-öğretim yılında 11 lise birinci sınıf şubesinde eğitim alan öğrencilerle yapılmıştır. Öğrenciler karşılaştırma için iki gruba ayrılmıştır. Her iki grupla haftada üç kez olmak üzere 80 dakikalık görüşmeler yapılmıştır.Problem Çözme Becerileri Testi (Issue Resolution Skills Test; IRST) öntest ve sontest olarak kullanılmıştır. IRST çeşitli çevresel problemlerve sorunlara yönelik çözüm üretme yeteneğini ölçmektedir. Kontrol grubuna uygulanan öğretme yöntemleri film gösterimi, grup çalışması, labaratuar çalışmalarını ve motive edici oyunları içermektedir. Deney grubu için de çevresel problemleri çözme becerisini geliştirmek amacıyla üzerine çizgi filmlerden yararlanılmıştır. Deney ve kontrol grubunda yer alan katılımcıların çizgi film ve kontrol grubuna uygulanan yöntemlerden öntest ve sontestte alınan performans ortalamaları tablolaştırılmış ve değerlendirilmiştir. Bulgular çizgi filmlerin çevresel problemleri çözme becerisi üzerinde etkili olduğunu göstermiştir. Araştırmada çizgi filmlerin öğrencilerin yerel ve global çevre problemlerine yönelik çözüm üretmede ve birlikte etkileşim içinde birlikte çalışarak sorumluluk aldıklarını gözlemlenmiştir. Bu çalışmadan elde edilen bulgulara dayanarak çizgi filmlerin öğrencilerin çevresel sorun çözme becerileri üzerinde önemli bir etkisi olduğu sonucuna ulaşılmıştır. Çizgi filmlerin güvenli sınıf ortamı içerisinde öğrencilerin gözlem becerilerini, hipotez kurma yeteneklerini ve yaratıcılıklarını geliştirdiği tespit edilmiştir. Sonuç olarak öğrencilerin çevresel sorun çözme becerilerinin geliştirilmesi için çizgi film ve benzer öğretim metotlarının kullanılması önerilmektedir. Öğrencilerin çevresel öğretim metotlarıyla birlikte diğer öğrenme aktivitelerinin beraber kullanılması öğrencilerin çevre ve bilimle olan ilişkilerini önemli ölçüde geliştirmektedir.

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