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# Poetry In Motion -A Journey of Science, Technology, And Society (STS) Students to Creative Expression in Western Visayas, Philippine

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## Abstract

**Purpose:** This study aims to determine the relationship between poems and songs in teaching some topics in Science, Technology, and Society (STS) in one of the state universities and colleges (SUCs) in Western Visayas, Philippines. **Research design, data and methodology:** This study utilized a one-group pretest-posttest design with an instrument formulated by the researchers from their subject, biodiversity, and genetically modified organisms-scores of students in both pre-test and post-test assisted as the raw data. The respondents were ninety students from Bachelor of Arts in English and a Bachelor of Science in Tourism using purposive sampling. The gathered data were subjected to statistical treatment using frequency, mean, standard deviation, and paired sample t-test. **Results:** The data revealed the respondents had low scores before the intervention but increased when introducing poems and songs in learning Science, Technology, and Society (STS). However, the pre-test and post-test results between poems and songs have no significant relationship; hence, the null hypothesis is rejected. **Conclusions:** Students enjoyed learning science through creative activities. Thus, poems and songs as creative outputs have the potential as instructional materials in STS, specifically for non-science majors. This endeavor is an excellent start to making students understand and appreciate Biodiversity and Genetically Modified Organisms.

**Keywords :** Science, Technology and Society, Biodiversity, Genetically Modified Organisms (GMOs), Poems, Songs, Non-Science Majors

**JEL Classification Code:** I21, I23, I29, Y20, Z19

## 1. Introduction

Science subjects are part of the curriculum in higher education institutions. Non-science majors must take science as a minor from their first or second year. At tertiary levels, subjects are categorized as minor and major. One of the recent innovations managed for the past three years is integrating online learning. The lack of interaction among students affected their social lives, but above all, the additional workload increased their burdens (Joaquin et al., 2020). However, one study exposed that college students today must be prepared; they perform poorly in science and mathematics. The implementation of the K12 Basic Education effects should be revisited by creating new guidelines for alignment and interventions of the curriculum for senior high school graduates to become college-ready (Mamba et al., 2020). These are some of the reasons that many believed the new curriculum failed. All Filipino teachers are motivated to strive to provide students with 21st-century skills and become lifelong learners.

Teachers today break stereotypes in teaching Science; many are now innovative and creative just to enhance interest and improve students' performance in learning the subject areas. Traditional methods and strategies are out, and

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new trends in 21st-century teaching tools are in for effective science education. The education system worldwide ventures to improve resources and money to have equipped facilities and state-of-the-art instructional materials.

The performance of university students is alarming. Many focused on gadgets and connectivity, listening to music, and social media. To address the issues specifically in STS, technology and the internet were utilized as institutional materials but focused on songs and poems available on the internet.

### 1.1 Objectives of the Research

a) Determine the relationship between poems and songs in teaching topics like biodiversity and genetically modified organisms (GMOs) in Science, Technology, and Society (STS) in one of the state universities and colleges (SUCs) in Western Visayas, Philippines.

b) Identify the respondents' responses on using poems in AB English and songs in BS Tourism in teaching biodiversity and GMOs, respectively.

### 1.2 Research Questions

a) What are the pre-test results of a Bachelor of Arts in English before using poems in learning biodiversity?

b) What are the pre-test results of a Bachelor of Science in Tourism before using songs in learning topics on genetically modified organisms (GMOs)?

c) What are the post-test results of a Bachelor of Arts in English after using poems in learning biodiversity?

d) What are the post-test results of a Bachelor of Science in Tourism after using songs in learning topics on GMOs?

e) Is there a significant difference between the pre-test and post-test in using poems in teaching biodiversity to Bachelor of Arts in English?

f) Is there a significant difference between the pre-test and post-test in using songs in teaching GMOs for a Bachelor of Science in Tourism?

e) Is there a significant difference between pretest poems and songs in teaching biodiversity and GMOs?

g) Is there a significant difference between post-test poems and songs teaching biodiversity and GMOs?

h) What are the responses of the selected university students about using poems and songs in teaching some topics in STS?

### 1.3 Significance of the Study

The findings of this study are beneficial for Department Heads and other key officials as a basis to encourage faculty in teaching science to be creative and innovative. Hence, a policy should be formulated and implemented for sustainable curriculum advances.

This study is helpful, especially to educators teaching non-science majors, to become creative and innovative in teaching science curriculum to university students. Students love to sing and read poems; hence, they utilize something they love to do and will provide ideas for educators to use as science teaching and learning strategies. There were a lot of studies worldwide about creative outputs, but limited to the Philippines; this research activity will create additional avenues for educators and researchers to engage in this topic to make science for non-majors' enjoyable and stimulating.

For students, the study's results will encourage and motivate them that science is not a tricky but a relevant subject in society through alternative teaching methods and strategies like creative outputs taken from various resources.

## 2. Literature Review

### 2.1 Non-Science Majors

One of the targets of educators in higher education institutions (HEIs) is to make students science-literate. It showed that 82% of university students are non-science majors. Thus, there are three critical aspects to make them science literate: highlight local socioscientific issues, prioritize common prospects in science that impact students' communities, and provide science engagements inside the classrooms (Gormally & Heil, 2022). For instance, major and nonmajor affective characteristics in learning biology education in college differ. However, additional findings revealed both categories can engage in scientific inquiry. Educators must concentrate on effective differences between nonmajors and majors to make them science-literate individuals (Herbert & Catner, 2019).

### 2.2 Science, Technology and Society

Science, Technology, and Society (STS) are all about integrated and holistic approaches connecting technology and science in the perspective of daily life and employing his understanding of making decisions. Studying STS improves students' expertise to become active and responsible in coping with life issues and problems. Thus, the primary purpose of STS is to increase knowledge and skills in science and technology and to be concerned about social and environmental issues. Nevertheless, technology changes the landscape of science (Devi & Aznam, 2019; Goldman, 2020; Rachmadtullah et al., 2022). In state colleges and universities (SUCs) in the Philippines, STS is one of the essential courses in general education. STS is geared towards Constructivism

Theory, where students create learning materials based on their understanding of the lessons, but lack of facilities and equipment affects students' performances. Thus, allocating specific budgets is necessary to provide enough instructional materials for teaching and learning processes (Rachmadtullah et al., 2022). However, in the Philippine education landscape, similar issues and problems have arisen for decades, including the lack of qualified teachers, the availability of instructional materials, the lack of classrooms, and the scarcity of facilities and equipment. These are evident in various national and international assessments, and very interested in taking science and technology courses.

## 2.3 Creative Outputs

Arts and science are two separate disciplines. Artists and Scientists are born to observe and create from different perspectives; consequently, their connection to our society is complicated. They live together, and often identical, across time and space. For instance, Islamic culture has intricate star-shaped architectural geometries related to arts and science (Zhu & Goyal, 2019). Hence, this study is anchored on using poems and songs to STS, specifically biodiversity. Creativity has always been vital to the science curriculum (Januchowski-Hartley et al., 2018). Many approaches incorporate different strategies outside the box, not traditional scientific ones. "Creativity is making new connections, new synapses," by Ivy Ross. Children who play music upgrade their brain structure, and their cerebral cortex increases. (Hamilton, 2020). In Biology, studying nature using poetry indicates a universal view of the flora and fauna. This perception connects traditional indigenous knowledge with scientific facts, thus allowing a sense of freedom in students' natural experience with life (Moya-Méndez & Zwart, 2022). In a study about using poetry in grade 9 chemistry, these arts-rich lessons improved students' curiosity.

By nature, humans are always gifted with the ability to invent, which is reflected in our present setting. The world is gearing toward more advanced technologies, but those machines are in contrast with humans. Humans are still superior because they can see the bigger picture than machines, which can only learn information. These inventions are products of science and the arts. Thus, arts and science are always interconnected with one another. Like the string theory, the universe is connected to the whole thing. Long before, well-known personalities like Leonardo de Vinci sketched inventions and drew skins' movement from cadavers. Further, Tomás Saraceno, a visual artist and sculptor, used nature in his creations, like the floating installation of cloud formation, the atmosphere, and the planet. Like Saraceno, Olafur Eliasson, a Danish-Icelandic artist, works with the earth and uses light, air, temperatures, and glaciers. Carl Sagan, an artist and cosmologist, worked with the Golden Records (Shaw, 2019). Thus, visual arts are one of the common forms used centuries ago. Many pieces of evidence were recorded to prove that visual arts documented the natural world. Rubalcaba (2022) states that innovation in education has been profoundly concentrated on instructional, technological, or regulatory elements. The need for innovation in education is vital; humans are evolving, thus education. Therefore, educators should always be ready to adopt current trends.

## 2.4 Poems as Instructional Materials In Science

Poetry is a powerful way of communicating scientific information and opening debate about scientific research. By writing poetry about specific scientific topics, students can learn how to communicate their work in an engaging and accessible manner. After completing this exercise, students can write a short poem about a specific scientific topic. They will also have gained experience providing constructive feedback to their classmates (Illingworth, 2023). One study displayed the relationship between poetry and science in traditional indigenous knowledge; this allows students to have the autonomy to mount and describe their intimate encounters with nature (Moya-Méndez & Zwart, 2022). A study on the Pantanal Sonora Project that combines music and environmental education uncovered the ability of the innovations to inspire rural community members to increase interest in science (Shirley et al., 2018).

## 2.5 Songs as Instructional Materials in Science

Using songs in science is fun and can cover content efficiently. This interactive approach can enable students to interact with the materials—students who have the ability or have no gift to sing always love songs (Crowther et al., 2023). The article by Haroldson (2023) exposed that the song can make students hook into lessons because it explains the new approach. With all the subjects, science is commonly focused on formulas, scientific names, and others, which causes students to dislike the subjects. However, introducing something new in the context of some things students love to do could help them eradicate wrong notions about science.

## 2.6 Biodiversity

In this study, topics like biodiversity were selected to introduce the innovations. Biodiversity is about life forms in the ecosystem, but due to different activities, both natural and artificial, living organisms decrease enormously

worldwide (Serafica et al., 2018). The status of biodiversity in the Philippines is alarming. Flora and fauna are disappearing (Bratt, 2021). Many reports from all types of media that our ecosystem is suffering from quick disappearance. As science teachers, we must educate students about the standing and importance of biodiversity in our country and the world.

### 2.7 Genetically Modified Organisms

Another lesson is the Genetically Modified Organisms or GMOs; this process refers to organisms whose DNAs were modified by genetic engineering. GMOs were already practiced centuries ago, but in 1994, the United States Food and Drugs Administration approved the first genetically engineered agricultural products for commercial cultivation (Michigan State University, 2018). Thus, in the early 2000s, GMO products were now available. The process helps increase yields, but potential risks like environmental impact and biosafety are the primary concern. Therefore, the result of the study advises conducting more research related to its effect on our environment and health concerns (Ghimire et al., 2023). One of the study's primary purposes is to assess university students' knowledge about GMOs.

## 3. Conceptual Framework

Figure 1 is the conceptual framework of this research study. This research is a one-group pre-test and post-test design. To test the performance of a Bachelor of Arts in English in learning Biodiversity through poems and a Bachelor of Science in Tourism in learning genetically modified organisms through songs. The research study is conducted four weeks per course since the topics have different schedules in the lessons in STS. The questionnaires used are 30 items taken from each lesson.

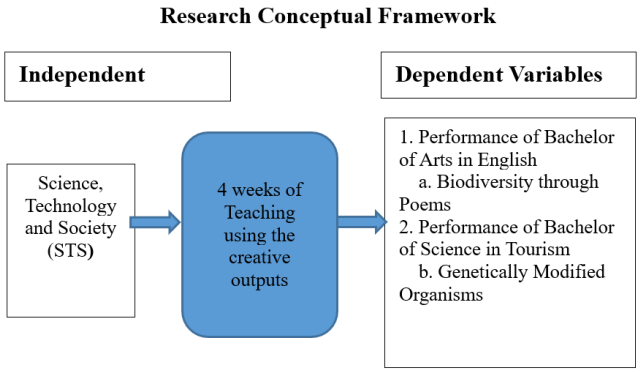


**Figure 1:** Research Conceptual Framework

### 3.1 Hypotheses

The statistical analysis was used to assess students' performance using three.

H1: There is a significant difference between the pre-test and post-test in using poems in teaching biodiversity to Bachelor of Arts in English.

H2: Is there a significant difference between the pre-test and post-test in using songs to teach genetically modified organisms (GMOs) for a Bachelor of Science in Tourism.

H3: There a significant difference between pretest poems and songs in teaching biodiversity and GMOs.

H4: There a significant difference between post-test poems and songs teaching biodiversity and GMOs.

## 4. Research Methodology

### 4.1 Research Design

A one-group pre-test and post-test design was utilized in this study. However, since numbers couldn't justify the instruments used enough, mixed methods were employed to understand the research completely; thus, interviews, focused-group discussion (FGD), and researchers' journals were used.

### 4.2 Research Methods

The multiple-choice questionnaire containing 30 items in each subject was a researchers-made validated by the faculty majoring in science and teaching STS in some selected state universities and colleges (SUCs) in Region VI, Western Visayas, Philippines. For the interview for FGD, an open-ended guide questionnaire was formulated. The researcher's journals contain notes about the researchers' observations before and after the conduct of the study.

### 4.3 Populations and Sample Size

STS is a general education subject, and all students enrolled will take the subject. However, the leading researcher only handled two sections during the academic year 2021-2022; hence, they were selected as respondents of this study. The Bachelor of Arts major in English comprises 60 students, and the Bachelor of Science in Tourism has 65 students.

### 4.4 Sampling Techniques

In this study, the sampling technique used was purposive sampling. The method was used because the respondents

were the students of the leading researcher, and it's guaranteed that all participants will join in the research endeavor. Incentives were given as additional points to all those actively joining in collecting the data. In this way, good results are effectively gathered.

### 4.5 Procedure of the Study

Before conducting the study, the researcher explained to his colleague and his students that one of his interventions in teaching the subjects is research-based. He plans to integrate poems and songs taken from the internet into STS biodiversity's teaching and learning processes. Thus, one of his plans is to employ songs and poems to make biodiversity easy, fun, and engaging. Also, to increase their interest to become protectors and warriors in protecting living organisms in the ecosystem. There was a verbal discussion among concerned individuals, and they agreed with the plan. The data were collected based on the student's current levels in the subject. The researchers pre-tested the respondents before discussing the lessons to see the participants' levels in the lessons. The 30-item exams run for almost 30 minutes, but since the time allotment for each 3-unit subject is 3 hours per week, the students were given an extra 15 minutes. They met twice a week; hence, the remaining 1 hour was assigned to discuss the research, the purpose, and the intervention. The researchers introduced the intervention to the students. The songs and poems were taken from the internet and other references and collected by the leading proponent for almost two years. Also, in his previous class, he asked his undergraduate students to write poems and songs about biodiversity and GMOs. These outputs were evaluated by fellow science educators from other regional SUCs. Then, with the help of the co-authors, they choose poems and songs suitable for the lessons. These poems and songs were used as motivational activities; some were incorporated into the lessons, and others were part of the activities. The researchers see that everyday poems and songs were part of the class discussions and activities.

### 4.6 Analysis of the Data

To answer the problem, gathered data were examined using frequency count, mean, standard deviation, and paired sample t-tests. In addition, the responses were coded, themed, and triangulated for a qualitative part.

## 5. Results and Discussion

Table 1 shows the participants' pretest results before learning biodiversity in STS. The participants learned science and technology during their basic education curriculum. But in these subjects, science is taught based on major areas such as Physical Science, Biology, Chemistry, and Physics in a spiral approach. There have been many loopholes in implementing the new science curriculum since 2012. In 2023, the politician suggested revising the K-12 Basic Education Program to K + 10 + 2. An additional budget is required to conduct more studies if the new proposal is applicable. But instead of spending extra money, enhance the curriculum, purchase more instructional materials and facilities, and train teachers to become more efficient and effective educators. Create mechanisms to motivate science teachers to attend seminars and graduate programs.

**Table 1:** The pretest results of University Students before learning Biodiversity in STS.

| | Mean | Sd | Description |
|---|---|---|---|
| ***Poems*** | | | |
| *Pre-test (Before)* | 11.24 | 3.22 | Low |
| ***Songs*** | | | |
| *Pre-test (Before)* | 11.61 | 2.29 | Low |

**Legend:** 24.01 - 30.00 (Very High); 18.01 - 24.00 (High); 12.01 - 18.00 (Average); 6.01 - 12.00 (Low); 0.00 - 6.00 (Very Low)

The data revealed that before the instruction, using poems as the instructional material in biodiversity stipulated in the instrument of this study and manifested by the students was low (M = 11.24, SD = 3.22). The data revealed that biodiversity was low before the instruction using songs in learning because ff M=11.61 with SD=2.29. The results showed that they needed to gain more knowledge of biodiversity even though this was already taught in junior high school (JHS) in the subject Biology. Many of them struggle even though it is essential in their daily lives. The result of the study indicates that they need more science learning during their basic education. Biodiversity has been learned for many years from ecosystem and environmental science. GMOs became a trend in the early 2000s, but they still need to be given a vital role in learning Biology in basic education curricula.

The study's findings revealed that ideas new to students during the pretest meet an average level of proficiency because of a lack of foundation about the topics (Coronel & Tan, 2019). However, this biodiversity is familiar to students; they still got low scores. This implies that more intervention is needed to understand and appreciate biodiversity. Since studies were conducted that confirmed that literary works

like poems and songs can improve learning and interest, this was formulated.

Table 2 displays the posttest results after the poems and song interventions in teaching university students' biodiversity.

**Table 2**: The post-test results of university students in learning biodiversity after the implementation of the interventions

| | Mean | Sd | Description |
|---|---|---|---|
| ***Poems*** | | | |
| *Post-test (After)* | 25.12 | 3.28 | Very High |
| ***Song*** | | | |
| *Post-test (After)* | 19.49 | 1.92 | High |

**Legend:** 24.01 - 30.00 (Very High); 18.01 - 24.00 (High); 12.01 - 18.00 (Average); 6.01 - 12.00 (Low); 0.00 - 6.00 (Very Low)

The data revealed that after the instruction using poems as instructional material in learning, Biodiversity manifested by the students was very high (M = 25.12, SD = 3.28). Also, when songs were part of learning GMOs, it had M=19.49, SD=1.93, and was interpreted as high. Many poems about Biodiversity and songs about animals and environments are available online. However, these findings showed that poetry is fascinating to university students than songs.

At an early age, children are fond of songs (Otchere-Larbi & Amoah, 2020). Poetry in teaching Chemistry significantly improved students' interest in the subject. Poetry is a common practice in science education worldwide. Songs containing science concepts are available on YouTube; these are *"Mr Parr's science songs", "Mr Pazzo's Science songs," "sciencemusicvideos," and "acapellascience"* (Mirkin et al., 2020).

Table 3 displays the paired sample t-test results in the difference in the level of understanding manifested by university students before and after the innovations in Biodiversity were conducted.

**Table 3:** Paired sample t-test results in the difference in the level of understanding manifested by the students before and after the conduct of instruction in Biodiversity

| | Mean | Sd | T | df | Sig. (2= tailed) |
|---|---|---|---|---|---|
| ***Poems*** | | | | | |
| *Pre-test and Post-test* | -13.88 | 2.10 | -46.60 | 49 | .000 |
| ***Songs*** | | | | | |
| *Pretest and Posttest* | 7.88 | 1.25 | -40.39 | 40 | .000 |

p<.05

Paired sample t-test result for poems between the pretest and posttest of the respondents showed that there is a significant difference in the level of understanding manifested by the students before and after the conduct of instruction (t (46) = -46.60, p<.005), hence, the null hypothesis is rejected. Additionally, the negative t-value indicates increased scores from the pretest and posttest. The findings explained that students have learned and enhanced their understanding during this study. For Songs, the t-test result exposed a significant difference in the level of knowledge manifested by the learners before and after the instruction using the three-dimensional instructional material (t (40 = 40.39, p<.005); hence, the null hypothesis is rejected. The negative t-value indicates an increase in scores from the pretest and posttest. The results mean that learners learned and enhanced their knowledge during this study.

Both control and experiment have positive results on students' performance but differ in terms of the strength of their effectiveness (Lawani et al., 2022). However, the results about poetry in teaching Chemistry were independent of gender, language use at home, and the type of large, urban school they attended. But the results were not significant for the small, semi-rural, private school research site.

Table 4 shows the independent sample test of the pretest between poems and songs in teaching biodiversity in STS.

**Table 4:** The Independent Sample Test of Pretest between Poems and Songs

| | M | Sig. | t | df | Sig. (2-tailed) |
|---|---|---|---|---|---|
| Pre-test between Poems and Songs | 11.61 | .036 | .64 | 87.35 | .525 |
| | 11.24 | | | | |

p<.05

The results of the study displayed Sig. = 0.36, t = .64, df = 87.35, and Sig (2-Tailed) = .525, which is greater than .05; thus, there is no significant relationship between the pre-test of poems and songs used as an intervention.

Table 5 shows the independent sample test of the post-test between Poems and Songs in teaching biodiversity in STS.

**Table 5:** The independent sample test of the post-test between Poems and Songs

| | M | Sig. | t | df | Sig. (2-tailed) |
|---|---|---|---|---|---|
| Pre-test between Poems and Songs | 25.12 | .005 | -10.19 | 81.25 | .000 |
| | 19.49 | | | | |

p<.05

The post-test results exhibited a Sig = .005, t = -10.19, df = 81.25, and Sig (2-tailed) = .000; hence, the results show a significant difference because the results are less than the .05. A study about integrating music into science showed an extensive improvement in students' academic achievement. Traditional teaching methods must be improved by

incorporating innovative approaches in science education (Cuevas, 2019).

According to Primastuti and Atun (2018), observing the variations in cognitive learning outcomes on chemical equilibrium from the subject, STS revealed better results than the traditional methods. Thus, the results recommend that the STS approach increases individuals' knowledge.

When trends and climate change issues were combined with STS, the results showed that teachers were using direct experiences to understand the lesson. However, because of unpreparedness, various concerns were found. Thus, training on incorporating climate change in STS is advised (Diquito, 2021). Similarly, proper procedures and more studies are needed before integrating poems and songs or any other innovations to enhance teaching and learning in STS lessons.

Figure 2 exhibits the participants' responses to learning STS through poems and songs.

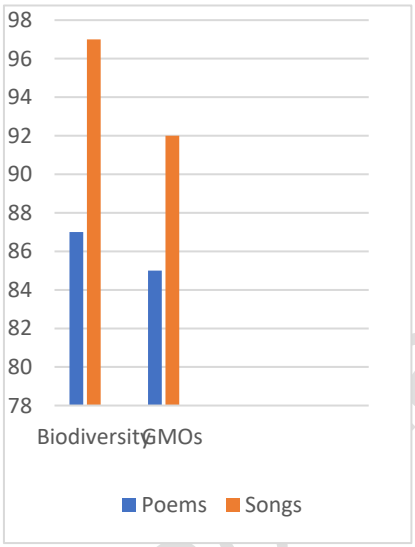


**Figure 2:** Responses of the participants in learning STS through poems and songs.

According to the results, 87% of participants liked poems, and 97% for songs in learning biodiversity.

According to participants 1, 26, 39, 52, 97, and 100, "*There were a lot of poems and songs available on the internet, and they conveyed a good message about learning the two lessons."*

Also, participants 19, 20, 25, 37, 57, and 60 responded that "*All the literary works are relevant to our lesson and the current events in our environment. We were motivated to learn."*

Participant 26 revealed, "*I hope with these innovations, many teachers will adopt and continue these strategies because it helped us a lot."*

In GMOs, 85% of the participants adored learning the subjects in poems and 93% in songs.

Participants 17, 22, and 47 called the innovations as good strategies.

Meanwhile, participants 25, 34, 38, 41, 69, 71, 72, and 88 adored the innovations.

Participants 23, 45, 57, and 77 explained, "*Those poems used in the lessons are significant to understanding GMOs in general and its pros and cons to humans and the environment*."

Participant 1 said, "*The choice of poems in the lesson has significant meaning. I was able to grasp completely the results behind why we need to adopt GMOs, but we should always be responsible for our actions."*

Of the responses, 55 said, *"We just need to be careful. We must read the labels of the product before buying and eating."*

Also, 15 concluded, *"The government should formulate regulations and policies for the public's safety. But poems and songs are effective strategies for learning biodiversity and GMOs."*

They all approved that supporting faculty interested in innovations to improve learning must be supported 100%. These strategies help them recognize the two lessons effectively and efficiently.

According to Cuevas (2019), the traditional way of teaching has minimal effect compared to better academic performance and the intervention of science pop tunes.

## 5. Conclusion

The study's results confirmed that using creative outputs like poems and songs taken from various sources like the internet, books, or written personally has excellent potential in enhancing science learning for non-science majors. Poems and songs have been used as teaching materials for many years. Poetry and music were used centuries ago, and many research outputs proved that they help increase academic performance regardless of educational level. Arts and Sciences are always intertwined with one another despite each difference. Specifically, a lack of teaching materials and resources is always a big problem in the Philippines. Results from different assessments and evaluations showed that the Philippine Science Curriculum is always below the standard. Many poems and songs are available online in biology, and students are even asked to create literary works inside the classroom. Some of these works are excellent and beautiful. We must find ways to protect our natural ecosystem. The rapid extinction of living things in all forms of ecology became a problem century ago; many interventions were

incorporated but with no use. In academe, science teachers worldwide are advancing instructional materials in all strategies, approaches, and methods to develop understanding and interests among science students. The education systems worldwide should support anything that can amend our biodiversity in its glory. Also, educating students about the cons and pros of GMOs should be meaningful. Everything we eat is almost advanced by technology. However, concrete procedures for implementing the proposed innovations are required for their effective implementation.

Thus, further studies are recommended for other courses to see the relevance of these findings. Also, aside from biodiversity and GMOs, use poems and songs in different lessons. In addition, this study also suggests using other creative outputs, like visual arts, dance, and essay writing, to ensure that creative outputs are vital to science teaching and learning.

The department chair and other key officials should support these novelties and inspire teachers to leave the traditional approach and become the 21st century. Also, provide funding and other related support to continue these research topics in all programs and courses to strengthen findings and become pioneers in creative outputs and science in the country and worldwide.

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