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Development of Micro-Lectures Videos in Teaching Ecosystem for Grade 10 Students

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Abstract

In STEM education, studying ecosystems is also crucial to sustainable education. The Philippines environment is now facing major environmental problems with these Filipino students' needs to develop their sense of ecological practices, this study aims to develop a micro-lecture video and learning activities. The researchers had undergone a needs assessment with the in-service science teacher aimed at gathering valuable information as a basis for crafting the developed materials. For the development of the micro-lecture videos, the researchers made use of the SAM Model. This was evaluated based on the four factors to be satisfied. Based on the evaluation results in the micro-lecture videos, the flow of energy was rated as very satisfactory of a mean (3.2425), biodiversity and stability were excellent (3.54365), and population growth and carrying capacity were Excellent (3.36115). The design learning activities were also evaluated; the content factors obtained an Excellent with a mean of (3.428), the format also obtained Excellent (3.3444), the presentation and organization obtained Excellent (3.8000), and the accuracy and up-to-datedness of information obtained an Excellent (3.7500). Hence, the development of micro-lecture videos and activities is recommended and accepted for its distribution to use as a learning material in the teaching ecosystem because this satisfies all factors that guarantee its quality. Through this study, a remarkable way to enhance the understanding of the concept of ecosystem and promote awareness of the environment.

Keywords: Ecosystem, Micro-lectures Videos, SAM, STEM

1. Introduction

The Philippines has abundant of natural resources, as seen by the diverse flora and wildlife found throughout the archipelago. It is one of the world's top hotspots for biodiversity. However, the state of the Philippine environment is now facing major environmental problems such as deforestation, fisheries depletion, land and water system degradation, and urban pollution. According to the report of DENR (2015) that the

Philippines lost between 20,000 and 62,000 hectares of forest each year, or an average of 40,000 hectares, between 1980 and 2010. This problem ties the importance of educating the younger generations in the environmental literacy for them to become a key solution to reverse foster long-term ecological stewardship

In the study of Nunez et al. (2017), it was revealed that K–10 students did not fail to have a level of environmental knowledge and behavior, but moderately. There is still much to be done to achieve the highest extent of student environmental knowledge, practice pro-environmental behaviors, acquire positive environmental attitudes, and express environmental sensitivity. As mentioned by Yucel et al. (2015), it is important to provide education to humanity to understand the environment, which will develop positive environmental attitudes, environmental conscientiousness, and environmental awareness. In this research, the focus lies on employing micro-lectures as a means to develop students' comprehension and conceptual grasp of the topic Ecosystem. The aim is to leverage this technology to enhance the learning process and deepen their understanding on ecosystem. Micro-lectures are quick videos created by instructors with the goal of delivering lessons in a way that does not overload the working memory of the learners. A Micro-lecture is a useful teaching tool that simplify teachings for greater comprehension that promotes a more dispersed and adaptable approach in learning (Franscisco, 2021). According to Arsal (2015), that micro-lectures are taught in five (5) to ten (10) minutes the concept where explain by simple, relevant, and interesting so that this increases the learners understanding compared to lengthy videos that are similar to traditional class discussions which it is lack appeal on student and potentially impact on their academic performance (Zhu et al., 2020).

To fill the gap mentioned above, the researchers developed a three (3) micro-lecture videos and learning activities in teaching ecosystem among the Grade 10 students. To attain the objectives of this study this aimed to: (1) Determine the needs assessment for developing micro-lecture in Ecosystem (2) Develop a micro-lecture packet learning on Ecosystem such as (micro-lecture videos and learning activities).

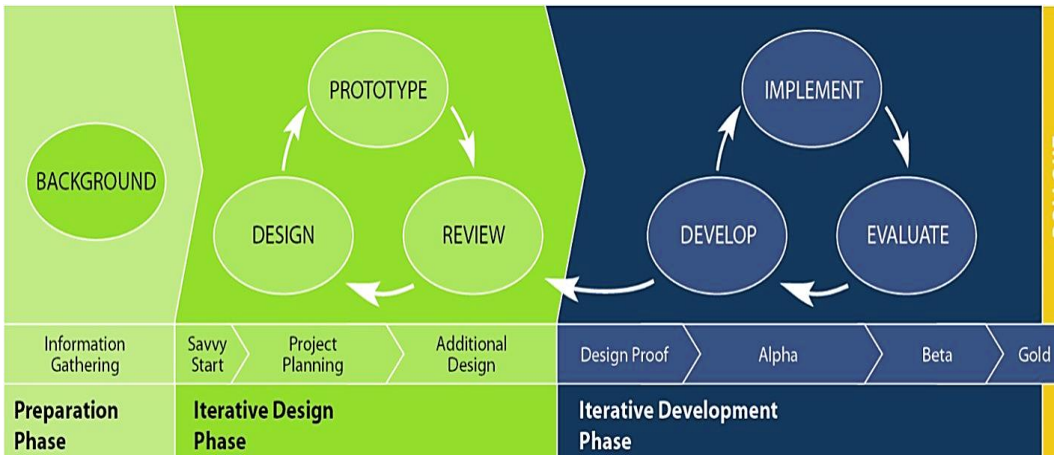
2. Methods

2.1 Needs Assessment Questionnaire

The initial step in gathering the background of the study is the preparation phase. The researcher conducts an assessment for the five (5) in-service science teachers who have already had five (5) years of teaching experience to determine the needs of this study to be conducted. The needs assessment aims to gather valuable information on the needs of designing micro-lectures, difficulties in teaching ecosystems, and suggestions as a basis for conducting the study. The data obtained from the interview questionnaire are the basis for crafting the design of the micro-lectures. This is to ensure the alignment of needs among Grade 10 students.

2.2 Development of the Micro-lecture Videos and Learning Activities

The development of the micro-lecture packet learning on Ecosystem using Successive Approximation Model “SAM”.



Data Gathering

This study underwent a process where the researcher first conducted a need assessment to gather valuable information in designing the developed materials. The researcher crafted the micro-lecture packet learning guided by the use of the K-12 science curriculum. The learning competencies were selected to craft and align the content of the materials. In starting the development of the micro-lecture videos, the researcher has created a storyboard that shows the flow and sequence of the content on the micro-lecture. This was assembled using software and different applications such as Adobe Premier Pro 2024, Adobe Photoshop 2024, and CatCup. After the final development of the micro-lecture, this was evaluated with the help of the in-service teachers from the public school in Lanao Del Sur and the thesis adviser. Evaluators have given their comments and suggestions to improve the micro-lecture videos and the learning activities. Finally, after two (2) prototypes, the developed micro-lecture videos and learning activities were recommended to be used as instruction in learning.

Data Analysis

The Mean were used or the average of the given numbers was calculated by the total count and used to analyze ratings in the needs assessment questionnaire and the developed micro-lecture videos and learning activities. Additionally, the standard deviation was applied to measure the spread of data relative to the mean.

A Likert scale was employed by the panel of evaluators to assess the packet learning such as micro-lectures and learning activities, each evaluation criterion was carefully examined, considering the degree to which the resource met each standard. The overall mean rating of the micro-lecture videos and learning activities was then interpreted using 4.00-3.25 Excellent, 3.24-2.50 Very Satisfactory, 2.49-1.74 Satisfactory, 1.73-1.00 Needs Improvement.

3. Results and Discussions

3.1 Needs Assessment for the In-service Science Teachers

Table 1. Identified Difficult Topics for the Third Quarter

Topic	Mean	Rank	Description
Coordinated functions of the Reproductive, Endocrine, and Nervous System	4.4000	2	**Difficult**
Heredity: Inheritance and Variation	4.8000	1	**Very Difficult**
Biodiversity and Evolution	3.0000	4	**Fair**
Ecosystems	3.6000	3	**Difficult**
Overall Mean	3.9500		**Difficult**

Note:5.00 – 4.20 = (Very Difficult) 4.19 – 3.39 = (Difficult) 3.38 – 2.58 = (Fair) 2.57 – 1.77 = (Easy) 1.76 – 1.00 = (Very Easy)

Table 1 shows the difficulties of topics in the third quarter for the Grade 10 level. The in-service science teacher respondents have rated Heredity: Inheritance and Variation as Very Difficult topic based on their knowledge and mastery. This also resulted that topic on Coordinated functions of the Reproductive, Endocrine, and Nervous System, and the topic Ecosystem rated as Difficult. Based on the result the researcher had focus only in the topic Ecosystem as the main focus of the study. The rise of ecological damages at present can affect various aspect on life. As mentioned on the study of Ristanto et al. (2021) damages occur in the environment are due to natural factors or human intervention. Human needs to have an education to develop the sense of caring towards the ecosystem. Environmental literacy is a crucial foundation for minimizing problems on ecosystem by learning concept of biology that discusses living things and their environment (Hutcheson et al. 2018; Setiawan et al., 2019).

Table 2. Summary of Responses on the Needs of Assessment by the In-service Science Teacher

Theme	Coded for	Quote
Suggested Method of Teaching	**Effectiveness on teaching Ecosystem**	*NA-ST1: "In teaching ecosystem, I used lecture method, outside strategy for them to observe. I let them watch video, learning games, and activities to let them connect the topic in real-world applications."* *NA-ST2: "I only use pictures and sometimes asks the students to watch some videos online."* *NA-ST3: "instructional materials and reading materials are crucial instrument for improving students' comprehension of the topic."* *NA-ST4: "Cite living things you can see within the Municipal of Madalum."* *NA-ST5: "Utilization of Visual materials (Images, Illustration) and providing examples based on the learners experience."*
Challenges encountered in teaching ecosystem	**Problems or issues in teaching**	*NA-ST1: "The most challenging topics are climate change, pollution, and habitat loss."* *NA-ST2: "actually since I am not a biology major it is really hard for me to discuss topics related to this. My knowledge about these topics were very limited only."* *NA-ST3: "Teaching environmental problems and issues, such as pollution and habitat destruction in particular*

		can be challenging because they are complicated topics that require personal willingness to adapt and apply what is right." *NA-ST4: "Energy transfer. Most of the students tend to have confusion in understanding this concept."* *NA-ST5: "Explaining the genetic diversity within species might require simplified yet comprehensive explanations to ensure understanding."*
Familiarity on Micro-lectures	**Developed micro-lecture**	*NA-ST1: "Yes, sometimes I used micro-lectures."* *NA-ST2, NA-ST5: "No I am not."* *NA-ST3: "Yes, I tried it in my Earth Science topic."* *NA-ST4: "Yes but I'm not using it."*
Benefits of Micro-lecture	**Effectiveness of the Instruction**	*NA-ST1: "Micro-lectures will enhance students conceptual understanding of the topic because, it is brief, personal and interactive. It tends to make basic concepts of difficult material easier for student to understand and improve the learning."* *NA-ST2: "I do not know since I am not using this method."* *NA-ST3: "Yes, using micro-lectures aids students in understanding ideas in a clear and simple manner."* *NA-ST4: "This is possible given that all materials are available."* *NA-ST5: "Yes I think so."*

Table 2 shows the summary results of the second part of the needs assessment answered by the in-service science teachers. Six (6) themes were identified. First theme identified was the method of teaching employed by the in-service science teacher. As mentioned, the make of practical activities, utilization of visual materials, videos, and games. The teaching tools most mentioned by the three (3) science teachers classified under the use of multimedia. There are numerous benefits of the application of multimedia, as discussed by the study of Abdulrahaman et al. (2020). Multimedia tools for teaching and learning have the ability to turn abstract concepts into concrete contents, present information in a short time, stimulate students' interest in learning, and lastly, provide for the teacher to know the student's ability to learn. The used of this type of tools may also adopted on teaching ecosystem as it will allow students to visualize the concept easily as mentioned by NA-ST5 the importance of the "Utilization of Visual materials (Images, Illustration) and providing examples based on the learners experience."

The next them was the difficulties of different areas in the topic ecosystem. A same result yielded in the field of environmental issues by the NA-ST1 and NST3. As introduce on the study of Aydin et al. (2023) that the environmental problems pose as one of the challenges that the world are now facing due to reasons behind on it such as the unconscious behaviors of people, negative attitudes, and the ignorance towards the environment. It was also corroborated in the answer of NST-3 that "Teaching environmental problems and issues, such as pollution and habitat destruction in particular can be challenging because they are complicated topics that require personal willingness to adapt and apply what is right." The energy transfer and genetic diversity within species are also mentioned as one of the difficult areas on the topic ecosystem.

Fourth theme recognized was the familiarity of the science teacher on Micro-lecture. This had shown that three (3) respondents are familiar and the two (2) of them have tried using micro-lecture. While the remaining two (2) science teacher are not familiar with this type of tools. The familiarity of the teachers with the innovative tools emerging are very important stepping stone in filling the competencies needed for 21st century learning.

The last theme shown was notion of the in-science teacher in using micro-lecture as an effective way to enhance the conceptual understanding of the students. As majority

agreed by the four (4) teachers. In the study of Cui (2020), the benefits of using micro-lectures shows an improvement on students' interests in learning and mathematical communication and reflection that will also be applicable in the field of science like teaching ecosystem.

Table 3. Summary of the Evaluation Result for the Micro-lecture Videos

Factors	Video 1	Video 2	Video 3	Mean of Means	Remarks
Content Quality	3.2200	3.6200	3.3600	3.4000	**Excellent**
Instructional Quality	3.0000	3.4200	3.2000	3.2066	**Very Satisfactory**
Technical Quality	3.2000	3.3846	3.1846	3.2564	**Excellent**
Other Findings	3.5500	3.7500	3.7000	3.6666	**Excellent**

Note: 4.00-3.25 Excellent 3.24-2.50 Very Satisfactory
2.49-1.74 Satisfactory 1.73-1.00 Needs Improvement

As seen in the table 10, this presented the means and means of means of each three (3) micro-lecture videos. Using the standard assessment tools from the DepEd called Evaluation Rating Sheet for Non-print Materials (Rubric 1). In the rubric 1 this contains the four (4) factors including the content quality, instructional quality, technical quality, and other findings. Based on the result on Rubric 1 the Content Quality of the micro-lecture videos obtained a total mean of 3.4000 remarks as an Excellent. This means that the micro-lecture videos satisfy important factors to be guaranteed its quality. This highlights that the contents are based on the Learning competencies, accurate, up-to-date, and logically organized that will ensure the conceptual development of the students in understanding ecosystem. In terms of the Instructional Quality, it was rated as Very Satisfactory with a total mean of 3.2066 this indicated that the develop micro-lecture videos are well presented in terms of its purpose, appropriateness to the grade level, and relevance of materials in the learning of the respondents. On the other hand, the technical Quality this was rated as Excellent by the evaluators 3.2564 the used voice narrator and music background are adequate to understand the concept of the lesson. Lastly, other findings also obtained an Excellent remark. The consideration of these four (4) factors are significant to assess the quality of this micro-lecture videos. As mentioned by Alghazo (2016) that in an educational material there are consideration for the determinant features that can provide a guide for the teachers and learners. In this sense, materials can be categorized into informative (inform about contents), instructional (guide through the access of contents), experiential (provide an experience with contents), eliciting (encourage the interaction with contents) and exploratory (assist to go beyond the content).

Table 4, Summary of the Evaluation Result for the Learning Activities

Factors	Mean	Remarks
Content	3.4286	**Excellent**
Format	3.3444	**Excellent**
Presentation and Organization	3.8000	**Excellent**
Accuracy and Up-to-Datedness of Information	3.7500	**Excellent**

Table 4 presented the summary of the means of the Learning Activities using the standard assessment of DepEd Evaluation Rating for Print Resources. These contain the factors such as the Content, Format, Presentation and Organization, and Accuracy and Up-to-Datedness of Information. All the four (4) factors have passed based on the result on the evaluation by the five (5) science teacher. The content factors obtained a mean of 3.428, the format obtained 3.3444, the

presentation and organization obtained 3.8000, and the accuracy and up-to-datedness of information obtained a 3.7500. Designing learning activities allow the students to explore and to learn that will develop student scientific skills, inquiry thinking, and reasoning or creativity. In relation to the Dale's Cone (1968) of learning theory one of the most effective methods is directly involve a purposeful learning experience. This suggests that the involvement of the students in the process will maximize their information retention. According to Wang et al. (2020), STEM education is essential for developing human resources who can reason and think critically, methodically, and logistically in order to address global issues and boost an economy. A STEM approach in comprehensive learning activities has been shown by several researchers to support 21st-century abilities (Mu'minah, 2019; Nurtanto et al., 2020; Perdana et al., 2021).

4. Conclusions and Recommendations

Based on the findings of the study the In-service science teachers identified ecosystem as a challenging topic for Grade 10 level. It was suggested that most frequent method that the in-service science teachers utilized under multimedia. Development of micro-lecture videos and learning activities meet all necessary quality factors for educational resources as it rated as excellent. This were suggested for distribution and applicable to use as a learning material for teaching the ecosystem.

The following recommendations can be taken into consideration. The science teachers may utilize micro-lecture videos in teaching Ecosystem. This can help the learning process not to be difficult for the student to comprehend the topic as it develops based on their needs and offers a clear visualization of the examples that reinforce the complexity of the lesson. Designing learning activities may also help to gauge the learning motivation and interest of the students. It is recommended to use collaborative activities that further enhance the performance of the student in learning.

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