

UTILIZATION OF CHATBOT AS NON-PRINT MATERIALS FOR THE ENHANCEMENT OF TEACHING INSTRUCTION IN ELECTROMAGNETISM IN GRADE 10

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DOI: <https://doi.org/10.54476/ioer-imrj/305678>

ABSTRACT

This study tries to evaluate the Chatbot as a non-print material to enhance the teaching instruction in electromagnetism in grade 10 students and to respond to the difficulties experienced by teachers and students in teaching electromagnetism. This study was done with selected students of San Mateo National High School involving 20 students who are currently studying Science 10. A survey was also conducted by the researchers to identify the possible competency and topics that became the focus of this research. This research used the ADDIE model in developing and utilizing the Chatbot as the non-print instructional material for the enhancement of teaching instruction in electromagnetism in Science 10. The researchers focused on the five (5) stages of the ADDIE model which includes analysis, design, development, implementation, and evaluation. In conclusion, this research provides a reference that by utilizing chatbots as non-print instructional material, an educator will engage the online learner nurture a successful learning community, make proper use of social media platforms, and alleviate the frustration and fear that goes along with learning electromagnetism. As a result of the evaluation, a chatbot is easy to use, more on online learners can learn faster using a chatbot and can learn things while using Facebook and Messenger.

Keywords: Chatbot, technology-based, non-print material, ADDIE model, Constructivism, Online Learning, Philippines

INTRODUCTION

The needs of the students when it comes to the learning process are expanding as technology progresses. Technology takes a great place in the process of learning for students. Technology and digital literacy are vital skills that 21st-century students should possess. Teachers should find more ways to teach lessons to students that are way more accessible with the help of technology.

Online education has quickly become widespread and accepted as another instruction platform among educational institutions worldwide. Although seasoned teachers embrace some teaching strategies through online education such

as integrating online formative assessment, and online platforms for motivation and discussion, some educators are still in doubt and feel anxious when asked to deliver online teaching modality. One advantage brought about by the pandemic was opening the door for online education platforms to be appreciated and maximize their usage.

The educational system of the Philippines is facing huge challenges. It was restructured because of the implementation of the senior high school here in the Philippines. The 2018 National Achievement Test (NAT) result shows that the Mean Percentage Score (MPS) of Science ranked last among the subject areas included in the NAT.

In the 2018 result, Science and Mathematics recorded the lowest mean which indicates that the students performed way below the acceptable level of MPS among all subjects (DepEd-Cagayan Valley, 2019).

The Philippines and other rich countries have the same school attendance level. Yet, the Philippine educational system continues to struggle to build high-quality outcomes as discussed in the study of Paqueo and Orbeta (2022). Based on the performance of our students as reflected on the results of the Program for International Student Assessment (PISA), our students at the international level obtained lower than the minimum level of proficiency in reading, science, and mathematics, which was also confirmed in 2019 by the Trends in International Mathematics and Science Study or also known as TIMSS. One of the recommendations in their study is to make good use of technology to produce a more learner-centered education as well as the improve the quality of education in the Philippines.

Textbooks are artifacts. They are part of worldwide education and many stakeholders have the chance to proofread and correct the book content before releasing and distributing it to

different schools. In most classrooms, they are the physical tools most intimately connected to teaching and learning. Most students rely on textbooks whenever they are confused about the topic being discussed by the teachers or when they don't understand the discussion at all. Textbooks are designed to translate the curriculum provided by higher education to be used both by the teachers and students. Each textbook has a precise mediating role that varies according to the specific nations, educational systems, schools, and classrooms. (Peacock and Cleghorn, 2004)

Orbeta and Paqueo (2022) suggested that technology can also be utilized to allow access to more diverse content than the traditional and existing resources that are available in schools. Utilization of technology in delivering instructions can promote more learner-centered learning where students have the opportunity to control their learning.

Agarwal's study (2022) identified that a chatbox is a kind of software application that is suitable for recognizing patterns from input and

producing outcomes based on the input. Chatbot is also defined as a virtual assistant, where it is intended to understand the users and their needs using methods of artificial intelligence. It is also stated that Chatbots are currently used as virtual agents to enhance the teaching-learning processes and different activities.

THE ADDIE MODEL

This research incorporates the ADDIE model. According to Samsudin et al. (2021), the ADDIE model is one of the most adapted and most flexible models for instructing students using technology because it is a more systematic and more appropriate model to be used.



Figure 1: ADDIE Model

The ADDIE model, is described by Molenda (2003) as “a colloquial term used to describe a systematic approach to instructional development, virtually synonymous with instructional systems development”. This model is composed of systematic phases that can be used for both traditional and online methods of teaching. These five phases involved, analysis, design, development, implementation, and evaluation that provide an ideal framework to execute instructional design approach for online learning modalities.

OBJECTIVES OF THE STUDY

This study aims to 1) Identify the possible competency and topics that need focus; 2) Find alternative ways and convenient platforms in teaching the learners; 3) Evaluate chatbot as a non-print material to enhance teaching instruction

in Grade 10 electromagnetism; 4) Engage the online learner nurture a successful learning community, use social media platforms properly, and alleviate the frustration and fear that goes along with learning electromagnetism.

METHODOLOGY

The researchers used the ADDIE model in the development of non-print instructional material that is utilized in teaching electromagnetism in Science 10. The researchers believe that the ADDIE model would help the teachers in improving their teaching methods which will also help them achieve learning goals as they use the Chatbot as non-print instructional material for the enhancement of teaching instruction of electromagnetism in Science 10. This instructional model would also help the students to acquire the knowledge and competencies needed. The ADDIE model is frequently used by developers of training and designers of instructional materials which represents a versatile and progressive guideline for developing an effective instructional tool (Culatta, 2018).

Analysis

In the ADDIE model, the beginning step in developing instructional material is analysis. The analysis stage includes the process of identifying the things that should be learned, problems, and possible solutions (McGriff, 2000). The analysis phase is one of the most important phases in the ADDIE model that is often mislooked. Like any other research, the excitement and eagerness to finish the result put the relevance and quality of the findings at risk (Shelton & Saltsman, 2008). In this case, the researchers tried to achieve the basic step of analysis by identifying the least mastered competencies of the students in electromagnetism which could be the possible topic content to be included in the chatbot.

In the context of design, the process of analysis that needs to be done involves the following aspects:

- Analyze the least mastered competencies that align with the DepEd content standard

- Analyze the least mastered topic in electromagnetism 10

The researchers asked the students about the topics they encountered that were difficult to understand, as well as the teachers about the topics and learning objectives they were not able to meet. The answers are gathered from the participants through a Google form survey, and curriculum guide where the most essential learning competencies are indicated and the least mastered topics.

The K-12 basic competencies and standards provide the researchers with a basic idea for planning the next step and providing an initial analysis of the topic content.

RESULTS AND DISCUSSIONS

1. Learners Analysis

The Chatbot design should focus on the learner's needs and preferences when it comes to learning. The instructional material design should also determine ways in which online learners are similar and different from traditional learners which also leads to a better understanding of the learners' needs in the topic Olgren (1998). This will be further discussed in the evaluation part.

The researchers identified the problem and the topics that should be discussed in the developed instructional material using the following responses from the participants:

"Applications of the electromagnetic spectrum and how electromagnetic induction occurs/works (electricity and magnetism)" - Participant A

"About Electromagnetic Radiation with their purpose and uses." - Participant B

"Just the electromagnetic spectrum" - Participant C

"My biggest area of confusion with the electromagnetic spectrum is how it is used. I occasionally have trouble figuring out which electromagnetic spectrum is being used with things I encounter daily." - Participant D



“Lack of the foundation of concepts about conductors and magnets. Application of motors and generators only” -Participant E

“Electromagnetic Induction, magnetic field flux, and intensity” - Participant F

“Various concepts such as electric current, electric fields, magnetic fields.” - Participant G

“Not enough tools to show the different concepts under it. Also, it is hard to let the students imagine how electromagnetic induction works.” - Participant H

“Lack of tools and equipment to be used for laboratory in teaching electromagnetism” - Participant I

The researchers focused on electromagnetic induction and electromagnetic spectrum in the developed instructional material.

2. Analysis of the Application to Utilize

In choosing the Chatbot application to utilize, the researchers considered the following aspects:

- Is the Chatbot application easy to manage and navigate?
- Is the Chatbot application accessible to all types of gadgets, whether laptop, PC, or mobile device only?
- Does the Chatbot application require large data usage?
- Does the Chatbot application cater the students with low economic status?

The researchers should seek answers to the questions mentioned above to provide a proper perspective in providing instructional materials to be utilized.

Design

The second phase of the ADDIE model is the design, which includes planning strategies, teaching approaches, and outlines of learning goals that are identified during the analysis phase. In the design phase, teachers should be able to

design a teaching plan that is based on the learning needs of the students. All information from the analysis stage is translated into an instructional design. According to Vulpen (2022), key points of the design phase are creating and mapping an outline of learning intervention and evaluation methods to be used as well as the alignment of learning goals.

In this phase, it is necessary to create careful planning of the design framework and start developing the instructional material. This means that it is important to have all and accurate guidelines for the creation of instructional material as defined in the analysis phase (Drljača, et.al.,2017). The teachers must also think of an appropriate and effective teaching approach to ensure students learning. In this research, the researchers used a constructivist approach to teaching where teachers help the students in creating knowledge through their own experiences and prior ideas.

The design phase includes additional detailed planning of the following:

- Educational learning objectives that are in line with the learning competency and standard set by the DepEd;
- Educational content (lessons or topics to be included);
- Activities and Assessment;
- Use of online technologies for knowledge presentation;

Some common tasks and questions related to this stage are:

- the type of media used (links, videos, animations, and simulators)
- the level and types of activities generated by the study (interactive and engaging, groupings or individual output)
- precise skills and knowledge developed (mental and cognitive skills)
- complete function features of each site and simulators

Development

The development phase incorporates both the analysis phase and the design phase and

focuses on the details of generating the instructional material that includes all the necessary tools and media to be used. In this phase, the preparation of the lesson to be discussed, experiments and activities are included as well as the instructional methods (Zulkifli et al., 2018).

Development is a rewarding stage, in this phase, we can see if the results are observable and concrete. This includes the review of the learning objectives, content development, content chunking, the creation of content of the lesson, the development of learning objects, assessment of the students, and other essential resources (Shelton and Saltsman, 2011). While developing the instructional materials it is very important to make sure that the learners achieve the target learning goals of the content. The development phase is getting everything and putting the plan into action thus, it also includes the creation and measurement of learning outcomes.

automated flow of conversation is aligned with the analysis and design phases

Implementation

In the implementation phase, the outputs of development are applied in the learning process to determine the quality of learning that covers the effectiveness, attractiveness, and efficiency of the instructional material. Implementation took place in Science 10 to get input from the students.

The researchers first presented the Chatbot content to the professor and a group of MA students who are currently enrolled in Electromagnetism and Optics and Acoustics subjects. During the presentation of the Chatbot instructional material content, some questions arose:

“How are you going to give an assessment to the students? How will you be able to collect their answers?” - Professor A
“Sir, the chatbot platform we used can collect word activities, and you can also add drive links where the students can directly submit their activities, we just don’t include it yet.” - Researcher B

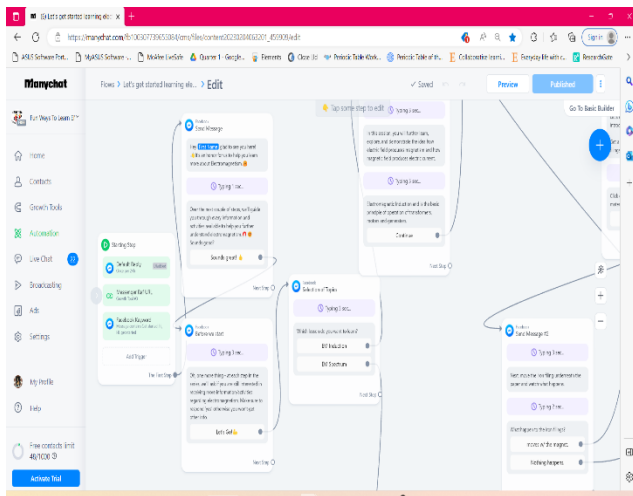


Figure 2. Automated Chat Flow using Manychat.com

In line with this, the researchers created a Facebook page named Fun Ways to Learn EM and used manychat.com to create the automated conversational flow of the Chatbot in the messenger. The automated flow of conversation on the Chatbot includes how the students will choose a topic, how they are given lectures and activities, and how they are assessed similar to a natural discussion. The development of the

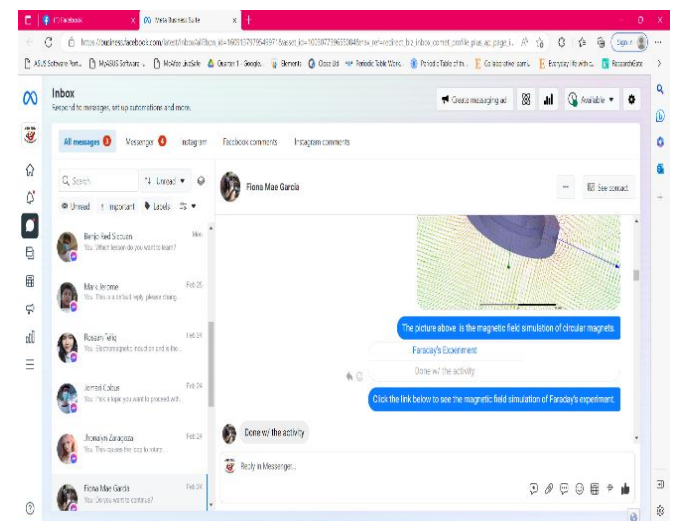


Figure 3. Chatbot Messenger Interface

Questions raised were properly addressed during that time. In addition, the completed and published Chatbot is utilized and maximized both by teachers and students.

After presenting the Chatbot to the professor and MA students, the Chatbot is then presented to the selected grade 10 students of San Mateo National High School who have difficulties understanding the lessons on the electromagnetic spectrum and electromagnetic induction. The messenger link of the chatbot was given to the students which directed them to the messenger Chatbot interface of the Facebook page created by researchers.

During the implementation, students submitted their answers in the activities and experiments integrated into the automated conversational flow to the Google Drive link indicated in the automated response of the Chatbot. The answers of the students are collected in Google Drive and teachers were able to check and write comments on the answers of the students.

a hard time coping with the traditional way of discussion in the classroom. It will also serve as an intervention activity for the non-performer student in school, and an enrichment activity for those advanced students.

Evaluation

The final stage of utilizing non-print material is evaluation and assessment. Evaluation is a time for reflecting and achieving the desired outcome of the instructional materials (Schwartz, F., & White, K., 2000). At this stage, the teacher assesses each student's performance, including the topic that was understood and the topic that requires more improvement.

The summative evaluation was done to determine students' learning outcomes and the quality of learning extensively (Ayre and Scally, 2014). This research applies formative assessment in terms of activities as well as, follow-up questions included in the automated conversational flow of the chatbot in the messenger to assess if the students understood the lesson or if they still needed more examples and explanations.

Researchers provide the students with a Google form for the evaluation of the Chatbot as Non-Print Material, its best features, and the student's suggestion for the improvement of the Chatbot. The researchers followed the framework in accomplishing the objective of the study by adapting the ADDIE model; it includes, an analysis phase, design phase, developmental phase, implementation phase, and lastly, evaluation phase.

The result of the student's evaluation, the best features of the chatbot are the following:

- easy to use, more on online learning,
- can learn faster using a chatbot,
- can learn things while using Facebook and Messenger.
- the way it is programmed to automatically communicate with the user,
- can pick a certain topic, accessible to everyone, is free to use, and cost of the internet.

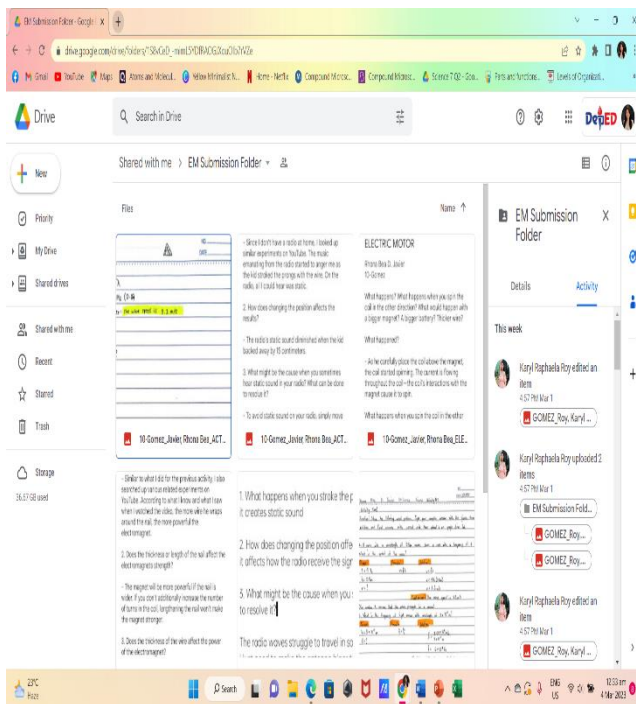


Figure 4. Sample of Answers of the Students on the Activities and Experiments Included in the Chatbot

The teacher will give the chatbot link to the students of Grade 10 during their asynchronous time to assist and help the learners who are having

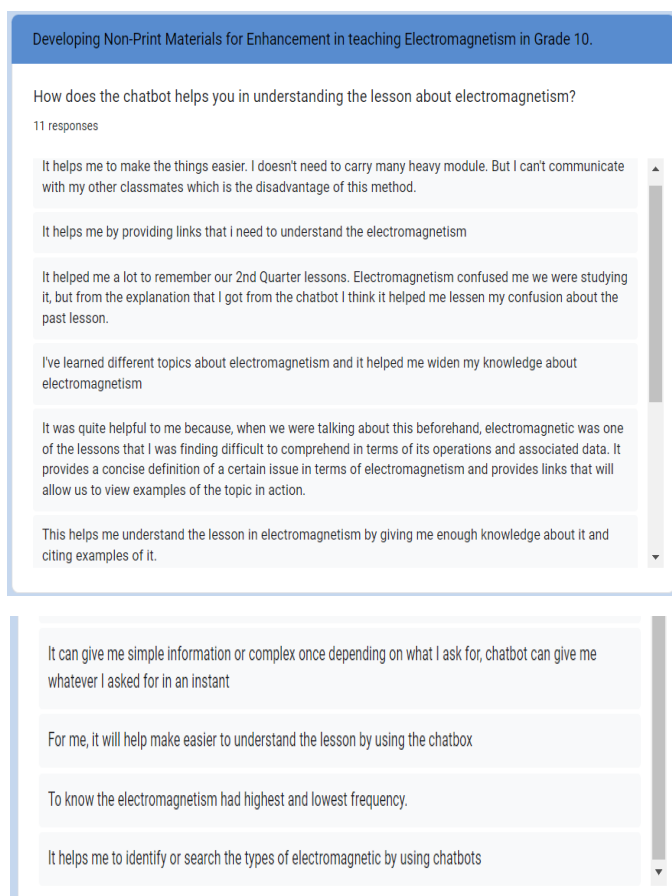


Figure 5. Responses of the Students

From the result of the student’s evaluation and suggestions about the best features and downgrade side of the chatbot, the researchers will use that to improve and enhance the features and functions of the chatbot to serve its purpose as another source of learning platforms.

CONCLUSION

Educators who are comfortable with traditional methods of teaching, struggle to engage students over the internet. In the 21st generation of students that we have, teaching in online platforms requires additional techniques for success. The ADDIE instructional model provides a venue for developing and utilizing an online platform of education. It analyzes the learning goals and standard that the students need to attain and sets

by the DepEd; the design and development phase creates the possible instructional materials to utilize; the implementation of instructional materials engage the students to have equal learning even in online modality; and lastly, the evaluation provides a venue for effectivity assessment and suggestions. By utilizing chatbots as non-print instructional material, an educator will engage the online learner to establish a successful learning environment, make proper use of social media platforms, and eradicate the frustration and fear that goes along with learning electromagnetism.

RECOMMENDATION

This research aims to provide effective learning using non-print instructional materials. However, the research itself has its limitations in covering all the topics from the curriculum guide provided by the Deped since the researchers chose the topic through a survey conducted on the chosen students of Grade 10 in SMNHS.

In addition, this research provides qualitative information that can be used by other researchers as future references for their study. The researchers might also use different platforms exploring more technology-based materials that are more effective and easier to use for the learning and teaching process which leads to the development of both students and teachers.

After presenting the research to the students and panelists, the following recommendations were suggested;

1. Add some more examples on a certain topic.
2. Provide an image or video regarding the activity that must be done.
3. Use Natural Language Processing (NLP) to Make Chatbots Seem Friendlier.
4. Add assessment activity with time limits like Google Forms and online and game-based quizzes websites which provide activity with a time limit.
5. Have a better analysis of the analysis stage of the research.
6. Includes a progress tracker to know the progression of the students in terms of their activity output.



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