EFFECT OF STRATEGIC INTERVENTION MATERIAL WITH AUGMENTED REALITY ON IMPROVING STUDENTS' ENGAGEMENT, COMPREHENSION, AND ATTITUDE TOWARDS SCIENCE

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SIMaTAR

Strategic Intervention Material for Teaching with Augmented Reality

STRATEGIC INTERVENTION MATERIAL FOR TEACHING WITH AUGMENTED REALITY (SIMATAR)

Is a collection of learning resource materials using Augmented Reality (AR) technology produced by DOST-SEI which aims to improve knowledge transfer, explore spaces and places and improve teaching and learning experiences and process through digital simulations and immersions in different 3D worlds.

LEGAL BASES

The response of our government to the challenges posed by the pandemic in the educational sector is the implementation of Basic Education Learning Continuity Plan (BE-LCP).

This program includes multiple learning delivery modalities such as modular and online distance learning (ODL).

In ODL, the teacher serves as the facilitator of learning and engage the learners in active participation using various technologies accessed through the internet.

Upon the recommendation of the Schools Division Offices (SDO), Regional Directors shall decide on the learning delivery modalities deemed appropriate in the context of the local conditions and consistent with the COVID-19 guidelines and regulations. (Department of Education Order 12, s.2020)

In our case, SDO-Manila implements online distance learning (ODL) as a learning modality.

CHALLENGING THE STATUS QUO

Considering the potential threats of ODL such as low engagement and motivation, communication gap and minimal contact time with the teachers and poor academic performance, we should find ways to minimize the impact of these challenges.

We proposed an online teaching solution that would utilize an effective educational technology learning resource such as augmented reality (AR) mobile application.

RELATED STUDIES

Chui (2021) emphasized that the rise of online learning drastically changed the way how students engage and learn.

The study highlighted the importance of the role of technologies in the distance learning. It has been recommended that schools and educational practitioners should provide different forms of learning resources, such as self-regulated learning activities for students.

RELATED STUDIES

Zhao (2020) mentioned that the decline of students learning satisfaction is due to the limited teaching-learning interactions in online classes.

The study cited that AR could enhance the user engagement and interaction in a daily house-setting and minimize the impact of environment changes on students' learning.

RELATED STUDIES

AR as a teaching material in learning was able increase student's motivation, student interaction in learning, interest in students learning and student understanding of the subject matter and students learning outcomes.

It creates a new experience in understanding learning and received a positive response from the users. AR was relevant in this time of COVID-19 pandemic since it helps students learn to be more independent and creates a positive impact for users on learning activities in all levels of education.

(Fadhil and Sumardi, 2019)

BENEFITS OF THE STUDY

Technology-driven teaching strategy using augmented reality mobile application is timely and relevant in this post-pandemic era because science educators are pressed with the challenge of delivering the safe and quality education in the new normal using ICT in teaching.

This study reinforces and strengthen the science curriculum policy of the Philippines which promotes constructivist, inquiry-based, and reflective pedagogical approaches

BENEFITS OF THE STUDY

AR provides with an exceptional learning opportunity that would improve their learning experience in the distance education.

Its offline application offers greater learning flexibility and facilitates the attainment of most essential learning competencies (MELCs) of the K to 12 Science Curriculum in an online distance learning

This study will provide baseline data to support the feasibility and practicality of utilizing AR as a teaching and learning tool in addition to the traditional modular approach in distance online learning.

OBJECTIVE OF THE STUDY

To determine the effect of Strategic Intervention Material in Teaching with Augmented Reality (SIMaTAR) on improving student achievement, engagement, and the attitude towards science.

SIMaTAR will cover the topics on Grade 8 Earth science such as earthquakes, typhoons, and other space objects of the solar system such as comets, asteroids, and meteors.

THEORETICAL FRAMEWORK

This theory explains the science of how people learn and the science of how to design instruction based on the twelve principles of multimedia design.
These 12 design principles are then translated and applied into the features of AR application.
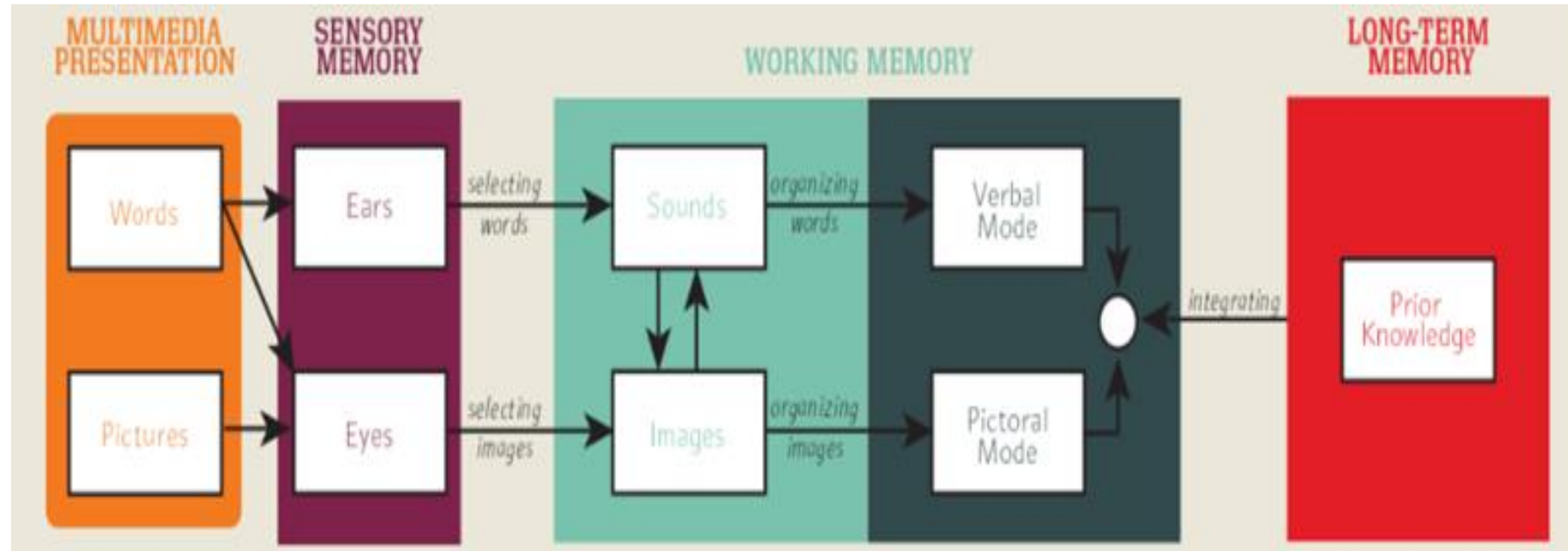
Mayer's Cognitive Theory of Multimedia Learning, by McGraw Hill, Copyright 2019 by McGraw Hill, Canada

STATEMENT OF THE PROBLEM

What is the effect of Strategic Intervention Material with Augmented Reality (SIMaTAR) to the students' mastery of the earth science concepts, level of engagement and attitude towards science?

1. Is there any significant difference between the pre-test and the post-test scores on the earth science concepts and on the attitude towards science of experimental and control group?

2. What is the student's level of engagement in science class after using SIMaTAR?

METHODOLOGY

Grade 8 (30 control, 30 experimental)

Both regular online synchronous class and SIMaTAR online class were scheduled once a week utilizing 60 min class hour.
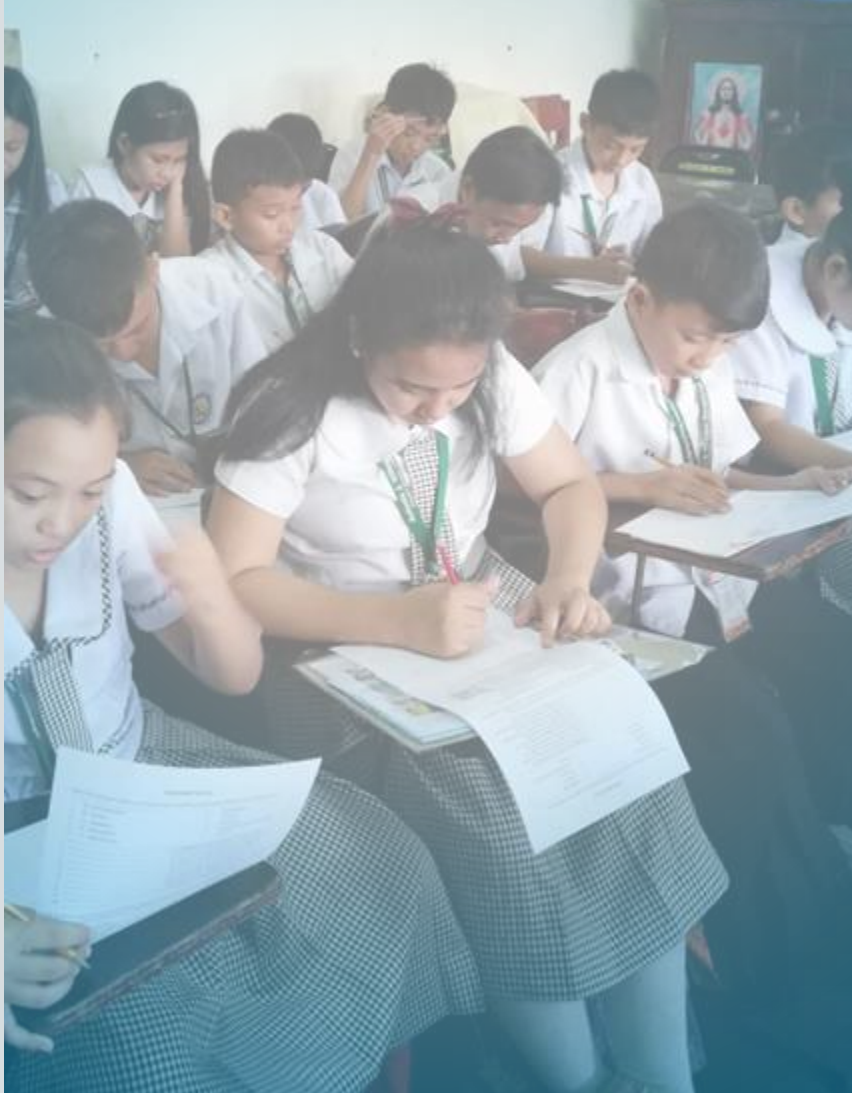
The 4 instruments were administered to the research before and after the implementation of SIMATAR.

The teacher-researcher conducted teaching demonstrations, classroom observations and focus group discussions.

RESEARCH INSTRUMENTS

Attitude towards science assessment form evaluates the student's before and after attitude towards science.

Focus group discussion interview form contains student's thoughts, ideas, feelings, perceptions about SIMATAR and its effects as well as suggestions on possible modifications.

Student's Engagement Survey Form provided accurate descriptions on the areas of students' learning experience such as ideas, feelings, perceptions about the usage of augmented reality application

Pre- and Post-test determines students' performance before and after using SIMATAR

100% of the students showed positive response to SIMaTAR

They showed eagerness to use AR technology application in the future to learn other science lesson.

RESULTS AND DISCUSSION

POSITIVE RESPONSE IN USING AR TECHNOLOGY

"I am excited, enjoyed and happy in using SIMaTAR"

"SIMaTAR help me in understanding the science lessons"

"Science lessons becomes easy to understand"

"I understand the lesson the lesson very well because of the SIMaTAR"

"I am excited because it is my first time to see augmented reality pictures"

"At first I am quite nervous in using the tablet but after using SIMATAR, me and my classmates enjoy studying science lessons."

SIMATAR FACILITATES SCIENCE LEARNING

- *"Each of us participated in the activity and the lesson become clear and easy to understand."*

- *"SIMaTAR is very easy to use, and I find it easy to study our lessons."*

- *"I find the 3D graphics and pictures in SIMaTAR amazing."*

- *"I am amazed how the graphics in SIMaTAR looks like so real."*

SIGNIFICANT DIFFERENCE IN PRE AND POST-TEST

Parameters	Experimental group		Control Group	
	Pre-test	Post-test	Pre-test	Post-test
Mean	25.86	34.40	25.30	27.40
Mean % Score	64.65	86.00	63.25	68.50
SD	5.07	3.63	4.59	4.59
Mean Difference	8.54		2.10	
No. of Students	30	30	30	30
T calculated	8.56		3.06	
T critical, 2-tailed	2.045		2.045	
Conclusion	Significantly Different at 5% Level of Significance		Significantly Different at 5% Level of Significance	

There is a **significant difference found between the pre and post test scores of experimental and control group. Substantial difference** was noted on the performance of experimental group after the implementation of SIMATAR.

SIGNIFICANT DIFFERENCE IN THE POST-TEST

Parameters	Post-test	
	Experimental group	**Control Group**
Mean Score	**34.4**	**27.4**
Mean % Score	86.00	68.00
SD	3.36	4.59
Mean Difference	**7.00**	
No. of Students	30	30
T calculated	2.002	
T critical, 2-tailed	5.11 with < .00001 P Value	
Conclusion	Significantly Different at 5% Level of Significance	

EFFECT OF SIMATAR TO ATTITUDE TOWARDS SCIENCE

Indicators	Before	VI	After	VI	Mean Difference
Attitude towards Science teacher	3.73	Strongly Agree	3.80	Strongly Agree	0.07
Anxiety towards Science	2.06	Disagree	1.90	Disagree	0.16
Enjoyment of Science	3.06	Agree	3.10	Agree	0.04
Relevance of Science	3.45	Agree	3.45	Agree	0.00

The student's positive attitude towards science remains the same after they use the SIMaTAR.

ENGAGEMENT IN SCIENCE CLASS AFTER USING SIMATAR

	Indicators of Students' Engagement	Mean	Interpretation
1	Helped me boost my motivation.	3.71	Strongly Agree
2	Helped me to stay focused on online class.	3.61	Strongly Agree
3	Improved my academic performance.	3.61	Strongly Agree
4	Improved my online class behavior.	3.71	Strongly Agree
5	Improved my attitude toward learning.	3.60	Strongly Agree
6	Improved my understanding of the science lessons.	3.50	Strongly Agree
7	Improved the communication with the teacher about the difficulties encountered.	3.60	Strongly Agree
8	Improved memorization of science concepts.	3.40	Agree
9	Helped me to reflect on science concepts.	3.61	Strongly Agree
10	Helped me in the analysis and synthesis of the science lessons explained in class.	3.71	Strongly Agree
	TOTAL	3.60	Strongly Agree

Students strongly agree that SIMaTAR mobile application improved their level of engagement in science class.

CONCLUSION

There is a positive effect on using SIMaTAR mobile application with synchronous online science class to students' comprehension on earth science concepts.

The student's comprehension on earth science concepts in both experimental and control group had improved.

However, the students' comprehension on earth science concepts in experimental group were significantly improved compared to the control group after utilization of SIMaTAR.

CONCLUSION

The indicators of attitude towards science of the experimental group after the implementation of SIMaTAR remains the same.

There is **no change in the students' perception on the attitude towards the teacher, anxiety towards science, enjoyment of science and relevance of science after the usage of SIMaTAR.**

CONCLUSION

Most of indicators of engagement in science class showed strong agreement. They strongly agreed that **SIMaTAR helped them to boost motivation, to stay focused on online class, to reflect on science concepts, and to analyze and synthesize science lessons explained in class.**

Students strongly agreed that SIMaTAR **improved their academic performance, online class behavior, attitude toward learning, understanding of earth science lessons and the communication with the teacher about the difficulties encountered.**

RECOMMENDATIONS

Integration of technology in science teaching which may improve students time-on-task and engagement on interactive and manipulative mobile applications.

This could provide learners with an opportunity to develop information, media, and digital literacy as part of the 21st century skills.

RECOMMENDATIONS

Capacity-building on handling AR technology driven classrooms emphasizing the relevance of integrating 21st century skills and learning environment.

Grade 8 science teachers could utilize SIMaTAR to help students improve comprehension in earth science lessons.

SIMaTAR should cover other areas of science, such as natural and physical science to help the students improve their learning outcomes.

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SIMaTAR | **THANK YOU!**
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