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COMPARING GEOSCIENCES-RELATED ENGAGEMENT GENERATED DURING AND AFTER THE USE OF MULTIPLE PEDAGOGICAL APPROACHES: ANIMATED VIDEOS, YOUTUBE, INTERACTIVE EDUCATIONAL GAMES, GROUP DISCUSSION AND POWERPOINT PRESENTATIONS

Andrew M. Singh
CUNY York College

Nazrul I. Khandaker
CUNY York College

Ality Aghedo
Johns Hopkins University

Jasmin Budhan
Tufts University

Belal A. Sayeed
Dewberry Geotechnical Company

See next page for additional authors

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SINGH, Andrew, Earth and Physical Sciences, York College of CUNY, 9420 Guy R Brewer Blvd, AC-2F09, Jamaica, NY 11451-0001, KHANDAKER, Nazrul, Geology Discipline, York College of CUNY, 9420 Guy R Brewer Blvd, AC-2F09, Jamaica, NY 11451-0001, AGHEDO, Ality, Environmental Science and Policy, Johns Hopkins University, Baltimore, Baltimore, NY 21218, BUDHAN, Jasmin, Tufts University, 419 Boston Ave,, Medford, MA 02155, SAYEED, Belal A., Dewberry Geotechnical Company, New York, NY 10001, FORDE, B'jorn K., Geology Discipline, Earth and Physical Sciences, York College-CUNY, Geology, 94-20 Guy R. Brewer Blvd, AC-2F09, Jamaica, NY 11451 and MAHABIR, Krishna, Science and Robotics Dept., Grover Cleveland High School, 2127 Himrod Street, Ridgewood, NY 11385.

INTRODUCTION

The COVID-19 pandemic has increased educators' reliance on online learning tools such as Blackboard Collaborate Ultra and Zoom meetings to deliver geoscience-related lessons in real-time. Assessments were conducted using introduction to geology, environmental geology, and oceanography - part of the City University of New York's (CUNY) newly implemented pathways curriculum. These general education courses belong to scientific world and life and physical sciences category and are intended for seamless transfer between CUNY campuses.

Students, however, have the option to disengage from participation. Students are able to disable microphones and cameras, as well as rely entirely on text-chat if they choose. Students also have the option to simply log-on and not be physically present at all. If a practitioner does not advocate for forced participation via assigning a heavy weight of the course grade to participation, then the burden of bolstering engagement is almost entirely on the practitioner.

GOALS

This study attempts to review different pedagogical approaches and create a rubric to measure engagement during and after the delivery of the course contents. These approaches include short animated videos, long, medium, and short YouTube videos, interactive educational games, group discussions and debates, PowerPoint presentations, etc. The goal is to find approaches that deliver an effective learning, but still encourage organic class participation.

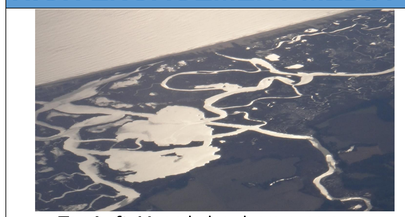
INITIAL FINDINGS

Short animated videos had the most total engagement with highly positively correlated with engagement during and after; long YouTube videos generated the most engagement during and after; single-player interactive educational games tied for highest total engagement and encouraged discussion during the game as well as after

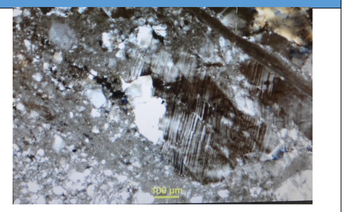
Short PowerPoint presentations with salient information did much better than longer presentations; and group discussions (when engaged upon) generated a moderate amount of total engagement.

Trends included: length correlated positively with discussion during delivery, but negatively with discussion after delivery; intensity played no part in discussion during an activity, but correlated positively with discussion afterwards. In general, high intensity material of any kind, has been deemed the best.

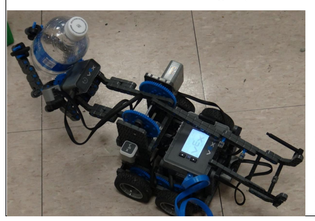
HIGH ENGAGEMENT MEDIA

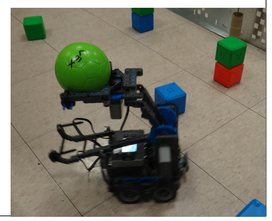


Top Left: Meandering rivers pose a construction challenge (**controversial**)



Top Right: Twinning in Feldspar minerals under microscope (**visual**)





Bottom Left & Right

Python compatible robots carrying out physical tasks such as lifting. They have applications in waste disposal and other areas (**Practical**)

RESULTS

		Length	Intensity	Engagement During	Engagement After
	Animated Video	Very Short	High Intensity	Low	Very High
YouTube	Youtube Video (with speaker and graphics)	Short	Medium to High	Almost none	Low to Medium
YouTube	Youtube Video (with speaker and graphics)	Medium	Medium	Low to Medium	Low to Medium
YouTube	Youtube Video (with speaker and graphics)	Long	Low to Medium	Medium	Medium
Games	Interactive Game (single player)	Medium	High	High	Medium to Low
Games	Interactive Game (group)	High	Medium	Very High	Almost none
PowerPoint	Powerpoint Presentation	Short	High	Almost none	Medium to High
PowerPoint	Powerpoint Presentation	Medium	Medium	Low	Low to Medium
PowerPoint	Powerpoint Presentation	Long	Low	Medium	Almost none

Table 1: Record of Engagement during different pedagogical approaches

Length or Intensity	Assigned Value
Very Short	1
Low	2
Low to Medium	3
Medium	4
Medium to High	5
High	6
Very High	7

Table 2: Assigning values to:

-Length
-Intensity
-Engagement

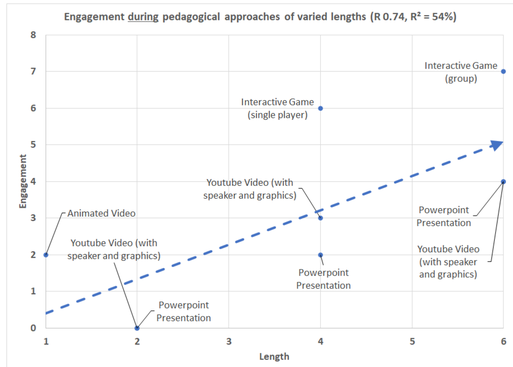
		Length	Intensity	Engagement During	Engagement After	Total Engagement
	Animated Video	1	6	2	7	9
YouTube	Youtube Video (with speaker and graphics)	2	5	0	3	3
YouTube	Youtube Video (with speaker and graphics)	4	4	3	3	6
YouTube	Youtube Video (with speaker and graphics)	6	3	4	4	8
Games	Interactive Game (single player)	4	6	6	3	9
Games	Interactive Game (group)	6	4	7	0	7
PowerPoint	Powerpoint Presentation	2	6	0	5	5
PowerPoint	Powerpoint Presentation	4	4	2	3	5
PowerPoint	Powerpoint Presentation	6	2	4	0	4

Table 3: Deploying assigned values for Length, Intensity and Engagement

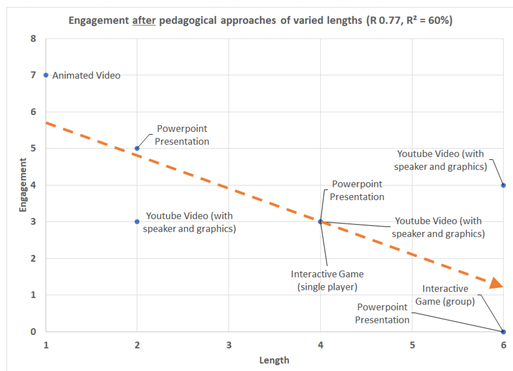
Metric	Correlation Coefficient	R^2
Length vs During	0.74	54%
Length vs After	-0.77	60%
Intensity vs During	-0.31	9%
Intensity vs After	0.66	43%

Table 4: Correlation coefficients and R-squared values for Length and Intensity versus Engagement (during and after).

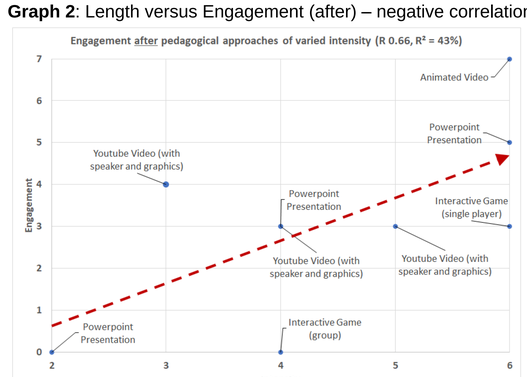
RESULTS



Graph 1: Length versus Engagement (during) – positive correlation



Graph 2: Length versus Engagement (after) – negative correlation



Graph 3: Intensity versus Engagement (after) – positive correlation

ANALYSIS & RECOMMENDATIONS

Correlation results are very intuitive (Table 1-4; Graph 1-3):

1) **Length:**
   If a pedagogical approach is longer, there is more engagement during delivery and less engagement after. Therefore, the teacher should attempt to engage during the medium, or else there will be limited participation both during, and after.

2) **Intensity**:
   High intensity material results in low engagement during the delivery. This makes sense, as the students want to pay rapt attention to the medium as it is being shown. Afterwards, engagement is high. The student has had time to process the material and the teacher can now engage. Intensity should never be low.

3) **Total Engagement**:
   Short Animated Videos of highest intensity, Long YouTube Videos of medium intensity, and medium length games of highest intensity garnered the highest total engagement.

4) **Type of content**:
   While this research was focused primarily on length and intensity, visually appealing media, controversial topics, and practical applications were received the best.

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ABSTRACT

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