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Action Research to Examine the Effects of Integrating Facebook, Twitter, and YouTube in Online Math Classes on Students' Engagement

Wejdan Abo-Alhija

Aspire International Academy, Dhahran, Saudi Arabia

wejdan.abo-alhija8558@my.ace.edu

Abstract. This research was implemented to examine the effects of integrating Facebook, Twitter, and YouTube in online math classes on students' engagement by correlating their formative assessment results. Thirty-three students of grade 11 and 12 were included in this research. The teacher presented math questions at an online math class and asked students to use Twitter and YouTube to look for answers and share their results on the math Facebook page. According to the formative assessment results, the students achieved higher results than before integrating Facebook, Twitter, and YouTube into online math classes. The interviews took place with students to determine students' views about using Facebook, Twitter, and YouTube in online math classes. Their results were evaluated, classified, and discussed diverse essential considerations about integrating Twitter and YouTube into online courses. The effect of integrating Facebook, Twitter, and YouTube on students' engagement and formative assessment results was investigated through students' surveys, online interviews, and teacher observation.

Keywords. Facebook, Twitter, YouTube, online classes, formative assessments, students' achievement

Action Research: Purpose, Problem Statement, Question(s), and Literature Review

Aspire International Academy is a British private school located in the eastern province of Saudi Arabia. The school teaches Cambridge International Education Programs (CIE) for kindergarten grades up to grade 12. The school is formed of more than 40 different nationalities. The school is also 1:1 in that all students from kindergarten up to grade 6 have IPads, and students from grade 7 up to grade 12 have HP laptops. This year, the school integrated mobile phones for high school students and laptops to approach diverse learners and student-centered learning. Since it's established, the school has formed a technology leadership committee responsible for conducting diagnostic surveys. Face-to-face technology needs assessments, meetings, and planning to discuss the current school technology integration situation. Focus on integrating the technology available in the school, proposing recommendations and new technologies to be incorporated, preparing a descriptive feasibility study of how to use new technology, and explaining why to integrate the latest technology with providing contact information and total cost. Also, frame face to face and virtual professional development sessions that will take place for teachers, students, administrators, and parents.

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All school rooms – not only classes – are outfitted with an internet landline, internet cable, projector, smartboard, CPU, keyboard, mouse, and speakers. The school also accommodates eight Wi-Fi networks for staff and students' devices; through the research and interviews, the staff and students can access the internet anytime and at home. Therefore, all students and teachers have digital access and equitable opportunity for diverse learners concerning gender, race, ethnicity, learning style, age, disability, and any other characteristics.

The school technology leadership committee's surveys indicated that many high school students feel bored during the math classes, which has been reflected in their formative assessments' low performance in the online math classes. Hence, the main issue that requires improvement is to increase students' engagement and constructive assessment results during online math classes by integrating Facebook, Twitter, and YouTube into online math class instructions. Therefore, students can get immediate feedback, assistance, and decision-making in group activities. It also fosters regulation in learning and helps students prioritize their thoughts, allowing them to create more motivational practices.

Purpose

This research proposes investigating the correlation of integrating Facebook, Twitter, and YouTube in online math classes on students' engagement by measuring their formative assessment results. During online Zoom classes, the teacher used to ask questions during the math classes and ask students to look for answers and then ask them to share their responses on the math Facebook page as text, picture, audio, or video. Then divide them into groups using the zoom rooms option, asking students to check and discuss the answers as group work and reflect their conclusion on the same Facebook page. The teacher will then conduct a formative assessment using a google form to check their understanding and evaluate their results based on their achievements. Then perform random interviews and share a survey to measure students' feedback of using Facebook. Twitter, and YouTube during online math classes. Thirty-three students of grades 11 and 12 participated in this research at math online class, and they were able to ask the teacher questions at any points.

Problem Statement

The problem is that the school technology leadership committee's surveys indicated that many high school students feel bored during the math classes, which has been reflected in their formative assessments' low performance in the online math classes. The teacher observed that most grade 11 and 12 students' constructive assessment results were average during online math classes. Also, most of the time, students are bored and not motivated during online math classes. Simultaneously, the teacher noticed that all her students are actively engaged in social media platforms, such as Facebook, Twitter, and YouTube. The teacher notified that Social media site environments could share the same formal educational settings, like approaching and assessing learners' needs, creating curriculum-based activities, and best practices of integrating the curriculum. However, social media sites require more creativity in curriculum integration to increase motivation and assist students in adopting more technological settings.

The pervasive influence of social media sites creates a unique environment that expands students' engagement and inspiration, which can be used in teaching and learning (Anderson, 2004). This context's primary feature is its ability to promote educational content in multiple formats, including voice threads, pictures, video, and text, empowering students to empower their needs. Additionally, it will allow access to immense educational content resources and interaction in a rich learning context permits teachers' real-time follow-up, feedback, and evaluation. Therefore. The teacher suggested enhancing students' motivation and increasing

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their online math classes' formative assessment results in the second term by integrating Facebook, Twitter, and YouTube to improve social media curriculum integration and enhance constructive assessment achievement in online math classes. Additionally, to facilitate students learning, communication, and interaction and to create collaborative and meaningful experiences. Therefore, the school technology leadership committee conducted student surveys and interviews to evaluate last week's formative assessment performances to address this matter.

Research Questions

1. What are the best practices of using Facebook as a social learning environment to increase students' engagement and formative assessment results in online math classes?
2. How to engage students in meaningful online collaborative activities using social media sites to fruitful their online math classes' engagement and formative assessment results?
3. How to integrate Twitter in online math classes to strengthen students' understanding to receive better engagements and formative assessment results?

Literature Review

In a rapidly changing technology, most educational settings need to develop social media classroom integration to fulfill various users. According to Doğan and Gülbahar (2018), educational settings have to include professional development plans to integrate social media sites into classroom settings. To better equip teachers to use one of its platforms, such as Facebook, as a learning environment that enables collaboration and enhances classroom interaction. Access and free cost efficiency is the foremost reason for comprehensive social media integration in education.

According to McCarroll and Curran (2013), social media facilitates and promotes user interaction and collaboration. According to Siemens (2004), connections and Interactions through networks guide to learning. Facebook collaborative performance can connect teachers and students in multiple online communication forms. Facebook users can interact through comments, likes, and shares (Moore-Russo et al., 2017) and use various types of posts and live videos. Doğan and Gülbahar (2018) found that student-instructor interaction was more significant than student-student and instructor-instructor based on the participants' reflection interviews. Therefore, Facebook expedites interaction between students and their teachers, which increases students' engagement, motivation, and formative assessment results.

Kang and Im (2013) identified that initial online learning required meaningful interactions. As Vygotsky (1978) recommended, improving the students' online settings can be enhanced when placed in groups based on their experience and proficiency. Interacting with peers also empowers learners to adopt and promote their metacognitive skills (Ally, 2008). Current online collaborative learning investigation observed how collective learning characteristics are addressed uniquely in online environments than traditional settings (Barkley et al., 2014; Major, 2015). Hence, it's crucial to find strategies that encourage teachers in generating and utilizing creative and collaborative teaching techniques (Hämäläinen, & Vähäsantanen, 2011, p. 179). as learner Interaction and collaboration in online instruction proceeds to be a priority (Kim & Bonk, 2006; Kearsley and Moore, 2012; Oncu & Cakir, 2011). Therefore, learning with technology can be summarized as creating unique designs to sustain teachers in organizing collaborative learning and creativity in developing technological contexts, which need and maintain explicit collaboration in problem-solving (Hämäläinen, & Vähäsantanen, 2011, p. 178).

In a learner-centered setting, the facilitator should understand each student's prior knowledge (Anderson, 2008). As Stodel et al. (2006) presented, diverse practice meanings for

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developing online learning are required of the learner-centered. In collaborative settings, students perform in groups to enhance understanding and approach learning goals with support from the teacher. Fulfilling social constructivism in an online classroom is an essential duty. To do it well, an online teacher needs to experience interaction and collaboration as different approaches in an online classroom than in a face-to-face classroom. However, best practices have increasingly started to emerge. (Robinson et al., 2017).

Social media platforms extend learning beyond traditional educational settings. Social media can endeavor to engage students in further profound learning experiences (Graham, 2014), such as Twitter, which is recognized for interactions and social support. Fenwick (2016) perceives that social media initiates different opportunities to build professional students ready to work and solve future problems. Twitter is a prevalent social media platform for educational activities to create an online presence and control a department's status (Palmer, 2014). Junco et al. (2013) noted that Twitter's universality amongst academics to its microblogging form, facilitating public communication to be both continuous and universal. Indeed, Knight and Kaye (2014) determined that Twitter was an amazingly flourishing platform for expanding communications and interactions between staff and students.

However, in research on UK engineering departments' use of Twitter, an amplifier tweeting style was one way only. Information is broadcast in a one-way communication style. Engineering departments that interacted more with their Twitter followers had a more extensive follow base and were mentioned more by other Twitter users (Palmer, 2014). students should move towards an interactional, two-way use of social media to facilitate discussion amongst the learning community. Social media use should be dynamic, exciting, and impartial, encourage two-way interactions, and build engaged communities on Twitter. Also, Twitter exhibits are used to support students' intellectual engagement and formative results. As an instructional means, Twitter can drive experiences of communication and effective peer interaction (Marie Condie et al., 2018).

Methodology and Data Collection Plan

The participant of this study was 33 students of grade 11 and 12 of online Mathematics classes. The teacher used to ask questions during the math classes and ask students to look for answers using Twitter and YouTube and then ask them to share their responses on the math Facebook page as text, picture, audio, or video. Then divide them into groups using the zoom rooms option, asking students to check and discuss the answers as group work and reflect their conclusion on the same Facebook page. The teacher will then conduct a formative assessment using a google form to check their understanding and evaluate their results based on their achievements. Then perform random interviews and share a survey to measure students' feedback of using Facebook. Twitter, and YouTube during online math classes to enhance engagement.

Students were able to ask questions to the teacher at the confusion points. This research examines the effects of using Facebook, Twitter, and YouTube in online math classes on students' engagement by measuring their formative assessment results. The interviews were conducted with students to determine students' perspectives of using Facebook, Twitter, and YouTube to enhance the engagement of the online math classes of Aspire Academy. Quantitative and qualitative data were collected through the formative assessment results, survey, and interviews documented and addressed to two Leadership Technology Committee members. Students' responses were evaluated, analyzed using descriptive statistics for constructive assessment results, and Narrative analysis for the survey and interviews within the research.

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Data Collection

In this research, quantitative and qualitative data were collected. The quantitative data was the students' online formative assessment results. The data were collected after online math classes before using Facebook, Twitter, and YouTube as engagement tools and then gathered again after using Facebook, Twitter, and YouTube as engagement tools during the online math classes. Therefore, both data (students' formative assessment results) were analyzed using descriptive statistics by finding the mean, median, mode, and range to measure the results.

The qualitative data was the students' survey results and interviews; they were collected after conducting the formative assessment. The survey was shared as a link to reflect students' feedback using Facebook, Twitter, and YouTube as engagement tools during the online math classes. The qualitative surveys with open-ended questions allow students to provide an individual answer, giving the students the privilege to precisely state how they feel about the problem, which offers extraordinary data that may exhibit other possibilities and concerns. The interviews were then planned, scheduled, and conducted virtually using the Zoom app to provide a more extensive understanding of any topics where participants may not talk about such matters in a group environment. Therefore, the collected data were used to analyze the problem from multiple sources. It focuses on using the feedback and experiences shared by students to answer the research questions.

Data Analysis

Formative Assessment(s) Results

The teacher conducts a formative assessment after each online math class to measure students' performance and achievements. For this research, two weeks' results have been recorded and used. The first and second tables represent the last week of the first term formative assessment online math classes results of grade 11 and grade 12, respectively, without using Facebook, Twitter, and YouTube as engagement tools during the online math class. The third and fourth tables represent last week's formative assessment results of online math classes of grade 11 and grade 12, respectively, after using Facebook, Twitter, YouTube as engagement tools during the online math classes. The daily formative assessment contains five questions; each is marked between 0.5 to 1.5 marks. Therefore, the total mark of the daily formative assessment is five marks.

Table 1

The formative assessment results of Grade 11 and before using Facebook, Twitter, and YouTube as engagement tools in the online math classes

Formative Assessment Results of Grade 11					
Day	Sunday	Monday	Tuesday	Wednesday	Thursday
Mean	2.30	2.35	2.54	2.43	2.66
Median	2.5	3	3.5	2.5	2.5
Mode	2	3	3	2	2
Range	0-4	0-5	0-4	0-5	0-5

Figure 1

The formative assessment results of Grade 11 before using Facebook, Twitter, and YouTube as engagement tools in the online math classes

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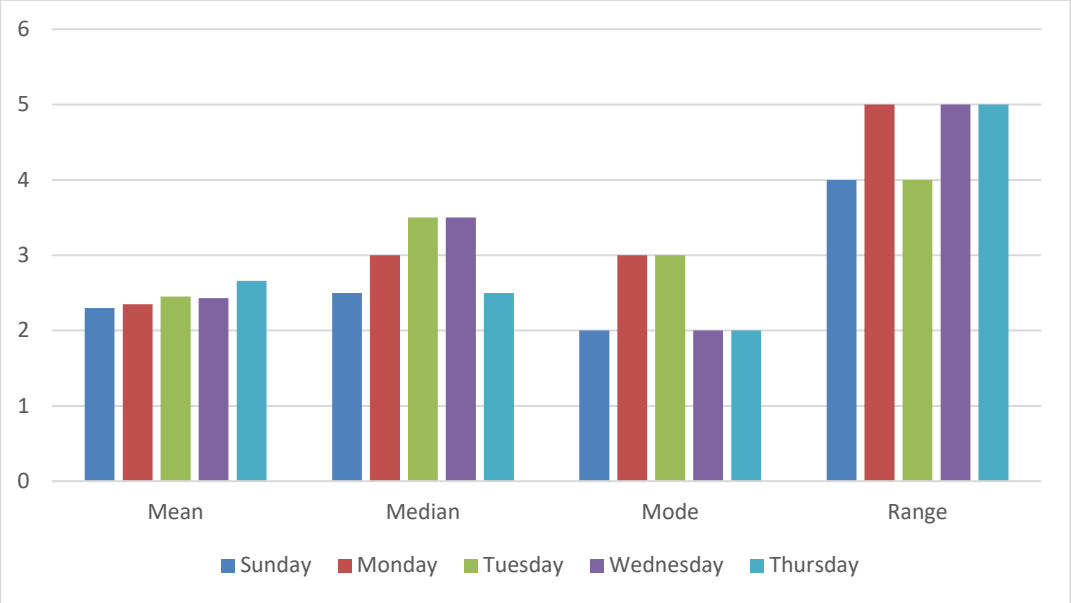

Table 2

The formative assessment results of Grade 12 and before using Facebook, Twitter, and YouTube as engagement tools in the online math classes

Formative Assessment Results of Grade 12					
Day	Sunday	Monday	Tuesday	Wednesday	Thursday
Mean	2.43	2.63	2.76	2.70	2.74
Median	2.5	2.5	3	3	3.5
Mode	2	2	3	3	3
Range	0-5	0-5	0-5	0-4	0-5

Figure 2

The formative assessment results of Grade 12 before using Facebook, Twitter, and YouTube as engagement tools in the online math classes

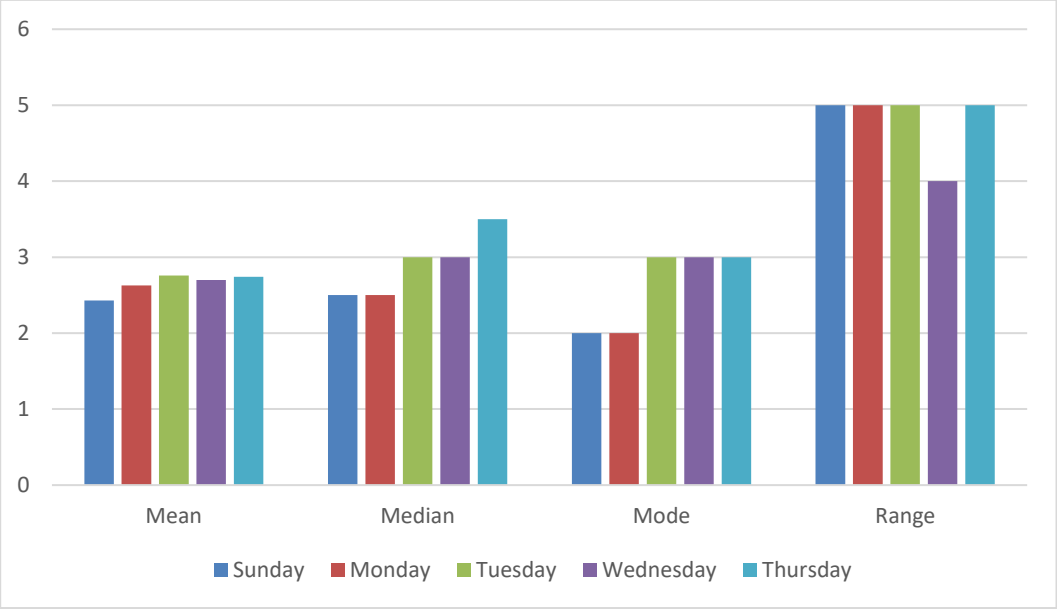

Table 3

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The formative assessment results of Grade 11 after using Facebook, Twitter, and YouTube as engagement tools in the online math classes

Formative Assessment Results of Grade 11					
Day	Sunday	Monday	Tuesday	Wednesday	Thursday
Mean	3.43	3.78	3.78	4.1	4.45
Median	3	3.5	4	3.5	3.5
Mode	3	3	4	4	4
Range	1-5	1-5	2-5	2-5	2-5

Figure 3

The formative assessment results of Grade 11 after using Facebook, Twitter, and YouTube as engagement tools in the online math classes

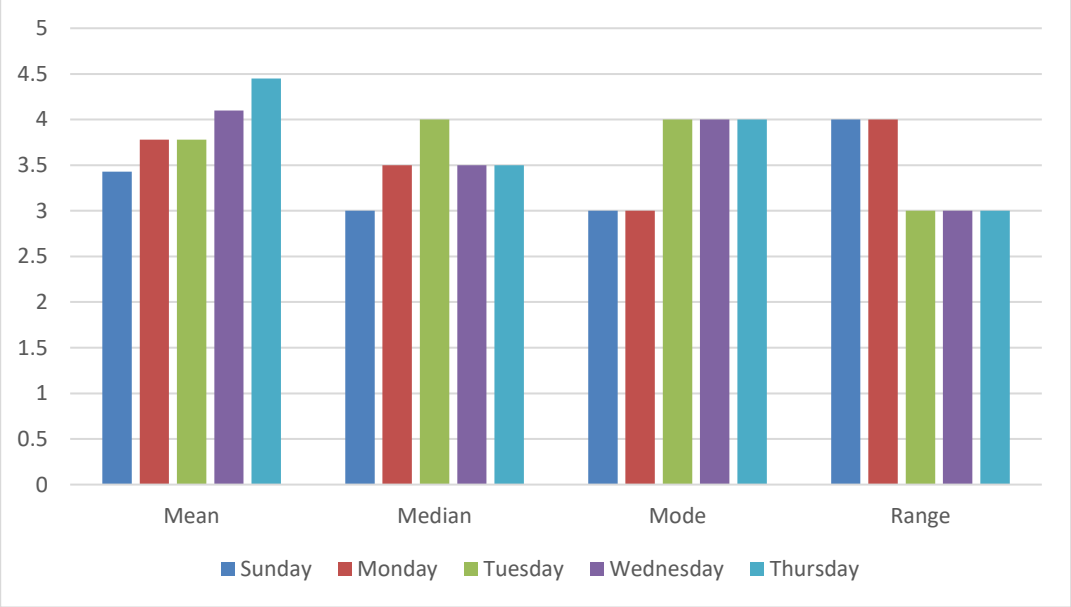

Table 4

The formative assessment results of Grade 12 after using Facebook, Twitter, and YouTube as engagement tools in the online math classes

Formative Assessment Results of Grade 12					
Day	Sunday	Monday	Tuesday	Wednesday	Thursday
Mean	3.56	3.77	3.88	4.3	4.7
Median	3	3	3.5	3.5	3.5
Mode	3	3	4	4	4
Range	1-5	1-5	2-5	2-5	2-5

Figure 4

The formative assessment results of Grade 12 after using Facebook, Twitter, and YouTube as engagement tools in the online math classes

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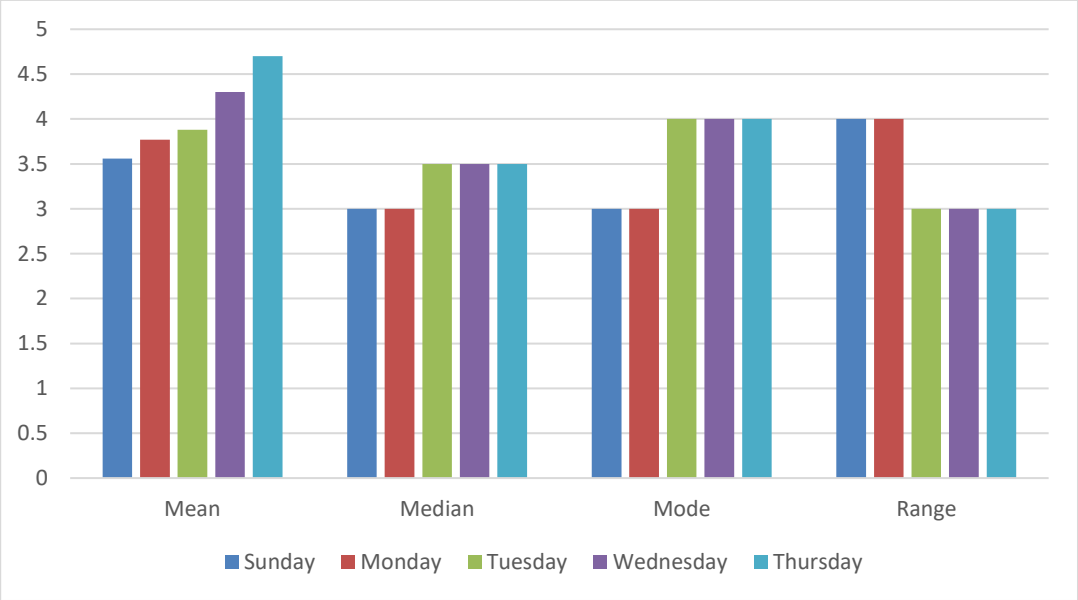

It's clearly stated that the mean (average), median, and mode of last week students' results of online math classes after using Facebook, Twitter, and YouTube as engagement tools was higher than the results of online math classes of the first term last week. The results were higher on all the days of the last week for both 11 and 12 graders. Therefore, Integrating Facebook, Twitter, and YouTube as engagement tools enhanced students' engagement and formative assessment results.

Surveys Results

The three open-ended survey questions were conducted on grade 11 and 12 students after finishing the last week's formative assessments. The survey answered were collected anonymously so students will feel free to put their real point of view. Most of the answers to the first questions was describing last week's online math class. Students mention they were more excited during the lesson. They used Twitter and YouTube to look for answers with explanations. Then they shared their responses on the math Facebook page in their favorite format like text, image, video, or as a voice thread. Then they described that they engaged in twitter by focusing on using hashtags to ask other teachers or students all over the world. Then they explained how it was exciting to use YouTube and sharing the videos links to the math Facebook page. For the second question, almost all the class descriptions that their best practices are while sharing their results on the math Facebook page and using hashtags to look for answers. They describe both practices as they were so excited during both activities. And finally, for the first question, the majority of grade 11 and 12 students' favorite social media site is Facebook. The second favorite social media site is YouTube, and the third favorite social media site is Twitter. Some students concluded that they prefer Facebook because they feel it's more comfortable and easier to use. However, some students figured that if they didn't choose Twitter as their favorite, they couldn't use Twitter effectively while looking for answers.
Here is a link to the survey questions:
https://forms.gle/4KH1XnjCygyP7QcB8

Interviews Results

There were three open-ended questions in the interview form, which are the following:

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1. What do you think about online math classes after integrating Facebook, Twitter, and YouTube as engagement tools during the online class?
2. Which practice enhanced your engagement and your achievements in the formative assessments?
3. What is your favorite practice during the online math classes? And why?

Some examples of data collected in the analysis of the replies are briefly listed below: "Although the online Math lessons are boring and challenging, I enjoyed last week lessons, and it supported me to do my homework" "It influenced my understanding of the lesson content to be part of the problem solving during the online math classes" "The teacher explained problems about the lesson's materials, and she answered my questions and assisted me whenever I need at the online math classes." Similar replies were collected in the interviews and then analyzed. One main conclusion becomes prominent: Integrating Facebook, Twitter, and Youtube into the online math classes are enormously needed to enhance engagement and formative assessment results. Most of the students' best practices were reflected in sharing their answers on the math Facebook page as it was accepted in different formats. Students indicated this as they exhibited their feedback based on their learning styles, which fostered their understanding of the topic. Another comprehensive reflection of best practices was about using the hashtag option on Twitter surprised most of them. They got their answers from real teachers and students worldwide, which signified more enthusiasm about learning. These results indicate that the students were frequently influenced by using Facebook, Twitter, and YouTube as engagement tools during the online math classes.

Future Action Plan and Force Field Analysis

Future action planning has been planned to use Facebook, Twitter, Youtube, and various social media sites to improve students' engagement and enthusiasm in the online math classes environments. Brainstorming and planning to integrate other online reflective, collaborative environments to promote students' interaction, communication, and concentration during the online math classes such as wikis and blogs. Plan to conduct professional development for teaching students the best practices of using web 2.0 tools. Plan to lead professional development for teachers to integrate and use the same methods and techniques with another curriculum context to better students' results. Plan to continuously support students in learning, integrating, and applying different web 2.0 tools in the online math classes. Prepare and allow students to share their feedback in various formats that support students' diverse needs and upgrade the understanding of the topic, such as video, picture, text, or voice threads.

The online math classes' teacher plans to create Zoom rooms, divide students into groups, and share what they understood from videos. Explain what they have to do for solving the math questions by sharing a short text, voice thread, short video, and pictures of each step, then ask them to share their findings, as text, pictures, voice thread, or videos on the math Facebook page or math blog page. Finally, ask students to do the formative-assessment and share the thumb-up emoji if they understood the lesson. Using these techniques can create a student-centered learning environment that is flexible, collaborative, approach all students' needs, and ensure inclusive and accessible learning experiences that meet any challenges to acquiring knowledge and developing skills and expertise.

Goals of Action Plan:

1. Improve students' engagement in the math online classes.
2. Create a reflective, collaborative environment during the online math settings.
3. Enhance students' formative assessment achievements of online Math classes.

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4. Integrate the same techniques with another curriculum context for the same grades.

Objectives:

1. To assist students in applying different Facebook, Twitter, and YouTube techniques in the online math classes.
2. To help students share their reflection in various formats (video, picture, text, or voice threads) about the topic.
3. To train students on best practices of Facebook, Twitter, and YouTube.
4. To train Grade 11 and 12 Teachers to use the same techniques to enhance students' achievements in other subjects.

Driving Force (needs/supports making success more likely)	**Restraining Forces** (barriers to success)
1. Supportive Policies and procedures. 2. Supportive administration. 3. Supportive parents. 4. Supportive faculty.	1. Lack of time as sometimes the math topic is long, and proceeding in this activity requires additional time. 2. Students' attendance, as when students are absent for more than two days, will be challenging to track and follow up with their improvement and achievement. ~~3. Some students will face a technical issue during the online lessons or in the middle of the activity.~~

Conclusion

Facebook, Twitter, and YouTube are 21st-century network tools used to emphasize the internet's social aspects as a method of communication, collaboration, and creative expression. These social media sites involve practice and resource-sharing that facilitates the creation of collaborative environments. It can also help the teachers and students design new teaching and learning techniques. Reaching these social media sites' expansions will allow creating personalized settings, collaboration, social networking environments, and meaningful transformation of practice, enabling students to take care of their learning and improve student engagement and interaction. Therefore, students can achieve and sustain the teaching means that facilitate their learning activities, interaction with peers, and social networks that enhance the collaboration between the students and the teacher in the virtual environment. Students are then involved in a self-oriented practice of reflection with the teacher, social media sites, and peers. They become motivated and enabled to create a stimulating and supportive learning environment to achieve their learning goals and enhance their learning expertise. The best design of online learning environments involves social media sites as a creative way of reflecting on curriculum design. Integrating social media sites such as Facebook, Twitter, and YouTube promotes content sharing, which approaches students' and teachers' reflective practice and critical feedback.

This research examined the effects of integrating Facebook, Twitter, and YouTube in online math classes on students' engagement by mapping their formative assessment results. The teacher presented math questions at an online math class and asked students to use Twitter and YouTube to look for answers and share their feedback on the math Facebook page. The teacher then conducted a formative assessment using a google form to check their understanding and evaluate their outcomes. According to the formative assessment results, the students

achieved higher results than before integrating Facebook, Twitter, and YouTube into online math classes. Then the teacher performs random interviews and shares a survey to measure students' feedback of using Facebook. Twitter, and YouTube during online math classes. Thirty-three students of grades 11 and 12 participated in this research at math online class, and they were able to ask the teacher questions at any points. The interviews took place with students to determine students' views about using Facebook, Twitter, and YouTube in online math classes. Their results were evaluated, classified, and discussed diverse essential considerations about integrating Twitter and YouTube into online courses. The effect of integrating Facebook, Twitter, and YouTube on students' engagement and formative assessment results was investigated through students' surveys, online interviews, and teacher observation.

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