

Flipping the classroom Concept through the WhatsApp Platform and the Microsoft PowerPoint Presentations for the Service of Teaching Mathematics, A Case Study in a Lebanese Public School

Naim (EL) Rouadi , Mohammad Faysal Anouti

PhD, Full Professor at the Saint-Joseph University, Faculty of Educational Sciences, Beirut, Lebanon

PhD Student, Faculty of Educational Sciences, Saint-Joseph University, Beirut, Lebanon



ABSTRACT: This research aims at examining the impact of the flipped classroom through the WhatsApp social media platform and the Microsoft PowerPoint presentations on the learning of twenty two students, equally divided into two groups, in the third year secondary class, section general science in a Lebanese public school during the Coronavirus pandemic. In addition, this study aims to presenting the mathematical lesson “the numerical sequences” in a new learning environment that differs than the one these students are used to through interaction, collaboration, and the features of the WhatsApp social media platform and the Microsoft PowerPoint presentations. For this study, the researchers have relied on the purposive non probability sampling technique and used it for their experiment to select the class of heterogeneous students. The qualitative data, through the open ended interview of this concurrent triangulation mixed method study, has revealed that the flipped classroom through the WhatsApp social media platform and the Microsoft PowerPoint presentations has eased students’ learning, positively influenced their understanding, self-confidence and behavior, made them share their learning responsibilities more than they got used to in the past, saved them too much time, reduced the pressure inside the class during the learning session, and provided them valuable time to invest inside the classroom through interactions and collaborations with each other and their teacher. The qualitative data has also revealed that teachers’ practices are fundamental in the success of the flipped classroom because their students tend to alienate themselves from any additional collaboration with their teachers because of the latter’s inappropriate practices, and that the well-constructed presentations and the interaction between each other and/or their teacher through the WhatsApp social media platform are important in terms of student’s perseverance and understanding of the lesson content through the flipped classroom. The quantitative data has revealed that only two students in the first group failed the assessment exam while three students in the second exam failed their own exam, and that most students performed very well with each group averaging 7.659 and 7.727 over 10 respectively. The researchers have recommended math teachers to change their practices, otherwise the inertia in education won’t be surpassed, and use this kind of flipped classrooms capable of easing their teaching and students’ learning. Finally, students were recommended to fully participate in this kind of digital learning environment that differs from the one they are used to make this concept a success and start changing the landscape of education.

KEYWORDS: Flipped classroom, WhatsApp social media platform, Microsoft PowerPoint presentations, teaching, learning, interaction, collaboration, digital learning environment, math teachers.



ISSN: 2350-0328

International Journal of Advanced Research in Science, Engineering and Technology

Vol. 8, Issue 1 , January 2021

I.INTRODUCTION

BACKGROUND OF THE STUDY:

It is a well-known fact that social media has become the new phenomenon that dominated the world and still is. Its platforms and networking sites are used by most people worldwide every day because they enable their users to share, exchange, comment, discuss, and receive the latest updates about lots of topics (Devi, Gouthami, & Lakshmi, 2019).

This massive and speedy expansion shook the core of how people communicate and collaborate with each other. In what matters for students, because of this reality, they have to realize and understand that, unlike previous generations, they can communicate and collaborate with their teachers, each other, and students in other schools, countries and continents in an unmatched interactive way (Devi, Gouthami, & Lakshmi, 2019).

Fortunately, the good things about social media don't stop here. Teachers and students are more than lucky to have the opportunity to transfer the knowledge, collaborate for the completion of tasks, assignments and even teach contents of lessons thanks to the provided platforms and networking sites (Devi, Gouthami, & Lakshmi, 2019).

Some teachers and students might question doing what was just said. They make ask themselves and others why would they use their platforms and networking site to teach and learn, and it is normal to ask that. They have to realize that social media enables people determining the kind of relationship they want to have online with others. They have one of two options when it comes to their social media platforms and networking sites. They can either use them for fun or come up with online relationship that can solidify their learning; and when it is about social media, the teachers and the students are both demanded to take advantage of the features provided by their social media to reach a much better learning environment (Devi, Gouthami, & Lakshmi, 2019).

After years of being available for the common people, some teachers endorse using the social media platforms and networking sites in teaching their own subject material, others are still against it, while others are still skeptical so they prefer to remain neutral when it comes to using social media in education. Despite that, social media was able to influence some teachers and educators to experiment their effect in education (Devi, Gouthami, & Lakshmi, 2019).

It is a fact for us to admit that, like no other technical devices, social media, through its platforms and networking sites, present us the opportunity to reinforce our thinking skills through collaboration at any time and from any place. So be sure that, if social media is given the right opportunity to justify its worthiness in education, then its implications in the ways we teach in the 21st century could be really huge and they must be considered seriously by those who design schools curriculums (Devi, Gouthami, & Lakshmi, 2019).

In addition to the endorsement that social media has been receiving by those who believed in its ability in changing the ways of teaching and learning, usage of the Microsoft PowerPoint presentations has remarkably increased over the years in many classes by many teachers, but despite that, no real examinations were done to identify their impact on the learning of the students. Even more, there is no reliable evidence about the influence of the Microsoft PowerPoint presentations, and to make things tighter when it comes to it, some pretend that any evidence is just anecdotal (Nouri & Shahid, 2005).

In 2000, Bryant and Hunton (2000) assured that improving students' learning relies on the medium presented for usage and the types of interactions, which unfortunately can be complex and not easy to identify and distinguish (Bryant & Hunton, 2000). Luckily, despite that dark fact, Hlynka and Mason (1998) indicated that the Microsoft PowerPoint presentations can ease the learning process and lead to a better structure of the content of the lesson on hand or that is going to be presented during a lecture (Hlynka & Mason, 1998).

In addition, Cook (1998) claimed that the slides of the Microsoft PowerPoint presentations offer us many features we should take advantage of and master (Cook, 1998), while Parks (1999) made no doubts about the fact that students would definitely be intrigued with the lecture or the lesson thanks to the slides' outlines and the graphs that positively influence their learning (Parks, 1999). Nevertheless, despite their claims, Harrison (1999) had his own opinion through which he questioned the impact of these presentations on the learning of the students (Harrison, 1999).

In addition to the social media platforms and networking sites, and the Microsoft PowerPoint presentations, the flipped classroom remained one of the most popular trends in education in recent memory. Nonetheless, we have to ask ourselves what is it about the flipped classroom that makes it unique (Teach Thought Staff, 2014).

The flipped classroom is a type of blended learning through-which students receive the content at home to prepare it and then practice it at school. The flipped classroom is the reverse of the classic way through-which students are introduced to the new content at school to form a background about it and then assigned their homework and projects (Teach Thought Staff, 2014).

The flipped classroom not only supports technology but also relies on it. Students might receive files, PowerPoint presentations slides, or pre-recorded educational videos through-which they review, study, and prepare their questions independently or through small groups to ask at school (Teach Thought Staff, 2014).

Through this concept, valuable time is saved in the class, students are forced to think at home about new content, study for and by themselves, come to school to apply what was learned at home and interact more with their colleagues in class. In this way, teachers can reflect on their teaching and modify it, students are motivated, and the quality of their interaction improves (Fig. 1) (Teach Thought Staff, 2014).

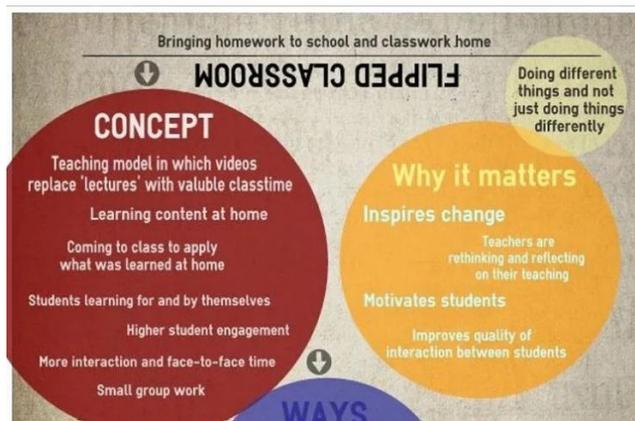


Figure 1: The Flipped Classroom (TeachThoughtStaff, 2014)

In the year 2020, the corona virus hit the world. Schools were forced to close and teachers found themselves teaching online because there was no way for them to teach inside the classrooms. At the beginning of the school year 2020-2021, some schools relied on the online learning due to the increasing number of the affected people by the pandemic, while others taught on and off in the classrooms.

In a situation like this, creativity is a must for the teacher to achieve the predetermined learning objectives. For that we may ask if we can use the flipped classroom concept (Fig. 2) through the WhatsApp platform (Fig. 3) and the Microsoft PowerPoint presentations (Fig. 4) to save valuable time in class, motivate the students, and improve their quality of interaction.

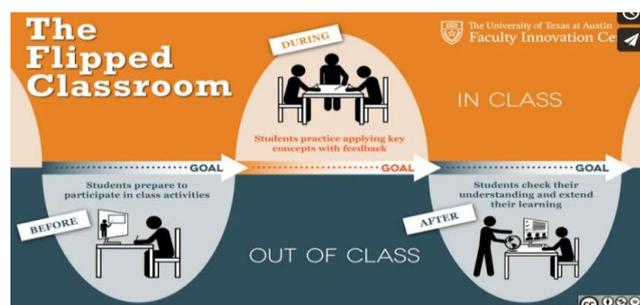


Figure 2: The Flipped Classroom (The University of Texas at Austin, 2020)



Figure 3: The WhatsApp Logo (pngsector, 2020) Figure 4: The Microsoft PowerPoint Presentations (envatout+, 2020)

During this pandemic, we may ask about the success of the flipped classroom concept by combining the features of the WhatsApp platform and the PowerPoint presentations to change the method of teaching mathematics.

Theoretical Framework: The flipped classroom, a concept pioneered by Jon Bergmann and Aaron Sams (Admin, 2014), is based on the constructivism model, through which learning becomes a social and active process. Its implementation is encouraged by two major factors: the prevalence of the videos, information and materials to use and create, and avoiding the poor learning outcomes that result from the traditional teaching in the classrooms (Flipped Classroom, 2020).

In the traditional teaching, teachers instruct and assess, and students take notes, follow the guided instructions, and have their homework, while in the flipped classroom teachers create to come up with videos and podcasts, and use books and websites (Flipped Classroom, 2020).

In other words, students receive the learning content at home, study them on their own pace and communicate with their own peers and teachers via online discussions after which they engage in the classroom with the help of their instructor (The University of Texas at Austin, 2020).

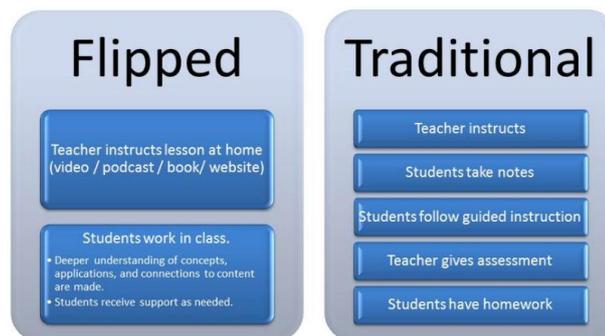


Figure 5: The Flipped Classroom vs The Traditional Teaching (Flipped Classroom, 2020)

In the last five years, the flipped classroom concept, also called the blended classroom, became very trendy to use in the secondary level and the higher education because it saves valuable time lecturing students inside the class and provides them learning content outside the school/university schedule (The University of Texas at Austin, 2020).

In simple words, contrary to the traditional teaching that leads to passive learning, the flipped classroom promotes active learning inside the classroom. It inverts the traditional teaching methods by delivering the instruction online outside the class and moving homework inside it (Fig. 6) (The University of Texas at Austin, 2020).

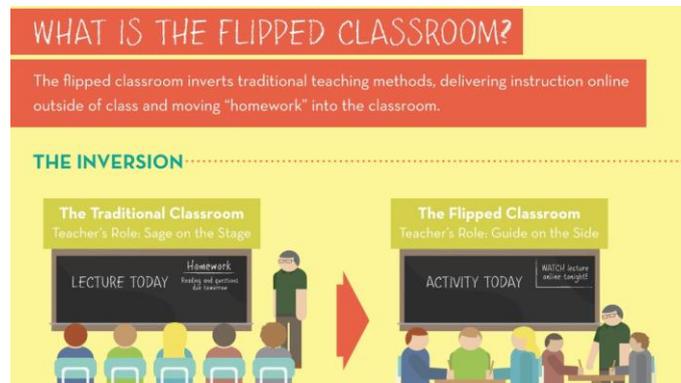


Figure 6: What is the Flipped Classroom (The University of Texas at Austin,2020)

The blended learning works because it is centered on the students who become active participants in their learning. It gives the teachers/instructors time in the classroom to scaffold student learning. It also provides the students with direct feedback and makes learning intentional and purposeful (The University of Texas at Austin, 2020).

The educational technology and actively learning are two key components of the flipped classroom model because they both influence students' learning environments in fundamental ways(Strayer, 2007), and according to the introduction of this study, the social media platforms and networking sites, and the Microsoft PowerPoint presentations have many features to take advantage of in education.

So it might be possible to use the flipped classroom concept in teaching mathematics by combining their features of the WhatsApp platform and the Microsoft PowerPoint presentations (Fig. 7).

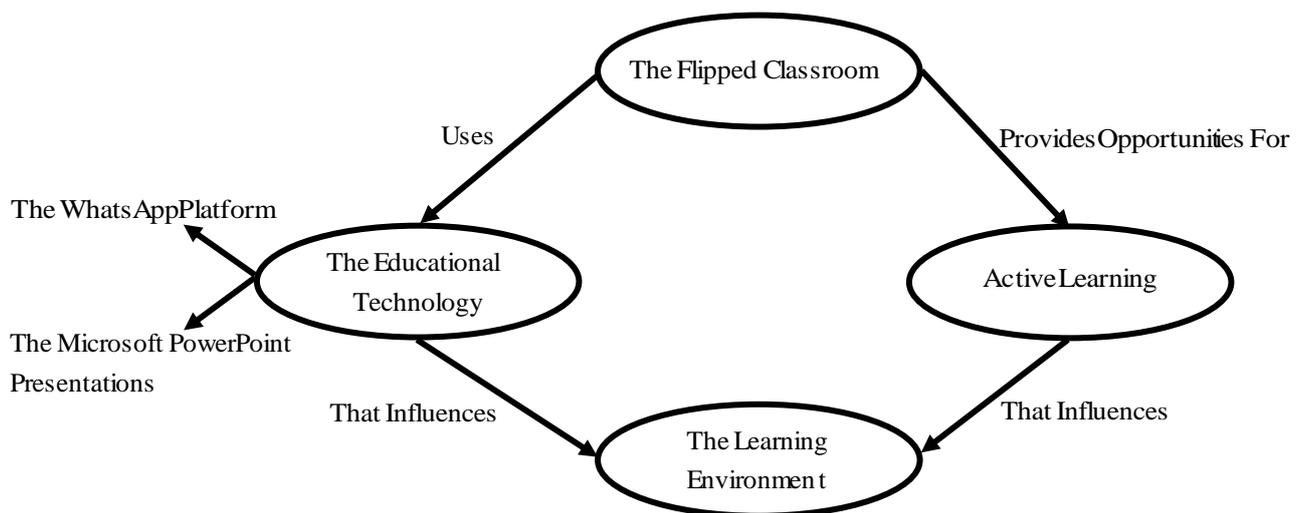


Figure 7 : The Flipped Classroom Theoretical Framework Through The WhatsApp Platform and The Microsoft PowerPoint Presentations

Purpose of the Study: This study has aimed, at examining the impact of the flipped classroom concept, through the WhatsApp social media platform and the Microsoft PowerPoint presentations, on the mathematical learning of two groups of 11 students in the third year secondary in a public school in Beirut, section general sciences, and their performance in the “numerical sequences” exams, and determining their opinions on this new learning environment.



ISSN: 2350-0328

International Journal of Advanced Research in Science, Engineering and Technology

Vol. 8, Issue 1, January 2021

Significance of the Study: This study has added to the practice by applying the flipped classroom concept through the features of the WhatsApp social media platform and the Microsoft PowerPoint presentations to teach a sample of 22 students in the third year secondary and examine their performance in the exams.

Research Questions

According to the qualitative data findings:

1. Is the flipped classroom concept through the WhatsApp social media platform and the Microsoft PowerPoint presentations beneficial for students' math learning?
2. Are students willing to use the flipped classroom through the WhatsApp social media platform and the Microsoft PowerPoint presentations instead of the traditional teaching in mathematics they got used to?

According to the quantitative data results:

3. What is the percent of students in each group who passed the math exam?
4. In overall, did the students in each group perform well in the math exam?

Research Hypotheses

According to the qualitative data findings, the researchers have constructed the following hypotheses:

H1: The flipped classroom concept through the WhatsApp social media platform and the Microsoft PowerPoint presentations is beneficial for students' learning.

H2: Students are willing to use the flipped classroom through the WhatsApp social media platform and the Microsoft PowerPoint presentations instead of the traditional teaching they got used to.

Limitations of the Study: This study has had one limitation to deal with. It was implemented in one class of 22 students who were divided into 2 groups. Each group attended the school for two weeks during each month of the school year for safety measures because of the corona virus that was taking over the world. For that, the researchers were unable to replicate the experiment with other students in other schools.

Delimitations of the Study: The 22 students in the third year secondary, section general sciences in a public school in Beirut, were motivated and collaborated with the researchers in the new learning environment that was provided by the flipped classroom concept which relied on the features of the WhatsApp social media platform and the Microsoft PowerPoint presentations. For that, results of the study were accurate although not generalizable.

II. LITERATURE REVIEW

Gradually through time, social media changed the communications landscape and took its rightful place at the top as one of the most important tool that provides humans' interaction as everyone is able to send, exchange, comment, blog and discuss different topics online (Syamala Devi, Lakshmi, & Gouthami, 2019).

So it is no strange that by time, the social media platforms and networking sites became very popular for humans to use. In 2019, the General Social Media Statistics revealed that Facebook was ranked first with an estimated 2.2 billion active users each month (Social Media List, 2019).

Facebook was followed by YouTube with an estimated 1.5 billion monthly users, Instagram with an estimated 800 million monthly users, WhatsApp with an estimated 700 million monthly users, Google + with an estimated 395 million monthly users, Twitter with an estimated 330 million monthly users. Snapchat with an estimated 301 million monthly users, million users, Reddit with an estimated 274 million monthly users, LinkedIn with an estimated 200 million monthly users, and Pinterest with also an estimated 200 million monthly users (Social Media List, 2019).

Now, one cannot deny that the impact of the social media on education has grown from one year to another. In higher education for example, the social media platforms and networking sites have successfully influenced students' discussions, thinking skills, knowledge construction and collaboration (Syamala Devi, Lakshmi, & Gouthami, 2019).



ISSN: 2350-0328

International Journal of Advanced Research in Science, Engineering and Technology

Vol. 8, Issue 1 , January 2021

Social media can be very useful for learning. It presents us with something we are not used to and that is the modern learning, which is about students planning, sharing ideas, progressing, collaborating and working in groups. Now when it comes to teaching, it is a fact that it could be either alluring or repulsive because it relies on our understanding of it and our experience in its field (Watanabe-Crockett, 2020).

When it comes social media, teaching through its platforms and networking sites can become easy for teachers to adopt, and those who are willing to extend their connections with their students are presented with a tremendous opportunity to do so (Watanabe-Crockett, 2020).

Unfortunately, because of the still illiteracy about employing social media in teaching, teachers must research how to employ its platforms and networking sites before interacting with their students in a digital learning environment (Watanabe-Crockett, 2020).

At first, these teachers might question giving social media a shot and they might even ask about the difference that social media could make by integrating it in their teaching. Is it going to benefit the students and make them more engaged? What materials, lessons and units suit better the social media platforms and networking sites? Is it possible to use it in all subjects?

Teachers might also ask about needing guidance and help to find their way in integrating social media in their teaching. Even more, if it turn out to be successful, they might about what to do next to keep on going. Teachers have to realize that it is normal to ask these questions because social media has cons (negatives) and pros (positives) (Watanabe-Crockett, 2020).

When it comes to the social media positives, teachers can depend on its platforms to increase students' engagement and increase their collaboration by making learning enjoyable for them, not to forget that it enables the teachers to remain in contact with their students and the parents at any time outside the school schedule. Even more, social media enables the students to reach other schoolmates and professional people outside the region they live in for schools' projects' consultation (Watanabe-Crockett, 2020).

So, by taking advantage of the social media interaction features, students' creativity, performance, brain-activity, self-confidence, and communication skills might very well be ameliorated and solidified (Thomson, 2018). In addition to that, teachers can benefit from the diversified the social media platforms and networking sites, and create the proper scaffolding for students' interaction and collaboration outside the school learning session (Syamala Devi, Lakshmi, & Gouthami, 2019), but despite that, they should keep on supervising everything in fear of things becoming out of control, and this is due to the fact that the social media usage among young people is a very hot topic (Hayton, 2019).

Finally, because of social media, teachers can create the proper scaffolding for students. It can become incredibly beneficial for didactics, from transferring to acquiring knowledge, interaction and collaboration between groups of students alone or with teachers outside the time assigned for the learning session inside the class (Syamala Devi, Lakshmi, & Gouthami, 2019).

Now, when it comes to the social media negatives, it is a fact that it can persuade students to join large groups for entertainment and that it is extremely distracting for students who might be neglect their homework for additional time of pleasure on the platforms and networking sites. Even worse, the behavior of the students might be negatively affected by social media and they might even lose their abilities in the face-to-face communication and interaction because of their misuse of their platforms and networking sites (Watanabe-Crockett, 2020).

The positives and the negatives of the social media is due to the fact that its platforms and networking sites were initially created for humans' pleasures by enabling them remaining socially connected with others, creating their profiles according to their personal view and presenting their image publically in the way they see fit; and despite that, many assure that social media has the potentials to be very valuable in teaching and learning (Syamala Devi, Lakshmi, & Gouthami, 2019), and that is because they believe that the role of social media is not terminated with the wikis, videos and bloggers and that it can additionally improve the interaction and collaboration between the people for the purpose of learning (Moran, Seaman, & Tinti-Kane, 2011).



ISSN: 2350-0328

International Journal of Advanced Research in Science, Engineering and Technology

Vol. 8, Issue 1 , January 2021

Take for example the students who suffer from false and poor understanding in school materials. Through their social media platforms and networking sites, these students can create an army of friends through online groups or privately and use their help to fill their gaps. For that, social media is seen by many as a proper solution for students' learning issues (Silius, Tervakari, & Miilumäki, 2009).

Facebook is one of the many social media platforms and networking sites that presents students with the opportunity to post their materials' questions online after their school time and be answered about them. Twitter allows the teachers to remind their students about their dates to submit their projects, inform them about important events, and provide them with new or needed information for their researches (Syamala Devi, Lakshmi, & Gouthami, 2019).

It has been said that a picture is worth thousand words, and this can be achieved through the Instagram platform by teachers publishing pictures about their students' work to showcase their hard work for the public and provide interesting details about them to the masses (Syamala Devi, Lakshmi, & Gouthami, 2019).

Fortunately, good things about social media don't stop here. It is ideal for teachers to use for the flipped classrooms concept by posting personal and YouTube videos, documents, links, images and other resources for students to use before a session. In this way, students will form an idea about the content of their next learning session before attending it (Syamala Devi, Lakshmi, & Gouthami, 2019).

So, it is obvious that through social media, teachers can create a new learning climate in which students are supported to become more active and take the lead inside the classroom; and in this climate, students have to hold their own share of responsibility in turning things a success for themselves and their teachers (Syamala Devi, Lakshmi, & Gouthami, 2019).

That said, students might feel weird about it at first, but they have to understand that collaborating with their teachers is extremely rich for their education, and for that, teachers have to set the right tone and encourage their students to communicate, discuss, contribute, develop, construct new knowledge, and put their own marks in this collaborative learning experience (Syamala Devi, Lakshmi, & Gouthami, 2019).

In addition to social media, the PowerPoint Software was initially a part of the Information and Communications Technology (ICT) program that was first developed by the Microsoft company (Gambari, Yusuf, & Balogun, 2015), designed and released in July 1987 to enhance and facilitate the visual presentations through its slides (Dreams Time, 2019); and despite not being originally developed for educational purposes, the Microsoft PowerPoint presentations found their way into the educational field (Childress, 2019).

It is said that people learn differently because of their different styles to do so. Some learn by listening, others through visual presentations, while some learn by exercising and practicing in both ways (Childress, 2019). The PowerPoint presentations present their users with the opportunity to use auditory aspects and visual effects, and it is valued as a good instructional medium capable of facilitating students' learning because of its ability to cover the content of any material easily in a much lesser time than the traditional teaching approach (Gambari, Yusuf, & Balogun, 2015).

In addition, many believe that the slides can grab the attention of the students and hold on to their interest during the presentation much longer than the classic teaching method. Despite that, some believe that the Microsoft PowerPoint presentations are not that much useful as an instructional medium because they limit the amount of details of the presented content, while others see it as a teacher-centered instructional tool because the teacher is in control and does nothing more than presenting his lecture or lesson in a different way (Gambari, Yusuf, & Balogun, 2015).

This argumentative issue is because of the theories about the work of humans' memory system, in the ways human gather, encode, retrieve and use information.

Scientists discovered that humans' brain is constructed of three major storage structures: the sensory system, the short-term memory and the long term memory where the sensory system registers the stimuli and holds to them briefly until they are recognized as self- stimuli or lost by time, the short-term memory has a limited capacity, receives information



ISSN: 2350-0328

International Journal of Advanced Research in Science, Engineering and Technology

Vol. 8, Issue 1 , January 2021

from the sensory system and holds on to it for a longer period of time through rehearsals, and the long-term memory is humans' knowledge permanent storage and receives information from both the sensory system and the short-term memory (Nouri & Shahid, 2005).

Researches showed that attention plays an important factor in transferring the information from the sensory system to the short-term memory to the long-term memory because the information would be quickly lost at the sensory stage if there was no attention (Nouri & Shahid, 2005).

In 1983, Francis M. Dwyer and Richard J. Lamberski found out that colors should be the center of any presentation because they make students pay more attention and improve their learning. Thirteen years later in 1996, these findings were supported by Aura Hanna and Roger Remington who found out that colors are a stimulus for memory (Nouri & Shahid, 2005).

In 1986, through his dual coding theory of memory and cognition, considered by many to be very effective in improving humans' memory, Allan Paivio suggested that humans' information processing consists of the imagery and verbal systems where the imagery system processes information about nonverbal objects like animations, images and colors, while the verbal system is associated with verbal vocal communications and speeches (Paivio, 1986).

According to Paivio' theory, a person can extend his learning with verbal aids, visual imagery, or both, and it happens that the way the human mind works supports his theory because the information can be represented visually or verbally, after-which these visual and/or verbal information are stored, organized and coded, and accessed to use later on to recall or retrieve an information (Paivio, 1986).

Add to Paivios' theory, in 1987, Reynolds and Baker (1987) found out that learning increases as the attention increases (Reynolds & Baker, 1987). Also in 1987, J. Peek indicated that humans' retention of information improves when they are presented with a text embedded in a picture (Nouri & Shahid, 2005).

Based on these findings, since the topics presented through the Microsoft PowerPoint slides rely first and foremost on colors, animations and images, then they should positively contribute to students' understanding, short term and long term memories (Nouri & Shahid, 2005).

In 2005, Nouri and Shadid (2005) found out through their study that PowerPoint slides positively influences students' attitude towards the instructor and the content presented, and hinted that these slides may also improve their short-term memory (Nouri & Shahid, 2005).

However, this depends on the topic at hand and the acting style students prefer. Nouri and Shadid (2005) also found out that the poor PowerPoint presentations negatively impact the attitude and the learning of the students, which shows the importance of a well-constructed and organized slides for a presentation; and even-though they did not find any significant effect of the PowerPoint presentation on humans' long-term memory, they requested examining the impact of well-constructed PowerPoint slides on a larger sample of students to better understand the impact of PowerPoint on humans' short and long-term memories (Nouri & Shahid, 2005).

In addition to the claims about the positives of the social media and the Microsoft PowerPoint presentations on the learning of the students, the flipped classroom concept was claimed by many to have positive influences on their learning. The flipping classroom is exactly how it sounds. It is about reversing the traditional teaching dynamic. In this way, students do not learn new content in the classroom through the teacher instruction, they learn it from sources or online sources during their own time and place outside the school schedule (Winjigo, 2020).

The assignments that once were considered as homework are tackled in the classrooms under the personalized guidance of the teacher. In addition, because the students spent time preparing at home, the teacher finds more time to spend with each student for his questions, an extra help he is seeking or an area he is finding challenging. Add to that, the collaboration and the teamwork between the students increase greatly (Winjigo, 2020).

More importantly, because the knowledge acquisition is taking place outside the classes, the low achiever students and the slow learners do not feel the burden of having to “keep up with others”. They are free to learn in a way that works for them, and they have the content to revisit and study multiple times (Winjigo, 2020).

Contrary to the traditional teaching approach through-which students rely on the teacher’s instructions as the only source for learning new content, they can explore much more with the flipped classroom concept by accessing multiple sources, or reaching the required sources for their learning through their teachers’ directions (Winjigo, 2020).

The teachers and the schools administrations have to realize that contrary to the online learning that requires hundreds of computers and/or laptops, the flipped classroom does not need all of that investment. All what it needs is attention, dedication, commitment and time (Winjigo, 2020).

Beside these positives, some teachers label students’ preparation and the time and effort for the teachers as negatives. These teachers have to realize that while the flipped classroom relies on students’ preparation at home ahead of time, they are not asked to understand the whole content completely. They can write down their questions to ask in the classroom after reading the content at home, or they can be divided into groups to collaboration and discuss the assigned content (Hughes & Hughes, 2020).

Finally, when it comes to teachers’ time and effort to prepare the content for the flipped classroom, these teachers have to realize that they can use these prepared material during the next years. So in this way, they are spending time preparing the content in the first year to use and save too much time in the following years(Hughes & Hughes, 2020).

Based on those findings and indications, we find ourselves intrigued to flip the classroom for the students through the WhatsApp social media platform and the Microsoft PowerPoint presentations, and see the impact of this flipping on students’ learning and exams’ performance.

III. METHODOLOGY

Design of the Research: For this study, the researchers relied on the purposive non probability sampling technique(Crossman, 2019), and usedthis technique for their experiment to select the class formed of heterogeneous students.

The researchers were examining the impact of flipping the classroom on the learning and the exams’ performance of students in the third year secondary, section general sciences, in a public school in Beirut through the WhatsApp social media platform and the Microsoft PowerPoint presentations; and for that, they have opted to use the maximum variation/heterogeneous type of the purposive sampling.

In the concurrent triangulation design in a mixed method approach, the quantitative and qualitative and data are collected concurrently, after-which the analysis comes later on. Both quantitative and qualitative methods are used to balance between them (Fig. 8), take advantage of their strengths and overcome a weakness that the researchers might encounter using one method only, just like with avoiding subjectivity in the interviews or in interpreting the collected quantitative data (Ortlieb, 2019).



Figure 8: The Quantitative and Qualitative Methods Balance (Ortlieb, 2019)

One challenge that occurs in the concurrent triangulation design in mixed method is the researchers’ lack of expertise in collecting the quantitative or qualitative data (Ortlieb, 2019).

After the quantitative and the qualitative data are collected, separate analysis are conducted, and despite being said that these analysis could happen concurrently, they are unlikely to literally happen at the same time (Ortlieb, 2019).

Triangulation occurs when all of the findings and the results are in, whereby the researchers can compare and contrast for similarities and incongruences, and interpret the results at the end of their investigation (Fig. 9) (Ortlieb, 2019).

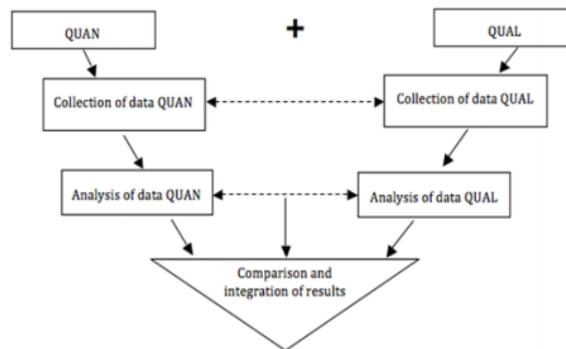


Figure 9: Concurrent Triangulation Design in Mixed Methods Research (Bentahar & Cameron, 2015)

Based on that, for the design of their study, the researchers have adopted the concurrent triangulation design in a mixed method approach.

Research Instruments:

First Instrument: For their study, the researchers have prepared the lesson “the numerical sequences” according to the objectives illustrated in the curriculum as follows:

- Define the numerical sequence.
- Define the sub-sequence.
- Model simple situations using sequences, meaning of variation of a sequence.
- Model situations by explicitly defined sequences or by recurrence.
- Go from the algebraic calculation to the graphic reading and vice versa.
- Know the variations of a numerical sequences.
- Define a bounded sequence from above, below or both.
- Identify the convergent and divergent sequences.
- Use the intuitive notion of a limit of a sequence.
- Define the arithmetic and geometric sequences.
- Know the variations of arithmetic and geometric sequences.
- Know how to write the general term of an arithmetic sequence and a geometric sequence.
- Calculate the general term and the sum of consecutive terms for the arithmetic and the geometric sequences.
- Compare two or three sequences.

The researchers have divided the lesson “the numerical sequences” into seven PowerPoint presentations as follows:

- The first PowerPoint was formed of the differences between the sets of numbers, and the definition of a numerical sequence with two examples.
- The second PowerPoint was formed of the definition of a sub-sequence, the variations of a sequence with an algebraic example, and a sequence bounded from above, from below or on both sides.
- The third PowerPoint was formed of the limit of a sequence, a convergent sequence, a divergent sequence, and remarks on the limits with two algebraic examples.

- The fourth PowerPoint was formed of the mathematical induction principle, a constant sequence with an algebraic example, and three theorems with examples.
- The fifth PowerPoint was formed of two adjacent sequences with an algebraic example.
- The sixth PowerPoint was formed of the definition of an arithmetic sequence, its variation, its explicit form, and the sum of its terms with algebraic examples.
- The sixth PowerPoint was formed of the definition of a geometric sequence, its variation, its explicit form, and the sum of its terms with algebraic examples.

After sending the PowerPoint to the students, one presentation after the other, they were given time to read and study them, and prepare their questions to ask and discuss in class. In addition, these students took advantage of the WhatsApp social media platform to interact with each other or the teacher when it was necessary.

Second Instrument: The researchers have prepared and validated two summative exams by two math coordinators to assess students' performance in each group at the end of the experiment, where each summative exam was of ten points.

Content of each of the two summative exams

The summative exam of the first group

I- [3 points]

In the table below, only one answer for each question is correct. Write the number of the question and verify your selected answer.

	Question	Answer a	Answer b
1	The sequence (U_n) defined for every natural integer as $U_n = \frac{5n^2 - 3n - 2}{8n^2 + 4n + 4}$ is:	convergent	divergent
2	If $S = \frac{1}{9} + \frac{1}{27} + \frac{1}{81} + \dots + \frac{1}{729}$, then $S =$	$\frac{1}{3^{20}}$	$\frac{121}{729}$
3	f is a function defined over $\mathbb{R} \setminus \{-1\}$ as $f(x) = \frac{1}{x^3}$. For every natural integer $n \geq 1$, the n th derivative of $f(x)$ is given as :	$f^{(n)}(x) = \frac{(-1)^n \times (n+2)!}{2 \cdot x^{n+3}}$	$f^{(n)}(x) = \frac{(-1)^n \times (n+2)}{x^{n+3}}$

II- [4 points]

Given the numerical sequence (u_n) defined as: $U_0 = 2$ et $U_{n+1} = \frac{U_n^2 + 9}{2U_n}$, where $n \geq 0$.

- 1) Show that for every $n \geq 1$, we have $U_n > 3$.
- 2) Prove that the given sequence is decreasing.
- 3) Justify the convergence of (U_n) and find its limit.
- 4) Let $V_n = \frac{U_n - 3}{U_n + 3}$ with $n \geq 0$.
 - a) Show that $V_{n+1} = (V_n)^2$, and deduce that $V_n = \left(-\frac{1}{5}\right)^{2^n}$.
 - b) In two ways, find the limit of (V_n) .

III- [3 points]

Let (U_n) be the sequence defined as:
$$\begin{cases} U_1 = 1 \\ U_{n+1} = \frac{6+U_n}{2+U_n} \end{cases}; n \geq 1. \text{ Let: } V_n = \frac{-2+U_n}{3+U_n}; n \geq 1.$$

- 1) Show that (V_n) is a convergent geometric sequence and calculate its limit.
- 2) Express U_n in terms of n and show that (U_n) is convergent.
- 3) Calculate $P = V_1 \times V_2 \times \dots \times V_n$.

The summative exam of the second group

I- [3 points]

In the table below, only one answer for each question is correct. Write the number of the question and verify your selected answer.

	Question	Answer a	Answer b
1	The sequence (U_n) defined for every natural integer n as $U_n = \frac{4n + (-1)^n}{2n^2 + n + 1}$ is:	convergent	divergent
2	If $S = 2 + 1 + \frac{1}{2} + \frac{1}{4} + \frac{1}{8} + \dots$, then $\lim_{n \rightarrow +\infty} S =$	$+\infty$	4
3	f is a function defined over $\mathbb{R} \setminus \{-1\}$ as $f(x) = \frac{x^2 - 3x - 3}{x + 1}$. For every natural integer $n \geq 2$, the n th derivative $f^{(n)}(x)$ is given as:	$f^{(n)}(x) = \frac{(-1)^n \times n!}{(x+1)^{n+1}}$	$f^{(n)}(x) = \frac{(-1)^n \times n!}{(x+1)^n}$

II- [7 points]

Consider the (U_n) and (V_n) defined as: $U_1 = 12, V_1 = 1, U_{n+1} = \frac{U_n + 2V_n}{3}, V_{n+1} = \frac{U_n + 3V_n}{4}$, for every $n \in \mathbb{N}^*$

- 1) Consider the sequence (W_n) defined as: $W_n = U_n - V_n; n \in \mathbb{N}^*$.
 - a) Show that (W_n) is a geometric sequence whose first term and ratio are to be determined.
 - b) Express W_n in terms of n and calculate $\lim_{n \rightarrow +\infty} W_n$.
 - c) Show that the sequence (U_n) is decreasing and that the sequence (V_n) is increasing.
 - d) Show that $U_n \geq V_n$.
 - e) Deduce that both sequences are convergent.
- 2) Consider the sequence (T_n) defined as: $T_n = 3U_n + 8V_n; n \in \mathbb{N}^*$.
 - a) Show that (T_n) is a constant sequence and calculate its common value.
 - b) Deduce that U_n and V_n in terms of n .
 - c) Show that (U_n) and (V_n) converge to the same limit.



ISSN: 2350-0328

International Journal of Advanced Research in Science, Engineering and Technology

Vol. 8, Issue 1 , January 2021

Exam Evaluation According to Anderson's Taxonomy

For evaluation, both assessment exams were examined according to Anderson's taxonomy.

The exam of the first group

First question:

- 1- Applying.
- 2- Analyzing.
- 3- Evaluating.

Second question:

- 1- Applying.
- 2- Applying.
- 3- Analyzing.
- 4- a- Applying.
- 4-b- Applying

Third question

- 1- Applying.
- 2- Applying.
- 3- Analyzing.

The exam of the first group

First question:

- 1- Applying.
- 2- Analyzing.
- 3- Evaluating.

Second question:

- 1- a- Applying.
 - 1- b- Applying.
 - 1- c- Applying.
 - 1- d- Analyzing.
 - 1- e- Analyzing.
-
- 2- a- Applying.
 - 2- b- Applying.
 - 2- c- Applying.

IV- The QUANTITATIVE DATA FINDINGS THROUGH AN OPEN ENDED INTERVIEW

An open-ended interview is a way to gather information from the masses. This type of interviews is considered open-ended because it usually focuses on the thoughts and feelings of the interviewees who have a prior idea about the content of the answer (Thibodeaux, 2019).

In their final step, the researchers interviewed seven students out of the 22 participants for feedbacks about flipping the classroom through the WhatsApp social media platform and the Microsoft PowerPoint presentations.

The first student declared that using the flipped classroom concept by sending the PowerPoint presentations of the lesson "the numerical sequences" through the WhatsApp platform to copy on their notebooks, study and prepare the questions for later sessions have benefited them in different aspects.

First, they saved valuable time in class during the Coronavirus crisis and interacted with each other and the teacher inside the class in a never before seen way for them because they knew about the content of the lesson, which allowed them to discuss and ask questions as much as they wanted.



In this way, students relied on themselves to prepare the content sent and were not left alone in this as they had the chance to interact with their peers and the teacher to dismiss any obstacles and keep on moving in their preparation prior to the class session.

The second student indicated that everything in our life has changed because of a pandemic. Luckily for students, the online learning is available and enables them to continue their studies at a distance. Though, despite that option, many students cannot get used to learning online because they are accustomed to learning inside the class, something they got used to since the kindergarten.

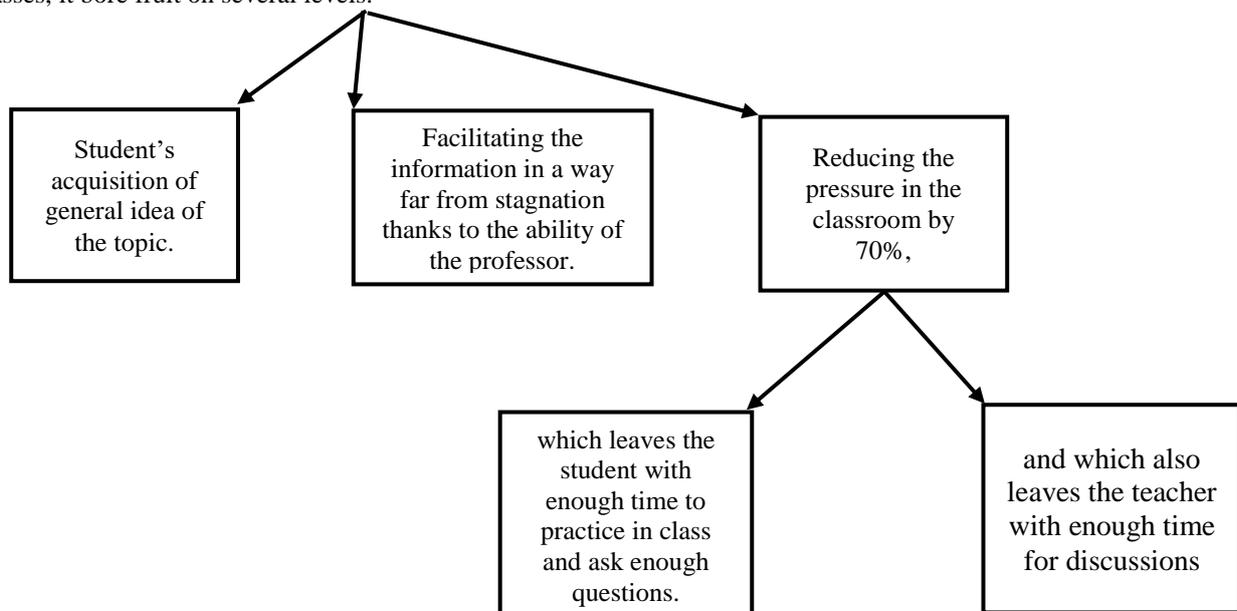
The flipped classroom is the medium that balances between the online learning and the students who despise it. They can receive the content through their beloved mobiles in a PowerPoint attractive format to prepare, have fun with the animations, the colors and the images, and interact online with their colleagues and teachers when it is needed, after-which they prepare themselves to attend their classes for a full time interaction.

In this way, the students are not receiving new content in class as they used to. The teachers do not have to write the whole content on the board and they will have more time to interact with the students and give more examples or let them give their own ones, something very beneficial for our condensed Lebanese curriculum that leaves little time to do so inside the class.

The third student expressed his opinion with all transparency without any complements or emotions, and according to him, the flipped classroom experiment could be either excellent, moderate or awful.

The experiment could be considered excellent if the teacher had high artistic, technical and creative abilities, moderate if the teacher had high artistic and creative abilities but low technical skills, or awful if the teacher lacked of all three abilities mentioned and was not available to contact or interact with.

The flipped classroom is a concept that suits all cases, and in a case like with the coronavirus that forced little time in classes, it bore fruit on several levels.



The main factors that played their roles well in the success of the experiment were the interaction with the teacher through the WhatsApp social media platform and inside the class, because of the valuable time saved, his ability to deal with the imposed reality and students' full commitment and their enough consciousness.

The flipped classroom has many positive points such as building a chain of knowledge about the lesson, attracting students' interest, building mutual trust between the teacher and his students, improving students' ability in



ISSN: 2350-0328

International Journal of Advanced Research in Science, Engineering and Technology

Vol. 8, Issue 1 , January 2021

understanding in mathematics, even the low achievers, through their personal work at home first and the teachers' effort in class later on, which positively influences students' information acquisition.

In normal situations, this student sees the flipped classroom as the most suitable method for teaching mathematics because it positively affects the students in all aspects from their understanding to their self-confidence to their behavior, etc...; and if it is up to him, then he chooses the flipped classroom concept as the only teaching technique for all times.

When it comes to the negatives, this student does not see any. However, it might be exhausting for the teacher during the first year because he has to prepare the content the videos or PowerPoint presentations, but this is only for the first year because he will be able to use the prepared content for later years and just adjust some points for the better.

The fourth student found the flipped classroom very beneficial as it allowed her to explore the lesson on her own for the first time in her life and extract the information and rules, which developed her mental capacities and enabled her remembering the lesson for a longer period of time.

Even more, this student indicated that having the content on her phone enables her accessing it at any time outside her school and home, and found out that she had more time to explore the lesson and prepare more questions to ask in class than she usually do; and it does not matter if these questions are meaningless or no, because asking them clears the students from many false and poor understanding.

Even more, valuable time was saved because students didn't have to copy what was written on the board, which enabled them finishing the explanation in a much lesser time, which as a result allowed them practicing more inside the classroom.

The fifth student indicated that the seriousness in work and perseverance are two options taken by the person on his own during his daily life. Unfortunately, many people do not take them into consideration because they prefer the easy alternative road.

Very few students realize the importance of perseverance and its long-term effect on their mathematical performance; and just like the teacher has high expectations about his students, it is a fact that they expect him to find ways to get them to persevere in their studies.

The flipped classroom can be considered as an adequate method that makes the students persevere in their studies if and only if they are willing to put effort at home prior to the learning session and if the teacher is able to invest the time saved in class in what benefits them, like dividing them into groups to interact through their beloved smartphones outside the class and discuss their share of the content with their peers inside it.

The sixth student declared that the online learning in Lebanon sparked a big deal of debate among the teachers and the students because of their lack of experience about it and because it represents a big challenge for those who are used to teaching inside the classroom through the years.

According to this student, flipping the classroom through the WhatsApp social media platform and the Microsoft PowerPoint presentations is considered among the best techniques in teaching because the student is erasing 50% of the pressure that he usually faces during the explanation inside the class by preparing the content at home.

The well-constructed PowerPoint presentations are very important in terms of student's perseverance and understanding of the lesson content, and combining it with the WhatsApp social media platform does not need the requirements of the online learning because the students are able to receive them through the platform, download them on their phone with a minimum internet speed, prepare them at home prior to their learning sessions, and interact with their colleagues at a distance when they need to do so. With the full commitment from the students and the teacher's skills and effort, students are destined to perform better in the exams because of the flipped classroom through the WhatsApp social media platform and the Microsoft PowerPoint presentations.

The sixth student went further and inquired students’ opinion about the flipped classroom concept through the descriptive statistics. 30% of the sample formed of students in the life science section endorsed the concept while 70% were against it because of bad teachers’ practices in their previous school years.

50% of the sample formed of students in the general science section was with the flipped classroom concept, while 50% were against. 90% were with copying the content, while 10% were against. 80% were with interacting with their colleagues online through the WhatsApp social media platform, while 20% were against. Finally, 60% were with preparing the content at home, while 40% were against, and if these percent revealed something, then they revealed that many students in Lebanon do not know about the positives of the flipped classroom because it is rarely used properly in schools here.

The seventh student created a slide through the Microsoft PowerPoint through which he provided the participants’ opinions about the flipped classroom, including his own. According to the result of his inquiry, the flipped classroom has many positives as it saves time, invests the surplus time, and enables the students preparing the content prior to the learning session.

The lesson gets to be completed in a much lesser time than it usually takes, and because of that the teacher can take advantage of the remaining time to complete the lesson with additional work in order to address any issue that may be raised. Now when it comes to the negatives, the participants did not see any valid ones as they concluded that the negatives are limited only to the student who neglects his duties, such as studying, reading and writing, which leaves him lacking behind with accumulated duties to deal with (Fig 10).

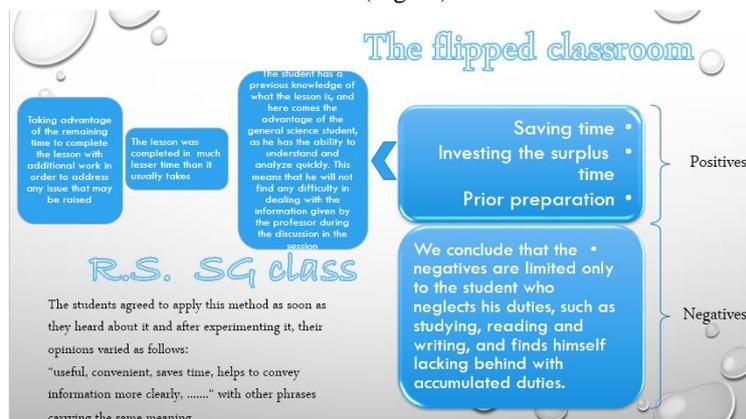


Figure 10: Students’ Opinion About the Flipped Classroom

V- QUANTITATIVE DATA RESULTS THROUGH THE DISCRIPITIVE STATISTICS

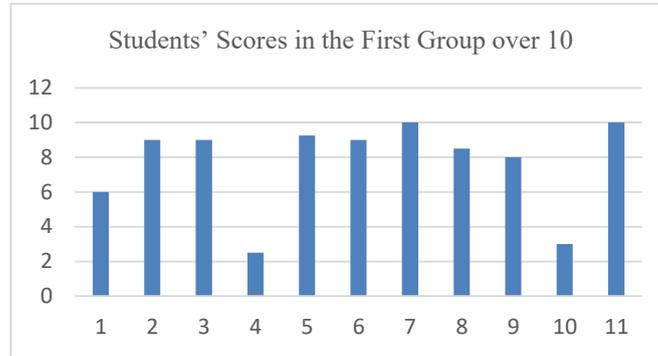
The quantitative data was determined through two assessment exams, one for each group.

Table 1: Descriptive Statistics for the First Group (Frequency, Percent and Average)

Regarding the first group, two students out of eleven “18.18% failed and 81.81% passed”, with an overall average of 7.659 over 10, which means that students’ performance in the first group was very good (Campbell, 2020).

Results of the First Group		
	Failed	Passed
Frequency	2	9
Percent	18.18%	81.81%
Overall Average	7.659/10	

Chart 1: Bar Diagram for Students’ Scores in the First Group over 10



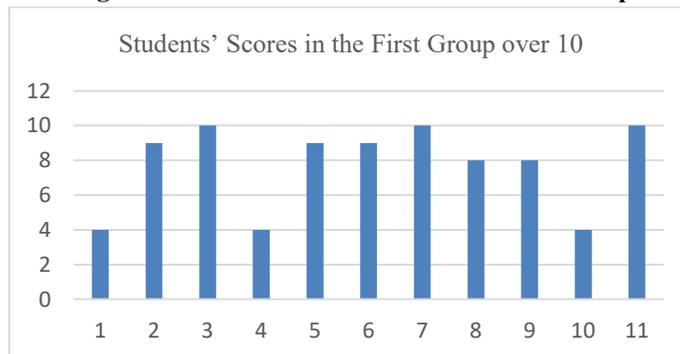
As seen by the above diagram, only two students failed while most students performed very well in the exam.

Table 2: Descriptive Statistics for the Second Group (Frequency, Percent and Average)

Regarding the first group, three students out of eleven “27.27% failed and 72.72% passed, with an overall average of 7.727 over 10, which means that students’ performance in the first group was very good (Campbell, 2020).

Results of the Second Group		
	Failed	Passed
Frequency	3	8
Percent	27.27%	72.72%
Overall Average	7.727/10	

Chart 2: Bar Diagram for Students’ Scores in the second Group over 10



As seen by the above diagram, three students failed while most students performed very well in the exam.

VI. Conclusion and hypotheses

Conclusion

Through the findings of the qualitative data, the researchers have concluded that the flipped classroom through the WhatsApp social media platform and the Microsoft PowerPoint presentations ease students’ learning, positively influences their understanding, self-confidence and behavior, makes them share their learning responsibilities more than they got used to in the past, saves them too much time, reduces the pressure inside the class during the learning session, and provides them valuable time to invest inside the classroom through interactions and collaborations with each other and their teacher; and that is why most students agreed about using the flipped classroom concept in mathematics in all lessons.



ISSN: 2350-0328

International Journal of Advanced Research in Science, Engineering and Technology

Vol. 8, Issue 1 , January 2021

In addition, the researchers have concluded that students can reject all the benefits delivered by the flipped classroom concept because of their teachers as some revealed that they refuse to use it because of their teachers' inappropriate practices in previous classes.

The researchers have also concluded that the well-constructed presentations and the interaction between each other and/or their teacher through the WhatsApp social media platform are important in terms of student's perseverance and understanding of the lesson content, and they are the cornerstones for the success of the flipped classroom.

Through the quantitative results, the researchers have concluded that students' performance in the exam was very good with each group averaging 7.659 and 7.727 over 10 respectively.

Hypotheses

Based on the qualitative data findings, the researchers accept both hypotheses H1 and H2 and can hypothesize that the flipped classroom concept through the WhatsApp social media platform and the Microsoft PowerPoint presentations is beneficial for students' learning, and that students are willing to use it instead of the traditional teaching they got used to despite some refusing to do so because of their teachers' practices in previous school years.

VII. Recommendations

For the teachers

- This study, through its qualitative data, has revealed that some students refuse to interact with their teachers more than they used to because of the latter's practices inside the classrooms, and that they even refuse experimenting the flipped classroom through the WhatsApp social media platform and the Microsoft PowerPoint presentations due to these practices.

Teachers have to accept the fact that students in this era are destined to play a role in the process of teaching and learning, and for that they are recommended to change their practices otherwise we won't be able to surpass the inertia in education we are suffering from.

- Based on the results of this study, teachers are advised to use the flipped classroom concept through the WhatsApp social media platform and the Microsoft PowerPoint presentations to save valuable time to invest inside the class, ease students' learning and make them active in the process of teaching and learning.

Despite some teachers claiming that preparing the content for the flipped classroom through the WhatsApp social media platform and the Microsoft PowerPoint presentations requires extra effort and too much time, they have to realize that this will be only for the first year as they will only have to modify their content in the coming years for the better according to students' poor and false understanding.

For the students

- Students should realize that they are not required to remain passive in their learning. On the contrary, they are a force to be recognized and that must play an essential role in the teaching and learning process. For that, they are recommended to fully participate in this kind of learning experiment that differs from the one they are used to make this concept a success and start changing the landscape of education.

REFERENCES

1. Admin. (2014). *Exploring The Bergmann & Sams School of Flipped Learning*. Retrieved from The Flipped Classroom Workshop: <http://www.flippedclassroomworkshop.com/bergmann-and-sams-school-of-flipped-teaching-learning/>
2. Austin, T. U. (2020). *Flipped Classroom*. Retrieved from The University of Texas at Austin, Faculty Innovation Center: <https://facultyinnovate.utexas.edu/instructional-strategies/flipped-classroom>
3. Bentahar, O., & Cameron, R. (2015). *Design and Implementation of a Mixed Method Research Study in Project Management*. Retrieved from The Electronic Journal of Business Research Methods, 13(1), pp 3-15. ISSN 1477-7029: https://www.researchgate.net/publication/308693088_Design_and_Implementation_of_a_Mixed_Method_Research_Study_in_Project_Management
4. Bryant, S., & Hunton, J. (2000). *The Use of Technology in the Delivery of Instruction: Implications for Accounting Educators and Education Researchers*. Retrieved from Issues in Accounting Education, 15(1), PP 129-162. doi.org/10.2308/iace.2000.15.1.129: <https://aaajournals.org/doi/abs/10.2308/iace.2000.15.1.129>
5. Campbell, J. (2020, 1 22). *Grading Systems*. Retrieved from EVERYDAY EDUCATION: <https://everydayeducation.com/blogs/news/grading-systems>
6. Cook, D. (1998). *The Power of PowerPoint*. Retrieved from Nurse Educator, 23(4), pp 5.: https://journals.lww.com/nurseeducatoronline/Citation/1998/07000/The__Power_of_PowerPoint.4.aspx



ISSN: 2350-0328

International Journal of Advanced Research in Science, Engineering and Technology

Vol. 8, Issue 1, January 2021

7. Crossman, A. (2019, July 18). *Convenience Samples for Research A Brief Overview of the Sampling Technique*. Retrieved from thoughtco: <https://www.thoughtco.com/convenience-sampling-3026726>
8. Devi, K., Gouthami, E., & Lakshmi, V. (2019). *Role of Social Media in Teaching – Learning Process*. Retrieved from Journal of Emerging Technologies and Innovative Research (JETIR), 6(2), 96-103. ISSN-2349-5162: https://www.researchgate.net/publication/330497773_Role_of_Social_Media_in_Teaching-Learning_Process
9. Dreams Time. (2019). *royalty free stock photos social media*. Retrieved from Dreams Tme: <https://www.dreamstime.com/royalty-free-stock-photos-social-media-marketing-interaction-people-which-create-share-exchange-information-ideas-virtual-image40242468>
10. envatotuts+. (2020). *How to Use PowerPoint (Ultimate Tutorial Guide)*. Retrieved from Envatotuts+: <https://business.tutsplus.com/series/how-to-use-powerpoint-ultimate-guide--cms-1207>
11. Flipped Classroom. (2020). *Flipped Classroom*. Retrieved from Flipped Classroom 101: <https://flippedclassroom101.weebly.com/theoretical-framework.html#:~:text=Where%20did%20the%20Flipped%20Classroom,understanding%20of%20the%20new%20material>
12. Gambari, A., Yusuf, H., & Balogun, S. (2015). *Effectiveness of Powerpoint Presentation On Students' Cognitive Achievement in Technical Drawing*. Retrieved from Malaysian Online Journal of Educational Technology, 3(4), pp: 1-12: <https://www.mojet.net/frontend/articles/pdf/v03i04/v03i04-01.pdf>
13. Harrison, A. (1999). Power Up! Stimulating your Students with PowerPoint. *Learning and Leading With Technology*, 26(4), 6-9.
14. Hayton, T. (2019). *Using Social Media in the Classroom*. Retrieved from British Council, Teaching English: <https://www.teachingenglish.org.uk/article/using-social-media-classroom>
15. Hlynka, D., & Mason, R. (1998). *PowerPoint in the Classroom: What is the Point?* Retrieved from Educational Technology. PP 45-48: https://www.jstor.org/stable/44428483?seq=1#metadata_info_tab_contents
16. Hughes, J., & Hughes, R. (2020). *Advantages And Disadvantages of Flipped Classrooms*. Retrieved from CPS: <https://www.cpsmanufacturingco.com/news/advantages-and-disadvantages-of-flipped-classrooms#:~:text=Advantages%20of%20flipped%20classrooms%20learning&text=Students%20have%20more%20group%20work,activities%20%20discussions%20and%20peer%20reviewing.&text=Stud>
17. Nouri, H., & Shahid, A. (2005). *The Effect of PowerPoint Presentations on Student Learning and Attitudes*. Retrieved from Global Perspectives on Accounting Education, 2(2005). PP 53-73.: https://pdfs.semanticscholar.org/1364/3aeb36d873bf4cfabe7011aea3243c380f2b.pdf?_ga=2.25376760.499191812.1586514384-18685610.1548514807
18. Ortlieb, E. (2019). *Concurrent Triangulation Design in Mixed Methods Research*. Retrieved from YouTube: <https://www.youtube.com/watch?v=DH-3XdEmMig>
19. Paivio, A. (1986). *Mental Representations: A dual coding approach*. Oxford: Oxford Science Publication.
20. Parks, R. (1999). *Macro Principles, PowerPoint, and the Internet: Four Years of the Good, the Bad, and the Ugly*. Retrieved from Journal of Economic Education, 30(3), p200-209: <https://eric.ed.gov/?id=EJ608985>
21. pngsector. (2020). *WhatsApp Images*. Retrieved from Pinterest: <https://www.pinterest.com/pin/821132944537327954/>
22. Reynolds, R., & Baker, D. (1987). *The utility of graphical representations in text: Some theoretical and empirical issues*. Retrieved from Journal of Research in Science Teaching: <https://onlinelibrary.wiley.com/doi/abs/10.1002/tea.3660240208>
23. Silius, K., Tervakari, A.-M., & Miiilumäki, T. (2009). Retrieved from Proceedings of International Technology Enhanced Learning Conference TELearn, Taipei, Taiwan: https://pdfs.semanticscholar.org/16a6/d460a28f09c46e9135817712aea843ec985b.pdf?_ga=2.173467427.1080521796.1586689018-1592317331.1586689018
24. Social Media List. (2019). *Full List of Social Media Platforms*. Retrieved from Social Media List: <https://socialmedialist.org/social-media-platforms-old.html>
25. Strayer, J. F. (2007). *THE EFFECTS OF THE CLASSROOM FLIP ON THE LEARNING ENVIRONMENT: A COMPARISON OF LEARNING ACTIVITY IN A TRADITIONAL CLASSROOM AND A FLIP CLASSROOM THAT USED AN INTELLIGENT TUTORING SYSTEM*. Retrieved from Dissertation, School of The Ohio State University, Graduate Program in Education: https://etd.ohiolink.edu/!etd.send_file?accession=osu1189523914
26. Syamala Devi, K., Lakshmi, V., & Gouthami, E. (2019). *Role of Social Media in Teaching – Learning Process*. Retrieved from Journal of Emerging Technologies and Innovative Research (JETIR): https://www.researchgate.net/publication/330497773_Role_of_Social_Media_in_Teaching-Learning_Process/link/5c42ec2992851c22a38001e5/download
27. Teach Thought Staff. (2014). *The Definition Of The Flipped Classroom*. Retrieved from Teach Thought: <https://www.teachthought.com/learning/the-definition-of-the-flipped-classroom/#:~:text=A%20flipped%20classroom%20is%20a,the%20students%20independently%20at%20home>
28. The College of St. Scholastica. (2020). *Flipped Classroom and Blended Learning Models*. Retrieved from The College of St. Scholastica: <http://www.css.edu/administration/information-technologies/center-for-instructional-design/teaching-guide/flipped-classroom-and-blended-learning-models.html#:~:text=In%20a%20flipped%20classroom%20%20students,blended%20learning%20works%20because%20it%3A&te>
29. The Flipped Classroom. (2020). *The Flipped Classroom*. Retrieved from The Flipped Classroom 101: <https://flippedclassroom101.weebly.com/index.html>
30. The University of Texas at Austin. (2020). *Flipped Classroom*. Retrieved from The University of Texas at Austin, Faculty Innovation Center: <https://facultyinnovate.utexas.edu/instructional-strategies/flipped-classroom>
31. Thibodeaux, W. (2019). *What Is an Open-Ended Interview?* Retrieved from Chron: <https://smallbusiness.chron.com/openended-interview-23923.html>
32. Watanabe-Crockett, L. (2020). *Teaching Simplified, Learning Amplified*. Retrieved from Wabisabi Learning: <https://globaldigitalcitizen.org/social-media-teaching-tips>
33. Winjigo. (2020). *The advantages of a flipped classroom*. Retrieved from Winjigo: <https://www.winjigo.com/the-advantages-of-a-flipped-classroom/>