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Teachers' Perceptions on the Negatives and Potential Positives of Social Media on Students' Mathematical Learning

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Abstract: ***This research of quantitative approach through its descriptive design examined the negatives of the frequent usage of social media, like WhatsApp and Facebook, on students' critical thinking, problem solving processes and mathematics learning in the secondary level. In addition, this research explored the potential positives of social media on students' learning according to teachers' perceptions and whether there are any differences between their perceptions based on their gender. The researchers adopted the descriptive design to explore the negatives and potential positives of social media on students' mathematical learning. For their study, the researchers were only interested in reflecting teachers' perceptions about the negatives and potential positives of social media, and if they think in the same way. The sample of the study was formed of 350 math teachers, 186 males and 164 females. The researchers employed a 5-point likert scale online survey questionnaire as the instrument. The researchers were able to reach these teachers all across Lebanon through the survey's link to determine their perceptions about social media according to their answers. For statistics, the researchers used the bar diagram to represent the gender of the math teachers, the descriptive statistics (the mode) and the Chi-Square Test for analysis. Results revealed that the majority of math teachers believe that social media is wasting students' time allocated for their study and has decremented their mathematical learning ability in different aspects. In addition, results also showed that math teachers, males and females, believe that students can exchange mathematical information through social media, which in turn provides them with additional learning resources and creates awareness to improve their mathematical learning. However, not so many teachers believe that social media can motivate students, increase their mathematical knowledge and improve their cognitive communication skills and confidence in math exams. The researchers recommended examining the effects of the frequent usage of social media in important aspects that concern students like their performance, through their grades and competencies, behavior and anxiety of math exams. In addition, the researchers called for more experiments related to the potential positives of social media in education in order to provide teachers with modern activities that can reinforce and ease students' mathematical learning.***

Keywords: Social media, negatives, potential positives, mathematics teachers, math learning, knowledge, critical thinking, problem solving processes, cognitive communication skills, education.

1. Introduction

1.1 Background of the study

Social media is a set of platforms and networking sites through-which billions of people interact with each other individually or by groups, through the internet, in virtual realities. These diversified platforms and networking sites enable anyone to send and receive any kind of images and videos(Akram, 2018). In addition, they enable their users to discuss, post and discuss different opinions with others. Children nowadays are literally surrounded by technology, especially smartphones and social media platforms and networking sites such as Facebook, WhatsApp, MySpace and Twitter(Akram, 2018). This imposing reality affected members of the society, like teenagers and adults, humans' medical health, business and education. Some assured that social media positively affected humans in different aspects of their life while others warned about the negative effects of its frequent usage and even fought against it(Akram, 2018). Students are like any member of a society affected by social media. Many warned about its negative effects on students. Armstrong (2012) and Abbas, Aman, Nurunnabi and Bano (2019) assured that, because of social media, students began to depend on the information available and provided by the networking sites and the web. They are using them to reach the answers they are looking for to complete their scholar tasks without trying to learn and retain knowledge (Armstrong , Steve;, 2012). In addition, the researchers indicated that students' understanding, focus on their tasks on hand and performance in schools are reduced because these students are busy checking their social media during their study time(Armstrong , Steve;, 2012; Abbas, Aman, Nurunnabi, & Bano, 2019). On the other hand, Scott (2015) and Mushtaq and Benraghda (2018) stated that social media is beneficial for education as its convenient usage provides the students with the opportunity to create groups that can result in ameliorating their academic performance through interaction and collaboration in projects and exams (Scott, Cody;, 2015; Mushtaq & Benraghda, 2018). Scott (2015) indicated that two third of the teachers truly believe that social media is harmful to students as it consumes their time, distracts them and affects their learning (Scott, Cody;, 2015). Due to the controversy surrounding social media in education, this research aimed at determining teachers' perceptions, in Lebanon, on the negative effects of students' frequent utilization of social media on their critical thinking and problem solving processes. In addition, it aimed at determining their perceptions on students' understanding deficits, poor and false understanding, acquiring and applying skills and information. Finally, this research aimed at determining if math teachers believe that social media can be beneficial for students' learning in mathematics.

2. Theoretical Framework

The activity theory is a theory that provides a better understanding about the state of social media and students through the "who is doing what, why and how", where its core is formed by the relationship between the subject (the human doer) and the object (the deed, the thing that is being done) while the outcomes could be intended or unintended

(Figure 1) (Hasan, 2014). Thus, it is an analytical instrument that can provide a better comprehension of the learning experiences for the students (Abdullah, 2014).For example a student's(the subject) goal could be usinghis socialmedia platforms and networking sites(the deed), an area where he is free from restrains, for his personal entertainment (the outcome).His intended intention could be spending some time having fun but the unintended consequences could be that the frequent usage of his social media has negatively affected his thinking and learning in mathematics. On the other hand, a student (the subject) might use his social media (the deed) in a way that improves his learning (the outcome) by acquiring more information in mathematics, increasing his knowledge and enhancing his reasoning.

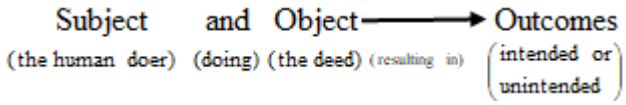


Figure 1: Te core of an Activity Theory (Hasan, 2014)

2.1 Research Questions

According to teachers' perceptions:

1) Does the frequent usage of social media waste students' time allocated for studying mathematics?
2) Does the frequent usage of social media negatively affect students' critical thinkingin mathematics?
3) Does the frequent usage of social media negatively affect students' problem solving processes in mathematics?
4) Does the frequent usage of social media negatively affect students' mathematical learning in understanding, acquiring information and constructing knowledge?
5) Did the students become reliant on social media in completing their mathematical tasks without any effort?
6) Can social media positively influences students' learning in mathematics?
7) Do math teachers, males and females, think in the same way about the negatives and potential positives of social media on students' mathematical learning?

2.2 Limitations of the Study

This study dealt with one limitation. Many mathematics teachers were out of reach because they were living and teaching at a distance in Lebanon. For that the researchers had to use an online survey to reach the 350 teachers who constituted the sample.

2.3 Delimitations of the Study

The cooperation of math teachers in filling the online questionnaire and sending the link for their colleagues to fill in the south, east, Beirut and its suburbs, and at Bekaa played a fundamental role on the accuracy of the findings of this quantitative study. In addition, seven mathematics teachers, with different academic degrees, had a strong influence on modifying the survey many times until it became fit with the objectives of the research.

3. Literature Review

It is commonly known that social media has expanded enormously over the last years. Billions of people use different forms of social media platforms and networking sites every day. In 2018, Facebook average 2.23 billion monthly active users, YouTube 1.9 billion users, WhatsApp 1.5 billion users, Instagram 1 billion users, Twitter 335 million users, etc… (Lua, Alfred;, 2019).

Facebook existed since the fourth of February 2004. It is considered as one of the best platforms and networking sites that enables people connecting with each other from different parts of the world(Akram, 2018).

YouTube was founded on the fourteenth of February 2005. It is known as the networking site that holds the biggest base of videos related to almost anything in the world. Through YouTube, people are able to post their videos and interact with others from any places in the world(Akram, 2018).

WhatsApp, used in more than 180 countries, was founded on the twenty fourth of February 2009. It enables its user to stay in touch with friends, relatives and colleagues anywhere at any time. It is available in many phones worldwide and it is known to be reliable in texting and calling (WhatsApp Inc;, 2019).

Instagram, owned by Facebook, was established on the sixth of October 2010. 95% of the Instagram users also use Facebook and they mostly use it to post their images, data, and videos(Akram, 2018).

Twitter existed since the twenty first of March 2006. Business men consider Twitter as very beneficial in reaching their clients or passing important information to each other even with a limit of 140 characters(Akram, 2018).

Moving forward, there are many definitions of learning. However, most educators define learning as a long lasting change of humans' knowledge, the strengthening and the growth of humans' deposit of information, a transformation of behavior, a process of change, the accumulation of information and the construction of knowledge, the acquisition of skills and the potential improvement of performance (Malamed, Connie;, 2016).

In addition, critical thinking is defined as humans' ability of observing, communicating, reasoning, analyzing, reflecting, synthesizing and creating. Moreover, it enables humans to go in-depth in any subject, clarify ambiguous things and take accurate decisions in problems (Elder, Nosich, Bankes, Barnes, & Polka, 2019).

Any new factor that affects students' learning has always been an interesting issue for researchers to explore. Social media imposed its presence in different aspects of humans' life. In education, work, mentality, health and social life(Hickey, Rick, 2012).

Social media is defined by many as the set of applications that permits online social interaction among its users. In addition, it is also acknowledged as the set that facilitates

collaboration and creates knowledge when its users trade information, discuss and share ideas(Abbas, Aman, Nurunnabi, & Bano, 2019).

In education, many supported the social media platforms and networking sites, while others were completely against it. Concerning the positives of social media in education, Akram (2018) stated that it enables students to exchange ideas online at a distance, even at early ages, and learn new stuff. In addition, Akram (2018) assured that students can share their knowledge with others and gain more because of effectiveness of social media in education(Akram, 2018).

Social media provides students with the opportunity to refresh and update their own base of information through its unique features. Akram (2018) went even further by saying students can think about their future from now and prepare themselves for future changes according to the development of the world exposed in front of them thanks to the features of the social media platforms and networking sites. Moreover, the researcher affirmed that when teachers post legit information or videos on social media, related to students' tasks, they support the low achievers with valuable information about homework, assignments and projects(Akram, 2018).

Abbas, Aman, Nurunnabi and Bano (2019) indicated that social media enables anyone to use its platforms to create unlimited number of groups through-which students can interact with their peers or others in different continents who are interested about the same subject. Moreover, through social media, students can create their own panel to use for exchanging ideas, modifying information and discussing topics related to their studies (Abbas, Aman, Nurunnabi, & Bano, 2019).

Unfortunately, this innovative technology had its fair share of negatives on many societies around the world. Social media enabled its users, especially those at a young age, to access unlimited number of data. Even-though this access permitted any student to use formidable data base of information to improve his learning, many learnersstarted relying on that data to complete their tasks without having the need to scratch their brain about the authenticity of the information presented online in front of them (Abbas, Aman, Nurunnabi, & Bano, 2019).

The powerful presence of social media changed the way people, like students, think, interact, learn and socialize. Many students became attached to their social media and virtual reality became more important to them than the developments of their surroundings in home and school. This strong bond had severe consequences as it negatively affected the learning behavior of many students, the way through which they were accustomed to learn and behave as a learner(ncflb;, 2019).

Concerning the negativity of social media in education, Akram (2018) revealed that students become lazy and depended on the massive information provided by the web and the social media networking sites to finish their scholar tasks without even trying to understand them. The easy access to any desired information reduced students' research skills and their abilities to retain knowledge(Akram, 2018).

The frequent usage of social media has been accused of hindering humans' learning and the development of their critical thinking in many topics. This didn't come from a void as a recent study at the Stanford University unveiled that those who are heavily distracted by their social media fail to concentrate and use their working memory in cognitive tasks much more than others (Schaefer, Mark;, 2016).

The frequent usage of social media also reduces students' abilities in face-to-face conversations because they will be more comfortable talking in a virtual reality without having the need to express their feelings in front of others. In addition, the frequent usage of social media drains students' time after school which forces them to copy their homework from their peers or fail to deliver it on time(Akram, 2018).

Moreover, not only students' grades are negatively affected by the frequent usage of social media because of their constant distraction by the updates in the virtual reality they prefer to live in, but many of them became unmotivated in doing anything in real life as they prefer to waste their time online instead of interacting with their surroundings(Akram, 2018).

To add to all of that, students have created their own worldwide internet language through abbreviations of words which they use while chatting and talking. This alone caused them major deficits in their English language. Instead of enhancing their grammar, oral and writing skills through the massive online literature, they shortened the words they use and made it a worldwide language (Akram, 2018).

Many admitted that social media harmed society and that students are the victims more damaged than anyone else. This might be due to the strong attraction features of the social media platforms and networking sites that allow students to avoid weariness while studying by joining the virtual reality they feel comfort about (Abbas, Aman, Nurunnabi, & Bano, 2019).

In a modern era ruled by unmatched technology, humans have the knowledge of their ancestors accumulated at the palms of their hands, yet most of them use their smartphones and social media platforms and networking sites in nothing more than publishing their opinions, videos and images of themselves with their friends or cats and dogs (Schaefer, Mark;, 2016).

Humans did not take advantage of the massive information, posted online, accessible for any Web or social media user to learn and build their knowledge. Many of them did not give a chance to listen to opposite opinions and their level of critical thinking is not that much better than those who lived in the eighteenth century, more than two hundred years ago (Schaefer, Mark;, 2016).

Finally, Schaefer (2016) revealed that a study showed that people are using their social media to contact those who think in the same way. These people neglect the opportunity

to listen to opposite views, learn and enhance their critical thinking in things that matter. In addition, the frequent usage of social media, to enhance our visual skillsto use our screens and present ourselves online in the figure that fits our perception, comes at the expense of our learning abilities and critical thinking, and can rise the Attention Deficit Disorder for any user (Schaefer, Mark;, 2016).

4. Methodology

4.1 Selection of the Subject

Social media has been surrounded with controversies for many years. Many researchers warned about the negative effects of its frequent usage while others saw it as an instrument that could serve education and take it to the next level. The world needs more researches about social media because it has expanded immensely among humans as billions are using its platforms and networking sites every day.

Since many warned about the negative effects of the frequent usage of social media on the learning of humans, the researchers aimed at determining mathematics teachers' perceptions, across Lebanon, about the effects of the frequent usage of social media on students' critical thinking skills and problem solving processes.

In addition, the researchers explored teachers' perceptions on students' learning from understanding to acquiring content information and constructing their content knowledge. Moreover, since many supported social media in teaching, the researchers also aimed at determining teachers' perceptions about the potential positives of social media on students' mathematical learning.

4.2 Design of the Research

A research of quantitative approach through its descriptive design does not begin with hypotheses; however, it develops them after collecting the data and analyzing them (CIRT;, 2015).

This research of quantitative approach through its descriptive design aimed at describing the current status of the frequent usage of social media by students in schools and its potential positives on their learning.

More precisely, this study sought at determining teachers' perceptions on the negative effects of that frequent usage on students' critical thinking skills, problem solving processes and mathematical learning. In addition, it aimed at determining teachers' perceptions on the potential positives of social media based on the findings of the data collected from math teachers in Lebanon. Moreover, this research explored if there are any differences between teachers' perceptions on the positives and negatives of social media according to their gender.

Further, when the target population is large, the random sampling technique is usually implemented (Bhat, Adi;, 2019). Based on that, the researchers adopted the simple random sampling technique to select the teachers for their study.

4.3 Research Instruments

The researchers used an online 5 point-likert scale survey questionnaire witha total of fourteen modified items. Seven items were designed, according to the literature,and modified to determine teachers' perceptions on the impact of social media and students' critical thinking, problem solving processes and mathematical learning. In addition, seven items were also designed, according to the literature, and modified to investigate the possible positives of social media on students' math learning.
Each of these fourteen items was ranked from one to five in the following way: 1 = strongly disagree, 2 = disagree, 3 = undecided, 4 = agree and 5 = strongly agree.

Negatives of Social Media on Students' Learning in Mathematics						
Nb	Question	Answers				
		Strongly disagree	Disagree	Undecided	Agree	Strongly agree
1	The frequent usage of social media, like the WhatsApp and Facebook, waste students' time allocated for studying mathematics					
2	The frequent usage of social media, like the WhatsApp and Facebook, negatively affects students' critical thinking in mathematics.					
3	The frequent usage of social media, like the WhatsApp and Facebook, negatively affects students' problem solving processes in mathematics, just like in a word problem.					
4	The frequent usage of social media, like the WhatsApp and Facebook, negatively affects students' understanding deficits in mathematic like poor and false understanding of the content because of their loss of focus.					
5	The frequent usage of social media, like the WhatsApp and Facebook, distracts students and negatively affects their ability of acquiring information in mathematics					
6	The frequent usage of social media, like the WhatsApp and Facebook, has negatively affected students' ability of constructing their mathematical knowledge.					
7	Students have become reliant on social media to copy their mathematical assignments, like a homework, from their classmates instead of putting efforts in completing them					

Positives of Social Media on Students' Learning in Mathematics						
Nb	Question	Answers				
		Strongly disagree	Disagree	Undecided	Agree	Strongly agree
1	Social media, like WhatsApp and Facebook, can afford students more ideas and methods to solve problems, and it can create awareness to improve their mathematical learning.					
2	Social media, like WhatsApp and Facebook, can allow students to exchange mathematical information.					
3	Social media, like WhatsApp and Facebook, can increase students' mathematical knowledge.					
4	Social media, like WhatsApp and Facebook, can motivate students to learn mathematics.					
5	Social media, like WhatsApp and Facebook, give students additional resources to learn beside their mathematical textbooks.					
6	Social media, like WhatsApp and Facebook, can improve students' confidence in math tasks like exams and projects					
7	Social media, like WhatsApp and Facebook, can improve students' cognitive communication skills by paying attention more, using their memory and reasoning.					

4.4 Validity and Reliability Test

The survey questionnaire of the research was validated by one mathematics supervisor with a PhD degree in math education, the general director of mathematics at the Center for Educational Researches and Development in Lebanon who holds a Masters' degree in math education, two math coordinators with a masters' degree, one teacherwith a teaching diploma and two mathematics teachers with a Bachelor degree. After validating the questionnaire the researchers piloted it to ten math teachers to examine its reliability. The survey questionnaire consisted of seven items concerning the negatives of social media, like WhatsApp and Facebook, and 7 items concerning its potential positives on students' mathematical learning. The Cronbach's Alfa was calculated through the Statistical Package for the Social Sciences (SPSS) version 23. According to the table shown below, the negatives of the frequent usage of social media on students' mathematical learning, consisted of 7 items, had a value of 0.850, indicating an excellent consistency. In addition, the potential positives of social media on students' mathematical learning, consisted of 7 items, had a value of 0.748, accepted since it was greater than 0.7.

	Reliability Statistics	Number
Factors	Cronbach's Alpha	of Items
Negatives of the Frequent Usage of Social Media on Students' Mathematical Learning	0.850	7
Positives of Social Media on Students' Mathematical Learning	0.748	7

4.5 Data Collection Procedure

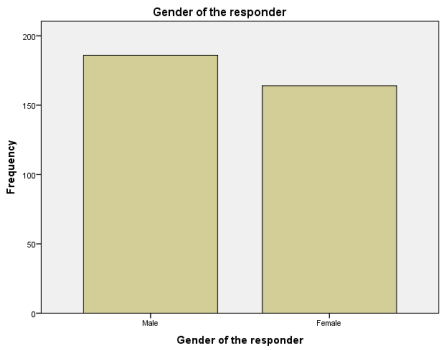
The researchers created an online survey questionnaire and sent it to mathematics teachers across Lebanon through a link on WhatsApp groups and emails. Teachers were asked to fill the survey and submit their answers. The researchers were able to collect the answers of 350 mathematics teachers in Beirut, Bekaa, the south and the north of Lebanon. At the end of the procedure of the data collection, the researchers organized the answers for the analysis.

5. Data Analysis

The data was collected from the online survey questionnaire through the Excel Spread Sheet. The researchers later on imported that data into the Statistical Package for the Social Sciences (SPSS) and analyzed it.

Table 1: Descriptive Statistics for the Respondents' Gender (Frequency and Percent)

	Gender of the Respondents	
	Frequency	Percent
Male	186	51.3%
Female	164	46.9%
Total	350	100%



Bar Diagram for the Gender of the Respondents

The bar diagram, which represents the gender of the respondents, clearly shows that there was no bias in the selection of the mathematics teachers who answered the online survey.The male teachers had 186 counts (53.1%) while the female teachers had 164 counts (49.1%).

Table 2: Descriptive Statistics for the Negatives of Social Media on Students' Mathematical Learning (Frequency and Percent)

	Frequency and Percent				
Negatives of Social Media	Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree
The frequent usage of social media, like the WhatsApp and Facebook, waste students' time allocated for studying mathematics	6 (1.7%)	34 (9.7%)	19 (5.4%)	201 (57.4%)	90 (25.7%)
The frequent usage of social media, like the WhatsApp and Facebook, negatively affects students' critical thinking in mathematics.	6 (1.7%)	99 (28.3%)	34 (9.7%)	160 (45.7%)	51 (14.6%)
The frequent usage of social media, like the WhatsApp and Facebook, negatively affects students' problem solving processes in mathematics, just like in a word problem.	10 (2.9%)	109 (31.1%)	20 (5.7%)	156 (44.6%)	55 (15.7%)
The frequent usage of social media, like the WhatsApp and Facebook, negatively affects students' understanding deficits in mathematic like poor and false understanding of the content because of their loss of focus.	11 (3.1%)	75 (21.4%)	30 (8.6%)	176 (50.3%)	58 (16.6%)
The frequent usage of social media, like the WhatsApp and Facebook, distracts students and negatively affects their ability of acquiring information in mathematics.	9 (2.6%)	75 (21.4%)	45 (12.9%)	169 (48.3%)	52 (14.9%)
The frequent usage of social media, like the WhatsApp and Facebook, has negatively affected students' ability of constructing their mathematical knowledge.	10 (2.9%)	98 (28.0%)	52 (14.9%)	148 (42.3%)	42 (12.0%)
Students have become reliant on social media to copy their mathematical assignments, like a homework, from their classmates instead of putting efforts in completing them	2 (0.6%)	12 (3.4%)	21 (6%)	173 (49.4%)	142 (40.6%)

Table 2 shows the frequency and the percent of each of the seven items that relate to the negatives of the frequent usage of social media on students' mathematical learning. For first item, 83.1% (57.4% + 27.5%) agreed that students are wasting the time allocated for studying mathematics in favor of using social media, 11.4% (1.7% + 9.7%) disagreed and 5.4% were undecided about it. For the second item, 60.3% (45.7% + 14.6%) agreed that students' critical thinking is negatively affected by the frequent usage of their social media, 30% (1.7% + 28.3%) disagreed and 9.7% were undecided about it. For the third item, also 60.3% (44.6% + 15.7%) agreed that students' problem solving processes in mathematics, like in word problem solving, are negatively affected by students' frequent usage of their social media, 34% (2.9% + 31.1%) disagreed and 5.7% were undecided about it. For the fourth item, 66.9% (50.3% + 16.6%) agreed that students' understanding is negatively affected by students' frequent usage of their social media, 24.5% (3.1% + 21.4%) disagreed and 8.6% were undecided about it. For the fifth item, 63.2% (48.3% + 14.9%) agreed that students' ability of acquiring information in mathematics is negatively affected by students' frequent usage of their social media, 24% (2.6% + 21.4%) disagreed and 12.9% were undecided about it. For the sixth item, 54.3% (42.3% + 12.0%) agreed that students' ability of constructing their own mathematical knowledge is negatively affected by students' frequent usage of their social media, 30.9% (2.9% + 28.8%) disagreed and 14.9% were undecided about it. For the seventh item, 90% (49.4% + 40.6%) agreed that students are copying their mathematical tasks using their social media instead of putting efforts in completing them, 4% (0.6% + 3.4%) disagreed and 6% were undecided about it.

Table 3: Descriptive Statistics for the Negatives of Social Media on Students' Mathematical Learning (Mode)
For a 5-points likert scale survey, the mode is the most appropriate measure to use(Sauro, 2016).

Negatives of Social Media	Item 1	Item 2	Item 3	Item 4	Item 5	Item 6	Item 7
Mode	4	4	4	4	4	4	4

Table 3 shows that most mathematics teachers, among the 350 respondents, agreed that students are wasting their time to study mathematics in favor of their social media which in turn has negatively affected their critical thinking, their processes in solving mathematics, their understanding, their ability to acquire mathematical information and their ability to construct their mathematical knowledge. In addition, most teachers agreed that many students nowadays are relying on their social media to copy their math homework without even trying to solve it at first.

Table 4: Descriptive Statistics for the Potential Positives of Social Media on Students' Mathematical Learning (Frequency and Percent)

	Frequency and Percent				
Positives of Social Media	Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree
Social media, like WhatsApp and Facebook, can afford students more ideas and methods to solve problems, and it can create awareness to improve their mathematical learning.	10 (2.9%)	139 (39.7%)	26 (7.4%)	161 (46.0%)	14 (4.0%)
Social media, like WhatsApp and Facebook, can allow students to exchange mathematical information.	2 (0.6%)	38 (10.8%)	17 (4.9%)	259 (74.0%)	34 (9.7%)
Social media, like WhatsApp and Facebook, can increase students' mathematical knowledge.	22 (6.3%)	182 (52.0%)	38 (10.9%)	98 (28.0%)	10 (2.9%)
Social media, like WhatsApp and Facebook, can motivate students to learn mathematics.	34 (9.7%)	182 (52.0%)	33 (9.4%)	87 (24.9%)	14 (4.0%)
Social media, like WhatsApp and Facebook, give students additional resources	15 (4.3%)	89 (25.4%)	38 (10.9%)	181 (51.7%)	27 (7.7%)

to learn beside their mathematical textbooks.					
Social media, like WhatsApp and Facebook, can improve students' confidence in math tasks like exams and projects	15 (4.3%)	147 (42.0%)	50 (14.3%)	126 (36.0%)	12 (3.4%)
Social media, like WhatsApp and Facebook, can improve students' cognitive communication skills by paying attention more, using their memory and reasoning.	19 (5.4%)	154 (44.0%)	49 (14.0%)	119 (34.0%)	9 (2.6%)

Table 4 shows the frequency and the percent of each of the seven items that relate to potential positives of social media on students' learning in mathematics. For first item, 50% (46.0% + 4.0%) agreed that social media, like WhatsApp and Facebook, can afford students more ideas and methods to solve problems, and it can create awareness to improve their mathematical learning, 42.6% (2.9% + 39.7%) disagreed and 7.4% were undecided about it. For the second item, 83.7% (74% + 9.7%) agreed that social media can allow students to exchange mathematical information, 11.4% (0.6% + 10.8%) disagreed and 4.9% were undecided about it. For the third item, only 30.9% (28.0% + 2.9%) agreed that social media can increase students' mathematical knowledge, 58.3% (6.3% + 52.0%) disagreed and 10.9% were undecided about it. For the fourth item, only 28.9% (24.9% + 4.0%) agreed that social media can motivate students to learn mathematics, 61.7% (9.7% + 52.0%) disagreed and 9.4% were undecided about it. For the fifth item, 59.4% (51.7% + 7.7%) agreed that social media give students additional resources to learn beside their mathematical textbooks, 29.7% (4.3% + 25.4%) disagreed and 10.9% were undecided about it. For the sixth item, only 39.4% (36.0% + 3.4%) agreed that social media can improve students' confidence in math tasks like exams and projects, 46.3% (4.3% + 42.0%) disagreed and 14.3% were undecided about it. For the seventh item, only 36.6% (34.0% + 2.6%) agreed that social mediacan improve students' cognitive communication skills by paying attention more, using their memory and reasoning, 49.4% (5.4% + 44%) disagreed and 14.0% were undecided about it.

Table 5: Descriptive Statistics for the PotentialPositives of Social Media on Students' Mathematical Learning (Mode)

Positives of Social Media	Item 1	Item 2	Item 3	Item 4	Item 5	Item 6	Item 7
Mode	4	4	2	2	4	2	2

Table 5shows that most mathematics teachers, among the 350 respondents, agreed that social media can afford students more ideas and can create awareness. In addition, they agreed that students can exchange mathematical information through social media and that it can provide them with additional resources to learn beside their mathematical textbooks. However, most math teachers disagreed about social media ability in increasing students' mathematical knowledge, motivating them to learn mathematics and improving their confidence in math tasks like exams and projects, and their cognitive communication skills by paying attention more, using their memory and reasoning.

Table 6: Results of the Pearson's Chi-Square Test on the Impact of Teachers' Gender on the Negatives of the Frequent Usage of Social Media on Students' Mathematical Learning

Negatives of Social Media	Alfa Value of Pearson Chi-Square
The frequent usage of social media, like the WhatsApp and Facebook, waste students' time allocated for studying mathematics.	0.845
The frequent usage of social media, like the WhatsApp and Facebook, negatively affects students' critical thinking in mathematics.	0.110
The frequent usage of social media, like the WhatsApp and Facebook, negatively affects students' problem solving processes in mathematics, just like in a word problem.	0.002
The frequent usage of social media, like the WhatsApp and Facebook, negatively affects students' understanding deficits in mathematic like poor and false understanding of the content because of their loss of focus.	0.105
The frequent usage of social media, like the WhatsApp and Facebook, distracts students and negatively affects their ability of acquiring information in mathematics	0.328
The frequent usage of social media, like the WhatsApp and Facebook, has negatively affected students' ability of constructing their mathematical knowledge.	0.011
Students have become reliant on social media to copy their mathematical assignments, like a homework, from their classmates instead of putting efforts in completing them.	0.376

The researchers implemented the Chi-square test of independence to examine the possible association with each of the negatives of social media and mathematics teachers' gender. There was no significant relationship between the first, second, fourth, fifth and sixth item of negatives of social media on students' mathematical learning and mathematics teachers' gender at the p-level < 0.05. However, there was a significant relation between the third and fifth items and mathematics teachers' gender at the level of $p < 0.05$.

Table 7: Results of the Pearson's Chi-Square Test on the Impact of Teachers' Gender on the Positives of the Frequent Usage of Social Media on Students' Mathematical Learning

Positives of Social Media	Alfa Value of Pearson Chi-Square
Social media, like WhatsApp and Facebook, can afford students more ideas and methods to solve problems, and it can create awareness to improve their mathematical learning.	0.063
Social media, like WhatsApp and Facebook, can allow students to exchange mathematical information.	0.627
Social media, like WhatsApp and Facebook, can	0.206

increase students' mathematical knowledge.	
Social media, like WhatsApp and Facebook, can motivate students to learn mathematics.	0.184
Social media, like WhatsApp and Facebook, give students additional resources to learn beside their mathematical textbooks.	0.331
Social media, like WhatsApp and Facebook, can improve students' confidence in math tasks like exams and projects.	0.435
Social media, like WhatsApp and Facebook, can improve students' cognitive communication skills by paying attention more, using their memory and reasoning.	0.506

The researchers implemented the Chi-square test of independence to examine the possible association with each of the potential positives of social media and mathematics teachers' gender. There was no significant relationship between the first, second, third, fourth, fifth, sixth and seventh item of potential positives of social media on students' mathematical learning and mathematics teachers' gender at the p-level < 0.05.

6. Conclusion, hypotheses and Recommendation

6.1 Conclusion and Hypotheses

Results of the study clearly showed that there was no bias between male and female respondents. Concerning the negatives of social media on students' mathematical learning, results showed that 83.1% of the mathematics teachers of the sample believe that social media is wasting students' time allocated for their study. 60.3% of the teachers believe that social media is negatively affecting students' critical thinking in mathematics and their problem solving processes. 66.9% also believe that the frequent usage of social media is harming students' understanding in mathematics. 63.2% believe that the frequent usage of social media is affecting students' ability of acquiring information in mathematics. 54.3% believe that students are unable to construct their mathematical knowledge due to the frequent usage of their social media. Finally, 90% believe that many students are copying their homework thanks to their social media instead of trying to solve it. Based on that, the researchers concluded that, in average, just over two thirds of the 350 mathematics teachers (68.3%) believe that presence of social media is harmful to students' mathematical learning.

Furthermore, results of the Chi-Square Test showed that there is no statistically significant difference between mathematics teachers' gender and five out of sevenitems of the social media negatives. This means that both male and female math teachers think mostly alike concerning the negatives of the frequent usage of social media on students' mathematical learning.

These results conform toArmstrong (2012) and Abbas, Aman, Nurunnabi and Bano (2019) who indicated that students' understanding has been affected by the presence of social media. They have lost their focus and they are only interested in checking their messages, posting and commenting even during the time allocated for their studies. They also assured that students have become reliant on their social media. They are copying their homework from their friends using their social media instead of spending time trying to solve it like they are supposed to. Not to mention that many students have become used to completing their homework through data provided by their social media without checking its authenticity(Armstrong , Steve;, 2012; Abbas, Aman, Nurunnabi, & Bano, 2019).

These results also conform to Akram (2018) who stated that the easy access to any desired information has reduced students' research skills and their abilities to retain knowledge, and has drained their time after school (Akram, 2018). They also conform to Scott (2015) who indicated that two third of teachers believe that social media is harmful for students' learning because it distracts them and consumes their time(Scott, Cody;, 2015).

Finally, these results also conform to Schaefer (2016) who revealed that humans'critical thinking is not that much better than those who lived in the eighteenth century, more than two hundred years ago and that the frequent usage of social media rises the Attention Deficit Disorder for any user and hinders his learning, working memory in cognitive tasks and critical thinkingdevelopment in many topics(Schaefer, Mark;, 2016).

Based on that, the researchers hypothesized that, in Lebanon, the frequent usage of social media is wasting students' time allocated for studying mathematics, affecting their mathematical critical thinking, their problem solving processes and their learning in understanding, acquiring information and constructing knowledge. In addition, the researchers hypothesized that many students have become reliant on social media in completing their mathematical tasks without any effort. Finally, the researchers hypothesized that gender does not influence teachers' perceptions towards the negatives of the frequent usage of social media on students' mathematical learning.

Concerning the potential positives of social media on students' mathematical learning, results showed that 50% of the mathematics teachers of the sample believe that social media, like WhatsApp and Facebook, can create awareness for students and afford them more ideas and methods to solve problems. 83.7% believe that social media can allow students to exchange mathematical information. 30.9% believe that social media can increase students' mathematical knowledge. 28.9% believe that social media can motivate students to learn mathematics. 59.4% believe that social media give students additional resources to learn beside their mathematical textbooks. 39.4% believe that social media can improve students' confidence in math tasks. Finally, 36.6% believe that social media can improve students' cognitive communication skills. Based on that, the researchers concluded that, in average, 46.9% of the teachers of the sample believe that social media can positively influence students' mathematical learning.

Furthermore, results of the Chi-Square Test showed that there is no statistically significant difference between mathematics teachers' gender and every item of the social media positives. This means that both male and female math

teachers think alike concerning the positivity of social media on students' mathematical learning.

The perceptions of 46.9% of the mathematics teachers of the sample conform to Scott (2015) and Mushtaq and Benraghda (2018) who stated that social media, through convenient usage, can be beneficial in education and can ameliorate students' performance through interaction and collaboration in projects and exams (Scott, Cody;, 2015; Mushtaq & Benraghda, 2018); Akram (2018) who stated that social media enables students to share their knowledge, exchange ideas online at a distance, learn new stuff from other peers and teachers and gain more (Akram, 2018); and Abbas, Aman, Nurunnabi and Bano (2019) who indicated that students can create groups, through social media, that enables them interacting with their peers or others, in different continents, interested about the same subject, forming their own panels through-which they can exchange ideas, modify information and discuss educational topics(Abbas, Aman, Nurunnabi, & Bano, 2019). However, 53.1% of these teachers do not believe in the role that social media can play in education.

Based on that, the researchers hypothesized that less than half of the teachers believe that social media can positively influence students' learning in mathematics. Finally, the researchers hypothesized that gender does not influence teachers' perceptions towards the potential positives of the social media on students' mathematical learning.

6.2 Recommendations

- Almost everyone in the world has his own smartphone with social media services. Many students are attached to their social media platforms and networking sites. Teachers consider this strong attachment as harmful and accuse it of negatively influencing students' learning.According to teachers' perceptions in this research, with an important factor, like social media, that seems to be negatively affecting students, it is a must to examine that influence in specific aspects that concern their learning. More studies have to be done on social media and students' performance, through their grades and competencies, especially in a material like mathematics which many consider to be very rigid.
- Smartphones have affected the behavior of humans all over the world. Their behavior at work has been diverted due to the presence of their smartphones near them. HAGORAMAGARA (2015) indicated that many factors are linked to students' negative behavior in the class. These factors usually lead to students' poor commitment and performance in a subject material such as mathematics. In addition, he indicated that many students try to use their smartphones during the classroom session instead of listening to the teacher(HAGORAMAGARA, 2015).Students are the future of any society; thus, future studies must focus on assessing the effects of smartphones and social media on the behavior of students in schools and universities.
- In a rigid material like mathematics, studies are neededto create modern activities that can ease students' learning. Unfortunately, many teachers think that students need a mathematical brain to be successful in math classes, unlike the philosopher Jean Piaget who assured that any student is capable of acquiring a good mathematical reasoning of numbers concepts and operations through convenient teaching of mathematics that supports his needs(Thompson, 2013). Thus, through experiments, it is a must to try examining if smartphones and social media networking sites and platforms can positively influence students' performance.
- Anxiety can negatively influence students' performance(Afolayan, Donald, Onasoga, Babafemi, & Juan, 2013). More researches are needed to determine some of the many factors that trigger students' anxiety. It is not enough that many researchers have indicated that smartphones and social media are associated to anxiety. More in-depth researches concerning anxiety are need. Since math anxiety can affect students' mathematical performance(Ayadi, 2018), then researchers have to examine the possible relation that might exist between students' math anxiety, smartphones and social media.

References

[1] Abbas, J., Aman, J., Nurunnabi, N., & Bano, S. (2019). The Impact of Social Media on Learning Behavior for Sustainable Education: Evidence of Students from Selected Universities in Pakistan . Retrieved from Sustainability, 11, 1683, 1-23. doi:10.3390/su11061683 : https://www.mdpi.com/2071-1050/11/6/1683/pdf

[2] Afolayan, J., Donald, B., Onasoga, O., Babafemi, A., & Juan, A. (2013). *Relationship between anxiety and academic performance of nursing students, Niger Delta University, Bayelsa State, Nigeria.* Retrieved from Pelagia Research Library, Advances in Applied Science Research, 4(5), 25-33. ISSN: 0976-8610: http://www.imedpub.com/articles/relationship-between-anxiety-and-academic-performance-of-nursing-studentsniger-delta-university-bayelsa-state-nigeria.pdf

[3] Akram, W. (2018). *A Study on Positive and Negative Effects of Social Media on Society*. Retrieved from INTERNATIONAL JOURNAL OF COMPUTER SCIENCES AND ENGINEERING, 5(10), 347-354. DOI: 10.26438/ijcse/v5i10.351354: https://www.researchgate.net/publication/323903323_A_Study_on_Positive_and_Negative_Effects_of_Social_Media_on_Society

[4] Armstrong , Steve;. (2012, October 21). *Negative Effects of Social Networking Sites for Students.* Retrieved from BUSINESS 2 COMMUNITY: https://www.business2community.com/social-media/negative-effects-of-social-networking-sites-for-students-0311887

[5] Ayadi, a. (2018). *THE EFFECT OF ANXIETY ON PERFORMANCE OF STUDENTS IN MATHEMATICS.* Retrieved from Research project, University of Ibadan: https://www.researchgate.net/publication/327645979_THE_EFFECT_OF_ANXIETY_ON_PERFORMANCE_OF_STUDENTS_IN_MATHEMATICS

[6] Bhat, Adi;. (2019). *QUANTITATIVE RESEARCH: DEFINITION, METHODS, TYPES AND EXAMPLES*. Retrieved from QuestionPro: https://www.questionpro.com/blog/quantitative-research/

[7] CIRT;. (2015). *Quantitative Approaches*. Retrieved from Center For Innovation in Research and Teaching: https://cirt.gcu.edu/research/developmentresources/research_ready/quantresearch/approaches
[8] Elder, L., Nosich, G., Bankes, P., Barnes, B., & Polka, C. (2019). *Defining Critical Thinking*. Retrieved from The Foundation For Critical Thinking: https://www.criticalthinking.org/pages/defining-critical-thinking/766
[9] HAGORAMAGARA, F. (2015). *THE IMPACT OF GRADE 10 LEARNERS" BEHAVIOUR ON THEIR ACADEMIC PERFORMANCE IN MATHEMATICS*. Retrieved from Thesis dissertation. UNIVERSITY OF SOUTH AFRICA: http://uir.unisa.ac.za/bitstream/handle/10500/19833/dissertation_hagoramagara_f.pdf?sequence=1&isAllowed=y
[10] Hickey, Rick. (2012, February 28). *Today Social Media is Everywhere. That's why it is so important we do it right*. Retrieved from OurPangea: https://ourpangea.wordpress.com/2012/02/28/today-social-media-is-everywhere-thats-why-it-is-so-important-we-do-it-right/
[11] Lua, Alfred;. (2019, January 24). *21 Top Social Media Sites to Consider for Your Brand*. Retrieved from Buffer: https://buffer.com/library/social-media-sites
[12] Malamed, Connie;. (2016, June 21). *10 Definitions of Learning*. Retrieved from The eLearning Coach: http://theelearningcoach.com/learning/10-definitions-learning/
[13] Mushtaq, A. J., & Benraghda, A. (2018). *The Effects of Social Media on the Undergraduate Students' Academic Performances* . Retrieved from (Research Project, University of Nebraska - Lincoln): https://pdfs.semanticscholar.org/a13c/78d7084bdb1ee478e5f0f2f7466d7d805b11.pdf
[14] Sauro, J. (2016, May 24). *CAN YOU TAKE THE MEAN OF ORDINAL DATA?* Retrieved from measuringu: https://measuringu.com/mean-ordinal/
[15] Schaefer, Mark;. (2016, September 5). *A thought exercise on social media and critical thinking*. Retrieved from Business Grow: https://businessesgrow.com/2016/09/05/social-media-and-critical-thinking/
[16] Scott, Cody;. (2015, September 24). *The Effects of Social Media on Education.* Retrieved from Greater Allegheny News: https://sites.psu.edu/alleghenynews/2015/09/24/the-effects-of-social-media-on-education/
[17] Thompson, P. (2013). *Constructivism in Mathematics Education.* Retrieved from Encyclopedia of Mathematics Education: SpringerReference Springer-Verlag Berlin Heidelberg. DOI: 10.1007/SpringerReference_313210 2013-05-10 00:00:07UTC: http://pat-thompson.net/PDFversions/2013ConstMathEd.pdf
[18] WhatsApp Inc;. (2019). *About WhatsApp*. Retrieved from WhatsApp: https://www.whatsapp.com/about/