

# The Impact of COVID-19 Pandemic on Modes of Teaching Science in UAE Schools

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## Abstract

The pandemic of COVID-19 has affected most of the education systems around the world and changed the way schools conduct their daily activities. As a result, the learning activities changed to an online mode of delivery. This study explores the impact of Corona-virus pandemic on modes of teaching science in UAE schools. The qualitative method was conducted with a sample size of 62 science teachers. Questionnaires were deployed through an online platform. The study found that COVID-19 pandemic requires a different type of practice and competencies in teaching science in order to optimize the use of available resources and learning technologies. It also came up with a list of digital tools and applications that might help support teaching science, for instance: LMS “Smart Learning Gate”, Microsoft Teams, PhET Interactive Simulations. The result also showed that the main challenges for science teachers during the COVID-19 was the absence of hands-on activities, conducting experiments in wet labs, fostering interaction in the online classroom, and managing students' behavior. The results of this study found that most of the science teachers preferred teaching via the traditional classroom. Following the necessity to switch to a blended classroom, they now prefer it to the traditional classroom. According to these findings, it is recommended that MoE provide science teachers with specific training on using ICT in teaching science.

**Keywords:** COVID-19, Online learning, Virtual classroom, Traditional classroom, Science teaching.

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## 1. Introduction

The coronavirus pandemic has affected educational systems worldwide. Most countries around have temporarily closed educational institutions in an attempt to contain the spread of the COVID-19 pandemic. These nationwide closures are impacting over 60% of the world's student population. Several other countries have implemented localized closures affecting millions of additional learners (UNESCO, 2020). In the UAE, the education sector has changed since cases of COVID-19 infection have been detected in the country. They prematurely closed all schools. As a consequence, all schools are trying to compensate for this loss by using online learning.

The current pandemic disrupted the teaching methods as well. It has been forced science teachers to make a switch to a virtual environment, which requires teachers to integrate technology into their instruction. They have to change their approach to positively impact both the content elements and the students' perceptions. Meanwhile, science teachers should be able to utilize technology to deliver science curriculum, assess learners, direct them to research topics, and to use student-centered strategies integrated with technology (Babacan, 2016). These competencies may indicate that there are differences in the experiences of teaching face-to-face as opposed to teaching online. The importance placed on relationship building and being able to understand students well enough to provide individualized instruction and a safe course environment means that teachers must be adept with virtual communication technologies. Many teachers will need to reconsider teacher-centered pedagogies and apply more effective student-centered learning methods (Borup et al., 2013).

Kennedy & Archambault (2012) found that many teachers felt the strategies used in their face-to-face classrooms did not make sense in the online environment. As a result, teachers have to change their approaches to teaching and their beliefs about teaching and learning. It meant switching from giving knowledge to guiding knowledge, which provides students what they needed as they needed it. This approach allows teachers to present the content in various ways, using text and multimedia and offered numerous chances for students to interact with the course content (DiPietro, 2010).

Yildirim & Sensoy (2018) studied the impacts of science teaching enriched with technological applications on the science course achievement levels. It has been determined that science teaching enriched by technical applications had a meaningful effect on the increase of the science course achievements level of the students and the permanence of this achievement. It also showed a significant rise in the science course achievement scores. Thus, using technology in learning environments logically and strategically with teaching methods will ease and enhance science learning (Oktay & Cakir, 2013).

Regarding the current circumstances, Sintema (2020) has explained that STEM subjects, which include science, affected negatively in terms of learner performance in the national examinations. It also found that teachers expect a drop in the Grade 12 students' performance this academic year if the number of Covid-19 cases increases. Besides, the researcher suggested that teachers have to step up their preparedness in containing

the negative effects of this epidemic by bringing in teaching modes and strategies aimed at ensuring that students in examination classes are adequately prepared for the examinations.

Therefore, Mulenga & Marbán (2020) explored how prospective teachers engage in online learning mathematics activities during the COVID-19 pandemic. The study proposed a comprehensive and advanced pedagogic design to render mathematics lessons through virtual classrooms during and beyond the COVID-19 age.

Due to the COVID-19 crisis, researchers and educators around the world are trying to find possible alternatives that can work for students to have a paradigm shift from the face-to-face modes of learning to online education. Therefore, the aim of this study is to explore the impact of Corona-virus pandemic on modes of teaching science in UAE schools.

### Research Problem

The COVID-19 pandemic has changed the running of science classrooms at UAE schools, and all schools are now using an online system to deliver the remaining parts of the science curriculum. During the transformation to online distance learning, perceptions and attitudes of science teachers vary across the UAE. Views and preferences in a traditional classroom, virtual classroom, and blended learning are also changing amidst the crises. Based on that, science teachers have to adapt rapidly to alternative ways of teaching.

Thus, the researcher explores the current situation by addressing the following research questions:

1. To what extent is the COVID-19 pandemic impacting science teaching methods?
2. What are the best websites, software, and applications that can be used for teaching science?
3. What particular challenges do science teachers face in online learning environments?
4. If science teachers have a choice between a virtual classroom and a traditional classroom, which one would they choose?

### Study Objectives

This study aims to reveal:

The extent of the impact of Corona-Virus pandemic on modes of teaching science in UAE schools.

### Significance of the Study

This study contributes to the existing literature in the field of science education, which other scholars could use in relation to the global pandemic. It also might be attention-grabbing for the ministry of education as it provides relevant information on how to prepare science teachers to combat the impacts of COVID-19 on their teaching competencies.

### Methodology and Procedures

This study followed a qualitative research method. It allowed science teachers to talk openly about their experiences during the implementation of distance learning. Data of the research were collected by using a questionnaire. Open-ended questionnaires were distributed randomly to science teachers at different emirates in public and private schools. Qualitative methods carried out in this exploratory study offered a chance to collect rich descriptive data since respondents were free to express their ideas based on what they have experienced in the current crisis.

The responses were coded using open coding procedures. Codes were developed and used in accordance with established guidelines (Creswell, 2012), and continuous refinement and revision of the codes occurred.

On this study, the participants (62 science teachers) were:

- 49 females and 13 males

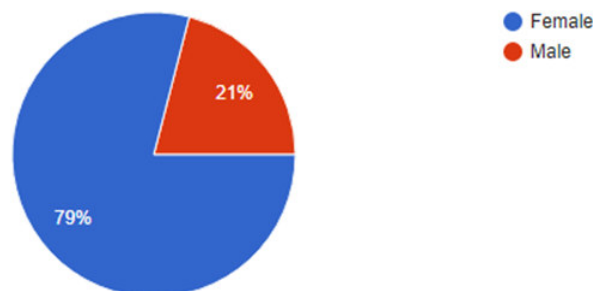


Figure 1. Percentage of Participants by Gender

Teachers reported the number of years of experience ranged from:

- Less than ten years: 30 (48.4%)

- Equal or more than ten years: 32 (51.6%)

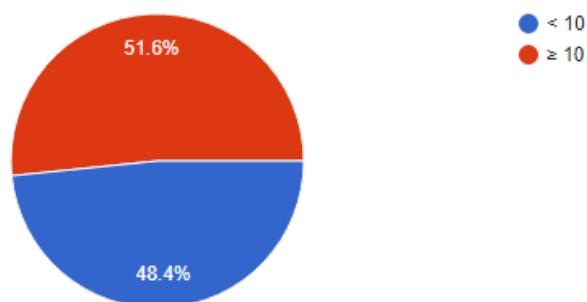


Figure 2. Percentage of Participants Based on Years of Teaching Experience

### Reliability

The researcher was agreed on the encoding process with a colleague. Then, To combat the fact that analyzers were expected to agree with each other a certain percentage of the time simply based on chance, reliability was calculated by using Cohen's Kappa where 1 as coding is utterly reliable and 0 when there is no agreement other than what would be expected by chance. Kappa was reaching (0.79), which represents a reasonably good overall agreement as it can be considered a substantial value if it is between (0.61- 0.80), according to Stemler (2001).

### Results and Discussion

#### Results and findings related to the first research question: To what extent is the COVID-19 pandemic impacting science teaching methods?

No	Aspect	frequency	percentage
1	Requiring different type of practice and competencies	16	25.8%
2	Focusing on theoretical education without any practical knowledge	14	22.6%
3	Lack of teacher-student relationships and interactions	11	17.7%
4	Little, because of using ICT tools before Covid-19	9	14.5%
5	Exploring and using new platforms and digital tools	8	12.9%
6	Reduce the ability to differentiate teaching among students	4	6.5%
<b>Total</b>		<b>62</b>	<b>100%</b>

Table 1. The impacting of COVID-19 pandemic on science teaching methods

Akin to the data gathered from the open-ended questionnaire, generally were classified into the six major categories regardless of the different responses given by science teachers. Moreover, most of the teachers, as appeared in table 1, pointed out that the current pandemic requires a different type of practice and competencies (25.8%) as one of the teachers stated that: “My teaching methods are completely changed to new electronic programs and strategies”.

The result showed that science teachers were focused on teaching knowledge rather than implementing effective practices for knowledge acquisition. Noura clarified this point by saying that: “Teaching has become less practical and more theoretical”, which might be attributed to inadequate preparation of science teachers in the area of optimizing the use of available resources and learning technologies, as mention in UAE Teacher standards (Darayseh, 2014).

On the other hands, the result showed that the shift to remote learning had effected some science teachers to become better with technology by exploring and using new platforms and tools as Laila mentioned: “the online resources that I have now been actively using has greatly aided student discussion and participation in the classroom”. Nowadays, Science teachers are trying to build their ICT competencies to be able to create activities, create videos, puzzles, and quizzes. According to that, they may be able successfully to run their classes as Fatima mentioned, “I am getting a better result and better feedback, students are enjoying a lot of smart learning”.

**Results and findings related to the second research question: What are the best websites, software, and applications that can be used for teaching science?**

No	ICT Tool	frequency	percentage
1	LMS “Smart Learning Gate”	23	12.1%
2	Microsoft Teams	18	9.5%
3	PhET Interactive Simulations	15	7.9%
4	ALEF Patform	15	7.9%
5	Liveworksheets	12	6.3%
6	nearpod	11	5.9%
7	Twig	11	5.9%
8	Tigtag	11	5.9%
9	YouTube	10	5.3%
10	Kahoot	10	5.3%
11	Quizizz	9	4.8%
12	Wordwall	7	3.7%
13	Padlet	6	3.2%
14	Google Classroom	6	3.2%
15	PPT	4	2.1%
16	Mozaik	3	1.6%
17	ConnectED	3	1.6%
18	Classkick	2	1.1%
19	Flocabulary	2	1.1%
20	Classroom	2	1.1%
21	Webex	1	0.5%
22	Poll Everywhere	1	0.5%
23	Labster's virtual labs	1	0.5%
24	Online whiteboard	1	0.5%
25	Flippity	1	0.5%
26	The Physics Classroom	1	0.5%
27	Gizmos	1	0.5%
28	Star Walk	1	0.5%
29	Big Bang AR	1	0.5%
	<b>Total</b>	<b>189</b>	<b>100%</b>

Table 2. The best websites, software, and applications used for teaching science

The table shows some of the tools and educational resources that they are helpful in supporting teaching science up to that point. Science teachers were asked to analyse and suggest the best resources that they use in teaching science. These may include tools that can help manage teaching and learning, such as communication tools, learning management systems, or other tools that teachers can use to create or access science content.

The result indicates that LMS “Smart Education Gate” is mostly used (12.1%) because it built by the UAE ministry of education, and it is integrated with the school community and allows teachers to monitor their students' progress. It was mentioned Microsoft Teams as in the second rank (9.5%), which is a unified communication and collaboration platform that give science teachers the ability to chat with their learners, having video meetings, file storage, file transfer, and application integration.

Then, most of the results focused on the tools that can create free interactive science simulations that are available online or through an app such as PhET sims, which contributes to engaging students through an intuitive, game-like real environment where students learn through exploration and discovery. Moreover, most of these tools and apps supported the Arabic language. They spared the parents some time and effort required to follow up on the performance of their children by allowing a direct contract with the school administration.

**Results and findings related to the third research question: What particular challenges do science teachers face in online learning environments?**

No	Challenges	frequency	percentage
1	A lack of hands-on activities and experiments (Transforming from wet lab to dry lab)	24	46%
2	A lack of science teachers competencies in fostering interaction in the online classroom	9	17%
3	Manage students' behavior	4	7.7%
4	Technical Issues (weak Wifi, don't own PC)	4	7.7%
5	Some scientific concepts are difficult to conceptualize	3	5.8%
6	Assess Students' Learning	3	5.8%
7	Time management	2	4%
8	Social presence: emotional expression, open communication	2	4%
9	Teaching elementary students	1	2%
<b>Total</b>		<b>52</b>	<b>100%</b>

Table 3. The main challenges that science teachers face in online learning environments

This table shows the main challenges that science teachers faced during the COVID-19 pandemic. In this mode, 46% of science teachers are missing the hands-on activity and experiential learning as well. This result is consistent with Kennedy & Archambault (2012), which showed that the online class did not support science teaching practice, and that reinforces the need for teachers training that focuses on the online learning environment.

Another challenge is might be the lack of science teachers' competencies in fostering interaction in the online classroom. Teachers have to give learners a real chance to make their learning experience as close to a face-to-face mode. For this to happen, teachers have to adapt teaching strategies that create successful student-centered learning in which students could feel motivated and comfortable to participate and construct knowledge and meaning.

**Results and findings related to the second research question: If science teachers have a choice between a virtual classroom and a traditional classroom, which one would they choose?**

Teaching Modes	frequency	percentage
<b>Traditional</b>	23	46%
<b>Virtual</b>	11	22%
<b>Blended</b>	16	32%
<b>Total</b>	<b>50</b>	<b>100%</b>

Table 4. Virtual classroom or Traditional classroom

The result regarding this question showed that most of the science teachers (46%) prefer teaching via traditional classroom. The reasons behind this may be that classroom learning helps students and teachers know each other in a better manner. It is also more helpful due to continuous interaction between students and teachers, as it is often necessary for science classes to complete a lab to understand the content. This is not possible to do in distance learning, and it makes science extremely difficult for students to comprehend online, as some teachers mentioned: "Traditional. As it enhances one to one correspondence with our students, great hands-on experience and it has the possibility of the socialized group".

The results also confirmed that there is a good desire among science teachers to use a blended model in teaching science, and this was stated by Ahmad: "Both of them, it will be a great teaching method for science because it will help in achieving content objectives and outcomes by smart methods".

**Conclusion and Recommendations**

It has been shown in this study that the COVID-19 pandemic had an impact on teaching science in the UAE. As a result, It seems essential to build and develop teachers' digital competencies in terms of creating hands-on activities and experiments, fostering interaction with students, managing students' behavior, Assess Students' Learning and time management.

In light of the findings of the research; the researcher recommends the following:

- The results of this study may serve the Ministry of Education and policymakers in evaluating the inclusion of online learning in teaching science in the UAE.
- The study recommends that science teachers need to consider various aspects to create an interactive online environment. They also have to use interactive tools such as PhET Interactive Simulations, Liveworksheets, nearpod, Twig, and Kahoot. Besides, building an MoE dry lab that fits with UAE science curriculums.
- MoE has to provide science teachers with specific training on using ICT in teaching science.

- The researcher encourages having other studies focusing on different subjects to be carried out.

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