

The Digital Transformation in Teaching Methods as the New Normal in Abu Dhabi Private Schools

التحول الرقمي في طرق التدريس كالموضع الطبيعي الجديد في مدارس أبوظبي
الخاصة

by

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of the requirements for the degree of
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Abstract

The COVID-19 pandemic has given an unexpected boost to digital education in K-12 schools. This pandemic forced a rapid shift to digital learning and accelerated educational digital tools integration. Many educational institutions worldwide have offered online and blended learning programs, citing the benefits of flexibility, accessibility, innovation, and sustainability. In the post-COVID-19 pandemic, digital learning seems to be the best choice that plays a significant role in quality education. According to much research, Online learning will interact with traditional teaching to provide more options, enhance education equity, and promote innovation by merging artificial intelligence and mobile education. The study investigates the digital transformation in Abu Dhabi K-12 private schools during COVID19 and how this shifting to distance learning and using technology tools affects the teaching methods. It also discovers the best teaching methods and strategies teachers adopt to engage the students and enhance their learning. On the other hand, the study explores teachers' perspectives on digital learning and schools' leaders' perceptions of the future of K-12 education post-COVID-19. The target sample population of the study consists of teachers, two subjects' coordinators, one Hod and one school principal from different private schools in Abu Dhabi. A mixed-methods data collection approach was applied to gather quantitative and qualitative data, including an online questionnaire and semi-structured interviews. The validity and reliability of the research tools were assessed carefully to verify that they were appropriate. The findings revealed that teaching methods had been changed from traditional to more flexible methods that fit the current COVID-19 crisis and beyond. The results also showed a positive teachers' perception of Digital learning, which school leaders believe will continue with us as the new normal. Meanwhile, they found the blended or hybrid learning model as the most successful teaching, and learning model during and post Covid-19.

Abstract in Arabic

أعطت جائحة COVID-19 دفعة غير متوقعة للتعليم الرقمي في المدارس (K-12). كما أجبر هذا الوباء على تحول سريع إلى التعلم الرقمي وتسريع تكامل الأدوات الرقمية التعليمية. قدمت العديد من المؤسسات التعليمية في جميع أنحاء العالم برامج تعليمية عبر الإنترنت ومختلطة ، مستشهدة بفوائد المرونة وإمكانية الوصول والابتكار والاستدامة. في ما بعد جائحة COVID-19 ، يبدو أن التعلم الرقمي هو الخيار الأفضل الذي يلعب دورًا مهمًا في التعليم الجيد. وفقًا لكثير من الأبحاث ، سيتفاعل التعلم عبر الإنترنت مع التدريس التقليدي لتوفير المزيد من الخيارات ، وتعزيز المساواة في التعليم ، وتعزيز الابتكار من خلال دمج الذكاء الاصطناعي والتعليم المتنقل. تبحث الدراسة في التحول الرقمي في المدارس الخاصة في أبو ظبي من مرحلة رياض الأطفال حتى نهاية التعليم الثانوي (K-12) خلال COVID19 وكيف يؤثر هذا التحول على التعلم عن بعد واستخدام أدوات التكنولوجيا على طرق التدريس. كما يكتشف أفضل طرق التدريس والاستراتيجيات التي يتبنها المعلمون لإشراك الطلاب وتعزيز تعلمهم. من ناحية أخرى ، تستكشف الدراسة وجهات نظر المعلمين حول التعلم الرقمي وتصورات قادة المدارس لمستقبل تعليم K-12 بعد COVID-19. تتكون العينة المستهدفة من الدراسة من معلمين ومنسقي مادتين ورئيس قسم ومدير مدرسة من مدارس خاصة مختلفة في أبو ظبي. تم تطبيق نهج جمع البيانات متعدد الأساليب لجمع البيانات الكمية والنوعية ، بما في ذلك الاستبيان عبر الإنترنت والمقابلات شبه المنظمة. تم تقييم صحة وموثوقية أدوات البحث بعناية للتحقق من أنها كانت مناسبة. كشفت النتائج أن طرق التدريس قد تم تغييرها من الأساليب التقليدية إلى الأساليب الأكثر مرونة التي تتناسب مع أزمة COVID-19 الحالية وما بعدها. أظهرت النتائج أيضًا تصورًا إيجابيًا للمعلمين عن التعلم الرقمي ، والذي يعتقد قادة المدارس أنه سيستمر معنا على أنه الوضع الطبيعي الجديد. وفي الوقت نفسه ، وجدوا أن نموذج التعلم المختلط هو أنجح نموذج تعليمي وتعلم أثناء وبعد COVID-19 .

Dedication

To the kindest heart and the purest soul that I miss, My Father

To the most wonderful and generous person in the world, My Mother

To my soulmate and my loving supporter, My Husband

To my little miracles, which made me a stronger mother

and a better person, Hamza and Taleen.

To my siblings for their unconditional love.

To my family for always believing in me.

To my best friends for keeping me on the level.

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List of Abbreviations

MoE	Ministry of Education
ADEK	Abu Dhabi Department of Education and Knowledge
UAE	United Arab Emirates
HOD	Head of Department
LMS	Learning management systems
MOOCs	Massive Open Online Courses
MMR	Mixed- Method Research
SSI	Semi-Structured Interview
TA	Thematic Analysis

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Chapter1: Introduction

1.1 Overview

The COVID-19 pandemic has caused the most significant educational disruption in history, affecting learners and teachers in nearly every country. This pandemic has made schools, colleges, and universities worldwide change their traditional teaching. Governments have adopted alternate distance learning to support quality education and avoid spreading the virus (De Giusti 2020). Despite that emergency remote learning has enabled schools to maintain the learning continuity throughout the forced school closures caused by the COVID-19 pandemic, students were impacted differently by these circumstances based on social factors. Many developing countries have significant challenges maintaining a stable Internet connection and online access to digital devices, and some research has shown some disadvantages such as the lack of social interaction with classmates and teachers, the lack of technical knowledge required to face this type of teaching, the quality of technological devices and tools (Alawamleh, Al-Twait & Al-Saht 2020)

Locally, due to the spread of COVID-19, the UAE Ministry of Education (MoE) was forced to fully implement distance learning by the end of the second trimester of the academic year 2019- 2020. Still, the United Arab Emirates (UAE) was well-prepared for distance learning, with smart-learning initiatives in place since 2012, allowing students to study and learn using mobile devices. Furthermore, the robust infrastructure supports internet connection stability and reduces technical challenges associated with online teaching and learning.

In fact, the UAE students in the various educational institutions were lucky because of the strong e-learning infrastructure that was established before the pandemic. The MoE offered free satellite broadband services for students in areas lacking connectivity and free home internet connection for families who have no home internet connection. Furthermore, it launched many learning platforms and educational resources suitable for distance learning, conducted professional training for school teachers and provided guidelines and instructions manuals to manage students' behaviour in distance learning to ensure a successful distance learning process.

1.2 Background

1.2.1 The Education System in the UAE

The education system in the United Arab Emirates is divided into public schools, private schools, and higher education. Private institutions are generally not under direct government control but are bound by guidelines set forth by the federal ministry and local authorities. The Ministry of Education (MoE) oversees all UAE-based education councils and authorities like the Department of Education and Knowledge (ADEK) in Abu Dhabi, Sharjah Private Education Authority (SPEA) and the Knowledge and Human Development Authority (KHDA) in Dubai.

The Abu Dhabi Department of Education and Knowledge (ADEK) was established in 2005 to oversee the management and administration of Abu Dhabi's schools and set the standards for educational outcomes, health and safety, and building and site requirements. ADEK is also in charge of adequately regulating private schools and higher education. It also keeps track of students' progress and assesses the efficiency of each school's educational system through the 'Irtiqaa' program. The private sector has developed as one of the most important education suppliers in the UAE. There is a massive network of private schools in Abu Dhabi, with 181

private schools serving more than 165,000 students. These schools provide a diverse range of programs, including the International Baccalaureate (IB), UAE Ministry of Education curriculum, British, American, French, Indian, Pakistani and Filipino curricula. However, they all should deliver core subjects such as the Arabic language, Islamic education and social studies (Tamm 2021).

1.2.2 Digital learning in the UAE

Investment in technology is critical for the Ministry of Education (MoE) to reach UAE Centennial 2071 and the UAE Vision 2021 National Agenda, which emphasizes the development of a first-rate education system and aims for all schools and universities. This vision required all students to be equipped with smart systems and devices for all learning methods, projects, and research. Therefore, resources and essential capabilities have been allocated toward educational infrastructure to improve the Emirati School Model - in which all public and private schools that adopt MoE systems follow the same curriculum - and make it more competitive on the world stage (Vision2021 2021). The UAE institutions had several digital and smart learning forms such as online learning, mobile learning, and distance learning programs even before COVID-19; some of the digital learning initiatives are mentioned below:

Hamdan Bin Mohammed Smart University

HBMSU is the first approved eLearning academic university in UAE. It was established in 2002 to provide online education through virtual learning environments and smart campuses. HBMSU provides engaging learning opportunities using mobile learning, discussion blogs, online classrooms, educational gaming, and social networking. The university has created, developed,

and implemented flexible and adaptive platforms to help learners with resources and track their performance (Procter 2020).

Mohammed bin Rashid Smart Learning Initiative

His Majesty Sheikh Mohammed bin Rashid Al Maktoum, vice president and prime minister of the United Arab Emirates and Ruler of Dubai, has launched the Mohammed Bin Rashid smart learning programme in 2012. This program aims to create a unique learning environment in schools by introducing smart classes where students use digital devices to learn. Around 400 campuses were equipped with the latest 4G networks, smart boards, tablets, and eContent, including textbooks and educational platforms collaboration (MoE 2018).

The Digital School

The Digital School is the first fully integrated digital school that offers smart and flexible distance learning to students anywhere. It provides students with digital learning resources suitable for Arab and international curriculum content. The students can interact with professional teachers and other learners via virtual classes and digital evaluation systems that allow students to self-learn and obtain certified qualifications. In September 2021, the Digital School welcomed its first class of students, and it aims to achieve one million students by 2026 (Thedigitalschool 2020).

42 Abu Dhabi

The Abu Dhabi Department of Education and Knowledge (ADEK) has partnered with 42 international to open 42 Abu Dhabi in September 2021, a disruptive coding school with zero classes, zero teachers, and zero fees (42abudhabi 2021). 42 Abu Dhabi is a critical enabler of Abu Dhabi's strategic vision of promoting a diverse and integrated education infrastructure

that empowers and develops human capital based on peer-to-peer learning. Students learn independently, support each other through projects and workshops, and develop through collaboration, communication, creativity, and critical thinking (ADEK 2020c).

E-learning platforms

Duroosi: which means ‘my studies’ in Arabic, is a YouTube channel that the UAE Ministry of Education has developed in collaboration with Etisalat and Google. Hundreds of tutorials based on the national curriculum for Grade 11 and 12 students are available on the channel, intending to assist families in reducing the high expense of private tuition (Pennington 2014).

Madrassa: An online platform with 5000 videos in mathematics, biology, chemistry, and physics. The Madrassa app, which was launched in 2018, gives over 50 million Arab students in kindergarten through grade 12 access to a free platform throughout the world (Madrassa 2017).

Al-Diwan eReader: An app developed by the UAE Ministry of Education allows learners to download books and study online. It enables teachers and students in government schools to access and participate in the learning curriculum via the Internet (MoE 2017).

1.2.3 ADEK Efforts Facing the COVID- 19 Pandemic

From March 2020, UAE has implemented distance learning in all UAE public and private schools and higher education institutions as a precaution to protect students from COVID-19. (figure1) shows the timetable of school events during the COVID-19 pandemic according to MoE in the UAE (ADEK 2020d).



Figure 1: Timeline of UAE school events during COVID-19 (ADEK 2020d).

In Abu Dhabi, ADEK worked closely with all private schools to ensure that they were prepared and well-equipped to execute distant learning during the school closure. All efforts were backed by a network of technology and education partners, from in-depth study and rigorous testing of several e-learning platforms to ensure essential accessibility and minimal disruption. On the other hand, ADEK Collaborated with telecommunication providers in UAE to secure the connectivity in the locations where students live and provided all schools with the required platforms, free of charge, as with Alef Education, Microsoft Teams, Class Dojo, and others. Moreover, electrical devices and internet access were made available to students upon request (ADEK 2020b).

The distance learning plan in Abu Dhabi private schools also involved providing rigorous online training for teachers to ensure their competence to develop and deliver quality online classes. Meanwhile, ADEK developed several guidelines and manual handbooks for stakeholders, teachers, and parents to assist them during this period of uncertainty and provide them with insights into student education and best practices. Furthermore, they have aided stakeholders in drawing lessons from this extraordinary crisis and constructing sustainable resilience in the educational system (ADEK 2020a).

1.3 Statement of the Problem

The education sector has long used developing technology to innovate and improve learning. In recent years, digital learning has shown consistent growth. Blended learning, online courses, and Learning Management Systems (LMS) such as Blackboard and Massive Open Online Courses (MOOCs) are becoming more common.

In contrast, the COVID-19 pandemic has accelerated the digital transformation of education despite the numerous obstacles such as low connectivity and a lack of technical skill in using online resources. It is evident that COVID- 19 crisis has shifted the educational paradigm and impacted the teaching profession. Moreover, it has sparked innovation in the education sector, and we have seen various innovative methods to support teaching and learning sustainability. Therefore, the concept of digital learning has evolved from a fashionable trend to an urgent need, and technology has emerged as a vital enabler for ensuring sustained access to education.

In August 2021, the Department of Education and Knowledge (ADEK) had launched the school reopening protocol and identified several learning models to reopen the school in September

2021 and allowed the private schools to choose from different models: Face-to-face learning, where students can attend schools daily; partial in-class learning, where the number of school hours will be reduced; and hybrid learning model that calls for alternate days of in-classroom teaching. Meanwhile, ADEK gave the private school the freedom to choose the duration, instructional materials, instructional strategy, and technology suited to their context (ADEK 2020a). This new situation required all schools administrators to prepare well for this new norm to keep up with this rapid digital transformation and the shift of the teaching and learning models. On the other hand, because teachers are on the front lines of maintaining learning continuity in this critical stage, teachers' roles may need to be adjusted to be effective in this new norm. They should feel comfortable and confident in this technological world as their digital-native students.

Numerous studies and guidance were published to support teaching and learning continuity during the pandemic. However, there are limited studies in the UAE for k-12 schools. This study makes a meaningful contribution to world knowledge. It provides a critical view of the digital transformation in teaching and learning activities in Abu Dhabi private schools before, during, and post COVID- 19. This study will help the stakeholders, especially teachers, benefit from this new norm and prepare for the post-pandemic phase.

1.4 Purpose of the Study

The study aims to investigate the digital transformation in Abu Dhabi K-12 private schools during COVID19 and how this shifting to distance learning and using technology tools affect teaching methods. Moreover, the study discovers the various teaching methods, strategies, and digital educational tools teachers adopt to engage students and enhance their learning. On the other hand, it explores teachers' perspectives on digital learning and schools' leaders' perceptions of the future of K-12 education post-COVID-19.

1.5 Research Questions

The study aims to answer the following four core research questions:

Research Question (1):

How did digital transformation affect the teaching methods in Abu Dhabi private schools during the COVID-19 pandemic?

Research Question (2):

What teaching methods and strategies are adopted to keep students engaged during and after distance learning?

Research Question (3):

What are teachers' perspectives on digital learning as the new normal in education?

Research Question (4):

What are schools leaders' perceptions on the future of education post-COVID-19?

1.6 Organization of Chapters

After providing background information and justifying the study's purpose, the following is the structure of this dissertation essay:

Chapter 1: Introduction - This chapter provides background information about the study's key points, connections, and gaps in earlier research. It also highlights the study's purpose and questions.

Chapter 2: Literature Review and theoretical framework – This chapter analyzes and evaluates relevant studies concerning digital learning. It also discusses the key theories related to digital learning.

Chapter 3: Methodology – This chapter describes the research design and methodology, including the sample and participants, data collection instruments, data collection processes, data analysis procedures, validity, reliability, and ethical considerations.

Chapter 4: Findings - This chapter presents the results of both the qualitative and quantitative data collected.

Chapter 5: Discussion - This chapter responds to the research questions and links the study findings to the literature reviews. It also provides the conclusion and implications of the study.

Chapter 2: Literature Review

2.1 Digital Transformation

Digital transformation (also known as digitalization) is widely used in 21st-century literature. It is associated with the 4th Industrial Revolution (4IR) as no economic area or business is immune to digital transformation impacts. The term “digital transformation” refers to the business approach of implementing the most recent ICT technologies like cloud computing, Internet of Things (IoT), big data, blockchain, artificial intelligence (AI), and machine learning (ML) and adapting them to the users’ potential to use these innovative ICT technologies (Mathew, Abduroof & Gopu 2021).

Historically, educational institutions adopted digital technologies to increase the efficiency of school administrative procedures such as class scheduling, budget management, and student tracking, improve safety and security, and provide information tools for staff, academics, students, and researchers (Patton & Santos 2018).

Many benefits of digitalization include increased production, cost savings, and innovation. Therefore, innovative or forward-thinking educational institutions are now recognizing the potential of technology to transform the learning environment, integrating the physical and virtual worlds and resulting in improved student outcomes (Patton & Santos 2018).

2.1.1 Digital Learning

In a digital context, digital technologies are hardware and software components that enable communication, accessibility, transmission, and storage of information. Digital learning is any instructional practice that uses digital technology to enhance students’ learning experience and

improve the learning outcomes, including online, mobile, virtual, and blended learning. It contains a wide range of digital materials, communications tools, evaluation systems, online educational platforms, online classes, adaptive software, and technology applications in the classroom (Schwartzbeck & Wolf 2012).

CIPD (2021) divided digital learning into three categories that overlap: formal, informal, and blended learning. In formal digital learning, technology is used to deliver formal courses, usually with fees, occurs primarily in educational institutions and leads to a qualification or certification. In contrast, informal digital learning uses technology to assist formal learning, and it occurs outside of the classroom with no assessments. Blended learning combines formal and informal learning with other types of learning. In general, formal learning refers to structured, pre-designed learning activities guided by an instructor, whereas informal learning refers to unstructured, unplanned, and, in most situations, incidental learning (Czerkowski 2014).

Digital learning and technology include a wide variety of facets, tools, and apps designed to assist and empower educators and students. Schwartzbeck & Wolf (2012) included the main facets of the digital learning tools shown in (figure2).

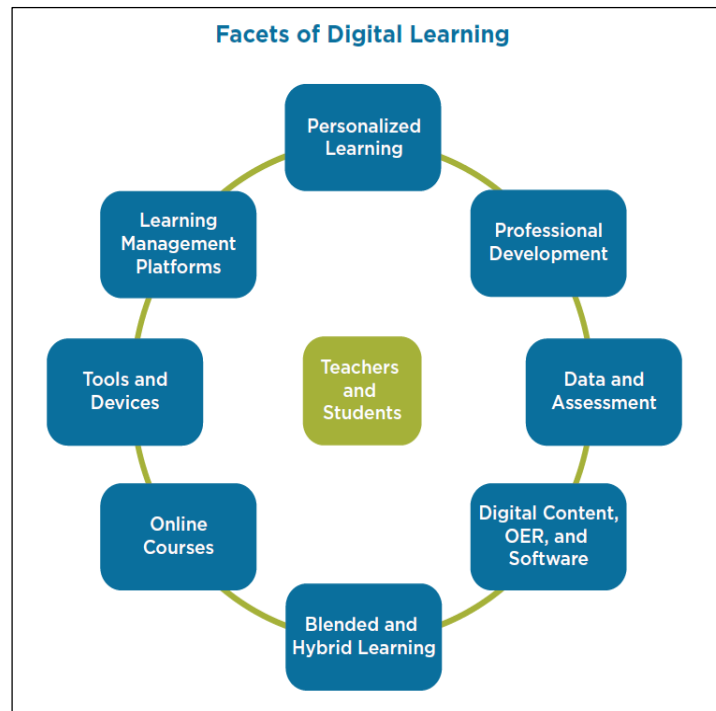


Figure 2: Facets of Digital Learning Schwartzbeck & Wolf (2012)

On the other hand, many Digital Learning tools have been mentioned in many pieces of literature as (Cleveland-Innes & Wilton 2009; CIPD 2020a):

- Virtual learning environments, such as webinars, online classrooms, and chat tools
- Online learning tools
- Social media applications
- Mobile learning apps include using smartphones, tablets, and laptops.
- Multimedia contents as YouTube and self-authoring tools such as blogs and wikis
- Learning management systems (LMS) and learning experience platforms (LXP)
- Cloud-based platforms
- Online course/resource platforms, including massive open online courses (MOOCs)
- Game-based learning applications such as Kahoot and Quizizz
- Artificial intelligence and machine-based learning
- Extended reality (XR) immersive technologies such as augmented reality (AR),

2.1.2 Digital Learning and Innovated Teaching Methods

Digital learning methods are innovative ways of teaching that use technology to increase educational quality and engage students in the learning process. The study findings of Sousa, Cruz & Martins (2017) revealed project-based learning, problem-based learning, digital storytelling, online learning environments, digital moments, educational games, and authentic learning as the main digital learning methodologies.

The recent shift in the implementation of digital technology for pedagogical purposes has enabled the development of next-generation learning environments, both physical and virtual, that feature improved connectivity, simplified communication pathways, and enhanced collaborative opportunities (Patton & Santos 2018). This advancement in technology promotes innovative approaches to empowering learners to develop their 21-century skills (Patton & Santos 2018). According to Efremova & Huseynova (2021), many learning modes, such as flipped learning, personalized learning, project-based learning, inclusive education, and adaptive learning, depend heavily on digital technologies. Moreover, Sousa, Cruz & Martins (2017) suggest that expanding technology in education prepares students to think critically and solve real-world problems, collaborate successfully, communicate effectively, and have more independence in the learning process.

Digital education success is mainly dependent on the student's performance: motivation, responsibility, persistence, and self-discipline (Shkil & Belikova 2020). Adopting effective and innovative teaching methods places the learner at the centre of the learning process regardless of whether engagement occurs face-to-face, remotely, or via blended learning modes, creating environments in which students receive the knowledge they need when they need them (Patton & Santos 2018).

Teachers can innovate their teaching methods that improve their classes' motivation, engagement, and efficiency by using digital learning tools. Also, they can provide tailored feedback to individuals regardless of whether they are working with a single student or a large group of students face to face or online (Patton & Santos 2018).

2.1.3 Barriers to the Use of Digital Technologies in Education

Despite the steady growth of digital learning, research shows several ongoing and relatively permanent barriers to more widespread delivery and participation in digital education. Buchanan, Sainter, and Saunders (2013) believe that influencing elements may be classed as either individual or contextual. However, some researchers have suggested categories for barriers or challenges of digital technology integration. Schulz, Isabwe, and Reichert (2015) developed a classification that includes four categories: human factors, such as mentality and belief; intrinsic values, such as degree of interest or satisfaction; tool-specific requirements, such as teaching methods; all of these aspects are controlled by environmental factors.

By conducting an in-depth qualitative review of e-learning literature from 1990 to 2016, Ali, Uppal & Gulliver (2018) found that most digital learning barriers can be thematically divided into three main categories: Technological, Instructional, and Individual. They proposed the TIPEC framework (Figure 3) to structure the literature on e-learning implementation barriers.

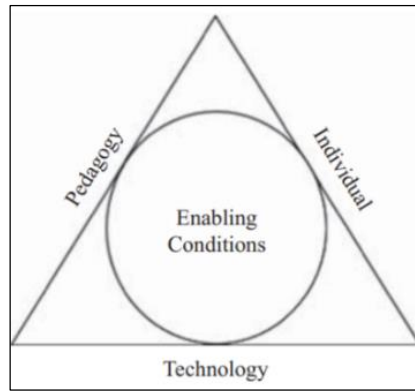


Figure 3: Digital learning barriers (Ali, Uppal & Gulliver 2018)

The Technological barriers include the lack of technology infrastructures, such as network capabilities, the lack of technical support, bandwidth and connections, un-friendly software and platform, low quality of digital devices and cybersecurity issues. On the other hand, the instructional category includes challenges for teachers and facilitators to create high-quality, practical, engaging and interactive educational content and material, such as teachers' digital proficiency levels and a lack of training and support. The review also noted the lack of student engagement and weak learner retention as individual barriers to successful adoption and implementation. (Ali, Uppal & Gulliver 2018)

Another literature review conducted by Choudhury & Pattnaik (2020) evaluated the benefits, drawbacks, challenges, essential success factors and methods to integrate digital learning from a stakeholder's perspective. The review identified different key challenges depending on the kind of stakeholder (individual learners, providers, practitioners, employers, and so on). Learning customization and flexibility were cited as the main advantages. On the other hand, autonomy and customization were cited as significant success elements. Thus, learning efficacy is dependent mainly on an interactive, tailored course that improves learners' choices.

2.1.4 Distance Learning

Distance learning has a long history (Sumnar 2000); the earliest attempts at distance learning were undertaken during the nineteenth century when print-based course materials were mailed to students. The second generation of distance education combined radio, video, recordings, and Disc multimedia. The Internet is the basis of the third generation of distance learning. The information revolution is credited with the emergence of Internet-based distance learning, where learning materials are accessible in digital forms. Students may even run virtual experiments and simulations (Han 2021). According to UNESCO (2020), The features of all distance learning forms are common, the teacher-learner separation by location or time, or both, also using media and technology to communicate and share knowledge during the learning process. Distance learning is frequently used synonymously with online learning, e-learning, distance education, correspondence education, external studies, flexible learning, and massive open online courses (MOOCs).

2.1.5 Online Learning

Online learning refers to correspondence or distance learning delivered through the Internet. It can be classified as synchronous and asynchronous learning. All learners can learn together and do the same activity simultaneously in synchronous learning, such as through live video conferencing, webinars, or virtual classrooms. In contrast, learners learn separately at different times in asynchronous engagement. Most asynchronous learning environments provide learning materials online as audios, videos, pictures, pre-recorded flipped lessons, graphics, and links to other collaborative spaces or information. Learners can view then participate in online forums as a virtual blackboard, email or chat room (Doucet et al. 2020; Al-Karaki et al. 2021).

Synchronous learning offers various advantages, whether done in person or through technology. It provides a facilitator presence, quick feedback, and peer engagement. Many research has identified the need for quick feedback while learners participate in a learning experience; synchronous learning gives more chances for such feedback, allowing learners to alter skill, information, and performance immediately. In comparison, Asynchronous learning allows learners independence, flexibility, and self-paced learning (Cleveland-Innes & Wilton 2009).

Online learning uses technology to enhance the learning experience and promote a more profound understanding for students through various tools and practices. According to Norman (2016), Online learning is the most revolutionary development in current education. It fundamentally changed the system, created incredible opportunities for everyone seeking to study, and reshaped the way we deliver information to students worldwide. However, Online learning also has disadvantages, including the digital divide, technological limits, a lack of belonging and connections, distractions, and a lack of engagement.

According to some studies, students retain 25-60% more material when learning online than only 8-10% in a classroom; this is primarily due to students' ability to learn faster online, which takes 40-60% less time to study than a traditional classroom environment. Students may learn at their own pace, going back and re-reading, skipping, or accelerating through subjects they see necessary (Li & Lalani 2020). In contrast, Yuhanna, Alexander & Kachik (2020) mentioned some drawbacks to adopting online learning: the difficulty of focusing on a screen for long periods and the increased chance for students to get distracted by social media or other websites. Another disadvantage revealed is that because all students' assignments and exams are completed from home, it's difficult for teachers to find the validity of the work and track the actual progress in students learning.

2.1.6 COVID- 19 Crisis and Digital Transformation in Teaching Methods

The COVID-19 epidemic impacted many facets of our life. It sparked a sudden and rapid shift in digital transformation. Educational systems were clearly affected by this pandemic. Many researchers worldwide have investigated the impact of COVID-19 on accelerating the digital transformation of education (Iivari, Sharma & Ventä-Olkkonen 2020; Banerjee et al. 2021; Kim, First & Kim 2021; Mathew, Abduroof & Gopu 2021; Timokhina 2021; Tregua et al. 2021).

Digital transformation is essential for students to continue learning and receive education even at home in these circumstances (Kim, First & Kim 2021). Governments worldwide have adopted alternate distance-learning strategies to support a decent education, and many efforts have made the transition easier for students and their parents. Students were provided with alternative resources as temporary solutions to begin active learning outside the classroom, including online classroom technologies such as Google Classroom, Zoom, and teacher-led podcasts (Huang et al. 2020).

Despite that emergency online teaching has enabled schools to maintain the learning continuity throughout the forced school closures caused by the COVID-19 pandemic, some research has shown some disadvantages such as the lack of social interaction with classmates and teachers, the lack of technical knowledge required to face this type of teaching, the quality of technological devices and tools (Alawamleh, Al-Twait & Al-Saht 2020).

On the other hand, a large body of studies has been conducted to investigate the challenges facing education and teaching since the beginning of this pandemic (Iivari, Sharma & Ventä-Olkkonen 2020; Mpungose 2020; Bawa'aneh 2021; Kim, First & Kim 2021; Timokhina 2021; Trust & Whalen 2021; Alawamleh, Al-Twait & Al-Saht 2020; Pokhrel & Chhetri 2021).

According to the research, students were impacted differently by the present circumstances based on social factors. Some studies revealed that many developing countries had significant challenges maintaining a stable Internet connection and online access to digital devices. UNESCO identified that certain student groups, such as low-income families, racial or religious minorities, migrants, in risky home situations, in rural regions, or with special needs, may require special consideration and strategies for distance learning during COVID-19. The same issue was mentioned by (Pokhrel & Chhetri 2021). Indeed, the digital divide problem was evident, and it was the primary obstacle to students' successful e-learning (Mpungose 2020). Not every student has the chance to participate in their digitalized primary education (Timokhina 2021).

The quick and unplanned move to digital learning in many countries induced by the pandemic has also revealed the absence of facilitators' training and readiness to deliver digital education in many institutions. While some teachers responded to COVID-19's difficult situation with resilience and innovation, others struggled (Timokhina 2021). Trust & Whalen (2021) investigated the K-12 teachers' experiences and challenges with emergency distance learning. They found that the most challenging part of emergency distance learning for teachers is utilizing technology, including finding suitable teaching technologies and troubleshooting digital tools and applications. Pokhrel & Chhetri (2021) pointed out that pedagogy available for face-to-face learning is not feasible for online learning that depends on technology, and one of the teachers' main challenges became students' motivation and engagement. According to Miao et al. (2020), teachers should design flexible learning activities and provide feedback to their students who can progress at their own pace; provide learners with opportunities to stay connected with peers and learn through communication, collaboration, and discussion while staying motivated and engaged. In addition, teachers should design differentiated learning activities for students and select which resources and digital tools will best benefit their students and pedagogical practice (Doucet et al. 2020).

Another challenge that faced online learning during this pandemic, as mentioned by (Pokhrel & Chhetri 2021), is that students with special needs or mobility limitations require more assistance and direction. Many caregivers and parents at home cannot provide these demands, obstructing this group's learning. Therefore, time and money must be invested to research the best options for these students' particular educational requirements.

According to (UNESCO 2020), Distance learning strategies' effectiveness is dependent on varying levels of preparedness. These include technological readiness, curriculum and supporting content readiness, pedagogical and home-based learning assistance, and the enthusiasm for evaluation and monitoring systems. Another factor is teacher readiness; teachers are responsible for designing and facilitating learning activities, monitoring, and evaluating students' home-based distance learning processes, adjusting their learning management accordingly, and assessing students' achievement and learning outcomes.

In comparison, many recent studies have found that good-quality digital learning is successful as traditional face to face learning, with little or no significant difference in students' performance. Teachers who have embraced e-learning are investigating the many capacities of having the technology to automate specific tasks. Homework and learning activities may now be scheduled for later release, while assignments due can be tracked. Teachers may quickly save all of their student's work in a database for convenient access, and students can keep track of their progress (Koet & Abdul Aziz 2021). Furthermore, Online learning has consumed less time than traditional classroom learning because learners have the option to study at their own pace. In such settings, the learning becomes more flexible, democratic, open, and accessible, independent of the student's location (Efremova & Huseynova 2021). Moreover, the students will have self-motivation and develop independent learning behaviour, which will benefit them later in life.

Regarding the studies on UAE education during this pandemic, Bawa'aneh (2021) investigated students' satisfaction, attitudes, and challenges in UAE public schools after eight weeks of distance learning. The findings indicated high satisfaction, a positive attitude, and few challenges experienced. According to Bawa'aneh (2021), the rich and pre-well-established educational plans with a continuous development plan for students and teachers to use the latest educational technologies have been reflected in the study results.

2.1.7 The Future of Education Post COVID- 19

There is no doubt that digital technology will continue to change how we live and work after this pandemic. Banerjee et al. (2021) stress that new digital technologies will have a significant and long-term impact on work outcomes and experiences for people across the board over the next five years. Advanced technologies allow us to plan or manage anything at any moment and continue our education in any scenario (Banerjee et al. 2021).

Some researchers found online and digital learning as the new normal, and we must adapt to it regardless of the learning methods (Kim, First & Kim 2021). Espino-Díaz et al. (2020) believe that online learning through ICT has stopped being an option in the teaching methodology and has become a need to continue the student learning process, as Malkawi, Bawaneh & Bawa'aneh (2021) noted. They also suggested that learning enhancements should be made constantly based on feedback from teachers and students regarding the advantages and disadvantages of online learning until the desired student satisfaction level is achieved.

Doucet et al. (2020) believe that crises drive innovations; with the available educational tools and proper professional development, teachers will transit to a mixed teaching approach. Banerjee et al. (2021) also noted that converting the traditional classes to digital classes on short

notice was difficult, but this served as a lesson in how rapidly things can adapt. Simultaneously, Shkil & Belikova (2020) saw the temporary conversion of the educational system to distance learning as a test of educational institutions' abilities to design and implement the educational process using current innovative technology. Malkawi, Bawaneh & Bawa'aneh (2021) also agreed that COVID- 19 crisis inspires us to try new things and develop unique and novel ways to enhance our learning experiences.

UNESCO (2020) concluded that the efforts that had been taken to ensure distance learning's success during COVID- 19 would establish the framework for more technologically enhanced pedagogical innovations, more flexible and adaptable learning environments, and a more dynamic education system. Arthur D. Little has created a framework for a long-term, sustainable transition to digital learning. This framework is shown below (Figure 4) and addresses specific governance, culture, pedagogy, and infrastructure/technology (Lasku, Khoury & Gustavsson 2021).

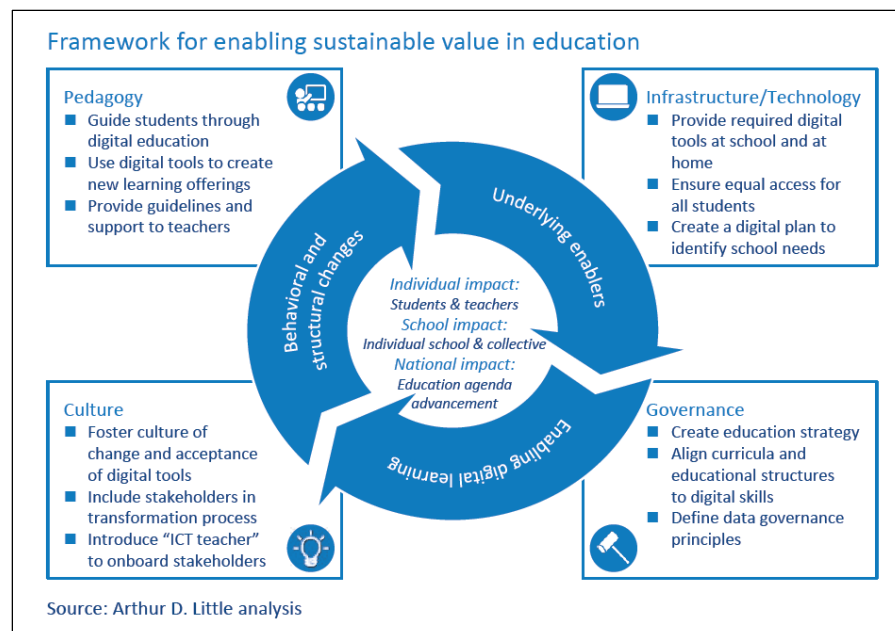


Figure 4: Enabling sustainable digital learning (Lasku, Khoury & Gustavsson 2021)

2.2 Theoretical Framework

2.2.1 Connectivity Theory

Behaviourism, Cognitivism, and Constructivism are the most common learning theories used to develop instructional environments. The core principle of these learning theories is that learning occurs inside the individual while ignoring learning outside of individuals, such as learning stored and modified by technology (Siemens 2005). Furthermore, these theories were developed for face-to-face education in schools when technology had almost no influence on learning. There was no reason to transform education into a distance model (del Valle García Carreño 2014). On the other hand, learning theories are concerned with the process of learning rather than with the value of what is taught. In a networked environment, how we get information is worth investigating.

For all the previous, Siemens (2005) raised the need for a theory to guide the production of learning resources for the networked world in the digital age. Connectivism theory was introduced in 2005 by George Siemens and Stephen Downes (Siemens & Downes, 2009) for the digital age. It sheds light on the learning abilities and tasks required for learners to thrive in the digital age where individuals learn and work in a networked environment (Siemens 2005).

Connectivism seeks to describe the learning inside the digital environment where knowledge is shared through a network of connections and learners build relationships with other learners and even digital sources such as Wikis, websites, forms and data clouds (del Valle García Carreño 2014). It is considered a reflection of our fast-changing society while society is becoming increasingly complicated, socially connected, global, and influenced by technological improvements (Sîrghea 2020).

Within the context of Connectivism, online learning promotes critical thinking and problem-solving activities that support large amounts of data (Ghofrani & Hollister, 2011). According to (Sîrghea 2020), every learning theory contributes to the design of online learning in some way, based on their beliefs about how learning occurs: Behavioral strategies focus on facts and what is required to grasp knowledge, Cognitive strategies concentrate on how to implement particular processes for successful learning, but constructivist approaches leverage the transfer to real-life application, where the pupil is, having the ability to generate personal meanings from what is taught. In contrast, Connectivism can serve as an essential instructional tool in developing previous learning theories in a connected and networked environment.

The current study is based on the Connectivism theory and focuses on the digital transformation in Abu Dhabi private schools during COVID- 19 and how this transformation and using technology tools affect teaching methods.

2.2.2 TPACK Model

The TPACK is a technology integration framework that identifies three types of knowledge that teachers must combine to integrate EdTech successfully: Content, Pedagogy, and Technology (Utama et al. 2019). This framework is built on Lee Shulman's pedagogical content knowledge (PCK) construct to include technology knowledge and describe how educators' understanding of educational technologies and PCK interact to deliver effective technology-enhanced teaching.

Over the years, the concept of TPACK developed through several papers, with the most detailed descriptions of the framework available in Koehler & Mishra (2005) and Koehler & Mishra (2008). As shown in (figure 5), the model consists of three main bodies of knowledge: content, pedagogy, and technology. The interactions between and among these bodies of knowledge,

represented as PCK, TCK, TPK and TPACK, are fundamental to ensuring high-quality instruction. According to Koehler, Mishra & Cain (2013), the interaction of these bodies of knowledge, both theoretically and practically, results in the forms of flexible knowledge required to integrate technology into education successfully.

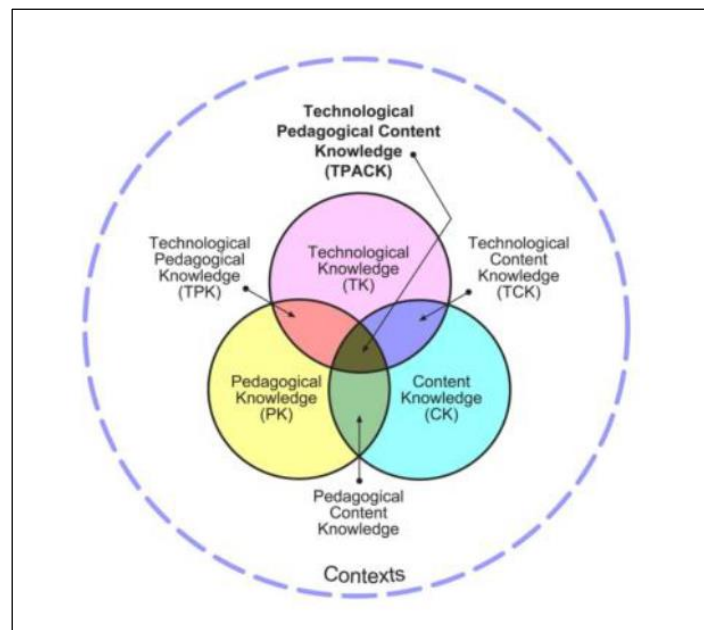


Figure 5: TPACK Model (Koehler & Mishra 2005)

Recently, Kainat et al. (2021) have conducted a study to explore the relationship between the use of the TPACK Model and teaching during COVID-19 at the secondary school level. They found a substantial connection between the use of the TPACK Model and teaching practices during the pandemic. Furthermore, the study results showed that teachers intentionally and unintentionally used the TPACK model. Moreover, the study recommended that a teacher training program be implemented to increase teachers' technology to manage technology, content, and pedagogical knowledge during the crisis. The TPACK model is a significant model for adopting technology in teaching. In practice, the teacher must be able to combine material and pedagogical knowledge with technical knowledge to generate pedagogically meaningful and high-quality digital learning.

2.2.3 SAMR Model

Dr Ruben Puentedura (2006) created the SAMR model to describe integrating technology in a learning environment to assist educators in designing and developing technology-based learning that will alter and improve students' learning experiences. SAMR model is a four-level framework: Substitution, Augmentation, Modification, and Redefinition; Substitution provides direct use of technology with no changes, Augmentation level offers the use of technology with functional changes, Modification level provides effective use of technology with re-design and usage of technology and Redefinition level provides creation with totally new activities previously inconceivable using technology.

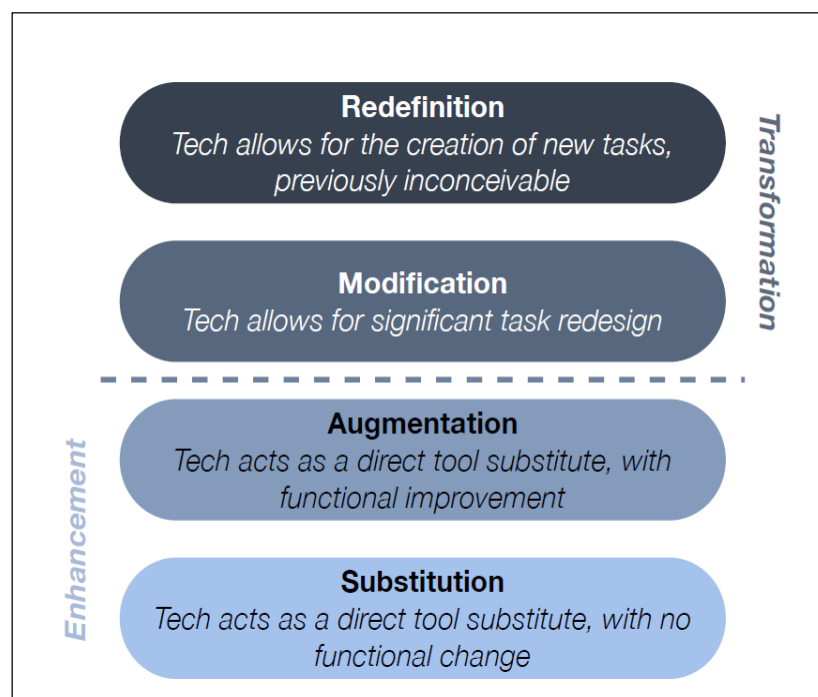


Figure 6: SAMR Model by Dr. Ruben Puentedura (2006)

According to Kristina et al. (2019), the SAMR model is a reflective tool that helps educators self-reflect and adapt their teaching practices via instructional technology. SAMR can also be used to enable teachers to 'move up' from lower to higher levels of teaching with technology,

leading to enhanced levels of teaching and learning (Hamilton et al. 2016). This model identifies the use of technology as Bloom's Taxonomy categorizes teaching and learning activities and demonstrates how to develop and assign different classroom activities and how each activity may support various learning styles and enhance students' learning.

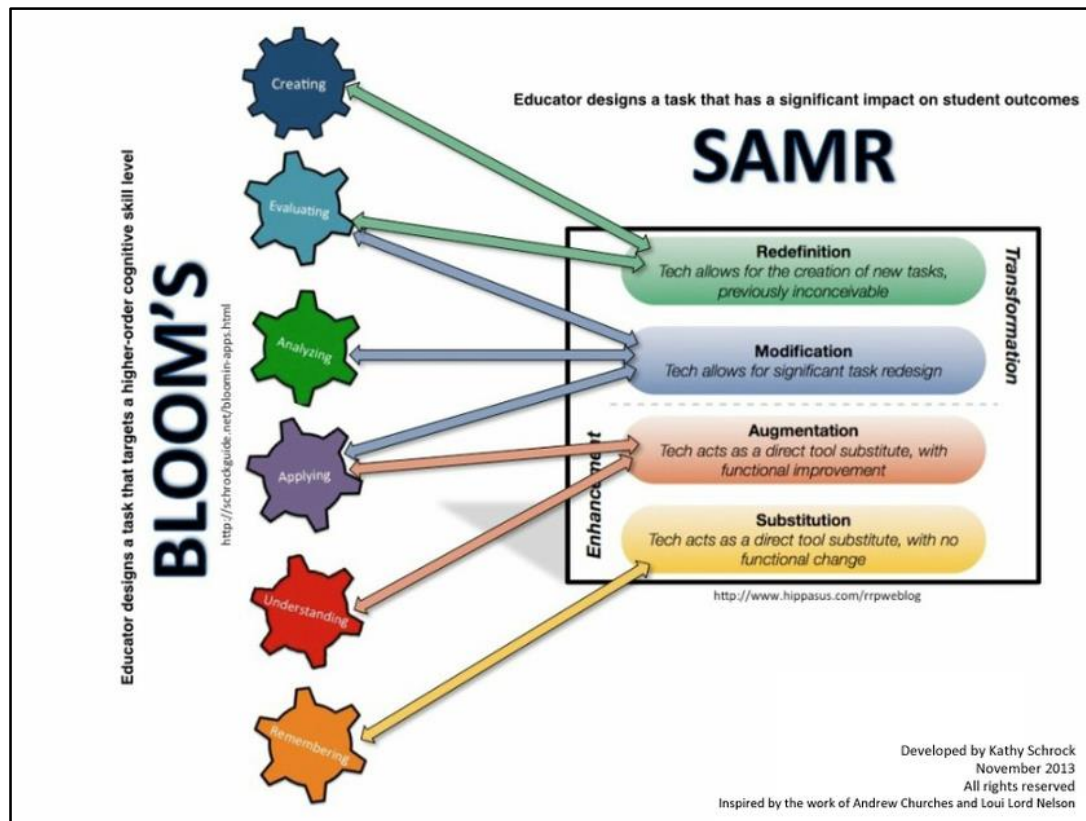


Figure 7: SAMR model & Bloom's Taxonomy

Chapter3: Methodology

3.1 Overview

This chapter describes the research design, sampling process, the research methodology and paradigm, and details related to the data collection tools and data analysis. This chapter also discusses the ethical consideration and the validity and reliability of the study, including key assumptions and challenges related to the data collection and analysis.

3.2 Research design

The research adopts a Pragmatism Paradigm and utilizes a mixed-method approach (MMR) to answer the research questions and fulfil its purpose. The researcher employed an online questionnaire to collect the quantitative data and semi-structured interviews to collect the qualitative data.

Mixed methods research is defined as an “approach to an inquiry involving collecting both qualitative and quantitative data, integrating the two forms of data, and using distinct designs that may involve philosophical assumptions and theoretical frameworks” (Creswell 2014). According to pragmatism, a mixture of quantitative and qualitative methods provides a clear understanding of the problem and improves the results' validity (Johnson & Christensen 2014). Additionally, Triangulation or combining several data sources to analyze the problem from various perspectives aims to provide a comprehensive understanding of the study problem than using one method alone while maximizing the benefits and minimizing each approach's weaknesses (Creswell 2014).

3.4 Research questions

A strong mixed methods study starts with a strong research question, and the study's objective shapes research questions that form the methodology and research design (Clark 2007). According to Cohen, Manion & Morrison (2018), the research questions must produce data that provides sufficient evidence to fulfil the research purposes and objectives and make conclusions. Researchers must ensure that the aims and objectives of the research are aligned with the research questions.

While the study investigates the impact of the digital transformation in Abu Dhabi K-12 private schools during COVID19 on the teaching methods, explores teachers' perspectives on digital learning as the new normal in education and schools leaders' perceptions on the future of education post-COVID-19, the primary study questions are:

Q1: How did digital transformation affect the teaching methods in Abu Dhabi private schools during the COVID-19 pandemic?

Q2: What teaching methods and strategies are adopted to keep students engaged during and after distance learning?

Q3: What are teachers' perspectives on digital learning as the new normal?

Q4: What are schools leaders' perceptions on the future of education post-COVID-19?

3.5 Sampling

Non-probability convenience sampling fits the quantitative data collection purpose in this MMR study. Convenience sampling, also known as accidental or opportunity sampling, selects the nearest participants from those who chance to be available and accessible at the time. The participants in the online questionnaire are forty-six teachers who teach in Abu Dhabi private schools that are readily accessible and willing to participate. Vulnerable populations such as students or teachers are frequently used as respondents based on convenience sampling (Cohen, Manion & Morrison 2018).

In contrast, non-probability purposive sampling was utilized in the interviews stage. The primary goal of a purposive sample is to establish a sample that can be assumed to be representative of the majority while emphasizing the characteristics of the population that are essential to the researcher's field of interest (Lavrakas 2008). Purposive sampling means that the sample is 'hand-picked' for the study based on their relevance to the investigated issue or their knowledge and experience about the topic. According to (Denscombe 2014), this sampling method is used when the researcher knows about the specific participants and chooses them to provide the most valuable data (Denscombe 2014). Therefore, the participants in the interview are one school's principal, one HoD and two subject coordinators from different Abu Dhabi private schools who have long experience in the education field and have a primary leadership positions.

3.6 Data Collection Instruments

The study has undertaken the (MMR) approach to answer the research questions and fulfil its purpose. The researcher employed an online questionnaire to collect the quantitative data and semi-structured interviews to collect the qualitative data.

3.6.1 Questionnaire

The online questionnaire was conducted through the google forms online platform. According to Cohen, Manion & Morrison (2011), the benefits of online surveys include reducing the cost and time required for distribution, data collection, and processing and providing access to a much broader and more diverse population. On the other hand, participants can complete the questionnaire anytime and anywhere. Furthermore, internet surveys could be more attractive than paper-based surveys using images, fonts, colours, and other design elements. The teachers' questionnaire (Appendix 2) had 15 questions, divided into five sections as described below and shown in (figure 8):

Introduction: The introduction declares the topic and the purpose of the study. The introduction states that the questionnaire's responses are anonymous as no personal data is requested, participation is voluntary, and there are no anticipated risks to participating in this study.

Teacher's Experience: This section includes questions about teachers' experiences, curriculum, subject, and grades they teach.

Technology Integration before and post-COVID-19: This section provides answers to the first research question (How did digital transformation affect the teaching methods in Abu Dhabi private schools during the COVID-19 pandemic?) by discussing and comparing the technology integration and digital tools utilization in the classroom activities before and after the pandemic.

Digital Transformation and Teaching Methods: This section answers the second research question (What teaching methods and strategies are adopted to keep students engaged during and after distance learning?) by exploring the different teaching methods and classroom strategies teachers use to deliver content and assess students understanding and assign homework.

Teachers' perspectives on digital learning tools: In this section, teachers answer the third research question (What are teachers' perspectives on digital learning as the new normal?) by sharing their point of views on 12 statements regarding digital learning.

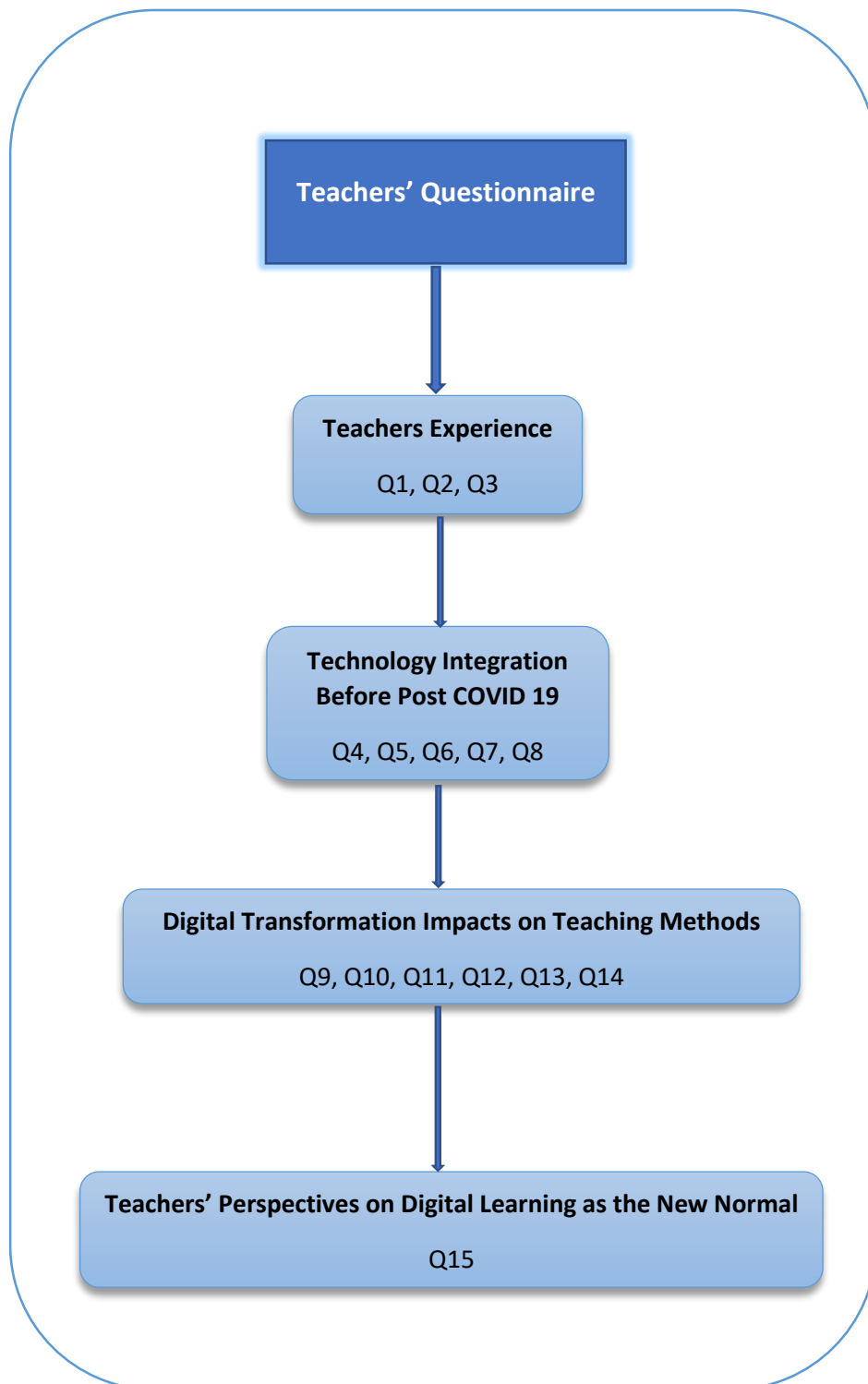


Figure 8: Teachers' Questionnaire breakdown

3.6.2 Interviews

According to Ryan et al. (2009), the interview is one of the most widely used methods in qualitative research. It involves a social interaction in the form of a conversation between the interviewer and the participant to obtain unquantifiable data such as participants' perceptions and experiences, contributing to a comprehensive data collection. The primary purpose of the interviews is to understand the phenomenon by fostering an open dialogue with the participants (Dörnyei 2007). The Interviews provide comprehensive data based on individuals' experiences and perspectives on a specific topic.

One-on-one semi-structured interviews (SSI) were employed to collect the qualitative data for the study. The (SSI) is a qualitative research approach to elicit subjective reactions from participants about a specific context or phenomenon (McIntosh & Morse 2015). The topic and questions are given in this type of interview. Still, the wording and sequencing of the questions may be adapted to each interviewee depending on their responses (Cohen, Manion & Morrison 2018). The nature of open-ended interview questions allows participants to offer as much detailed information as they like while simultaneously allowing the researcher to ask probing questions (Turner 2010).

The interviews allow participants to engage directly and share their experiences, feelings, and thoughts about the digital transformation during COVID19 and its impact on teaching methods and teachers' roles. It also explores their perspectives as school leaders on the future of education after COVID-19. Therefore, semi-structured interviews were conducted with one school's principal, one HoD and two subject coordinators from different Abu Dhabi private schools who have long experience in the education field and have primary leadership positions in their schools. The semi-structured interviews included four core open-ended questions (Appendix 4)

to help understand the research problem and answer research questions Q1, Q2 and Q4. Before the interview, an online participant consent form was sent to the participants (Appendix 3).

3.7 Validity and Reliability

Instruments chosen for data collection in any research design must pass validity and reliability tests to be considered suitable measures (Dikko 2016). The researcher employed an online questionnaire to collect the quantitative data and semi-structured interviews to collect the qualitative data. Maxwell (2008) mentioned that collecting information from various individuals and settings using multiple methods eliminates the possibility of chance correlations and systematic biases due to a single approach. It allows for a more accurate assessment of the explanations' generality. Denscombe (2014) also claimed that MMR might improve data accuracy and reliability through Triangulation, reduce bias in research, and offer a 'practical, problem-driven approach to research.

Triangulation or combining quantitative and qualitative data improve the research's validity and reliability and the conclusions that can be drawn from it: the accuracy of the research design and its relevance for the study purpose and questions, methodological considerations rigour, compatibility of results and conclusions with the supplied evidence, reasonable and believable inferences drawn and the quality of data synthesis (Cohen, Manion & Morrison 2018).

3.7.1 Validity and Reliability of Survey Data

Belson (1986) states that the validity of surveys (such as face-to-face, mail, telephone, or Internet) may be seen from two perspectives. First, if respondents who complete surveys do so correctly, honestly, and accurately, second, those who do not complete their questionnaires provide the same distribution of responses as those who complete their questionnaires. According to Cohen, Manion & Morrison (2018), the issue of honesty arises as more surveys are conducted online and whether the respondents state the truth about themselves and the topic they respond to. However, the questionnaire's piloting and guarantees of anonymity and non-traceability may avoid such issues (Cohen, Manion & Morrison 2018). Therefore, the questionnaire in the study is considered a reliable data collection tool that may encourage honesty because of its anonymity. On the other hand, a pilot survey was used to test and refine the questionnaire questions.

3.7.2 Validity and Reliability of Interview Data

Interviews are frequently combined with other data collecting techniques to provide the researcher with a well-rounded collection of information (Turner 2010). In the case of face-to-face interviews, direct interaction at the interview implies that data can be verified for accuracy and relevance as it is collected (Denscombe 2014). However, a practical way to enhance interview validity is to reduce bias as feasible. Bias can be introduced through the interviewer's and respondent's attributes and the substantive nature of the questions (Cohen, Manion & Morrison 2018). Researcher bias influences the interview may include the interviewer's attitudes, opinions, and expectations as the interviewer's tendency to seek answers that match her predetermined beliefs or theory (Maxwell 2008). McNamara (2008) makes many suggestions

for creating good research questions for interviews. Questions should be as neutral as possible to avoid judgmental wording that might influence answers and should be worded clearly.

In the same context, Jacob & Furgerson (2012) advised conducting interviews by choosing a suitable location for the interview where a good recording can be produced with no distractions. Also, collecting the consent form from the participants at the beginning of the interview gives them plenty of time to read the form and ask any questions about consent. Moreover, Jacob & Furgerson (2012) also indicated that building a good connection and trust with the participants may encourage better responses and honesty. For that, the interviewer should begin with a social conversation to establish positive relationships with the participants. Also, the interviewer should arrange the questions in ascending order of difficulty, starting with the easiest and ending with the most difficult, to gradually instil confidence and trust in the interviewee. The sources of validity and reliability issues mentioned previously were carefully evaluated while interviewing the participants to improve the validity and reliability of the interview data. On the other hand, pilot interviews were conducted to evaluate the interview questions.

3.7.3 Pilot Survey and Interview

Many researchers have emphasized the importance of conducting a pilot study as fundamental to any research because it detects potential flaws in the measurement instrument (Teijlingen & Hundley, 2001). Calitz (2009) believes that a pilot test of questions helps identify unclear or ambiguous statements in the research protocol, while Van Wijk and Harrison (2013) indicate that the pilot studies can add value and credibility to the entire research project. Dikko (2016) states that “The term ‘pilot studies’ refers to mini versions of a full-scale study (also called ‘feasibility’ studies) and the specific pre-testing of a particular research instrument such as a questionnaire or interview schedule”.

A pilot survey is used to test and refine the questionnaire using a smaller sample size than the intended sample to determine whether the survey successfully meets the study's objectives or not (Sincero 2012). According to Dillman et al. (2014), the primary purpose of piloting the questionnaire is to improve the questionnaire reliability, validity, and practicability. It is crucial to ensure the clarity of the questionnaire items, instructions, and layout; to detect any misunderstood or incomplete objects; to remove ambiguity or difficulty in wording; and verify the intended audience's readability levels (Cohen, Manion & Morrison 2018). Given the significance of the pilot study, an online pilot survey was sent to three teachers from different private schools teaching various subjects. The initial survey piloting revealed the uncertainty of two questions that use technical terms. These questions were modified and clarified later using straightforward wording, making all the questionnaire questions easy to understand.

In the interview data collection phase, the pilot study determines how effectively the interview method operates by identifying potential problems and areas that may need to be adjusted. Pilot interviews help to highlight ambiguities of complex and unneeded questions. It allows the researcher to practice and perfect the interviewing techniques (Berg 2001). Also, it helps to determine whether each question produced a sufficient response and whether responses are correctly interpreted concerning the requested information. Moreover, issues such as inadequate recording and response rates can be identified to implement preventative steps or safety nets (Edwin R. & Venora 2001).

Pilot interviews were conducted with two participants that were chosen using purposive sampling and their willingness to participate. According to (Turner 2010), the participants should have the same criteria as feasible for the set of participants for the main study. Following the initial reviews, the questions of the interview were evaluated in the pilot test, and the researcher utilized

probing inquiries to explore the participants' points of view that needed clarification. One question was changed, and one question was added to the interview questions.

3.8 Data analysis

3.8.1 Quantitative Data analysis

The gathered data from the questionnaire were analyzed using Google Sheets. The mean and standard deviation were calculated and used to explain the survey's results. In addition, Google Forms provided frequencies, percentages, and visual charts, which helped in data analysis.

3.8.2 Qualitative Data analysis

Thematic Analysis (TA) method was used in the study to analyze the semi-structured interview because it is a simple, flexible, and widely popular approach for analyzing qualitative data (Kiger & Varpio 2020). TA was initially developed by Virginia Braun and Victoria Clarke for psychology research. According to Braun & Clarke (2006), Thematic analysis is a qualitative data analysis method that involves searching across a data collection to detect, analyze, and report on repetition.

The purpose of thematic analysis is to find themes or relevant or intriguing patterns in data. A robust thematic analysis does more than merely summarize the data; it analyzes and makes meaning of it (Maguire & Delahunt 2017). TA is suitable for many research interests and theoretical perspectives. It could be used to analyze a wide range of data, such as media transcripts of focus group discussions or interviews. Also, it could be used to analyze a wide

range of research questions, such as exploring people's perspectives or discovering particular phenomena in particular contexts (Clarke & Braun 2013).

3.8.3 MM Data Analysis

A convergent parallel mixed methods approach has been followed to analyze quantitative and qualitative data together to provide a comprehensive picture of the research problem. A convergent parallel design enables the researcher to conduct the quantitative and qualitative data concurrently at the same phase of the research process, weigh the methods equally, analyze the two components independently, and finally combine the findings to provide an overall interpretation (Creswell & Clark 2007). Similarly, Cohen, Manion & Morrison (2018) stated that quantitative and qualitative data are collected and analyzed separately, seeking similarity, difference, and complementarity, before being combined.

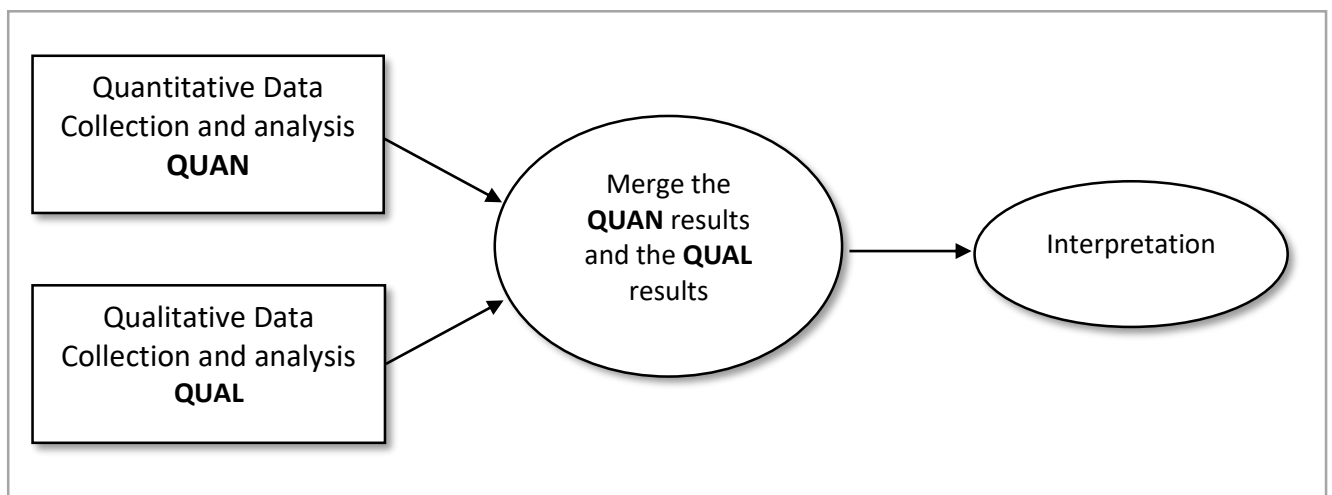


Figure 9: Convergent Parallel Mixed Methods, Adapted from Creswell (2014)

3.9 Ethical considerations

Creswell & Clark (2007) emphasize ensuring that the research design respects the ethical considerations of participants. In internet surveys, informed consent, anonymity, privacy and confidentiality, non-traceability, protection from harm, the precautionary principle, and data security are essential considerations (Hammersley & Traianou 2012). On the other hand, the interview's ethical dimension must be considered, for example, informed consent, confidentiality guarantees, beneficence and non-maleficence. Meanwhile, what counts as data must also be considered in ethics, such as switching off the recorder or the camera if the participant prefers to discuss something 'off the record' (Cohen, Manion & Morrison 2018).

The researcher followed many steps to ensure confidentiality, privacy, and anonymity of data during collection, storage, analysis and publication: All participants were provided with informed consent (Appendix 1) and (Appendix 3), including information about the study's topic, purpose, and institutional approval. Moreover, the online questionnaire did not ask participants for any personal information, including their names and collected only the necessary information after the research topic was provided in the informed consent. In addition, neither the participant ID nor the email address was saved by the Google Forms platform to maintain confidentiality.

3.10 Summery

This chapter began by presenting and describing the research design that discussed the study's questions, participants, and quantitative and qualitative data collection methods. Then, the validity and the reliability of the research instruments were concerned. Next, the data analysis procedures were addressed in detail. Finally, the ethical considerations were highlighted, and the following chapter will present the findings of this study.

Chapter 4: Findings

4.1 Introduction

The findings of the quantitative and qualitative data collection instruments (Teacher's questionnaires and interviews) used to address the study's research objectives are presented in this chapter. The questionnaire was created using Google Forms, and the resulting data were exported to Microsoft Excel for detailed statistical analysis. The mean and standard deviation were calculated and used to explain some results. On the other hand, the qualitative data collection and transcription responses in the semi-structured interviews were analyzed using the thematic analysis technique.

4.2 Finding of the Questionnaire

The teachers' questionnaire (Appendix 2) was developed for this study and included 15 questions divided into five sections to find research questions answers, as shown in (Figure 8).

4.2.1 Teacher's Experience

This section includes questions about teachers' experiences as curriculum, subject, and grades they teach. The questions and the participants' responses are detailed below:

Q1: Which curriculum do you teach?

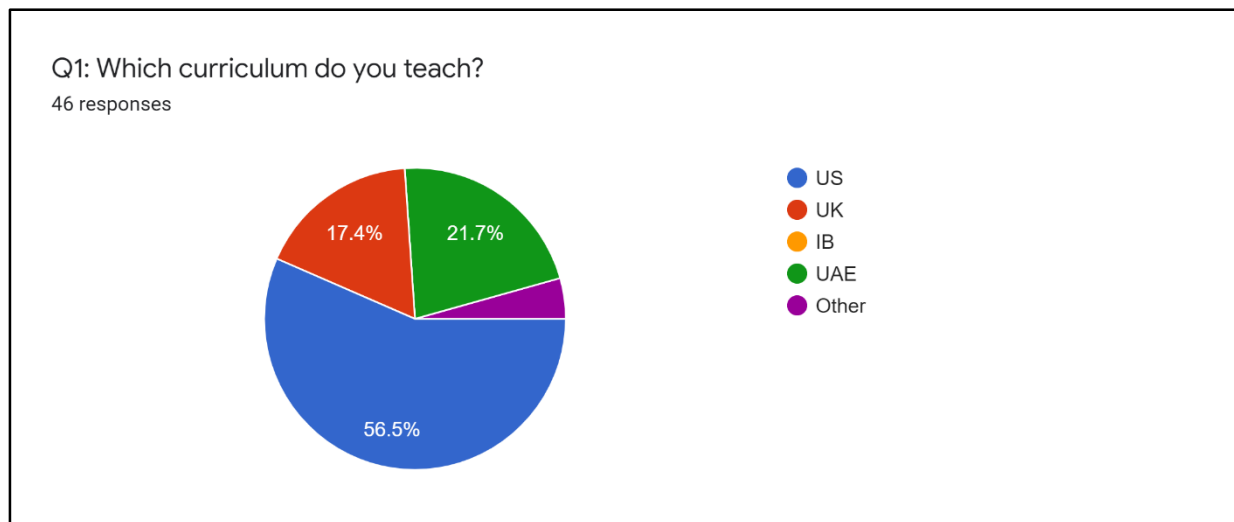


Figure 10: Results of Q1- Participants' Teaching Curriculum

The findings indicate that most participants in the questionnaire (56.5%) work in private schools that follow an American curriculum. In comparison, around (22%) of them are teachers in private schools that follow the UAE curriculum, and around (17%) of teachers from the UK curriculum private schools.

Q2: Which subject do you teach?

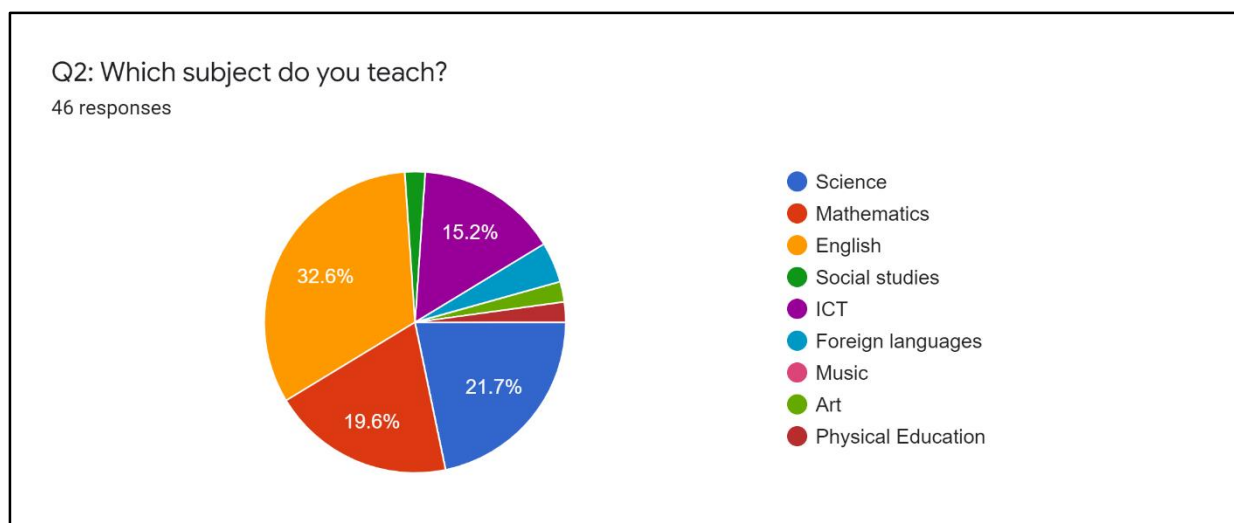


Figure 11: Results of Q2- Participants Teaching Subject

The question result revealed that most of the respondents- around (33%) are English teachers, while approximately (20%) of the participants are mathematics teachers, and about (22%) are science teachers. On the other hand, ICT teachers participated as (15%) of the total participants. While few PE, arts, social studies, and foreign languages teachers participated in the questionnaire.

Q3: Which grade level do you teach?

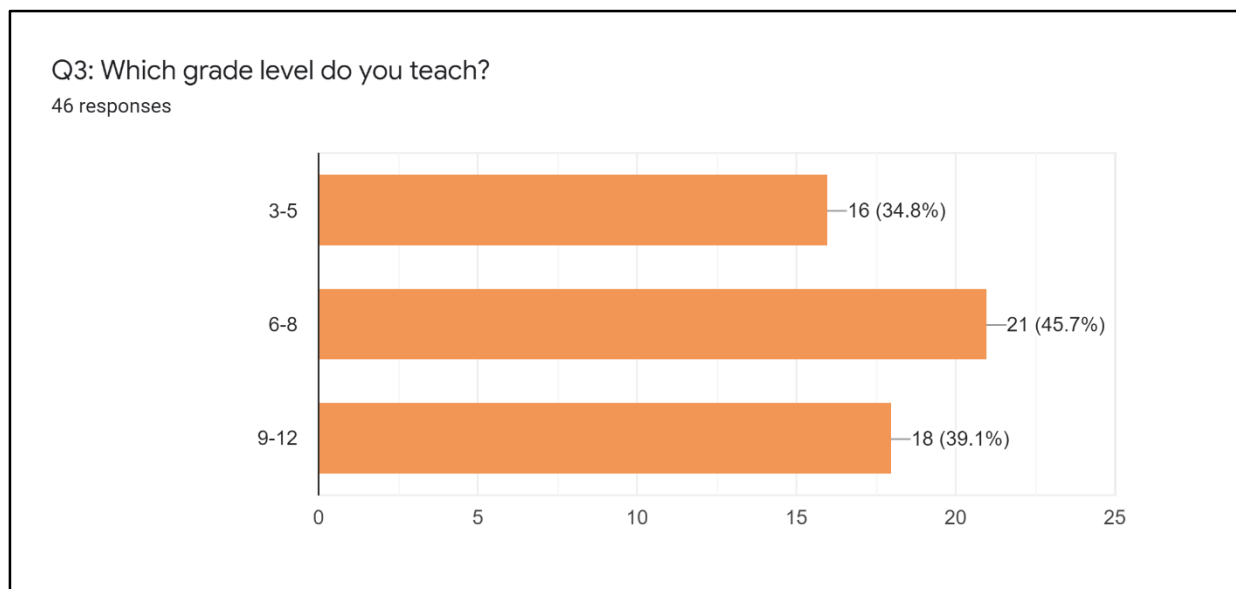


Figure 12: Results of Q3- Participants' Grade Level Teaching

The findings indicate that around (46%) of the participants teach middle school students while around (35%) teach grades 3 to 5, and about (39%) teach high school students.

4.2.2 Technology Integration Before and Post-COVID-19

This section questions try to explore the changes brought by COVID-19 in technology integration by the schools and how teachers employ digital tools during class activities by comparing the situation before and post the pandemic. The findings of these questions are detailed below:

Q4: Did your school has an iPadic classroom policy before COVID-19, where the school provides iPads for students when needed?

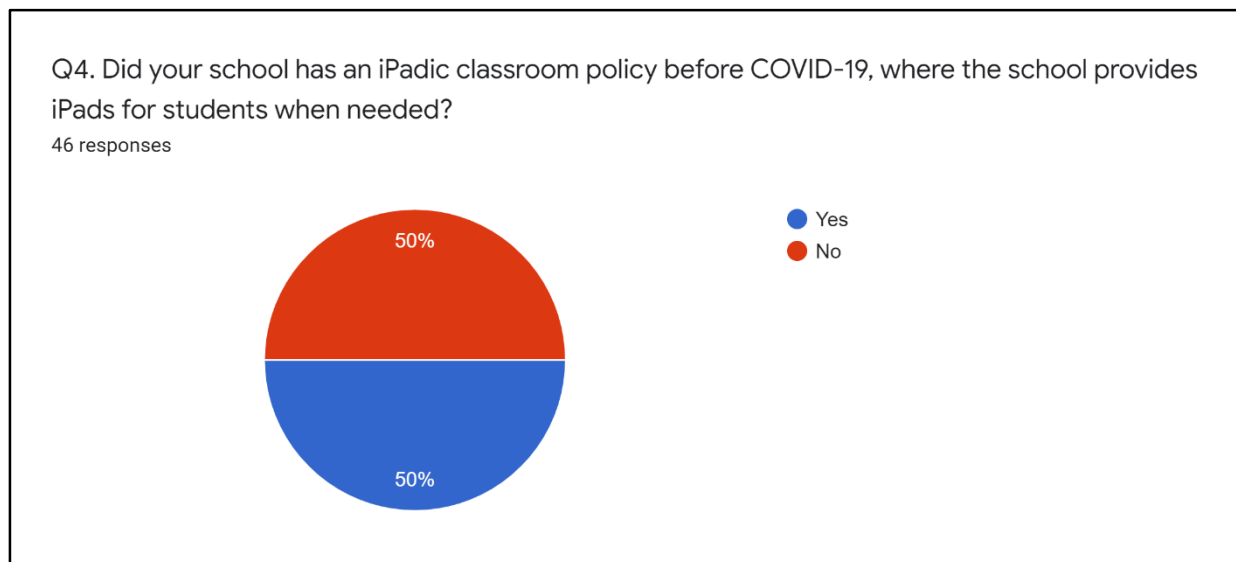


Figure 13: Results of Q4- iPadic classroom policy

The responses to this question show that half of the participants' schools provided iPads for students to use in learning and in-class activities before COVID-19. While, the other half of them agreed that their school didn't have this policy.

Q5: Did your school adopt a BYOD policy before COVID-19, where the students bring their own devices to the classroom to learn?

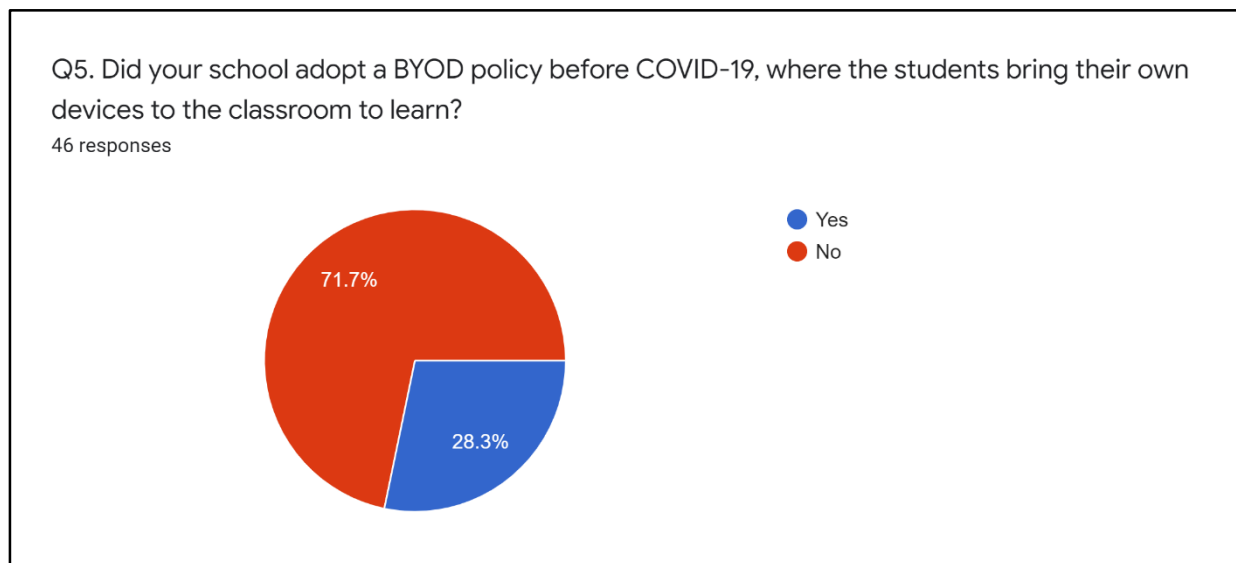


Figure 14: Results of Q5- BYOD policy

Around three-quarters of the participants revealed that their school didn't adopt a BYOD policy before COVID-19, while (28%) work in schools that adopted this policy where the students bring their own devices to the classroom to learn.

Q6: How frequently did students use digital devices for class activities before COVID-19?

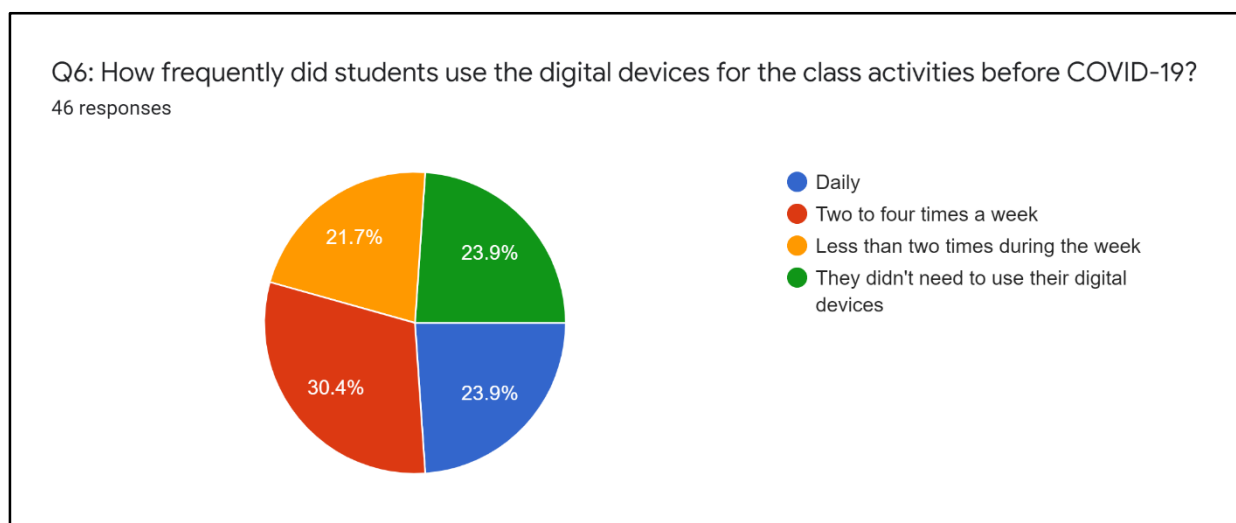


Figure 15: Results of Q6- Using Digital Devices before COVID-19

The teachers' responses to this question demonstrate that students used digital devices for class activities before COVID-19 with different frequencies. About (24%) of the participants revealed that their students didn't need to use any digital devices during class. At the same time, around (30%) of them mentioned that their students used digital devices two to four times a week and about (22%) of teachers said that their students need to use their digital devices less than twice a week. In comparison (24%) of teachers required their students to use digital devices daily to learn and work on class activities before the pandemic.

Q7: How frequently do your students who attend school physically use their digital devices for class activities nowadays?

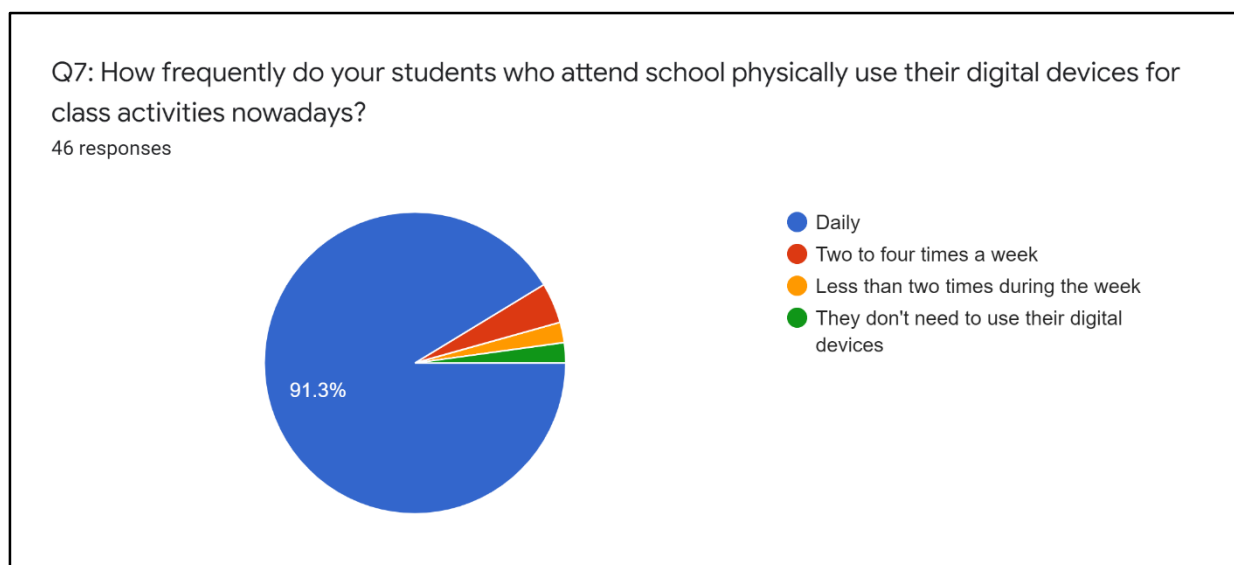


Figure 16: Results of Q7- Using Digital Devices Nowadays

Forty-two teachers, which is equal to (91%) of the total participants, confirmed that their physically attended students nowadays need to use their digital devices daily for class activities. In contrast, two teachers answered that their students use smart devices two to four times weekly. Still, one teacher responded that his/her students use digital devices less than twice a

week. Another teacher stated that his/ her students don't need to use any digital devices to learn and participate in the class activity.

Q8: How would you describe your digital literacy skills before and post the pandemic?

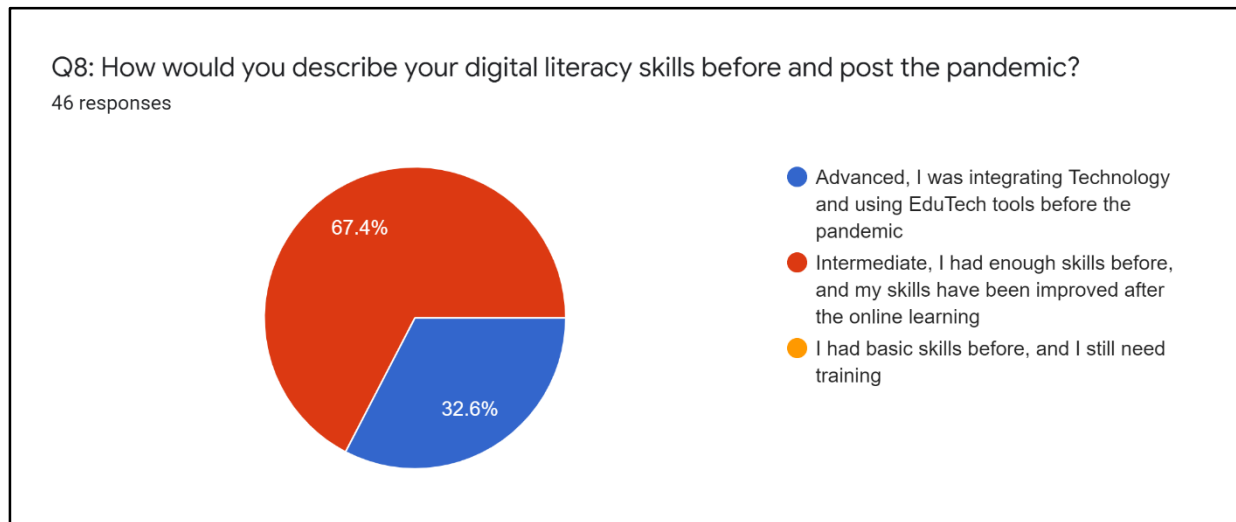


Figure 17: Results of Q8- Teachers' Digital Literacy

Approximately (67%) of the participants stated that they had enough digital skills before the pandemic, and their digital skills have been improved after online learning during the pandemic. The rest of them (33%) stated that they had advanced skills to use and integrate technology even before the pandemic. In comparison, no teacher mentioned the need for training to use the technology tools due to their lack of digital skills.

4.2.3 Digital Transformation and Teaching Methods

Q9: From your point of view as a teacher, to what extent do you think digital transformation during COVID-19 impacted your teaching methods?

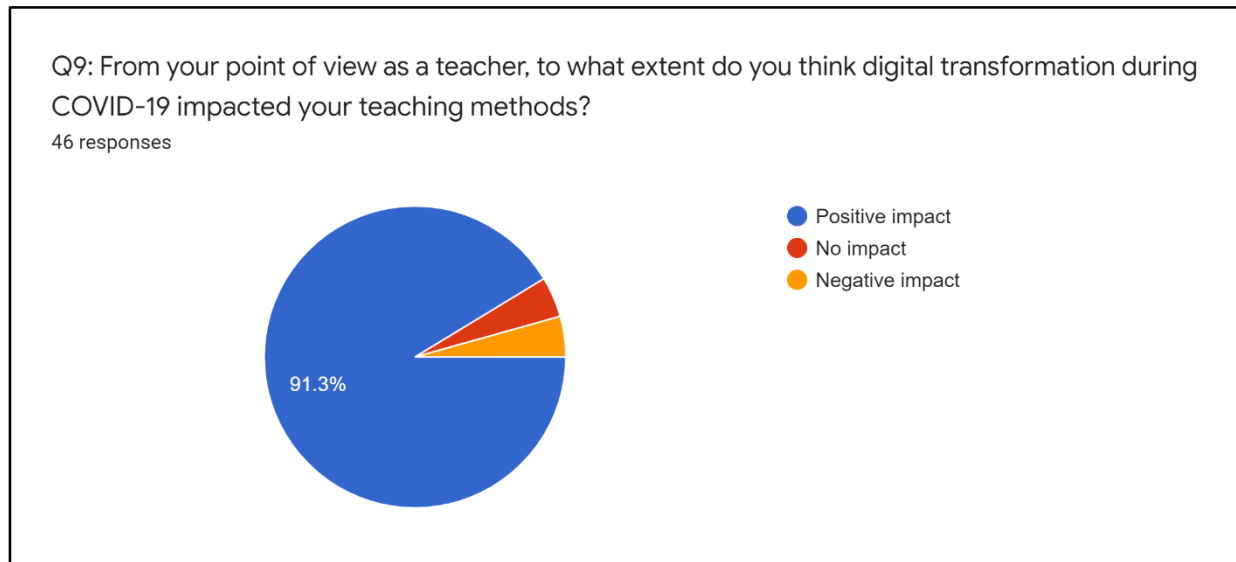


Figure 18: Results of Q9- Using Digital Devices Nowadays

There is a strong indication from this question's findings that the digital transformation during COVID-19 impacted the participants teaching methods positively, where about (91%) of them agreed on that. In contrast, two participants indicated that it had no impact on their teaching methods, and another two participants found that the digital transformation during COVID-19 impacted their teaching methods negatively.

Q10: Do your teaching strategies now depend more on digital devices and Educational Technology (EdTech) tools than before the COVID-19 pandemic?

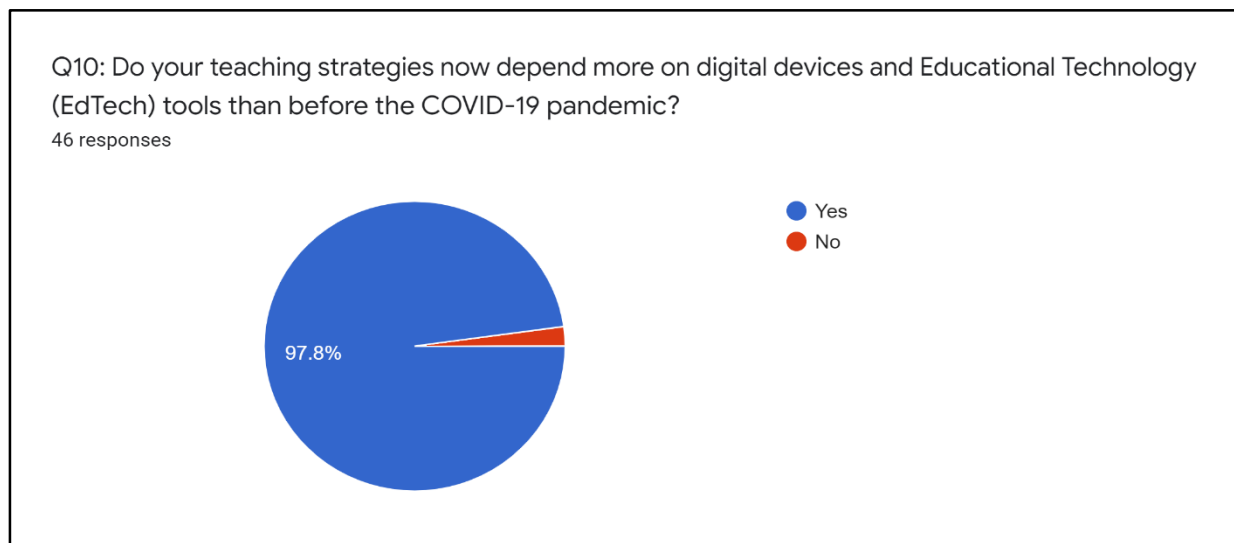


Figure 19: Results of Q10- Teaching Strategies and EdTech Tools

The overwhelming majority of the participants agreed that their teaching strategies now depend more on digital devices and Educational Technology (EdTech) tools than before the COVID-19 pandemic. Forty-five participants' responses were “Yes”, while only one teacher disagreed with that.

Q11: What teaching methods do you use with your face-to-face and online students?

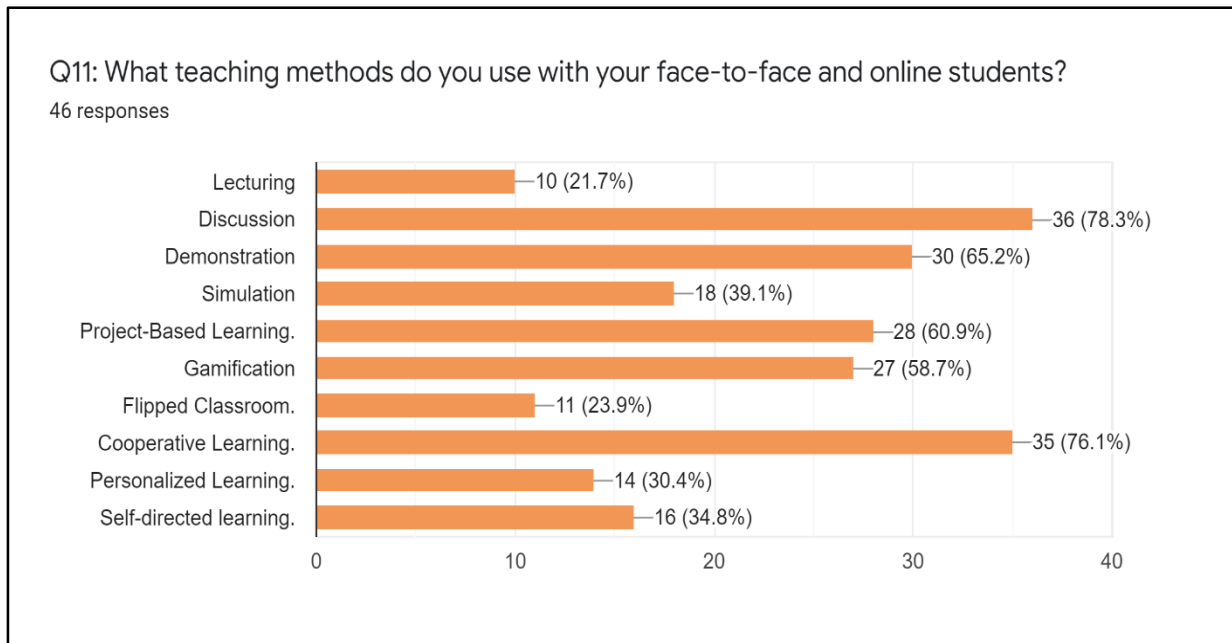


Figure 20: Results of Q11- Teaching Methods

This question discovered teachers' teaching methods with their face-to-face and online students. The responses revealed that more than three-quarters of participants use discussion and cooperative approaches more than other classroom strategies. The findings also revealed that the demonstration method, where teachers show students how to do something by modelling, is the third most popular teaching strategy for teachers, with (65%) of the total responses. Then the project-based learning and the gamification methods came next, with around (60%) of the respondents. Furthermore, the simulation strategy has also been mentioned by around (39%) of the participants. On the other hand, fourteen teachers indicated they utilize personalized, and sixteen teachers adopt self-directed learning with their physical and online students. Finally, lecturing and flipped classroom strategies were the least two teaching methods used by teachers, with less than ten participants for each.

Q12: In the classroom, what do you use to deliver content (explain) your lesson?

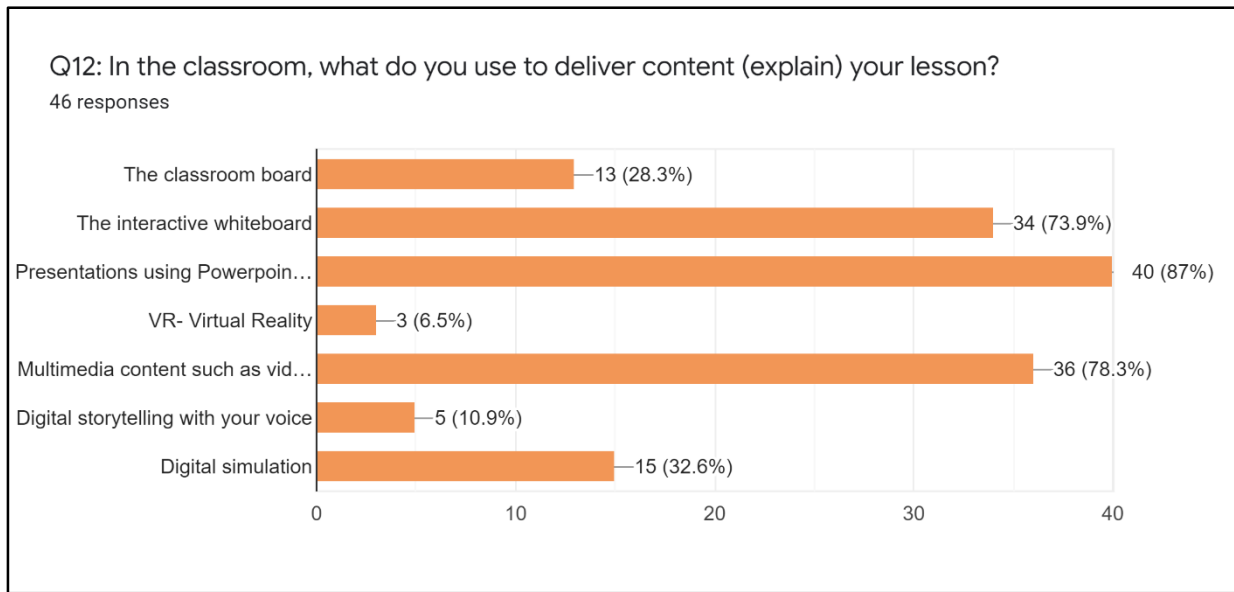


Figure 21: Results of Q12- Deliver Content Methods

The findings of this question show that most of the teachers who participated in the questionnaire (87%) use presentations applications such as PowerPoint, Nearpod, and Prezi to explain their lessons. Around (78%) of teachers revealed that they use multimedia content such as videos and animations to deliver the lesson content. In contrast, about (74%) of them use the interactive or the smart whiteboard in the classroom.

The findings also indicated that fifteen teachers (32.6%) of the sample usually use digital simulation techniques to deliver their lessons. On the other hand, thirteen teachers still use the traditional classroom board to teach their students. In comparison, only five teachers use digital storytelling and explanation recorded with their voices, and only three teachers mentioned VR- Virtual Reality to enhance student learning.

Q13: What do you use to assess your students' understanding during the lesson?

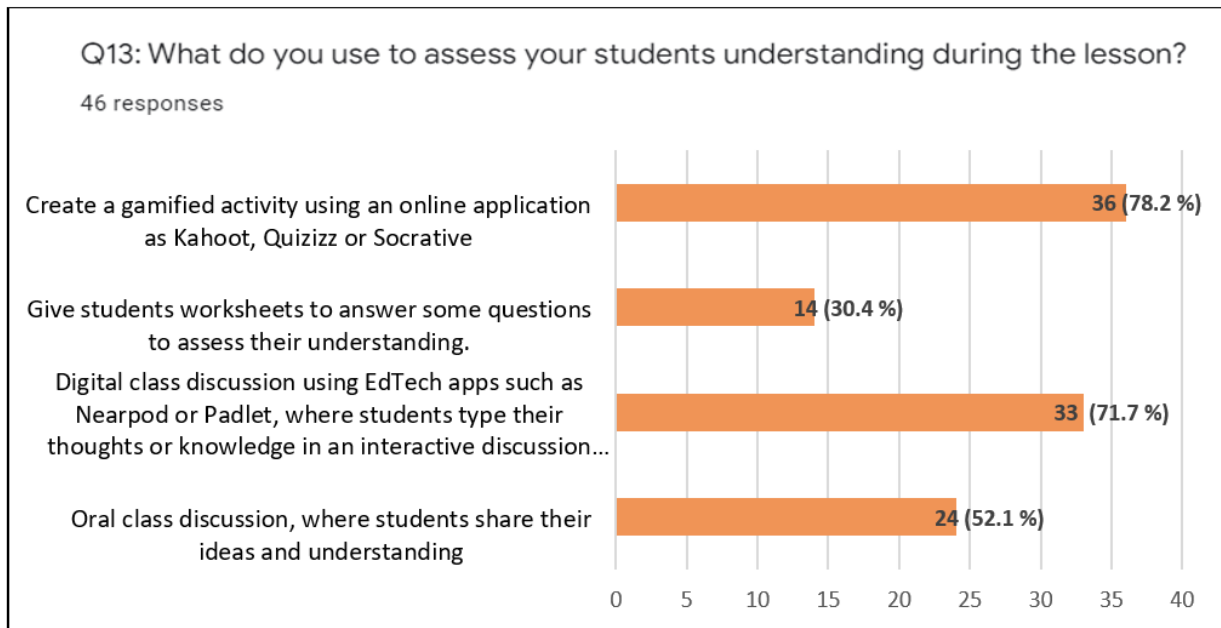


Figure 22: Results of Q13- Assessment Methods

The findings show the formative assessment methods teachers use to assess students' understanding during class time. Around (78%) of participants indicated that they usually create a gamified activity using an online application such as Kahoot, Quizizz or Socrative. In contrast, almost (72%) of the participants mentioned that they prefer to conduct a digital class discussion using EdTech apps such as Nearpod or Padlet. These apps allow students to type their thoughts or knowledge on an interactive discussion board. On the other hand, around half of the participants indicated that they conduct an oral class discussion, where students share their ideas and knowledge, while approximately (30%) of them give students worksheets to answer some questions to assess their understanding.

Q14: How do you assign homework for your students?

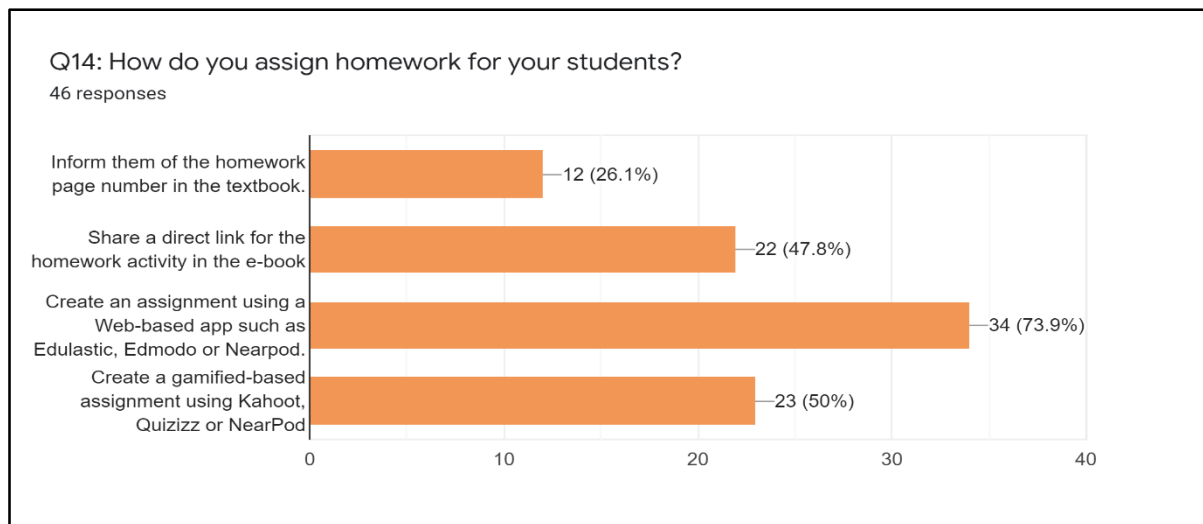


Figure 23: Results of Q14- Assignment Methods

This question discovers the different methods teachers adopt to assign homework to students. The findings show that (68.4%) of the teachers usually create assignments for their students using a web-based app such as Edulastic, Edmodo or Nearpod. While, more than half of the participants (55%) stated that they prefer to create a gamified-based assignment using Kahoot, Quizizz or Nearpod as homework. The third chosen method by eighteen participants was to share a link for the assigned homework activity in the e-book with the students. At the same time, twelve teachers stated that they usually give homework from the textbook and inform the students of the homework page number to answer it at home.

4.2.4 Teachers' perspectives on digital learning tools

Q15: From your point of view, please answer the questions below by selecting: Strongly agree, Agree, Disagree or Strongly Disagree.

The findings of Q15 were analyzed in Table1. A set of twelve items (A1 to A12) allow the teachers to indicate their perception of digital learning, as shown in Table1. On the other hand, Table 2 displays the distribution count, and the stacked bar chart in Figure 24 shows a variable spread across the options.

The descriptive statistics show the highest scored mean = 3.59 for A6: “Digital learning supports innovative learning methods such as flipped classrooms, project-based learning, and personalized learning” and (SD 3.10). The lowest scoring mean (2.89) is computed for Item A11:” Using digital learning tools could foster cheating in class and on assignments” and (SD 2.46).

For Item A1: “Digital learning tools save teachers time when planning and creating lesson activities”, there was slightly more variety in responses; fifteen teachers strongly agreed with this statement, twenty-two teachers agreed, while nine teachers disagreed. In contrast, only one teacher disagreed with A2: “Digital learning tools support creating interactive lessons to motivate and engage students.”

The findings also show that the most strongly agreed statement by the participants is “Digital learning supports innovative learning methods such as flipped classrooms, project-based learning, and personalized learning.”63% of the respondents strongly agreed, 33% agreed, and only two disagreed. In contrast, the most debatable statement was “Using digital learning tools could foster cheating in class and on assignments”, where 24% of the respondents strongly agreed, and 41% agreed, but 35% disagreed.

Criteria		N	Mean	SD
A1	Digital learning tools save teachers time when planning and creating lesson activities	46	3.13	2.68
A2	Digital learning tools support creating interactive lessons to motivate and engage students	46	3.50	3.01
A3	Digital learning tools support creativity and critical thinking in the lesson	46	3.39	2.92
A4	Digital learning provides tools to assess students and provide them with instant feedback	46	3.54	3.06
A5	Digital learning supports students-centre learning	46	3.37	2.88
A6	Digital learning supports innovative learning methods such as flipped classrooms, project-based learning, and personalized learning	46	3.59	3.10
A7	Using digital learning tools promotes collaborative learning	46	3.20	2.72
A8	Digital learning tools increase access to the learning resources by sharing information and contents	46	3.52	3.04
A9	Digital learning tools promote differentiation in the classroom	46	3.28	2.81
A10	Digital learning tools could distract the students	46	3.04	2.55
A11	Using digital learning tools could foster cheating in class and on assignments	46	2.89	2.46
A12	Using Digital tools requires more training for teachers	46	3.52	3.04

Table 1: Q15 Descriptive Statistics

Teachers' perspectives on digital learning									
Criteria	Strongly Agree		Agree		Disagree		Strongly Disagree		N
Digital learning tools save teachers time when planning and creating lesson activities	15	33%	22	48%	9	20%	0	0%	46
Digital learning tools support creating interactive lessons to motivate and engage students	24	52%	21	46%	1	2%	0	0%	46
Digital learning tools support creativity and critical thinking in the lesson	22	48%	20	43%	4	9%	0	0%	46
Digital learning provides tools to assess students and provide them with instant feedback	27	59%	17	37%	2	4%	0	0%	46
Digital learning supports students-centre learning	19	41%	25	54%	2	4%	0	0%	46
Digital learning supports innovative learning methods such as flipped classrooms, project-based learning, and personalized learning.	29	63%	15	33%	2	4%	0	0%	46
Using digital learning tools promote collaborative learning	14	30%	27	59%	5	11%	0	0%	46
Digital learning tools increase access to the learning resources by sharing information and contents	26	57%	18	39%	2	4%	0	0%	46
Digital learning tools promote differentiation in the classroom	18	39%	23	50%	5	11%	0	0%	46
Digital learning tools could distract the students	7	15%	34	74%	5	11%	0	0%	46
Using digital learning tools could foster cheating in class and on assignments	11	24%	19	41%	16	35%	0	0%	46
Using Digital tools requires more training for teachers	26	57%	18	39%	2	4%	0	0%	46

Table 2: Q15 Distribution count

Teachers' perspectives on digital learning

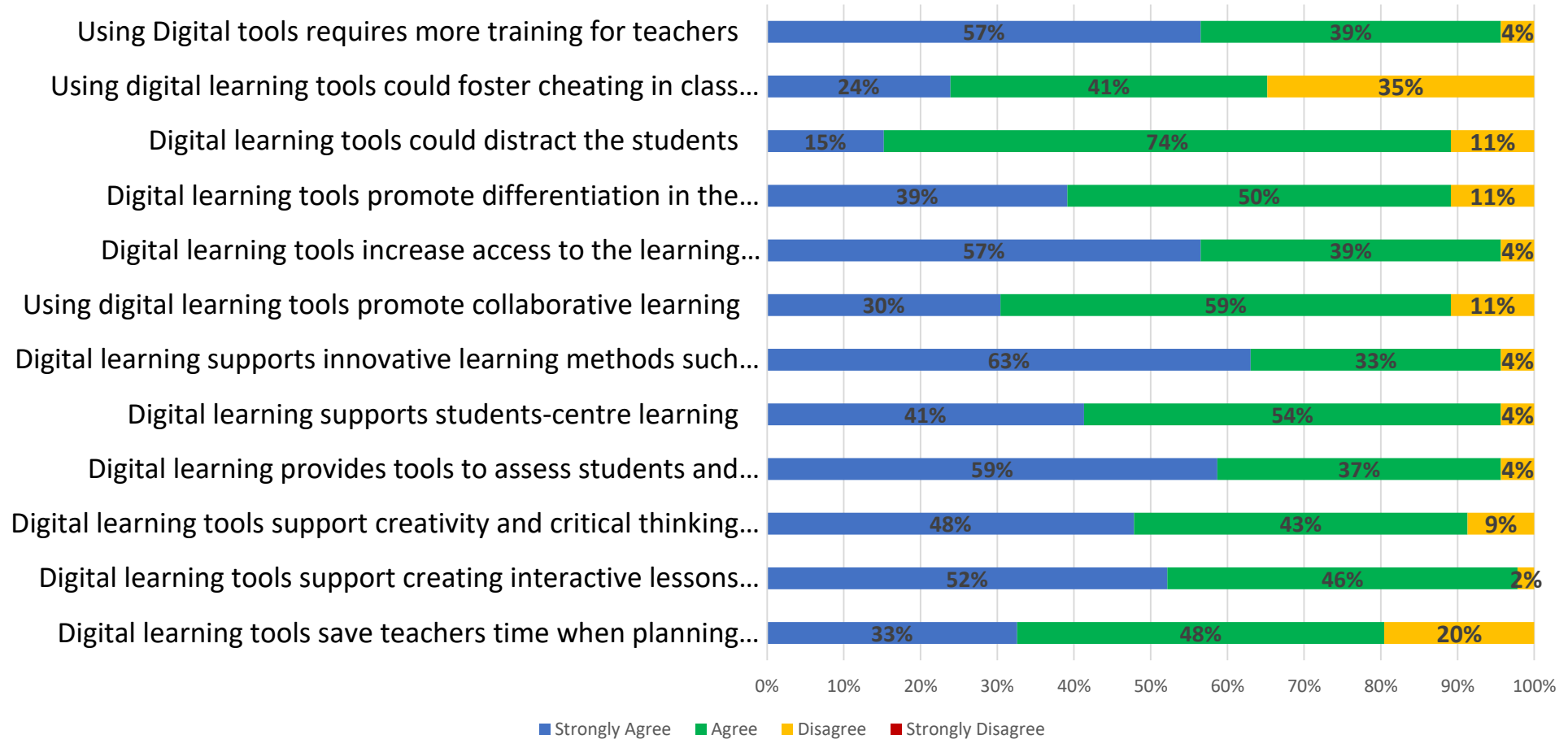


Figure 24: Results of Question 15 – Stacked Bar Chart

4.3 Finding of the Interviews

The collected data were transcribed and then analyzed thematically. The interviewees' responses are presented below, followed by the generated codes and extracted themes. The participants' names are not revealed and assigned letters instead for ethical considerations.

4.3.1 Semi-Structured Interview Transcription

Q1: Do you think that Covid-19 redefine the role of teachers? How?

C1: “I believe that teachers’ role had become more complicated than when learning took place only in person. Teachers have worked hard to create a new environment for their students to allow education to continue. The teacher has a different role from that he used to have in the classroom, as students are able to get knowledge simply through clicks on their own phones, tablets and computers”.

C2: “For sure, as a coordinator and teacher, I was utilizing various technologies in my classrooms before COVID-19, but this pandemic has challenged me to think outside the box and search for new technologies that I had not previously used in my classes... distance learning has helped me become a better teacher by exposing me to this challenging condition that requires to motivate and engage students while they are learning from home”.

H: “Yes, I think this pandemic enhanced the role of teachers.... teachers have to learn and use new technological platforms in their teaching to achieve their objectives”.

P: “Yes, definitely. Covid-19 has changed the expectations that we have for teachers and in terms dramatically altered and redefined their roles. Teachers are now required to be knowledgeable about different types of devices and how to use them to enhance learning. In addition,

troubleshooting knowledge is no longer restricted to the IT Team or ICT teachers, but it encompasses all teachers regardless of the subject they teach”.

Q2: How do you think digital transformation during COVID-19 affected teaching methods and strategies?

C1: “Teaching has changed from a traditional method to a more flexible method that fits the current COVID-19 crisis and beyond. Using technology and teaching methods that depend on technology has become a must for the continuity of learning”.

C2: “I think the shift to distance learning didn’t change teaching methods; only the delivery method has been changed to be online or hybrid. I believe teachers must be flexible and prepared for everything. Maybe the positive thing is how quickly many teachers used necessary technology tools that they did not use in the past. When schools resume as before, teachers will be more connected than before; they will record videos of their lessons, use presentations and online games for online and physical students”.

H: “Teaching methods and strategies have been changed because of COVID-19 ... now teachers use many platforms that help them achieve their objectives and encourage students to interact even if they are not in a face-to-face learning environment”.

P: “Teaching strategies had to be adapted to include digital tools within them. In addition, the Blended Learning Model became the most successful model of teaching during Covid-19. Teachers had to modify the existing Teaching Strategies to accommodate the Blended Model; for example, group work has changed to include Break-Out Rooms instead of the normal face to face groups.

Q3: What best teaching methods and strategies should teachers adopt to keep the students motivated and engaged during and post the pandemic?

C1: Teachers should be equipped with digital and pedagogical skills to teach remotely, online, and through blended hybrid learning, whether in a high, low or no-tech environment.

C2: “During the remote learning, I was striving mainly to utilize differentiation for my synchronous learning session. Breakout rooms option has allowed me to enhance student collaboration. Also, I have the opportunity to meet one-on-one with students who are struggling far from the class distraction.

H: “Actually, teachers can adopt any strategy that works effectively with their students, teachers can use the problem-solving method, ask-answer approach, collaborative learning also, teachers can use multimedia and display videos that attract students to their lessons and assess them using web applications such as Kahoot”.

P: “I believe that teachers should put more emphasis on independent learning and create individualized learning paths for students, so they become more engaged and involved in their learning”.

Q4: How do you see the future of education post-Covid-19?

C1: “I believe that we will have blended (mixed) models of teaching, where remote and digital platforms support in-person classroom teaching”.

C2: “Of course, the teaching will depend more on technology. Schools should improve the technology infrastructure and ensure that all students have the required devices to continue

learning under any condition. This crisis was difficult. However, it enforced to evaluate the educational systems and prepare well for any future circumstances”.

H: “I think the pandemic gives us the chance to try a new way of teaching. Maybe there was online learning for many years at universities, but nowadays, we are trying it in our schools which is an additional credit to teachers in general”.

P: “I see digital learning as the new normal. Digital learning is an important skill to be taught so students become ready for the workplace. If we look at the updated inspection framework and curriculum frameworks around the world, digital skills have become an independent skill that must be evident within the classroom. The workplace itself requires individuals fluent in the use of technology”.

4.3.2 Extracted Codes and Themes

The table below describes the preliminary themes and the codes associated with them from the verbatim transcription of semi-structured interviews.

Participant	Text	Codes	Themes
C1	I believe that teachers' role had become more complicated than when learning took place only in person	Teacher new role after COVID-19	COVID-19 impacts on Teaching
C1	The teacher has a different role from that he used to have in the classroom		
P	Covid-19 has changed the expectations that we have for teachers and in terms dramatically altered and redefined their roles.		
C2	Distance learning has helped me become a better teacher	Digital learning enhanced teachers' role	
H	I think this pandemic enhanced the role of teachers		
H	Maybe there was online learning for many years at universities, but nowadays, we are trying it in our schools which is an additional credit to teachers in general		
C1	Teachers should be equipped with digital and pedagogical skills	The need for teachers' digital skills	Teachers Readiness and Professional Development
P	Teachers are now required to be knowledgeable about different types of devices and how to use them to enhance learning. In addition,		

	troubleshooting knowledge is no longer restricted to the IT Team or ICT teachers, but it encompasses all teachers regardless of the subject they teach		
H	Teachers have to learn and use new technological platforms in their teaching to achieve their objectives.	Learn new technologies	
C2	Teachers must be flexible and prepared for everything.	Teachers' readiness	
C2	The delivery method has been changed to be online or hybrid.	Digital Learning facets (Online, hybrid, remote and blended learning)	Digital Learning during and post COVID-19
C1	I believe that we will have blended (mixed) models of teaching		
P	The Blended Learning Model became the most successful model of teaching during Covid-19		
P	I see digital learning as the new normal.		
C2	This pandemic has challenged me to think outside the box and search for new technologies	Teaching methods depending on new technologies	Technology and Innovative Teaching Methods
C2	Using technology and teaching methods that depend on technology has become a must.		
P	Teaching strategies had to be adapted to include digital tools within them		
P	Digital skills have become an independent skill that must be evident within the classroom.		

H	The pandemic gives us the chance to try a new way of teaching.	New teaching methods	
H	Teachers can use the problem-solving method, ask-answer approach, collaborative learning		
H	Teachers can use multimedia and display videos that attract students to their lessons and	Using presentations and multimedia	Using Technology and EdTech Tools
C2	They will record videos of their lessons, use presentations and online games for online and physical students.		
C1	Where remote and digital platforms support in-person classroom teaching.	Using online applications and games	
C2	They will record videos of their lessons, use presentations and online games for online and physical students.		
H	Assess them using web applications such as Kahoot		
C1	Students are able to get knowledge simply through clicks on their own phones, tablets and computers.	learning recourses accessibility	Accessibility and Flexibility
C1	Teaching has changed from a traditional method to a more flexible method that fits the current COVID-19 crisis and beyond.	Flexible teaching	

H	Now teachers use many platforms that help them achieve their objectives and encourage students to interact even if they are not in a face-to-face learning environment	Students' engagement	Students Motivation and Engagement
H	Teachers can use multimedia and display videos that attract students to their lessons		
P	Create individualized learning paths for students so they become more engaged and involved in their learning		
C2	This challenging condition that requires to motivate and engage students while they are learning from home	Students' motivation	Communication and Collaboration
C2	When schools resume as before, teachers will be more connected than before	Teachers' communication with students	
C2	I have the opportunity to meet one-on-one with students who are struggling far from the class distraction.		
C2	The break-out rooms option has allowed me to enhance student collaboration.	Students' collaboration	
H	Teachers can use the problem-solving method, ask-answer approach, collaborative learning.		
P	Group work has changed to include Break-Out Rooms instead of the normal face to face groups		

C2	I have the opportunity to meet one-on-one with students who are struggling far from the class distraction.	Help struggling students	Differentiation and Individualized Learning
C2	I was striving mainly to utilize differentiation for my synchronous learning session.	Differentiation during online learning	
P	I believe that teachers should put more emphasis on independent learning and create individualized learning paths for students, so they become more engaged and involved in their learning	individualized learning	
C2	Schools should improve the technology infrastructure and ensure that all students have the required devices to continue learning under any condition.	School technology infrastructure	School Readiness
C2	It enforced to evaluate the educational systems and prepared well for any future circumstances	Evaluation of the educational system	

Table3: Interviews extracted codes and themes

Chapter 5: Discussion

5.1 Introduction

This chapter analyzes and discusses the quantitative and qualitative findings from both questionnaires and interviews and is divided into five sections. The first section discusses the quantitative findings from the online teacher's questionnaire. The second section discusses the qualitative results of the semi-structured interviews. The third section integrates both qualitative and quantitative discussions, followed by the conclusion and implication, and finally, the study's limitations.

5.2 Discussion of the Quantitative Data

As the Data analysis section mentioned, the questionnaire was conducted to collect the quantitative data that answer the research questions Q1, Q2 and Q3.

5.2.1 Discussion of Research Question (1)

How did digital transformation affect the teaching methods in Abu Dhabi private schools during the COVID-19 pandemic?

Q4, Q5, Q6, Q7, and Q8 findings indicated that some schools that didn't have iPadic classrooms or didn't adopt BYOD policy had been forced to integrate technology and utilize digital devices through different school plans to ensure the continuity of students learning. Moreover, the teachers' responses revealed that nowadays, the students need to use their digital devices daily

for class activities compared with pre-COVID-19, when they did not need to use their digital devices in different class activities or used them a few times a week.

These findings also indicated that the digital learning concept has evolved from a fashionable trend to an urgent need. Moreover, technology has emerged as a vital enabler for ensuring sustained access to education. On the other hand, the finding revealed that most teachers' digital skills had been improved after online learning and utilizing interactive digital tools due to the pandemic compared to the situation before the pandemic. Some studies support this result as they found that the lack of facilitator skills had slowed online learning and digital integration in using digital learning methods and their resistance to developing and using them CIPD (2021).

5.2.2 Discussion for Research Question (2)

What teaching methods and strategies are adopted to keep students engaged during and after distance learning?

Q9, Q10, Q11, Q12, Q13, and Q14 results discovered teachers' best suitable teaching methods and strategies to keep students engaged during distance learning and after returning to classrooms. According to (Kim, First & Kim 2021), whatever learning methods are used, the epidemic has undoubtedly shifted the educational paradigm, and we must adapt to the new normal.

There is a strong indication from findings that digital transformation during COVID-19 impacted the teachers' teaching methods positively, where most participants agreed that their teaching strategies now depend more on digital devices and Educational Technology (EdTech) tools than before the COVID-19 pandemic.

At the same time, the findings revealed that class discussion and cooperative learning approaches had been adopted by teachers more than any other classroom strategy during the pandemic, which provides student-centred learning. The results also indicate that the Demonstration approach is the third most helpful teaching strategy, where teachers show students how to do something by modelling. The project-based learning and gamification methods came next. In addition, teachers mentioned simulation, personalized learning and self-directed learning as active teaching strategies. Finally, lecturing and flipped classrooms methods were the less-used teaching methods adopted by teachers for online and in-class lessons.

The majority of respondents had employed digital tools primarily for content delivery, assessment and student engagement. Most teachers revealed that they depend more on interactive multimedia tools, presentation applications and the available digital resources such as the smart whiteboard to explain the lessons. Meanwhile, teachers create a gamified activity using an online application that provides excellent motivational power to engage students even without any rewards, simply for the fun of playing and the chance to win (Dicheva et al. 2015). In contrast, many teachers prefer digital communication and collaboration by conducting a digital class discussion using EdTech apps and tools as formative assessment. Few teachers use paper assessments as worksheets to assess students' understanding.

For students' assignments, the findings show that most teachers usually use a web-based application to create an assignment or ask the students to complete a gamified-based task as homework. Moreover, some teachers share a direct link for the assigned homework activity in the e-book. In contrast, few teachers still depend on the textbook to set homework for their students.

5.2.3 Discussion for Research Question (3)

What are teachers' perspectives on digital learning as the new normal?

The descriptive statistics from Q15 results reveal a positive teachers' perception of Digital learning. Many teachers agreed that Digital learning tools benefit them as they help save their time when planning and creating lesson activities. At the same time, these tools help them create interactive lessons that motivate and engage students while promoting differentiation in the classroom. Also, most respondents agreed that digital learning supports innovative teaching methods such as flipped classrooms, project-based learning, and personalized learning. Moreover, it promotes students-centre learning and 21- century skills such as creativity, critical thinking and collaborative learning.

On the other hand, Gamification gained prominence as leading to effective long-term learning during this pandemic. Gamification-based IRSs (Interactive Response System) such as Kahoot, Quizizz and Socrative allow students to create their own characters, nicknames, and avatars and advance through stages while earning points and badges to get their own full engagement (Solmaz & Cetin 2017). Park & Kim (2021) examined the influence of gamified online learning on student learning in 140 elementary and middle schools by employing a gamified online learning tool. The findings showed that gamified online learning programs improved students' motivation, self-efficacy, and self-determination while increasing their understanding.

The overwhelming number of participants agreed that Technology-enhanced learning environments and digital tools benefit the students' learning by supporting access to the learning resources and sharing materials and content. On the other hand, online assessment tools motivate students and provide immediate feedback to teachers and students about their learning progress (Dicheva et al. 2015; Solmaz & Cetin 2017; Bicen & Kocakoyun 2018; Nadeem 2020).

In contrast, many teachers believe that digital learning tools could distract students. According to (Limniou 2021), using digital devices in class for non-class related activities has a negative impact on course performance and self-reported understanding of course topics. The consequences of digital distraction in the classroom have been proven to correspond with poor learner outcomes such as decreased classroom performance and grades. Because digital distraction pushes students to multitask, produces cognitive overload, distracts students' attention, and prevents deeper learning (Aaron and Lipton 2018). According to (Limniou 2021), students who use only one application during lecture time performed better academically because they were less distracted from their fundamental tasks of absorbing and retaining knowledge.

The questionnaire responses revealed another negative impact of using digital devices is it could foster cheating in assignments and assessments. Technological advances and online learning have enhanced education. However, they also have facilitated cheating in courses (Turner & Uludag 2013). Many digital instruments could assist in cheating in e-tests, including digital calculators, MP3-player, wireless earphones, and a microphone (Curran, Middleton & Doherty 2011). During the COVID-19 pandemic, the shift from on-site to online testing in education institutions has harmed academic integrity, where online tests had higher rates of cheating than on-site exams. Noorbehbahani, Mohammadi & Aminazadeh (2022) indicated that cheating detection and prevention technologies are required to combat prohibited behaviours.

Before the unprecedented Covid-19 epidemic, the education system relied heavily on teachers' ability to teach but during the pandemic, the traditional teaching methods had been entirely replaced by online and distance learning. Teachers who had previously strived for proficiency in physical classroom teaching were rushing to equip themselves to be online instructors (Karuppannan & Mohammed 2020). In contrast, it has been noted that digital competence is an important factor in using digital tools in education (Koehler, Mishra & Cain 2013). So, the new

situation requires more training for teachers to have the necessary digital skills to use the available digital resources and different EdTech tools efficiently.

5.3 Discussion of the Qualitative Data

The findings from the semi-structured interviews revealed the extracted codes through which ten specific unifying themes were conceptualized:

- COVID-19 impacts on Teaching
- Teachers' Readiness and Professional Development
- Digital Learning during and post COVID-19
- Technology and Innovative Teaching Methods
- Using Technology and EdTech Tools
- Accessibility and Flexibility
- Students' Motivation and Engagement
- Communication and Collaboration
- Differentiation and Individualized Learning
- School Readiness

5.3.1 Discussion of Research Question (1)

How did digital transformation affect the teaching methods in Abu Dhabi private schools during the COVID-19 pandemic?

The interview questions Q1 and Q2 findings indicated that teaching strategies had been adapted due to the digital transformation brought by COVID-19 to ensure the continuity of teaching and learning. The instructional delivery method has been changed to online or hybrid, which depends basically on technology and digital tools. Some school leaders believe that this transformation impacted teachers' roles directly as it became more complicated. In contrast, some participants believe that the recent crisis has challenged the teachers and redefined their teaching methods to depend more on technology than before.

The new situation revealed the need for teachers' continuous professional development to keep them flexible and well prepared for any circumstances in the future. According to the interviewees' responses, teachers must include new EdTech tools and platforms in their teaching approaches to achieve their objectives. At the same time, teachers should be knowledgeable in ICT skills and troubleshooting to utilise different digital devices to decide how and when to use them to enhance the teaching and learning process.

5.3.2 Discussion of Research Question (2)

What teaching methods and strategies are adopted to keep students engaged during and after distance learning?

The interview Q2 results revealed that teaching methods had been changed from traditional to more flexible methods that fit the current COVID-19 crisis and beyond. Teachers adopted many different EdTech tools such as multimedia, presentations, and videos to attract students during

online learning during distance learning. On the other hand, they use interactive platforms and gamified applications to motivate and engage students. This pandemic gave teachers the chance to try new ways of teaching during remote learning; they adapted their teaching methods to depend on technology and digital learning tools, which continue to be used nowadays in their classrooms.

As mentioned by the participants, the new adapted innovative teaching methods encourage effective communication and collaboration. Teachers became more connected with their students by using digital tools than before. On the other hand, they had the opportunity to meet the struggling students individually, far from the class distraction. On the other hand, digital collaboration features such as the Break-out room allowed students to work collaboratively as in the face-to-face learning environment. Moreover, teachers could utilize differentiation approaches, assign different activities depending on students' levels, and apply problem-solving and independent learning strategies using digital learning tools. Another point mentioned by the participants is the accessibility advantage where students could get knowledge simply through clicks on their own phones, tablets or computers and access the educational resources anytime and anywhere.

5.3.3 Discussion of Research Question (4)

What are schools leaders' perceptions on the future of education post-COVID-19?

The interview results indicated that school leaders believe that digital learning will continue with us as the new normal in education. They also think that the blended learning model is the most successful teaching model during and post Covid-19, where remote and digital platforms support

in-person classroom teaching. This also was suggested by Bawa'aneh (2021), who believes the hybrid educational system is the ideal model for the future of education.

The school leaders also stressed that teachers should be well prepared for the new normal, which also needs to re-design the curriculum following contemporary educational technology approaches and improve schools' technology infrastructure to continue learning under any condition.

5.5 Conclusion and Implications

COVID- 19 crisis has shifted the educational paradigm and impacted the teaching profession, which brought a big challenge for school leaders, teachers and students worldwide. The pandemic's extended duration has opened up new areas for the development of digital learning tools. It also encourages teachers to create engaging lessons and use gamified web applications to attract students' attention and improve their performance.

When COVID-19 is mostly over, there will be several competing recommendations for what to do next. Various studies have benefited significantly from this new norm, and many educational institutions have prepared themselves for the post-pandemic phase. Therefore, teachers should strive to have a positive attitude toward technology, develop a digital teaching culture, support flexible teaching approaches, and use innovative technologies. At the same time, they should be aware of and take advantage of areas where EdTech can be beneficial by understanding and knowing each platform's function. Meanwhile, schools should help instructors create technology-assisted teaching approaches by providing training and professional development to improve their abilities in incorporating technology into teaching and learning activities.

The COVID-19 pandemic also drew much-needed attention to the necessity of connectivity at school and home. It also provided a better awareness of the different aspects of the digital divide, equity gaps, and challenges related to children's online safety. It demonstrated the need for governments to work more closely with development partners to eliminate technological barriers and cut connectivity costs and the importance of investing in digital infrastructure and digital literacy (UIT, UNESCO & UNICEF 2020). Governments should have a vision and a clear plan for the future. They should re-evaluate existing digital policies in light of the COVID-19 situation, requiring international solid collaboration and discussion (Tregua et al. 2021). Digital education stakeholders must take several steps to take advantage of the COVID-19 shift toward digital learning and develop a sustainable digitalized education system.

5.6 Limitations of the Study

The research study has a few limitations. It was initially intended to have a larger sample size, but due to COVID-19 precautionary measures, it wasn't easy to enter any private school in Abu Dhabi or meet any school leader to conduct an interview. On the other hand, it took a long time to distribute the questionnaire to teachers in different private schools or even send the link to complete it during the school closure period. Another limitation of the study was that there was no Arabic copy of the questionnaire for Arabic, Islamic and A.S.S teachers. So, the study didn't include all subject teachers in the Abu Dhabi private schools.

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Appendix

Appendix 1: Consent Form (Teachers Questionnaire)



The Digital Transformation in Teaching Methods in Abu Dhabi Private School as the New Normal

Dear Teachers,

Thank you in advance for your participation in this study - I'm Laiali Dweedar, and I am pursuing my Master of Education in ICT at The British University in Dubai under the supervision of Dr Tendai Charles. The dissertation topic is : " The Digital Transformation in Teaching Methods as the New Normal in Abu Dhabi Private Schools".

The purpose of this questionnaire is to discover your thoughts about Digital Transformation in teaching methods brought by COVID-19 in Abu Dhabi private schools. There are no anticipated risks to participating in this study. Your participation is voluntary, and your responses to this questionnaire are entirely anonymous as no personal data will be requested. By completing this questionnaire, you have given me consent to use this data for my research project.

If you have any questions or concerns regarding this study, please contact :
Mrs. Laiali Dweedar (laialy2112@gmail.com)

 laialy2112@gmail.com (not shared) [Switch accounts](#) 

*Required

I have read and understood the above information, and I agree to participate in this study. *

☐ Yes, I agree

[Next](#) [Clear form](#)

Appendix 2: Teachers Questionnaire

Teacher's Experience

Q1: Which curriculum do you teach? *

☐ US

☐ UK

☐ IB

☐ UAE

☐ Other

Q2: Which subject do you teach? *

☐ Science

☐ Mathematics

☐ English

☐ Social studies

☐ ICT

☐ Foreign languages

☐ Music

☐ Art

☐ Physical Education

Q3: Which grade level do you teach? *

☐ 3-5

☐ 6-8

☐ 9-12

[Back](#)

[Next](#)

[Clear form](#)

Technology Integration

Q4. Did your school has an iPadic classroom policy before COVID-19, where the school provides iPads for students when needed? *

- ☐ Yes
- ☐ No

Q5. Did your school adopt a BYOD policy before COVID-19, where the students bring their own devices to the classroom to learn? *

- ☐ Yes
- ☐ No

Q6: How frequently did students use the digital devices for the class activities before COVID-19? *

- ☐ Daily
- ☐ Two to four times a week
- ☐ Less than two times during the week
- ☐ They didn't need to use their digital devices

Q7: How frequently do your students who attend school physically use their digital devices for class activities nowadays? *

- ☐ Daily
- ☐ Two to four times a week
- ☐ Less than two times during the week
- ☐ They don't need to use their digital devices

Q8: How would you describe your digital literacy skills before and post the pandemic? *

- ☐ Advanced, I was integrating Technology and using EduTech tools before the pandemic
- ☐ Intermediate, I had enough skills before, and my skills have been improved after the online learning
- ☐ I had basic skills before, and I still need training

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Digital Transformation and Teaching Methods

Q9: From your point of view as a teacher, to what extent do you think digital transformation during COVID-19 impacted your teaching methods? *

- ☐ Positive impact
- ☐ No impact
- ☐ Negative impact

Q10: Do your teaching strategies now depend more on digital devices and Educational Technology (EdTech) tools than before the COVID-19 pandemic? *

- ☐ Yes
- ☐ No

Q11: What teaching methods do you use with your face-to-face and online students? *

- ☐ Lecturing
- ☐ Discussion
- ☐ Demonstration
- ☐ Simulation
- ☐ Project-Based Learning.
- ☐ Gamification
- ☐ Flipped Classroom.
- ☐ Cooperative Learning.
- ☐ Personalized Learning.
- ☐ Self-directed learning.
- ☐ Other: _____

Q12: In the classroom, what do you use to deliver content (explain) your lesson? *

- ☐ The classroom board
- ☐ The interactive whiteboard
- ☐ Presentations using Powerpoint, NearPod, Prezi,
- ☐ VR- Virtual Reality
- ☐ Multimedia content such as videos and animations
- ☐ Digital storytelling with your voice
- ☐ Digital simulation

Q13: What do you use to assess your students understanding during the lesson? *

- ☐ Oral class discussion, where students share their ideas and understanding
- ☐ Digital class discussion using EdTech apps such as Padlet, students type their thoughts or knowledge in an interactive discussion board.
- ☐ Give students worksheets to answer some questions to assess their understanding.
- ☐ Create Pop quizzes using one of the gamified applications as Kahoot, Quizizz or Socrative

Q14: How do you assign homework for your students? *

- ☐ Inform them of the homework page number in the textbook.
- ☐ Share a direct link for the homework activity in the e-book
- ☐ Create an assignment using a Web-based app such as Edulastic, Edmodo or Nearpod.
- ☐ Create a gamified-based assignment using Kahoot, Quizizz or NearPod

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Teachers' perspectives on digital learning

Q15: From your point of view, please answer the questions below by selecting: Strongly agree, Agree, Disagree, Strongly disagree: *

	Strongly agree	Agree	Disagree	Strongly disagree
Digital learning tools save teachers time when planning and creating lesson activities	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Digital learning tools support creating interactive lessons to motivate and engage students	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Digital learning tools support creativity and critical thinking in the lesson	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Digital learning provides tools to assess students and provide them with instant feedback	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Digital learning supports students-centre learning	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Digital learning supports innovative learning methods such as flipped classrooms, project-based learning and personalized learning.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Using digital learning tools promote collaborative learning

☐☐☐☐

Digital learning tools increase access to the learning resources by sharing information and contents

☐☐☐☐

Digital learning tools promote differentiation in the classroom

☐☐☐☐

Digital learning tools could distract the students

☐☐☐☐

Using digital learning tools could foster cheating in class and on assignments

☐☐☐☐

Using Digital tools requires more training for teachers

☐☐☐☐

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Appendix 3: Consent Form (Teachers Interview)

Interview Consent Form

This form is intended to take your consent to participate in an interview under the moderation of Laiali Dweedar, who is conducting the research study.

The purpose of this interview is to understand and analyze your perception of Digital Transformation in teaching methods brought by COVID-19 in Abu Dhabi private schools.

There are no anticipated risks to participating in this study. Your participation is voluntary, and your responses are entirely anonymous as no personal data will be requested.

 laialy2112@gmail.com (not shared) [Switch accounts](#)



*Required

I understand that my participation is voluntary and that I am free to withdraw at any time without giving any reason and without there being any negative consequences. *

☐ I Agree

☐ I Disagree

I understand that my responses will be kept strictly confidential. My name will not be linked with the research materials, and will not be identified or identifiable in the report *

☐ I Agree

☐ I Disagree

I understand that the interview will be recorded to be used only for Master's Thesis Research *

- ☐ I Agree
- ☐ I Disagree

I agree to take part in the above research study *

- ☐ I Agree
- ☐ I Disagree

Submit

Clear form

Appendix 4: School Leaders' Interview Questions

Q1: Do you think that Covid-19 redefine the role of teachers? How?

Q2: How do you think digital transformation during COVID-19 affected teaching methods and strategies?

Q3: What best teaching methods and strategies should teachers adopt to keep the students motivated and engaged during and post the pandemic?

Q4: How do you see the future of education post-Covid-19?