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5G APPLICATIONS VIA VIRTUAL REALITY TECHNOLOGY IN EDUCATION

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ABSTRACT

Fifth-generation (5G) technology has been widely adopted in all spheres of society, fostering excellent development across a range of sectors and domains. In education, 5G technology has greatly improved the interactive communication between teachers and students, and students and human-machine in the smart teaching mode. With its functions for teaching, research, management, and evaluation, the smart teaching mode has created a new paradigm for digital education. It provides smart teaching cloud services to external tutors as well as instructors and students at affiliated colleges and universities. However, educational institutions today are still unaware of the importance of 5G and VR (virtual reality) in education, because they do not apply their use in classroom teaching and learning activities. In fact, they are still faced with unstable network problems that interfere with the teaching and learning process. Therefore, this preliminary study is dedicated to discussing the awareness of 5G applications with VR technology in education. This is to see the extent of the knowledge of instructors and students regarding the use of 5G and VR in their educational activities. The study approach has been decided upon as an online survey based on an opinion poll (questionnaire) due to the rapid turnaround, prompt delivery, and simple return. The results showed that 90% of the respondents said they had heard of VR technology, and 89.13% had used the 5G application for teaching and learning. This shows that 5G technology has been widely used in education, and VR technology is gradually entering people's vision. In conclusion, this study will be able to give some awareness to educational institutions in particular, to apply the use of 5G and VR in future education.

Keywords: *5G, Education, Virtual Reality Technology*

1. INTRODUCTION

Recent technological advancements have changed societies and improved living standards globally. The new concept of Fifth Generation (5G) cellular networks brings together a diverse set of devices and machines with uniquely significant advances over previous technologies. With 5G technology, users can interact more efficiently and have a more satisfying experience [1]. Three distinct characteristics, namely ubiquitous connectivity, extremely low latency, and very high-speed data transfer, broadly define 5G networks [2]. With its faster, more powerful, and feature-rich features, 5G technology is also having a significant impact on the education sector [3]. The education information technology sector has opened up new development opportunities following the rapid development of 5G technology; many new educational teaching platforms, such as Learning Pass, Tencent Classroom, and Qingshu Platform have appeared.

In order to improve the path and quality of talent training, education informatization platforms must actively use technology to combine the benefits of educational models, reform conventional

educational ideas, and conduct scientific and systematic education programs. Education information platforms are becoming the demand of students and teachers in the context of 5G. The resource sharing platform and the 5G network advantage, as well as the intelligent teaching and training resource sharing platform can accommodate users' requests for access to the platform at any time, from any location, and any device, as well as provide the necessary resource support for 5G application [4].

Over the past few years, wireless networks have gained popularity and generated a lot of interest from the public, as a result of the rapid growth in mobile devices [5]. The current 5G-and-beyond mobile networks are projected to exploit radio resources via several access technologies for various applications in light of the globalization of mobile services [6]. In parallel, the number of mobile users and intelligent machines using data services is skyrocketing [6]. Device can access a variety of applications and services, such as heavy-bandwidth multimedia sources, immersive media, such as augmented reality (AR) [7, 8] and virtual reality (VR) [9], and traffic handling from a large cluster of sensors, i.e., Internet of Things (IoT) [10, 11], interference management [12, 13], and routing [14].

Virtual Reality (VR) technology is a computer simulation system that makes it possible to create and interact with virtual worlds. VR technology use in teaching and learning has emerged as a crucial component in the advancement of education [15]. This is because the integration of 5G and VR technology in the classroom of integrated wiring technology will improved clarity in VR images, become more intelligent, and easy switching and display [16]. Furthermore, the lower latency makes 5G capable of handling the rising data load, making it perfect for VR [17]. Students can respond behaviorally to and interact with virtual world objects thanks to 5G and VR technology. With the help of data sensing apparatus, they are able to control the wiring technology's display and perform direct operations on objects [18]. Virtual simulations teaching resources and digital VR teaching resources are all accessible to users thanks to the platform data resource sharing system, carrier resource sharing system, and teaching resource sharing system, respectively [19].

Nevertheless, some educational institutions still ignorant of the value of VR and 5G technologies in education. This is due to their perception that the evolution of this technology brings new security difficulties, such as the development of new access channels and security downgrading [20]. Furthermore, they are aware that the primary obstacle to VR implementation is its high cost. According to a study by [21], the cost of implementing VR in the classroom is the main barrier because it necessitates specialized hardware and software. Technology issues may arise due to inappropriate or poor-quality equipment. Additionally, as teachers need to possess a high degree of expertise in order to effectively employ VR technology in the classroom, the expense of training them must also be considered. Therefore, in this study, we survey the awareness of the use of the 5G application platform with VR in education to see the extent of their knowledge of this technology.

The remaining section of the paper are arranged as follows: Section 2 contributes four dimensions in this study. While in Section 3 discusses the methodology. Section 4 presents the results and discussion. Finally, section 5 address the conclusion of the paper.

2. LITERATURE REVIEW

In new era of education, smart learning platform are not a novel notion. We adopt it in terms of four dimensions: hardware, technology, function, and service [22]. The methods used in education are also evolving very quickly. One type of mobile learning is heading towards e-learning applications, which will make it easier for students to access desired texts and problem-solving tools [23].

2.1 5G Communication

The newest cellular mobile communication technology, known as 5G, is an expansion of 2G, 3G, and 4G networks. Every phase of this mobile communication technology change is almost ten thousand times faster [24]. 2G brought reliable mobile phones and worldwide interoperability, which also enable SMS text messaging. 3G provides the ability to download files from the Internet quickly with the availability of high-speed data. 4G allows the public to access online platforms and high-speed mobile internet services, which offers notable improvements in data capacity and speed [25]. The most potent cellular wireless networks are those using 5G technology, with the features of low energy consumption, low latency, fast speed, high reliability, and wide coverage [26, 27]. 5G technology is part of a larger revolution that also includes artificial intelligence (AI) and cloud computing to drive a more robust and sustainable platform [28]. Figure 1 shows the evolution of

mobile communication [29]. In reality, 5G is the framework that supports all wireless connections across all domains, enabling connectivity for literally everything (device, machine, or item).

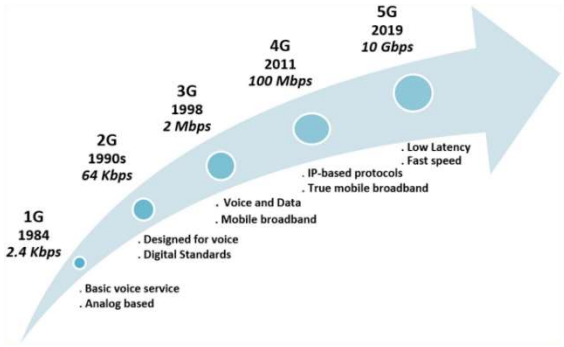

Figure 1: The Evolution of Mobile Communication

Around the world, 5G technology is being used to enhance the infrastructure and quality of service of wireless networks [30, 31]. The heightened mobile bandwidth, mass machine communication, extremely high reliability, and low latency communication that 5G was able to achieve present a plethora of opportunities for the fields of education, industrial manufacturing, healthcare, sports, and entertainment, among others.

The exceptional performance and capability of 5G provide the framework for enabling new technologies in Education 4.0 [32]. Education 4.0 is a new paradigm in the teaching and learning field that aiming to prepare students and the next generation of learners for the impending industrial revolution [33]. That incorporates new technologies like advanced robotics, three-dimensional (3D) printing, and the Industrial Internet of Things (IIoT) along with new skills. The objective is to integrate technology into the curriculum, improve the university experience, and modify the way learning is done [34]. By offering an abundance of educational resources and enabling students to communicate from anywhere at any time, 5G technology in education allows us to develop a variety of intelligent education application scenarios that contribute to equal access to education [35]. Figure 2 shown the evolution of the education industry.

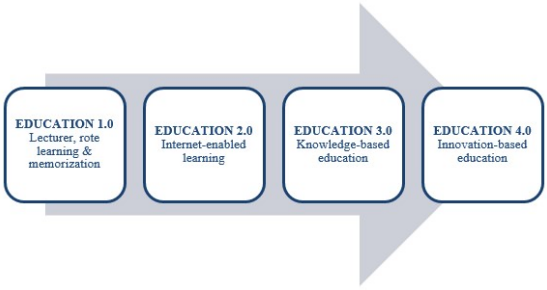

Figure 2: The Evolution of The Education Industry

2.1.1 Benefit of 5G in education

There are many benefits of 5G in education, including:

a. Faster connectivity: The rollout of 5G significantly improves internet connectivity for educational establishments, including colleges and universities. Students and teachers can access online resources and course materials more effectively with faster upload and download speeds. Because of the improved connectivity, learning materials load more quickly, cutting down on waiting times and improving learning.

b. Enabling seamless video conferencing: Facilitating smooth video conferencing: One of 5G's most revolutionary effects on education is its capacity to enable smooth video conferencing. The low latency and high data transmission rates of 5G make remote lectures and virtual classrooms simple to use. With buffering and connection problems eliminated, educators and students can now work together, ask questions, and have real-time conversations without being interrupted infuriatingly.

c. Advancing remote learning opportunities: 5G has increased the potential for remote learning, which was made evident by the COVID-19 pandemic. Students can access educational apps, take part in interactive virtual classrooms, and watch live lectures from any location with 5G. Because of this increased flexibility, students can customise their study plans to meet their unique needs, which increases accessibility and inclusivity in education.

d. Improving accessibility and inclusivity: 5G's influence on education extends beyond its technological prowess to include concerns about inclusivity and accessibility. Students from underprivileged communities or remote locations can now receive education of the same calibre as their urban counterparts thanks to faster internet access. Furthermore, assistive

technologies enabled by 5G can accommodate students with disabilities, guaranteeing a more inclusive educational experience for everybody.

2.2 Virtual Reality Technology

A variety of technologies come together to create VR which allows users to interact and see in a virtual environment [36]. These settings frequently show 3D space, which could be imaginary or realistic. The user can explore the virtual world, move in it, and even interact with certain virtual features [37]. By replicating immersive experiences for our senses using computer-generated sights or movements, the human brain is deceived into momentarily perceiving these experiences as a true type of reality. The success of VR is contingent on the production of captivating 3D interactive immersive pictures [38]. Professional tools like data gloves and stereo glasses enable VR technology, which may imitate 3D reality and give users a realistic 3D visual, hearing, and touch experience. Through natural behavior, it can establish how people interact with information and facilities [39]. According to [40], VR is a combination of three I's, which is Interaction, Immersion, and Imagination as shown in Figure 3.

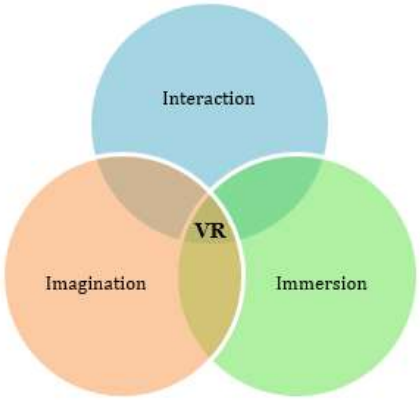

Figure 3: Three I'$_i$

2.2.1 VR and education

In general, the process of promoting learning, gaining information, skills, or virtues is referred to as education. The primary objective of education is to equip students with the knowledge and abilities required by society to help them become prepared for citizenship, the workforce, and life [41]. Students' functional, cognitive, and psychomotor skills improve when technology is used in educational interventions [42]. The emphasis of the new educational approaches is on daily activities, ethics, values, and problem-solving [43]. VR is regarded as an indispensable learning tool in this era of extreme technological advancement. VR is becoming more and more helpful in educational settings due to its realistic, immersive, and interactive qualities [15, 44]. By creating simulations that are safe, immersive, and realistic, VR can be used to give students realistic interaction situations with machinery, architectural structures, or anatomical structures that are difficult or expensive to access physically [45]. Therefore, it is crucial to examine the fundamental ideas underlying learning paradigms such as behaviorism, cognitivism, constructivism, connectivism, and experientialism [46] in order to verify the relationship between them and VR. Table 1 shows the explanation of learning paradigms.

Table 1: Explanation of Learning Paradigms.

Categories	Explanation
Behaviorism	Among the most well-known and established theories in education is this one. It maintains that learning occurs when an individual observes their surroundings and then modifies their behavior.
Cognitivism	Users can expand their knowledge base by adding new information to this category.
Constructivism	A method of instruction where students construct their own knowledge.
Connectivism	A continuous learning system where students use technological tools to learn outside of the traditional classroom.
Experientialism	The teacher serves as a facilitator, but the learner's own experiences are what most contribute to the acquisition of knowledge.

2.2.2 Benefit of VR in education

There are many benefits of VR in education, including:

a. Engagement: Students have consistently shown VR to be engaging and motivating in the classroom. Researchers regularly incorporate interest and motivation measures into their studies, and their results consistently demonstrate that VR increases participants' engagement and interest in the subject matter. Numerous researchers have also connected VR to increased student motivation [47–50].

b. Inaccessible environments: With the use of VR technology, users can replace their actual reality with any location, real or imagined. Teachers can use this capacity to accomplish learning goals that are unsatisfactorily unmet by the current physical location's constraints. Field trips and other similar activities are often

impossible due to financial and logistic problems. Projects like [51], historical city tour using VR, however, show how VR can give access to educational experiences. With VR technology, students can use VR headsets to visit historical landmarks, museums, and other cultural sites in a more immersive way.

c. Distance learning: VR also has the potential to expand learning opportunities to new locations and demographics beyond face-to-face learning. It may be able to address the drawbacks of the current online learning and distance education methods by uniting people over great distances and offering them immersive environments in which to engage with one another. In their 2017 article, [52] discuss the possible application of VR in distance learning, emphasizing the advantages that could arise from multi-user virtual campuses that allow students to collaborate and meet.

d. Language learning and special education: VR technology allows students to immerse themselves in a language-learning environment by interacting with native speakers and practicing real-life scenarios. Besides, VR technology can help students with special needs by providing a safe and controlled environment for learning and practicing social and communication skills.

2.2.3 The challenge of applying VR in education

While incorporating VR in education has many benefits, it does not come without its challenges. In this section, we highlight some of the key challenges in implementing VR in education.

a. Lack of VR specific pedagogy: Although VR can be somewhat successfully forced into current educational paradigms, researchers concur that strong pedagogy related to VR is necessary to fully utilize it for learning. Authors [53] contend that educators will only produce problematic implementation if they merely attempt to mimic "face-to-face didactic experiences of learning" (p. 223). Authors [54] point out that "it will be necessary to know how to build and deploy educational programs that are well adapted to this technology," (p. 237). Authors [55], figuring out "how best to utilize this technology to better enhance students' learning in a manner that is not merely recreating, or replacing the physical classroom" (p. 17) is the biggest challenge when it comes to using VR. Consequently, pedagogy must be specifically created for VR. In fact, a common critique of the majority of recent studies evaluating VR for education is the dearth of knowledge-based pedagogy supporting VR use.

b. Cognitive demand: The immersive capacity of VR is not only its greatest affordance, but it also might make it more challenging to use effectively. Authors [56] notes that "Higher levels of immersion sometimes do not improve learning performance," (p. 2). Authors [57] remarks that learning occurs best when there is no external input. They point out that the intricacy of immersive VR can result in "extraneous cognitive processing" (p. 2), which reduces the medium's capacity to aid in the learning of a particular concept. As they put it, "Immersive VR may create so much unnecessary cognitive processing that the learner is left with insufficient cognitive resources to retain the lesson's essential content" (p. 10). Authors [58] found that when study participants used VR, working memory processing demands increased, which decreased knowledge acquisition.

c. Immersion breaking: While instructional design can influence cognitive load to some extent, there are other factors that may make VR ineffective for teaching. Users' ability to become fully immersed in a VR experience is contingent upon a multitude of intricate factors originating from both VR hardware and software. If this isn't done correctly, illusion-breaking components like visual aberrations or low-quality 3D assets could lessen the immersive advantages of VR. In their analysis of scientific research on VR in education, authors [59] discovered that certain studies suggested that if the VR experience was not realistic enough, "this may detract for the learning experience" (p. 102). This is not to say that every VR experience has to have lifelike, photorealistic graphics—many of the best ones have low-poly, straightforward color palette art—but rather that there should be consistency and a dearth of distracting visual elements. Learners lose out on the main reason they are using VR in the first place if immersion is disrupted.

2.3 Education as A Function and Service

Modern education needs to be focused on the future and the wider world. It is inevitable that teaching methods will become more and more computerised. The majority of learners have received strong learning support from the online education system, which has been heavily involved

in the unique period of the epidemic [60]. Teachers can create courses, course resources, question banks, take exams, push materials, sign in, quizzes, voting, questionnaires, discussions, and other daily teaching activities online through the sharing platform. It over-come the time and space limitations of traditional classroom teaching. Hence, combining the online learning platform service system and offline classroom teaching is important. The de-sign of a learning environment may not only ensure the normal implementation of teaching activities in exceptional conditions, such as an epidemic, but also maximize the benefits of online and offline teaching, optimize the teaching process, and enhance students' learning outcomes [61].

Immersion virtual reality (IVR) is one example of the cutting-edge technology that will undoubtedly play a significant role in education both now and in the future [62]. IVR refers to engaging users in an artificial environment that replaces their natural surroundings and fully engages them with the artificially created environment [63]. To experience immersive and dynamic 3D learning, students can bring laptops, smartphones, or VR headsets to class. With the aid of this cutting-edge technology, students are better able to learn from real-world scenarios similar to those found in the classroom.

2.4 Related Work

Table 2 shows previous studies on the application of VR and 5G in education. Based on the table below, we can see that VR and 5G has already been used in a various educational subject, including English, physical education, medical, engineering, art history, and others. This further proves the importance of VR in education fields.

Table 2: Previous Studies on The Application of VR and 5G in Education.

Authors	Objectives	Results/Conclusion
[64]	To develop a mobile network application for interactive virtual reality education.	Compared with LFU (Least Frequently Used) and LRU (Least Recently Used), the suggested method increases FoV (Field of View) coverage by 30% and lowers caching costs by 25%.
[65]	To create and evaluate a brand-new situational English teaching scenario using 5G+ VR technology.	The suggested approach increases instructional efficacy, which has important ramifications for the teaching of English.
[66]	This paper provides a thorough analysis of the evolution and reforms of PE services in the context of 5G connected communications	To support students' overall development, the 5G-driven PE will offer them a diversified, impartial, and objective education in addition to adaptive learning services.
[42]	This study suggests using 5G technology and emerging virtual reality technology to enhance IPC (ideological and political courses) at colleges and universities.	The findings indicate that college and university students who have been Communist Party members are most interested in IPC. Confirming this, roughly 29.7% of college students and 26.81% of university students who belonged to the communist youth league supported IPC, whereas only 14.29% of the general public expressed interest in it.
[67]	This study uses virtual reality technology, or VRT, to create a virtual sports environment education program.	The findings indicate that the five schools have experienced a more than 65% de-crease in safety incidents related to sports since implementing VRT in PE. Further-more, there has been a more than 20% in-crease in the number of students participating in PE and sports on their own, and there has been a rise in the students' interest in sports and sports education.
[68]	To determine the degree to which immersive VR and AR technologies enhance particular medical education and training competencies in healthcare practitioners.	The findings show that VR is a widely used technique in the field of medical education technology research, with a tendency to improve educational outcomes.

[69]	Assessing the benefits of VR learning games in an engineering school setting's Virtual and Augmented Reality Technology-Enhanced Learning (VARTeL) environment.	The post-test results show a significant improvement of roughly 24.8% over the pre-test results, demonstrating the usefulness of the VARTeL for engineering education.
[70]	To suggest a programmable VR application for art history educators that shows paintings for examination and the questions that go along with it.	The system evaluation backs up the idea that the suggested VR system, with its medium workload and excellent usability, can be used in art history classrooms.

Table 3 shows a comparative analysis of the security level, energy efficiency, and cost reduction for different 5G technologies used in Physical Education.

Table 3: Comparative Analysis of 5G Techniques in Physical Education.

5G techniques	Cost reduction (%)	Energy efficiency (%)	Security level (%)
Model-based practice	80	80.2	85.9
Virtual reality	85	82.5	89.8
Internet of Things	72	94.5	95.6
Artificial intelligence	89	88.1	91.5

3. METHODOLOGY

This questionnaire has 15 questions, and a total of 230 people participated in the survey to answer. We divided the 15 questions into three types: 5G audience groups, 5G software user habits, and 5G software application questions. Then, we assessed each question individually using these three criteria. Figure 4 depicted the research framework of the study.

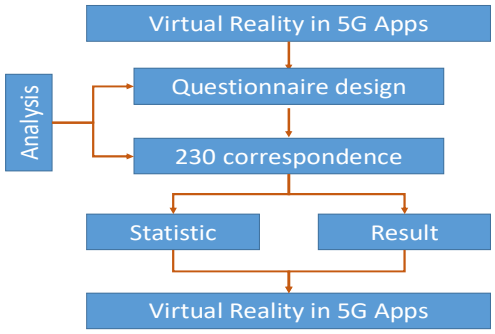

Figure 4: The Research Framework

4. RESULT AND DISCUSSION

In resource sharing platform, teachers can dynamically gather students' learning data in real time. They can then use this information to conduct learning analysis during the learning process to accurately determine the students' current proficiency and areas of need. Finally, they can offer targeted interventions to promptly adjust the teaching strategy. The technologies employed like the VR is to create an accurate management and testing system, a smart education system that combines physical and emotional and to write, record, organize, and select student data from the comprehensive quality assessment process in the smart learning environment in order to support educational equity. In order to understand the awareness of current 5G application with VR, this paper conducted a network questionnaire survey on 230 relevant persons in education sector.

4.1 Analysis of 5G Audience Groups

A total of 230 people participated in this research, with the majority of young people between 20 and 40 years old, accounting for 80.43% of the total number of people surveyed, as shown in Table 4. The results showed that 43.91% of the respondents are between the ages of 30 and 40 years, while 36.52% are between the ages of 20 and 30, 10.87% are under the age of 20, and 8.70% are beyond the age 40.

Table 4: Age Composition of the Respondents.

Age	Percentage (%)
Under 20 years old	10.87
Between 20 and 30 years old	36.52
Between 30 and 40 years old	43.91
Over 40 years	8.70

Table 5 shows the results of the survey on the identity of the interviewee. The results showed that there were more teachers among the respondents,

which is 69.13%, meanwhile, 30.87% of them are students.

Table 5: Identity of The Interviewee.

Identity	Percentage (%)
Teacher	69.13
Students	30.87

4.2 Analysis of 5G Software User Habits

90% of the respondents in this research said they had heard of VR technology. This shows that VR technology has gradually entered people's vision. Among them, 37.39% of the respondents said they knew a lot about VR technology, symbolizing that has been accepted and integrated into people's daily life, as shown in Table 6. Meanwhile, 36.52% of the respondents knew a bit about VR, 6.96% knew little about VR, and 9.13% hardly knew about VR. Lastly, 10.00% of the respondents never had heard about VR.

Table 6: Respondents' Level of Knowledge of VR Technology.

Level of knowledge	Percentage (%)
Heard of and know a lot about VR	37.39
Heard of and know a bit about VR	36.52
Heard of but know a little about VR	6.96
Heard of but hardly know about VR	9.13
Never heard	10.00

Study Tone is a free app that combines mobile learning, mobile teaching, mobile reading, and mobile social networking. It is widely used by teachers and students in universities nationwide. The data from this study, through researching this app, shows that 89.13% of respondents have used Study Tone, and 78.26% of learners use it more frequently, with 38.26% indicating that they use it at least once a week. This is represented in Table 7. This shows that teachers are gradually becoming more dominant in using the Internet and adopting an interactive approach to learning and teaching.

Table 7: Analysis of Respondents' Frequency of Use Regarding the Learning Connect App.

Frequency of use	Percentage (%)
On average used more than once a week	40.00
On average used once a week	38.26
On average used once a semester	2.17
On average used once a year	8.70
Not used at all	10.87

Due to a series of policy requirements, different teachers may use different teaching platforms. We, therefore carried out more recent research, through which we learned that Tencent Courses (52.61%), Qingshu Platform (57.39%), B-site, I want to learn by myself, and China Student Muzheng.com (41.30%) are all the main venues for Internet teaching at present as shown in Table 8. The Qingshu platform, in particular, combines lectures, assignments, chats, electronic resources, and exams. Teachers can set the proportion of students' grades for modules such as live learning, assignments, e-books, and exams and generate final grades through scientific calculations.

Table 8: Information on Respondents' Use of Types of Learning Platforms.

Types of learning platforms	Percentage (%)
Tencent Classroom	52.61
Qingshu Platform	57.39
Bilibili	56.09
China Student Catechism Network	41.30
WoYaoZiXue Website	51.74
Others	43.04

In order to fully understand the terminals used by students in the class, this study fully explored their usage habits. The study results in Table 9 showed that about half of the respondents said that both mobile phones and PCs were acceptable for teaching and learning activities, 55.22%. Meanwhile, 25.65% of the respondents said that they preferred to use PCs for teaching and learning activities, and 19.13% said that they preferred to use mobile phone for teaching and learning activities.

Table 9: Results of the Study Terminal Propensity Survey.

Terminal propensity	Percentage (%)
Mobile phones	19.13
Computer	25.65
Both acceptable	55.22

From the preliminary research, it is clear that 80.43% of the respondents in this study belong to the youth. As a result, there are certain economic differences between them and their perception of new things, so there are differences in the terminals they use and the network environment. The results of this research in Table 10 showed that 35.65% of the respondents said that the software they use supports 5G networks, 36.52% said that most of the software they use supports 5G networks, and 10.87% said that it does not support it at all.

Table 10: Analysis of the Results of Whether the Learning Terminal Supports 5G Networks.

Learning terminal supports 5G network	Percentage (%)
All software is supported	35.65
Only supported by most software	36.52
Only supported by some software	6.09
Very few software support	10.87
Not supported at all	10.87

4.3 Analysis of 5G Software Application Problems

According to the research results, we found that the biggest problems faced by the use of 5G software are focused on the stability of the network. Users may encounter network interruptions, video lag, and the inability to update and upload coursework on timely manner in the process of using the software. Approximately 77.39% of respondents reported that they had encountered unavailability or disconnection of the 5G network during using the software, as shown in Table 11. In addition, 70%-80% of respondents had experienced problems with coursework not opening, downloading, and video lagging while studying, as shown in Table 12.

Table 11: Analysis of Software Usage in A 5G Network Environment.

Software usage in a 5G network environment	Percentage (%)
This is the case for all software	45.22
This is present in most software	32.17
Only a fraction of software has this	2.17
Exists in very few software	6.96
Not at all	13.48

Table 12: Problems in The Use of The Software.

Problems in using the software	Percentage (%)
Exceptionally high frequency	36.09
Somewhat high frequency	40.00
Low frequency	4.35
Very low frequency	9.57
Never	10.00

As 5G technology is widely used in education, we should be aware of the security issues of 5G, such as personal information leakage, data security, and other issues. According to the survey results, about 77.39% of people said they had received harassment or spam messages, and 46.96% said they received harassment messages after all the software they had used. Of course, 22.61% of people said they rarely or never encountered such personal information leakage, as shown in Table 13.

Table 13: Analysis of 5G Software Usage Security.

5G software usage security	Percentage (%)
This is the case for all software	46.96
This is present in most software	30.43
Only a fraction of software has this	3.91
Exits in very few software	8.26
Not at all	10.43

4.4 Discussion

Justify issues for knowledge creation and also the research gap that this study fulfils.

The finding shows that 89.13% of respondents have used 5G application for teaching and learning. However, the awareness and knowledge of 5G was limited among Malaysian, especially the students, as the 5G technology is new and has not yet launched officially [71]. Next, the finding also shows that 90% of the respondents said they had heard of VR technology. However, most higher education institutions in Malaysia has not implemented VR in their education system. This is proven by the result of a previous study, where 96.2% of the respondents did not use VR in their higher education [72]. This shows that VR is not a current trend in higher education in Malaysia.

5. CONCLUSION

In conclusion, in the field of education, 5G technology has greatly improved the interactive communication between teachers and students. VR technology has also created a more conducive, relaxed, and pleasant teaching atmosphere, which further improves the quality of teaching and learning in the classroom. Therefore, this study is dedicated to discuss the awareness of 5G applications with VR technology in education. Where, the survey was conducted through a Google form, and a total of 230 instructors and students answered the survey question. The results showed that 90% of the respondents said they had heard of VR technology, and 89.13% had used the Study Tone application for teaching and learning. This shows that 5G technology has been widely used in education, and VR technology is gradually entering people's vision. In addition, based on the analysis results of this research, and in response to the problems that exist in the process of 5G software application, the following suggestions for the development of the education industry in the 5G era are proposed: (1)

Continue to strengthen the construction of 5G networks and enhance the coverage of 5G networks; (2) Optimize and improve the functions of 5G education software to enhance teaching quality; and (3) Strengthen network security monitoring and do a good job of protecting data and information.

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