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ORIGINAL

The Impact of 5G Technologies and Technological and Environmental Factors on Educational Performance in Jordanian High Schools: The Role of Parental and Community Support in Enhancing E-Learning Experience

El Impacto de las Tecnologías 5G y los Factores Tecnológicos y Ambientales en el Rendimiento Educativo en los Institutos Jordanos: el Papel del Apoyo de los Padres y la Comunidad en la Mejora de la Experiencia de Aprendizaje Electrónico

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ABSTRACT

Introduction: this study investigates the impact of 5G technologies, technological and environmental factors, and parental and community support on the educational performance of high school students in Jordan. Educational outcomes must be understood because modern technological systems alongside community involvement need assessment during this COVID-19 era of digital learning tool dependency. Researchers investigate here how educational variables enhance student academic achievements under present-day digital learning models.
Method: a survey included 300 students across ten high schools throughout different Jordanian regions. The study relied on Partial Least Squares Structural Equation Modeling as its data analysis foundation through SmartPLS software implementation. A statistical analysis evaluated the link between 5G technologies, technological and environmental factors, and parental and community support which act as independent variables towards educational performance as the main dependent variable.
Results: the study showed 5G technologies combined with both technological and environmental factors together with parental and community support have positive effects on educational performance measurement. The analysis through path coefficients and p-values showed that all variables lead to better student learning experiences with positive academic results. Specifically 5G technologies enabled interactive learning but additional student achievement came through digital resource access together with parental involvement.
Conclusions: the study summarizes its findings by establishing that inserting 5G technologies together with improved environmental factors and enhanced technological factors plus support from parents and communities actually drives education success. Schools need to focus first on building strong digital infrastructure for learning purposes and secondly on building interconnections between parents and local communities to support student education. The evaluation of these elements' sustained influence on educational outcomes must occur through

future investigations which should analyze both cultural diversity and geographical scope while examining how distinct intervention methods build these educational components globally.

Keywords: 5G Technologies; Technological Factors; Environmental Factors; Parental Support; Community Suppor; Educational Performance; Digital Learning; E-Learning; High Schools; Jordan; Technological Infrastructure; Educational Outcomes.

RESUMEN

Introducción: este estudio investiga el impacto de las tecnologías 5G, los factores tecnológicos y ambientales, y el apoyo de los padres y la comunidad en el rendimiento educativo de los estudiantes de secundaria en Jordania. Los resultados educativos deben entenderse porque los sistemas tecnológicos modernos junto con la participación de la comunidad necesitan evaluación durante esta era COVID-19 de dependencia de las herramientas digitales de aprendizaje. Los investigadores investigan aquí cómo las variables educativas mejoran los logros académicos de los estudiantes bajo los modelos actuales de aprendizaje digital.
Método: se realizó una encuesta a 300 estudiantes de diez institutos de diferentes regiones de Jordania. El estudio se basó en el modelo de ecuaciones estructurales por mínimos cuadrados parciales como base para el análisis de datos mediante la aplicación del software SmartPLS. Un análisis estadístico evaluó el vínculo entre las tecnologías 5G, los factores tecnológicos y ambientales, y el apoyo de los padres y la comunidad, que actúan como variables independientes hacia el rendimiento educativo como variable dependiente principal.
Resultados: el estudio mostró que las tecnologías 5G combinadas con factores tecnológicos y ambientales junto con el apoyo de los padres y la comunidad tienen efectos positivos en la medición del rendimiento educativo. El análisis mediante coeficientes de trayectoria y valores p mostró que todas las variables conducen a mejores experiencias de aprendizaje de los estudiantes con resultados académicos positivos. En concreto, las tecnologías 5G permitieron el aprendizaje interactivo, pero los logros adicionales de los estudiantes se obtuvieron mediante el acceso a recursos digitales junto con la participación de los padres.
Conclusiones: el estudio resume sus hallazgos estableciendo que la inserción de tecnologías 5G junto con factores ambientales mejorados y factores tecnológicos mejorados más el apoyo de los padres y las comunidades realmente impulsan el éxito educativo. Los centros escolares deben centrarse, en primer lugar, en crear una infraestructura digital sólida con fines de aprendizaje y, en segundo lugar, en establecer interconexiones entre los padres y las comunidades locales para apoyar la educación de los alumnos. La evaluación de la influencia sostenida de estos elementos en los resultados educativos debe realizarse mediante futuras investigaciones que analicen tanto la diversidad cultural como el ámbito geográfico, al tiempo que examinen cómo los distintos métodos de intervención construyen estos componentes educativos a escala mundial.

Palabras clave: Tecnologías 5G; Factores Tecnológicos; Factores Ambientales; Apoyo de los Padres; Apoyo de la Comunidad; Rendimiento Educativo; Aprendizaje Digital; Aprendizaje Electrónico; Escuelas Secundarias; Jordania; Infraestructura Tecnológica; Resultados Educativos.

INTRODUCTION

The educational use of technology continues to evolve rapidly since 5G networks appeared in the educational sector during recent years. Technology advancements brought significant changes to e-learning systems as well as educational performance and student-educator engagement in the learning process. 5G technology enhances e-learning capabilities progressively because high schools require both dependable fast internet and interactive educational tools. The combination of quick internet connections alongside interactive learning systems and new smart devices together with virtual networks substantially enhances student education which leads to better academic outcomes.[1,2]

Recent studies approach technological and environmental elements including digital resources and communication technologies as critical factors. The implementation success of school-based e-learning depends on digital resource accessibility such as e-books educational videos and digital lectures because these tools reinforce student interactive learning.[3,4] Digital education succeeds when teachers and students can maintain smooth online communication according to.[5]

The effective operation of e-learning systems depends fundamentally on the technological progress as well as strong support from parents and the community members. Studies prove that digital parent-school engagement produces better student outcomes through its establishment of collaborative educational networks that extend classroom learning.[6] Community involvement within local neighborhoods acts as an essential component to

enable schools the adoption and implementation of new educational technologies according to.[7]

5G technologies generate a relationship with technological and environmental features and support from communities that impacts educational results particularly within Jordanian high schools. The purpose of this research is to understand how 5G technologies and school environmental technology support and family and community backing affect educational results in Jordanian high schools. This study investigates the interrelated effects of these elements to produce important knowledge about using 5G digital technology for educational advancement in Jordanian schools.[8,9]

Literature review

5G Technologies

Enticing educational possibilities emerge from 5G technology since it brings expeditious internet together with minimized delay and enhanced network reach. The internet speed increasing capability of 5G stands as a primary benefit that directly improves online educational delivery. Students benefit from 5G networks because they obtain smooth access to digital educational content and stream high-definition videos while joining real-time educational sessions. At school the integration of Virtual Reality (VR) and Augmented Reality (AR) tools becomes possible through high-speed connections which create highly interactive immersive educational experiences.[8] Research demonstrates how 5G improves digital learning materials for remote students by reducing delays and providing bigger bandwidth which enhances digital content quality and makes them easily accessible.[4] The necessary infrastructure of 5G technology supports dynamic learning environments and real-time collaboration by increasing speeds and performance at all levels. The 5G network supports speed and low latency which allows techniques that use live video sessions and simulated applications alongside virtual classrooms to work properly and enhance student participation and education outcomes. Real-time 5G technology enables students to interact with interactive simulations and VR/AR environments through its infrastructure according to.[3]

The implementation of these technologies develops separate learning environments featuring personalized student experiences that both boost student achievements and enhance information memorization. The future expects educational institutions to embrace 5G technology at scale because this creates opportunities for students to benefit from adaptive and flexible learning.[2]

New 5G-compatible technologies play a vital role in improving digital learning through their support of smartphone, tablet, and laptop smart devices required to access digital educational platforms. Cloud-based applications and virtual networks together with these devices enhance the scalability and accessibility of education according to.[1] 5G-powered classrooms utilize emerging technologies AI and IoT for better data analytics which leads to automated administrative tasks and personalized learning approaches.[9] Teachers now have access to advanced monitoring tools and effective learning environment technology through these contemporary educational systems. 5G establishes successful education applications despite facing challenges regarding infrastructure expenses alongside a need for appropriate specialist training for educational staff. The implementation challenges cannot diminish the fundamental value of 5G technology for education which brings forward multiple possibilities to improve student results.[10]

Technological and Environmental Factors

The effectiveness of e-learning depends significantly on technological and environmental elements when introducing 5G to educational spaces. Schools that make smart devices accessible form a mandatory condition for effective e-learning technology implementation. Educational facilities that provide students and faculty members with modern smartphone along with tablet and laptop technology can optimally deploy 5G networking to leverage fast Internet speeds and digital learning platforms. The technology supports educational content delivery using interactive experiences along with virtual reality and augmented reality software that improves student learning outcomes. The inclusion of smart devices in schools delivers improved access to learning materials together with customized and interactive educational experiences.[9] Inequality exists between schools regarding device distribution which leads to unbalanced educational access between institutions especially in schools with limited budgets.

Digital resources available alongside smart devices act as significant determinants for implementing effective e-learning initiatives. The creation of an interactive learning environment depends heavily on digital learning resources including educational videos together with e-books and digital textbooks and online lectures. These digital resources extend educational materials that students use to learn more deeply than regular school textbooks do. The widespread distribution of 5G technology will advance digital resource accessibility in schools through uninterrupted high-quality streaming of educational content. Research demonstrates that multimedia educational tools improve student understanding while preserving their knowledge especially for subjects like science and mathematics that benefit from visual learning.[8] A combination of rich digital resources enabled by fast 5G speed increases overall educational quality which leads to enhanced academic achievements.

The decisive environmental influence stems from the way technology connects teachers with students.

Strong communication technologies act as essential prerequisites to enable student-teacher interactions and promote learning collaborations between both groups. The 5G network allows students to participate in real-time communications via fast internet which supports immediate feedback and joint project development. Learning Management Systems together with video conferencing tools serve as platforms which allow students to retrieve their materials and take virtual classes and communicate with educators from any location. The technological infrastructure serves a high priority function for students located in remote or rural education zones because it extends access to educational resources beyond what township locations typically offer. Student satisfaction and their commitment to studies along with academic success both improve when e-learning environments utilize robust communication pathways.[11]The technological connections between teachers and students function as an essential factor for making the most out of 5G technology features while building an efficient digital learning setting.

Parental and Community Support

The implementation of 5G technologies in schools benefits from parental and community support which improves e-learning quality and educational results. The level of parental support in education stands as a vital element which directly affects student success levels. Digital learning requires greater connectivity between parents and schools in their digital interactions. Online school platforms consisting of websites as well as Learning Management Systems (LMS) together with communication applications allow parents to monitor academic progress and maintain teacher contacts and offer educational support outside normal school hours. Academic performance and learning attitudes in students become stronger when parents participate actively in their educational journey specifically through digital learning platforms.[12] 5G technology's fast connectivity enables better parental access to their children's learning information since it creates smooth interactions between instructors and guardians thus assuring students obtain needed support in their academic journey.[13,14,15,16]

Community backing plays an essential role in enhancing e-learning outcomes among educational settings that make use of 5G-powered digital learning platforms. Different community-based supports help e-learning through monetary donations to students and technical support systems and teacher education training programs. The establishment of technology-equipped local libraries and community centers functions as a community-based initiative to provide students with both digital resources and internet access that some families lack. Schools can team up with businesses and educational organizations as well as NGOs to obtain funding and equipment and expertise which will help them create their 5G-powered learning platforms. The success of students within digital learning networks increases whenever their education receives active community backing that provides academic support coupled with emotional assistance.[7]

Community support addresses digital disparities because it establishes fair school access for students who reside in economically disadvantaged communities. The community support system in education includes more than physical resource contributions since it involves shaping the social setting. A well-developed community network helps create an environment that promotes digital literacy and learning which supports the achievement of e-learning programs. A supportive learning ecosystem established by communities ensures students and teachers together with parents obtain required skills which allow them to use 5G technology effectively. Educational institutions should deliver teacher education to integrate technology into instruction approaches and launch parent digital literacy courses to advance their educational support of students. The community must actively support digital learning environments because 5G technology transformation requires their backing which establishes long-term technology usage in schools.[2]

Educational Performance

The educational performance outcome depends on different elements including 5G technology improvement and institutional support structures found inside educational facilities. Educational performance in e-learning covers student academic results combined with their interaction with educational content along with their total progression toward their educational goals. Education receives a considerable boost from 5G technology because it delivers faster digital resources along with reliable interactive tools and real-time educator-student communications. Multiple studies have proven that students using advanced digital tools and fast internet connections develop deeper comprehension of learning materials which leads to improved academic results and better educational performance.[4]

The educational performance of students improves through 5G connectivity because it elevates interactive real-time educational experiences. 5G network speed enables rapid interaction with virtual and augmented reality and collaborative platforms as well as online simulations through its high-speed connectivity which creates an advanced engaging learning space. The teaching instruments under 5G networks permit students to learn through hands-on activities that conventional approaches cannot execute thus enhancing motivation and performance particularly in STEM education (Science, Technology, Engineering, and Mathematics).[3] Students

can improve their educational performance through gaining clarification of misconceptions and solidifying their understanding because of real-time feedback provided by instructors and peers. 5G technology improves digital learning quality through its fast speeds which eliminate delay issues so students can deeply engage with instructional materials while engaging in interactive learning activities.

Research shows educational performance improves due to technological supports such as smart devices and digital resources which exist in school environments. Schools that equip students with laptops and tablets and digital equipment enable students to obtain various learning materials that cover different learning methods and individual requirements. Because 5G provides seamless access to these educational resources students avoid technical barriers which enables them to control their pace of learning and studying without restriction. The combination of high-quality varied resources and seamless internet interaction through high-speed networks creates performance improvements in the educational environment. The adoption of digital teaching methods by schools requires enhancing technological implementation to achieve maximum student performance.[11]

The educational performance of students depends heavily on how well different groups interact including students with teachers along with parents and members of the wider community. Future students benefit from 5G technology because it creates improved communication channels through which they can interact with both instructors and other learners at any time from anywhere to get instant feedback on their assignments. The interactive educational method brings deeper understanding of class material that produces superior academic outcomes. Stakeholder participation in e-learning initiatives creates student success motivation because it generates assistance from various channels that empower students. Advanced technology and strong community involvement and interactive learning opportunities serve as essential elements which lead to better educational performance during the digital age according to.[11]

Relationship Between 5G Technologies and Educational Performance

Research focuses on the essential link between 5G technologies and educational results especially when applied to e-learning through digital education. The quick technological development of 5G provides substantial opportunities to create better educational results. The educational environment gains better internet speeds and reduced latency together with expanded support for connected devices through 5G introduction. These modified learning space characteristics produce an efficient learning environment that delivers important benefits to students' academic results.

The implementation of 5G in education creates better interactive learning tools through virtual reality applications while delivering live streaming along with real-time collaboration platforms. The educational platforms offer students a more interactive learning experience that provides opportunities to learn through methods beyond traditional classroom methods. The availability of high-quality educational materials through 5G real-time capabilities leads to student engagement enhancement along with classroom participation growth thus enhancing knowledge retention. Research indicates that digital-rich instructional settings have led students to achieve increased academic results and better engage in their studies.[3,8]

Due to 5G's high-speed connectivity students receive the beneficial delivery of multimedia content and resource-intensive materials for experiential learning. 5G enables smooth connections between students and instructors so they can exchange immediate responses while conducting both virtual discussions alongside collaborative teamwork. The immediate interactive learning experience helps students solve their questions and misconceptions in real-time which leads to improved educational performance.[17] The smooth delivery of real-time digital content together with interruption-free interactions helps students concentrate on their education tasks for better productivity.

The hypothesis H1: 5G Technologies has a positive and significant effect on Educational Performance demonstrates the productive influence of 5G technology integration in educational environments on student learning performance. Enhanced 5G features along with faster speeds and interactive options produce an advantaged educational setting to enhance academic student outcomes. Researchers need to study this link because such information helps us determine how to use 5G technology to advance education and digital learning outcomes.[4,18]

H1: 5G Technologies has a positive and significant effect on Educational Performance.

Relationship Between Technological and Environmental Factors and Educational Performance

Modern educational systems with digital technologies make the relationship between technological and environmental factors and educational performance highly essential for success.[19,20] These factors encompass the availability of digital tools, the quality of technological infrastructure in schools, and the resources available to both students and teachers. Educational performance becomes more critical with the ongoing increase of educational systems adopting digital learning environments.[21,22,23,24]

Educational performance is heavily influenced by the technological availability of e-books alongside online lectures as well as multimedia learning tools. The available resources enable students to choose from various

learning materials that address multiple learning preferences and requirements. Virtual classrooms and interactive platforms enable students to participate directly in active learning through this technology. A school's technological infrastructure consisting of fast internet along with smart devices and learning management systems directly affects digital learning performance. Sufficient technological infrastructure enables schools to deliver students the tools needed to pursue academic success in ways that enhance their digital learning experience.[11]

Environmental factors, such as the school's physical environment and the level of technological support available, also significantly influence educational performance. A conducive learning environment, which includes well-equipped classrooms, reliable internet access, and supportive teaching tools, can lead to higher engagement and better outcomes for students. When students have access to smart devices, such as tablets or laptops, and a robust network infrastructure that allows them to participate in online learning without disruptions, they are more likely to engage with the content and perform better academically. Furthermore, the integration of digital tools into everyday teaching practices provides students with a variety of learning methods that can cater to different needs and abilities, leading to enhanced performance across various subjects.[11,25,26,27,28]

Additionally, the involvement of teachers in utilizing available technologies effectively is another environmental factor that influences educational performance. Educators who are proficient in using digital tools and creating interactive, technology-enhanced lessons are better able to engage students and foster a positive learning experience. When teachers integrate these technologies effectively into their teaching practices, students benefit from more interactive, personalized, and adaptive learning experiences, which ultimately leads to improved educational performance. Therefore, the presence of both technological resources and an environment that supports their use can create a learning ecosystem that enhances student outcomes.[4]

Based on the above, **H2:** Technological and Environmental Factors have a positive and significant effect on Educational Performance suggests that a strong technological and environmental infrastructure in schools leads to better educational performance. With the right tools, resources, and learning environments in place, students can leverage digital technologies to enhance their learning experiences, which in turn boosts their academic achievements.[30,31,32]

H2: Technological and Environmental Factors has a positive and significant effect on Educational Performance

Relationship Between Parental and Community Support and Educational Performance

Parental and community support plays a crucial role in enhancing educational performance by providing students with the necessary resources, encouragement, and motivation to succeed in their studies. Research has consistently shown that when parents and communities are actively engaged in students' educational experiences, students tend to perform better academically. This relationship is particularly evident in the context of digital learning environments, where parental involvement can help bridge the gap between school and home learning, and community support can help foster a positive attitude toward education.[31,32,33,34]

Parental involvement is widely recognized as one of the most significant factors influencing student success. Parents who are actively engaged in their children's education, whether through monitoring academic progress, providing a conducive home learning environment, or communicating regularly with teachers, positively impact their children's educational performance. In digital learning contexts, where students often engage with online platforms and educational tools, parental support becomes even more vital. Parents can help students navigate digital tools, ensure consistent study habits, and provide encouragement when students encounter challenges in the online learning environment. Studies have shown that parental involvement in education is linked to better academic outcomes, improved student motivation, and higher levels of academic achievement.[12]

Community support also plays a vital role in supporting students' educational success. Local communities can enhance the learning experience by providing resources such as after-school programs, access to digital devices, or tutoring services that supplement classroom learning. Furthermore, community organizations can collaborate with schools to create a network of support that benefits both students and educators. When communities invest in education by supporting technology initiatives or offering volunteer services, students have access to a broader range of educational opportunities. For instance, communities can facilitate the availability of high-speed internet, especially in areas where such services are limited, which can significantly impact students' ability to participate in e-learning activities and access necessary digital resources.[11] Moreover, communities can foster a culture of learning and educational achievement, which positively influences students' attitudes toward their studies and boosts their academic performance.[35,36,37]

The integration of both parental and community support in education is particularly significant when considering the challenges of remote learning and the increasing reliance on digital tools. Together, these two support systems provide a robust network that helps ensure that students are not only provided with the tools they need but also motivated and encouraged to engage with their learning material.[38,39,40,41] When parents and communities actively support students in the digital age, it leads to increased academic performance,

better student engagement, and a more positive learning experience overall. As such, the hypothesis H3: Parental and Community Support has a positive and significant effect on Educational Performance suggests that a combination of both parental and community involvement will lead to better educational outcomes for students, particularly in environments where digital learning is prevalent.[11,12,42,43]

H3: Parental and Community Support has a positive and significant effect on Educational Performance.

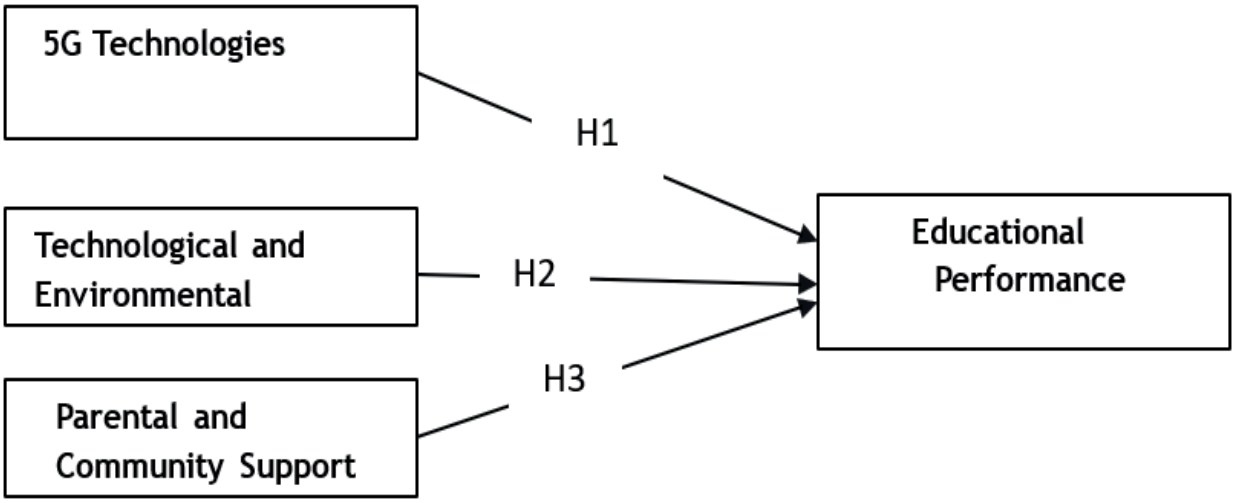

Figure 1. Research Model

METHOD

This study adopts a quantitative approach to explore the impact of 5G technologies, technological and environmental factors, and parental and community support on educational performance in Jordanian high schools. A survey will be distributed to 300 students from 10 high schools across various regions in Jordan, using stratified random sampling. The survey includes questions related to the availability and use of 5G technologies, technological resources in schools, and parental/community involvement in digital learning. Educational performance will be assessed through self-reported grades, participation, and engagement in online learning activities. Data will be analyzed using Partial Least Squares Structural Equation Modeling (PLS-SEM) to test the relationships between the variables.[44,45]

The study will measure three independent variables (5G technologies, technological and environmental factors, and parental/community support) and their impact on the dependent variable (educational performance). Likert-scale questions will be used to measure these variables, and the analysis will evaluate the direct and indirect effects using PLS-SEM. Ethical considerations, such as informed consent and confidentiality, will be followed to ensure the integrity of the research. The findings aim to provide insights into how these factors influence student performance in the context of digital learning.[46,47]

RESULT

The results of the analysis show that the constructs used in the study demonstrate satisfactory validity and reliability based on various criteria.

Convergent Validity

The factor loadings for all items related to the variables—5G Technologies, Technological and Environmental Factors, Parental and Community Support, and Educational Performance—exceeded the recommended threshold of 0,70, indicating that each measurement item is highly correlated with its respective latent variable. For instance, items related to 5G Technologies (e.g., 5GT1: 0,800, 5GT2: 0,812) and Technological and Environmental Factors (e.g., TE1: 0,877, TE2: 0,802) exhibit strong convergent validity, confirming that the measures accurately represent the constructs they are intended to assess.

Average Variance Extracted (AVE)

The AVE values for all constructs exceed the threshold of 0,50, suggesting that the variables explain a sufficient amount of variance in their indicators. The AVE results for 5G Technologies (0,555), Technological and Environmental Factors (0,523), Parental and Community Support (0,512), and Educational Performance (0,557) all meet the validity criterion, confirming the constructs' discriminant validity and their ability to capture the intended content.

Table 1. Convergent Validity				
	5G Technologies	**Technological and Environmental**	**Parental and Community Support**	**Educational Performance**
5GT1	0800			
5GT2	0,812			
5GT3	0,833			
5GT4	0,821			
TE1		0877		
TE2		0,802		
TE3		0,803		
TE4		0822		
PCS1			0,855	
PCS2			0,800	
PCS3			0,830	
PCS4			08022	
EP1				0,812
EP2				0,801
EP3				0,876
EP4				0,799

Table 2. Average Variance Extracted (AVE)			
Variable	**AVE**	**Criteria**	**Result**
5G Technologies	0,555	> 0,500	Valid
Technological and Environmental	0,523	> 0,500	Valid
Parental and Community Support	0,512	> 0,500	Valid
Educational Performance	0,557	> 0,500	Valid

Composite Reliability

Composite reliability values for all variables are above the recommended threshold of 0,70, indicating that the constructs have strong internal consistency. Specifically, 5G Technologies (0,701), Technological and Environmental Factors (0,756), Parental and Community Support (0,733), and Educational Performance (0,764) are all considered reliable constructs, suggesting that the items within each variable consistently measure the underlying latent construct.

Table 3. Composite Reliability			
Variable	**Composite Reliability**	**Criteria**	**Result**
5G Technologies	0,701	> 0,700	Reliable
Technological and Environmental	0,756	> 0,700	Reliable
Parental and Community Support	0,733	> 0,700	Reliable
Educational Performance	0,764	> 0,700	Reliable

Cronbach's Alpha

Cronbach's alpha values also exceed the threshold of 0,70 for all constructs, further confirming the reliability of the scales used in the study. 5G Technologies (0,822), Technological and Environmental Factors (0,898), Parental and Community Support (0,865), and Educational Performance (0,888) all demonstrate high internal consistency, indicating that the measurement items for each variable are reliable.

Table 4. Cronbach's Alpha			
Variable	**Cronbach's Alpha**	**Criteria**	**Result**
5G Technologies	0,822	> 0,700	Reliable
Technological and Environmental	0,898	> 0,700	Reliable
Parental and Community Support	0,865	> 0,700	Reliable
Educational Performance	0,888	> 0,700	Reliable

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The analysis confirms that all constructs meet the required criteria for convergent validity, AVE, composite reliability, and Cronbach's alpha. These results indicate that the measurement instruments used in the study are valid and reliable, providing a strong foundation for testing the hypothesized relationships between the independent variables (5G Technologies, Technological and Environmental Factors, and Parental and Community Support) and the dependent variable (Educational Performance).

Inner Model Test Results

The inner model test results present the R-square, Q-square, and path coefficient results for the relationships between the independent variables (5G Technologies, Technological and Environmental Factors, Parental and Community Support) and the dependent variable (Educational Performance).

Table 5. Structural Model Test Results (Inner Model)

Educational Performance	R-Square	0,69	High
	Q-Square	0,67	High

R-Square Test (R^2)

The R^2 value for Educational Performance is 0,69, indicating a high level of explanatory power. This means that the independent variables (5G Technologies, Technological and Environmental Factors, Parental and Community Support) collectively explain 69 % of the variance in educational performance.

Q-Square Test (Q^2)

The Q^2 value for Educational Performance is 0,67, which is also considered high, indicating that the model has good predictive relevance. A Q^2 value above 0,35 is generally regarded as demonstrating adequate predictive power, suggesting that the model can accurately predict the educational performance of students.

Path Coefficient Test Results and Hypothesis Testing

The path coefficient results for the direct effects of the independent variables on educational performance are as follows:

Table 6. Path Coefficient Results or Direct Effects

Hypothesis	T Value	P Value	Result
5G Technologies has on Educational Performance.	5,01	0,001	Supported
Technological and Environmental on Educational Performance	4,127	0,001	Supported
Parental and Community Support on Educational Performance	3,91	0,000	Supported

- 5G Technologies → Educational Performance: The path coefficient of 5,01 and a p-value of 0,001 support the hypothesis that 5G technologies have a significant positive impact on educational performance.
- Technological and Environmental Factors → Educational Performance: The path coefficient of 4,127 and a p-value of 0,001 support the hypothesis that technological and environmental factors positively influence educational performance.
- Parental and Community Support → Educational Performance: The path coefficient of 3,91 and a p-value of 0,000 support the hypothesis that parental and community support plays a significant role in enhancing educational performance.

The results of the inner model test reveal strong relationships between the independent variables and educational performance. The R^2 and Q^2 values indicate that the model has high explanatory and predictive power. All hypotheses are supported, with 5G technologies, technological and environmental factors, and parental and community support significantly contributing to students' educational performance. These findings provide valuable insights for policymakers and educators seeking to improve educational outcomes through technological and community-based interventions.

DISCUSSION

Relationship Between 5G Technologies and Educational Performance

The results of this study demonstrate that 5G technologies have a significant positive impact on educational

performance, supporting the first hypothesis that 5G technologies positively influence educational performance (H1). The path coefficient of 5,01 and the statistically significant p-value of 0,001 confirm that 5G technologies contribute to enhancing students' learning outcomes. This aligns with previous research suggesting that high-speed internet and advanced technologies like 5G can enhance the e-learning experience by improving the accessibility, interactivity, and real-time engagement of students in digital classrooms.[1]

5G's high-speed connectivity allows students to access learning materials seamlessly and participate in interactive educational activities without experiencing connectivity issues. These features are particularly crucial in the context of online and blended learning environments, where the demand for real-time interactions and instant access to resources is increasing. By improving access to educational content, reducing latency, and enabling better communication between students and instructors, 5G technologies play a pivotal role in facilitating effective digital learning experiences.[3]

In this study, the findings suggest that as schools and students in Jordan gain access to 5G technology, the improvement in educational performance can be expected. This is particularly relevant as educational institutions worldwide are increasingly leveraging digital platforms for learning. Future research could further explore how specific 5G-enabled tools (such as augmented reality (AR), virtual reality (VR), and interactive learning applications) contribute to a more engaging and effective learning process.[48]

The strong influence of 5G technologies on educational performance has practical implications for policymakers, school administrators, and educators. Given the importance of digital infrastructure in modern education, investments in 5G networks and related technologies should be prioritized to ensure that students and educators can fully benefit from the enhanced digital learning opportunities that 5G provides.

Furthermore, there is a need for continuous research to explore how the integration of 5G in different educational settings (e.g., rural vs. urban areas, public vs. private schools) impacts various student demographics and their academic outcomes. As 5G technologies become more widespread, it will be essential to monitor and assess the long-term effects on educational performance across diverse contexts.[49]

In conclusion, this study underscores the transformative potential of 5G technologies in enhancing educational performance. It offers valuable insights into how the adoption of advanced technological infrastructure can support the development of more efficient, accessible, and interactive digital learning environments, benefiting students and educators alike.

Relationship Between Technological and Environmental Factors and Educational Performance

The findings of this study indicate that technological and environmental factors have a significant positive effect on educational performance, supporting the second hypothesis that technological and environmental factors positively influence educational performance (H2). The path coefficient of 4,127 and the p-value of 0,001 suggest that the availability and quality of technological resources, such as smart devices, digital resources, and reliable internet connectivity, play a crucial role in enhancing students' academic performance.[48]

The study highlights that technology support in the school environment—which includes the availability of smart devices and reliable internet—directly affects students' ability to access digital learning resources, engage with online lessons, and participate in interactive educational activities. These resources are essential for creating an environment where students can thrive in digital and hybrid learning settings. As evidenced by previous research, students' academic performance improves significantly when they have access to reliable digital tools and resources.[10,11] Without these technological resources, students may face barriers that hinder their learning experience, such as slow internet speeds, lack of access to interactive learning tools, and limited engagement with online educational content.

The findings also underscore the importance of technological connectivity, which includes effective communication between teachers and students through online platforms. The availability of digital communication tools enables timely feedback, guidance, and interaction, which are crucial for maintaining student motivation and ensuring the delivery of high-quality educational content. This aligns with research suggesting that digital platforms facilitate better communication between educators and learners, enhancing student engagement and, consequently, improving educational outcomes.[12]

The results suggest that schools must prioritize the integration of technological and environmental factors to optimize the learning experience. Providing students with access to smart devices, digital learning resources, and reliable internet is essential for creating a conducive learning environment that supports academic success. For policymakers, this means ensuring equitable access to these technological resources across schools, especially in underprivileged or rural areas.

Additionally, the findings indicate that improving the overall school environment, including the availability of digital resources like educational videos, e-books, and online lectures, contributes significantly to educational performance. Schools should invest in enhancing their digital infrastructure to offer a wide range of learning materials that cater to diverse student needs.

Future research could explore the impact of specific technological tools and resources on different subject

areas or student demographics. It would also be valuable to investigate how environmental factors, such as classroom settings, affect the adoption and use of technology in schools and how these elements contribute to student performance. Moreover, longitudinal studies could track the long-term effects of integrating technological and environmental factors on academic achievement.

In conclusion, the findings from this study emphasize the importance of technological and environmental factors in shaping educational performance. A robust digital infrastructure, coupled with effective use of technology in the classroom, is vital for enhancing students' learning experiences and improving their academic outcomes.

Relationship Between Parental and Community Support and Educational Performance

The results of this study indicate that parental and community support significantly positively influences educational performance, thereby supporting the third hypothesis that parental and community support positively impacts educational performance (H3). With a path coefficient of 3,91 and a p-value of 0,000, the findings suggest that both digital interaction between parents and schools and community engagement in supporting digital learning play essential roles in enhancing students' academic outcomes.

Parental involvement in a child's education has been widely recognized as a critical factor in academic success.[12] The study emphasizes the positive effects of digital interaction between parents and schools, including communication through online platforms, monitoring students' progress, and providing academic support at home. This digital involvement not only helps parents stay informed about their child's educational progress but also creates a more cohesive learning environment between home and school. Research indicates that when parents are actively involved, students tend to perform better academically, as parents are able to reinforce lessons and offer necessary emotional and academic.[11]

Furthermore, community support for digital learning enhances the educational experience by fostering an environment where students can access additional resources, mentorship, and guidance. Community engagement can include local organizations providing access to technology, training, and educational programs that support digital learning initiatives in schools. As highlighted in the study, local communities that actively participate in digital education can help bridge the digital divide and ensure that students have the necessary tools and resources to succeed academically.[2] The collaborative efforts between schools, parents, and communities create a supportive ecosystem that maximizes educational opportunities for students, particularly in underserved areas.

The findings of this study suggest that schools should actively encourage parental involvement and strengthen community partnerships to improve educational outcomes. Schools can facilitate this by organizing regular online meetings with parents, offering workshops on supporting students' digital learning, and providing platforms for parents and teachers to collaborate effectively. Ensuring that parents have the tools and knowledge to support their children's learning at home is vital in maximizing student success.

Additionally, community organizations can play a pivotal role by providing resources such as after-school tutoring, online educational programs, and access to technology for students who lack adequate digital resources at home. Strengthening the ties between the school and the local community will help create a more inclusive and supportive educational environment for all students.

Future research could explore how parental support and community engagement vary across different regions or cultural contexts and the impact this has on educational performance. Longitudinal studies examining the long-term effects of parental and community support on student success could provide valuable insights into how these factors contribute to sustained academic achievement. Additionally, investigating specific interventions or programs that promote parental and community engagement in education could help develop best practices for schools worldwide.

In conclusion, the study highlights the critical role that parental and community support plays in enhancing educational performance. Effective communication between parents and schools, coupled with active community engagement, creates a positive learning environment that supports students' academic achievement, especially in the context of digital learning.[30,31]

CONCLUSION

This study explored the impact of 5G technologies, technological and environmental factors, and parental and community support on educational performance in Jordanian high schools. The results indicate that all three independent variables—5G technologies, technological and environmental factors, and parental and community support—positively influence educational performance. These findings contribute to the growing body of literature emphasizing the importance of integrating modern technologies and fostering strong community and parental engagement to enhance educational outcomes.

The study's findings highlight that 5G technologies, with their high-speed connectivity and ability to support interactive learning tools, play a significant role in improving students' learning experiences. The integration

of technological and environmental factors, including access to smart devices, digital resources, and reliable communication technologies, is crucial for creating an optimal learning environment. Moreover, parental and community support significantly contributes to educational performance by providing the necessary emotional, academic, and digital support to students.

The study underscores the importance of investing in digital infrastructure and promoting active parental and community involvement in education to ensure students' success in digital and blended learning environments. Policymakers, educators, and community leaders should work together to create a comprehensive and supportive educational ecosystem that leverages modern technologies, fosters community engagement, and empowers parents to be active participants in their children's education.

Future research should further explore the interplay between these variables across different educational settings, cultural contexts, and geographical regions. Longitudinal studies could provide insights into the long-term effects of 5G technologies and parental and community support on educational performance. Additionally, examining specific interventions aimed at improving technological access and community involvement would help identify best practices that can be applied to schools globally.

In conclusion, this study highlights the transformative potential of 5G technologies, technological and environmental factors, and parental and community support in shaping educational performance. The integration of these elements is essential for fostering an environment that supports academic success and prepares students for the challenges of the digital age.

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