Analysis of Competencies Required for Teachers According to the Kingdom's Vision 2030

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ABSTRACT

This study examines digital technology integration in Saudi Arabian schools from the viewpoints of teachers and administrators. The research employed a mixed-methods approach, involving surveys for 346 teachers and 155 administrators, as well as in-depth interviews with a subgroup of 12 teachers and 12 administrators. The findings reveal that both teachers and administrators acknowledge the significance of digital technology in education, with most indicating access to and utilization of digital tools. Challenges identified encompass technical issues, inadequate training, and bureaucratic obstacles. Qualitative insights delve into subjects like digital skills, infrastructure needs, integration's prospects and hurdles, and the influence of Vision 2030 on tech adoption. The study emphasizes advancements in digital integration while recognizing areas for enhancement, including more teacher training, addressing bureaucratic impediments, and harnessing digital technology to align with Vision 2030's educational objectives.

KEYWORDS

Administrator Perspectives, Digital Technologies, Quality of Education, Saudi Arabia, Teacher Perspectives, Vision 2030

INTRODUCTION

Background

Saudi Arabia's Vision 2030 is a visionary and meticulously crafted strategy to redefine the nation's financial and societal landscape based on its education (Allmnakrah & Evers, 2020). Vision 2030 envisions propelling the Kingdom of Saudi Arabia into an era characterized by progress and prosperity based on a transformative roadmap focusing on education. Saudi Arabia's Vision 2030 recognizes the education system as the basis for addressing socioeconomic inequalities and shaping the nation's destiny. The number one objective of Vision 2030 is the domestic education system, which it aims to address through a dynamic and responsive educational tool. The Vision aspires to instill in students crucial skills and adaptability, which are critical elements for navigating the ever-evolving global landscape beyond conventional knowledge dissemination (Al-Adwan & Al-Edwan, 2017). The Vision 2030 goals recognize and reflect the need to nurture a destiny generation that survives and prospers

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amidst unprecedented socioeconomic challenges. In particular, the Vision 2030 tool was created to address gaps and issues in Saudi Arabia's education system. This tool positions the education system as a cornerstone for societal development, envisioning a machine that goes beyond traditional paradigms. Vision 2030 seeks to instill in students the capability to confront and triumph over challenges, fostering resilience and flexibility. This educational, imaginative, and prescient approach aligns with the broader goals of societal improvement and economic diversification, recognizing that well-prepared and highly skilled personnel are indispensable for reaching these bold goals.

This view of the education system as a linchpin underscores its strategic importance within Vision 2030. It is not merely an element but a catalyst, propelling the Kingdom toward a future where expertise, talent, and innovation converge to achieve progress. Vision 2030 inspires a future-prepared body of workers capable of contributing to the country's financial diversification by emphasizing the development of a responsive educational machine. Moreover, acknowledging the ever-evolving global context indicates a consciousness of the existing challenges and opportunities. This imaginative and prescient approach seeks to prepare students for eventualities and equip them with the adaptive capabilities needed to thrive in an uncertain future. This future-oriented method resonates with the dynamic nature of cutting-edge challenges, emphasizing the significance of training as a transformative force.

Overview of Vision 2030 and its Educational Goals

The basic structure of Saudi Arabia's Vision 2030 lies in the strategy designed to project the state into a technology-progressive state. This tool aims to instill progress and prosperity in the nation through the education system. It applies a transformative approach to the Vision by acknowledging the education system's pivotal role in societal improvement. Vision 2030 offers a tool for skills and knowledge improvement for the people of Saudi Arabia that goes beyond the traditional provision of knowledge. It aspires to be a crucible for nurturing crucial skills and abilities ideal for navigating the intricacies of the twenty-first century. The academic goals encapsulated in Vision 2030 are testaments to a relentless commitment to fostering innovation, kindling creativity, and instilling a profound obligation among college students (Alkhazi & Al-Dossary, 2018). This imaginative approach transcends the confines of conventional pedagogy, embracing a transformative paradigm shift in the direction of dynamic and generation-driven study experiences. Vision 2030 positions education as the linchpin for societal development and financial transformation. It aims to bring about an era in which students are not only academically gifted but equipped to confront the multifaceted and demanding situations of the modern-day world.

The comprehensive aspect of the education goals underscores a holistic approach, acknowledging that the Kingdom's development is based on the abilities of its populace. The emphasis on fostering innovation and creativity displays knowledge that the future prosperity of Saudi Arabia hinges on a workforce able to push the limits of tradition. Moreover, the Vision acknowledges the importance of imbuing a deep feeling of responsibility among students. This goes beyond educational prowess and extends to developing morally and socially accountable people who can contribute meaningfully to the broader societal fabric. A pivotal aspect of Vision 2030's academic goals involves embracing the younger generation as a transformative pressure (Allmnakrah & Evers, 2020). The Vision proposes an educational tool that harnesses technology to create immersive and adaptive study environments in a generation dominated by rapid technological advancements. This acknowledges the function of technology not as supplementary but as an essential element that complements studying and prepares students for the needs of a digitalized future.

Significance of Digital Technology in Achieving Vision 2030 Objectives

The digital transformation necessary to meet Vision 2030's educational aspirations presents the critical element of recognizing the era's potential to revolutionize teaching and learning; the Vision positions the virtual generation as a catalyst for achieving academic excellence. The Ministry of Education has

defined the hard and fast virtual abilities teachers must possess in line with Vision 2030. These talents will allow teachers to seamlessly integrate virtual technology into their teaching practices (Aljusupport et al., 2020). The infusion of digital equipment into training is not always merely a technological development but a strategic move to improve the quality and effectiveness of the learning process. It envisions classrooms wherein interactive and immersive digital equipment empowers teachers to engage students innovatively, fostering a love for learning and nurturing critical thinking abilities.

The ongoing implementation of the virtual transformation tasks under Vision 2030 is evident in prominent authorities' investments in infrastructure and assets. These investments are geared toward creating an atmosphere that supports virtual mastering, ensuring that schools are equipped with vital equipment and technology. Moreover, the difficulties of the COVID-19 pandemic have acted as an accelerant, compelling educational institutions in Saudi Arabia to quickly adapt to distance and hybrid learning models (Alotaibi & Alotiby, 2022). This unexpected shift has underscored the urgency and importance of reliable virtual education infrastructure. Various obstacles remain regarding some aspects of Vision 2030, although notable strides have been made in implementing virtual transformation projects in the Saudi Arabian education system. These challenges embody numerous dimensions, ranging from problems related to teacher education and development to equitable access to technology and resources. Additionally, cultural and social obstacles pose complex challenges to the full-scale adoption of virtual technology in training (Alkhazi & Al-Dossary, 2018).

Problem Statement

This study addresses the complexities of integrating virtual technologies into teaching practices and examines the connection between teachers' skills and the broader goals of Vision 2030. Despite the concerted efforts to implement a digital transformation, Saudi Arabian education faces many complex, demanding situations. Foremost among these challenges is the need for comprehensive instructor education and development packages. Vision 2030 offers an opening between theory and practice, with teachers grappling to translate theoretical expertise into effective pedagogical techniques while digital abilities are delineated in Saudi Arabia. A need for increased proficiency among teachers could improve the integration of virtual technology into teaching practices. This hinders the belief in the full capability of technology in the classroom. Access to technology and resources is another ambitious undertaking. The authorities must invest significantly in infrastructure to make more resources available in all academic institutions. Rural and less prosperous areas often have less access to contemporary technologies, with diverse implications for educational inequality.

Therefore, the digital divide is a fundamental challenge that must be addressed to ensure equitable opportunities for all students in Saudi Arabia. Moreover, Saudia Arabia's cultural and social fabric introduces nuanced, demanding situations. The traditional emphasis on face-to-face interaction and conventional teaching methods may also create resistance to the full-scale adoption of virtual technology. Striking a balance between maintaining cultural values and embracing the benefits of a virtual education system poses a delicate challenge for teachers and policymakers alike. It is necessary to delve deeper into teachers' competencies based on the demands of virtual technology integration. Teachers play a pivotal role in realizing the objectives of Vision 2030 since they are the ones implementing the educational strategies. Their virtual skills directly affect the quality and efficacy of virtual education.

This research seeks to fill a crucial hole in current understandings by focusing on the virtual abilities of teachers in Saudi Arabia. It aims to unravel the complexities surrounding integrating virtual technologies into teaching practices and understand the connection between teachers' skills and the broader goals of Vision 2030. Understanding the challenges teachers face and identifying the areas in which extra support and education systems are needed is fundamental. The research focuses on interventions and the significant strategic issues that can enhance teachers' capabilities to leverage virtual technology. The study aspires to contribute valuable insights to catalyze modifications of the Saudi Arabian education system by aligning teachers' skills with the broader imagination and vision.

Research Questions

1. What are teachers' digital competencies in primary, middle, and secondary schools in Saudi Arabia?
2. How do teachers in the Kingdom of Saudi Arabia integrate digital technologies into their teaching practices?
3. What challenges do teachers face in developing and implementing digital competencies in their teaching practices?
4. How can teachers in the Kingdom of Saudi Arabia be supported in developing their digital competencies and integrating digital technologies into their teaching practices?

LITERATURE REVIEW

Theoretical Framework

The Kingdom of Saudi Arabia has embarked on a bold adventure with its Vision 2030 initiative, aiming to convert and provide training for numerous sectors. This literature review explores key works that provide insights into the demanding situations and opportunities for improving virtual technology integration in the Saudi Arabian education system (Arab News, 2024). It aims to contribute to a comprehensive understanding of the landscape by synthesizing diverse perspectives. It seeks to shed light on the intersection of technology and training in the context of Vision 2030. The literature underscores the multifaceted nature of demanding situations and opportunities. This review encompasses various technological, policy, and systemic dimensions and collectively contributes to the information on virtual generation integration in Saudi Arabian education, aligning with Vision 2030.

IoT Adoption Model for E-Learning and Digital Transformation of Education in Saudi Arabia

Ali et al.'s (2023) research study introduces an Internet of Things (IoT) adoption model, particularly in the context of gaining e-knowledge in Saudi Arabian training. The paper explores the technological components of IoT but also reflects on its implications for training by providing a case study. This study considers how emerging technologies like IoT can be integrated into the training system in alignment with Vision 2030. Another research study by Al Ohali et al. (2018) focuses on the virtual transformation of education in Saudi Arabia, deploying a countrywide management system for K-12 education. This research offers a practical approach to how digital technology is being carried out countrywide, contributing insights into the infrastructural components of technology integration. Ali et al.'s (2023) research on the IoT adoption model and Al Ohali et al.'s (2018) study both look at the virtual transformation of education and offer insights into the realistic implementation of technology. The alignment with the transformative goals of Vision 2030, facilitated by the understanding of how emerging technologies are being implemented, provides a basis for comparing their impact on educational outcomes.

Comparative Analysis of Information and Communication Technology Policies

Studies that compare information and communication technology (ICT) in the Saudi and international contexts are essential for understanding how educational ICT policies and strategic plans can be modified and developed. Alghamdi and Holland (2020) compare ICT integration rules in Saudi Arabia and Ireland. This research is critical for providing expertise in Saudi Arabia's laws in an international context, highlighting areas for development. The comparison provides insights into powerful strategies and describes the modifications needed to improve technology integration in the Saudi Arabian education system, aligning with Vision 2030. The comparative analysis of regulations offers a basis for understanding the strategic landscape. It emphasizes the significance of aligning

ICT guidelines with the overarching goals of Vision 2030. This study's significance is its ability to understand the need for a complete and coherent policy framework.

Achieving Aspirations through Educational Reform and Societal Transformation

Integrating digital technologies is crucial for achieving the broader aspirations mentioned in Vision 2030. Mitchell and Alfuraih's (2018) article focuses on how Saudi Arabia can reach the National Transformation Program 2020 and Vision 2030 goals via education. It offers an overarching view of the function training plays within the broader societal transformation expected via Vision 2030. In this case, the article highlights the relevance of understanding the educational reform required to contextualize the importance of digital era integration in accomplishing countrywide goals. Another study by Allmnakrah and Evers (2020) addresses the need for an essential shift inside the Saudi education system to implement Vision 2030. The paper presents insights into systemic challenges that must be addressed to integrate digital technology successfully. It contributes to understanding the educational reform required to achieve the dreams set by Vision 2030. Relatedly, Mitchell and Alfuraih (2018) provide macro-level expertise on how education contributes to societal transformation.

Integrating Sustainability into Higher Education Curricula

Bataeineh and Aga (2023) and Alshammari et al., 2023 discuss integrating sustainability into higher education curricula, aligning with the goals of Saudi Vision 2030. The research offers insights into broader educational techniques that could complement virtual integration efforts, fostering a holistic method closer to achieving Vision 2030, although not directly associated with technology. Alotaibi and Alotiby's (2022) work explores the significance of social media platforms for the sustainable improvement of Saudi Arabia's higher education after COVID-19. It presents a modern-day approach to the role of digital technology in responding to global challenges, emphasizing their importance in reaching the sustainability goals mentioned in Vision 2030. Sousa et al. (2023) also address sustainable technology in higher education worldwide. The book affords a broader context for knowledge of how sustainable technology practices can align with the goals of Vision 2030, although it is not directly focused on Saudi Arabia. It offers a theoretical basis for technological sustainability and may provide valuable frameworks applicable to the Saudi academic landscape. These research studies emphasize digital education for sustainable improvement and contribute to the more comprehensive goals of Vision 2030. Sustainability in training extends beyond technology, and these studies offer insights into systemic adjustments required for long-term effects.

Competence Frameworks

Comparing international frameworks and models in digital competencies with the Kingdom's Vision 2030 goals is essential for harmonizing teachers' requirements and challenges for implementing the required transformation. The following review of these frameworks links them to the Kingdom's Vision 2030 requirements.

DigCompEdu

One of the distinguished frameworks shaping digital competence is DigCompEdu, which was developed with the support of the European Commission. It offers teachers a comprehensive set of virtual capabilities, emphasizing pedagogical practices, collaboration, and virtual citizenship. This framework serves as a benchmark for comparing teachers' digital readiness and presents a foundation for information on the multifaceted nature of virtual competence.

Teacher Digital Competency Framework

The teacher digital competency (TDC) framework is another extensive model that addresses the virtual skills required for effective teaching in the 21st century. It goes beyond technical abilities and encompasses elements including pedagogy, assessment, and the moral use of technology. The

TDC framework presents a nuanced perspective on how teachers can seamlessly integrate virtual gear into their teaching practices.

Alignment of Teacher Competencies With 21st Century Challenges

Teachers play a pivotal role in preparing college students for the demands of the 21st century. The alignment of teaching capabilities with these challenges no longer involves only technical proficiency but also the potential to foster critical thinking, creativity, and digital citizenship. DigCompEdu and the TDC framework offer courses for teachers to navigate the complicated landscape of the present-day education system, ensuring that their skills align with students' evolving needs. The European Commission's report on digital competence (DIGCOMP) affords a broader perspective on virtual competence throughout various sectors (Al-Sharafi et al., 2019). The framework emphasizes the importance of digital competence as a critical ability for active citizenship and employability but is only partially relevant to Saudi Arabian education. However, understanding DIGCOMP is essential for contextualizing the role of digital competence in Vision 2030's economic diversification and societal transformation goals.

Vision 2030 and Education

Vision 2030 outlines transformative goals for the education system based on Saudi Arabia's comprehensive blueprint for national improvement. The aims include improving the quality of education in the country, fostering an understanding-primarily based economy, and preparing college students for the demands of a rapidly changing world. The emphasis on training as a catalyst for societal progress positions teachers as key marketers in accomplishing those goals. Previous studies have delved into the impact of Vision 2030 on technology training, shedding light on the ongoing efforts to integrate virtual technology into Saudi Arabian classrooms. These studies uncover the challenges and possibilities teachers face in aligning their practices with Vision 2030. They emphasize the need for robust teacher training programs, infrastructure upgrades, and coverage guides to leverage educators' ability to understand Vision 2030 goals. The intersection of those two dimensions is essential for understanding the role of teachers in Saudi Arabian education, which reflects the digital competence frameworks and Vision 2030 goals. DigCompEdu and the TDC framework offer a lens through which to assess teachers' preparedness for the needs of Vision 2030 (Arab News, 2024). Teachers must go beyond technical skills to include pedagogical innovation and reach a level that enables them to align their capabilities with the transformative goals of Vision 2030.

Challenges and Opportunities

Challenges in Digital Competence

Although DigCompEdu and the TDC framework provide a strong foundation, translating these frameworks into practice presents significant challenges. Teachers may also need access to continuous professional development, and resistance to change may emerge in conventional educational settings.

Opportunities via Vision 2030

Vision 2030 presents a unique possibility to conquer these challenges. The dreams of Vision 2030 necessitate a paradigm shift in education, supplying the impetus for comprehensive instructor education programs aligned with digital competence frameworks. Vision 2030 lays the basis for a knowledge-based financial system by investing in teachers.

Synergy Among Competencies and Vision 2030

Enhancing Pedagogical Practices

DigCompEdu and the TDC framework spotlight the significance of using virtual technologies pedagogically. Vision 2030's purpose of improving high-quality training aligns with teachers' need to innovate pedagogically, which leads to integrating virtual resources to foster crucial thinking and creativity.

Preparing Students for the Future

The abilities mentioned in DigCompEdu and the TDC framework are designed to prepare teachers for college students' dynamic needs (Ferrari, 2013). Vision 2030's emphasis on knowledge-based abilities reinforces teachers' desire to instill these talents in students, ensuring they are well-prepared for the workforce.

Addressing Infrastructure Gaps

The European Commission's record on DIGCOMP underscores the significance of virtual competence in diverse sectors. Vision 2030's attention to infrastructure upgrades in training, which includes presenting essential virtual resources, aligns with the recommendations of virtual competence frameworks. This provides a comprehensive strategy for overcoming infrastructure challenges.

RESEARCH METHODOLOGY

Participants

Sampling Strategy for Teachers and Administrators

The participants in this study were drawn from the population of male and female teachers (n=3386) and school directors (n=155) in primary, middle, and secondary schools in the Arar metropolis, Saudi Arabia. The sampling method employed an aggregate of stratified random sampling for the survey phase and purposive sampling for the interview section.

- **Survey Phase:** The sample for the survey section included 346 teachers and 155 administrators. We applied stratified random sampling for a representative pattern based on school stages. This approach divided the populace into strata by faculty degree, after which participants were randomly chosen from every stratum. This method aimed to limit sampling bias and allow the generalizability of the findings to the broader populace.
- **Interview Phase:** For the interview phase, we used purposive sampling to select 12 teachers and 12 administrators based on their interest and expertise in integrating virtual technologies into teaching practices. This technique results in insights from contributors with specific traits or reports [27]. The chosen participants were deemed most suitable to offer valuable perspectives on the study's questions. The pattern length for the survey section (346 teachers and 155 directors) and the interview segment (12 teachers and 12 directors) was determined by carefully considering the study objectives and sampling strategies.
- **Survey Phase:** The survey sample size was designed to reflect the larger population, ensuring that the findings could be generalized to teachers and directors in Arar's primary, middle, and secondary schools. Using a stratified random sampling approach contributed to the robustness and validity of the survey results.
- **Interview Phase:** The interviewees were purposefully chosen based on their expertise in integrating virtual technologies into teaching practices, ensuring they have a wealth of knowledge and a variety of perspectives. The smaller interview sample size was deemed large enough to achieve data saturation and an in-depth exploration of contributors' responses.

Data Collection

Surveys to Quantify Digital Technology Usage

The first part of the quantitative survey was designed entirely for teachers and comprised 35 questions. These questions assessed teachers' digital skills in numerous domains, including the pedagogical use of digital technology, virtual citizenship and ethical service, evaluation of the use of virtual equipment,

professional development and gaining knowledge of frequent layout for getting to know, virtual support assessment, and scholar collaboration and communication. We used a Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree) to measure teachers' virtual abilities. The survey aimed to provide quantifiable data on the extent of teachers' proficiency in using digital technologies.

The second part of the quantitative survey was developed for college administrators and included 30 items. This section gauged the level of Vision 2030 implementation in schools, focusing on elements including the use of digital technologies in teaching and learning, the supply of technology, and the amount of education and support provided to teachers. Like the teacher survey, a Likert scale was utilized to measure the directors' views on implementing Vision 2030 (Graham et al., 2012). This quantitative survey aimed to examine the administrators' viewpoints concerning the strategic desires of Vision 2030 within the educational landscape. Both survey elements were grounded in the literature on virtual skills and technology integration in training. The teacher surveys included questions about virtual literacy and citizenship, reflecting the technological pedagogical content information (TPACK). School directors' were asked about technology infrastructure, teaching education systems and assistance, and faculty lifestyles (Alotaibi & Alotiby, 2022). Utilizing these questions ensured that the surveys aligned with the study objectives and previous studies in teaching and technology.

In-Depth Interviews to Explore Qualitative Insights

In addition to the quantitative surveys, we incorporated a qualitative approach by conducting semi-dependent interviews. Twelve teachers and twelve college directors participated in these interviews. We aimed to delve deeper into participants' perspectives on virtual technology and their respective institutions' implementation of Vision 2030. We wanted to gain qualitative insights to complement the quantitative data obtained through the surveys (Hixon et al., 2012).

Interview Design: The interview questions were primarily based on the questions used in the quantitative surveys. They were crafted to elicit detailed information about participants' ideas and perceptions regarding digital capabilities and technology integration in teaching. The interviews were conducted face-to-face, audio-recorded, and ultimately transcribed for thorough evaluation.

Participant Selection: Participants were purposively selected primarily based on their roles and duties in the schools, ensuring good representation. Teachers came from various subject areas and grade levels, while school directors included principals and vice principals from numerous regional schools. This variation aimed to capture a comprehensive range of experiences and insights.

Thematic Analysis: We used thematic analysis to interpret the qualitative results from the interviews. This involved identifying styles and themes within the documents, leading to a deeper understanding of interviewees' views on digital abilities and Vision 2030 implementation.

Data Analysis

1. Quantitative evaluation using statistical analysis.
2. Qualitative evaluation using coding and thematic analysis.

RESULTS AND DISCUSSION

Overview

The Saudi Arabian education system has been transformed in recent years, marked by a concerted attempt to combine digital technology with teaching and to gain comprehensive knowledge. The Kingdom's Vision 2030 has inspired the education sector, positioning digital technology as a critical enabler of progress. Thus, it has become a blueprint for economic and social transformation.

Vision 2030 and Digital Transformation

Vision 2030, spearheaded by Crown Prince Mohammed bin Salman, recognizes the pivotal function of the education system in shaping an information-based economic system. The initiative emphasizes fostering innovation, vital thinking, and digital literacy among Saudi Arabian residents (Alzahrani & Elyas, 2019). Professional development and the integration of cutting-edge technology into classrooms in alignment with these goals have led the teaching sector to witness huge investments in digital infrastructure.

Digital Competencies of Teachers

Teachers in Saudi Arabia have responded to the decision to aim for a digital transformation with a commendable display of digital competencies. The Digital Competencies Self-Assessment Survey, a cornerstone of this study, highlights teachers' proficiency in various domains. From pedagogical use of digital technology to virtual citizenship and moral use, teachers show high levels of competence, indicating a readiness to leverage technology for effective teaching and gaining knowledge.

Digital Resource Accessibility

A vital element of digital integration is the accessibility of sources, and Saudi Arabian teachers benefit from a robust framework. In terms of implementing Vision 2030, our survey found high Cronbach's alpha coefficients for constructs such as the supply of digital resources, education, and teacher guides. This underscores the dependable, well-developed guide facilitating the seamless use of digital tools and resources in educational settings.

Challenges and Opportunities

Despite the positive trajectory, challenges persist. Technical challenges, highlighted in the regression analysis, emerge as a significant barrier. Wi-Fi connectivity and equipment malfunctions pose hurdles to otherwise proficient teachers (Hixon et al., 2012a). The qualitative data further illuminate teachers' pedagogical, technical, and administrative challenges. This nuanced understanding is crucial for tailoring interventions to address specific problems.

Descriptive Statistics for All Constructs Measured in the Study

Table 1 displays the various areas of digital technology proficiency, the associated survey items, and Cronbach's alpha for each item. All Cronbach's alpha values exceed 0.7, indicating acceptable internal reliability for research purposes.

Table 2 demonstrates the reliability analysis results for the survey measuring the implementation of Vision 2030. The overall Cronbach's alpha is 0.93, indicating good internal reliability. Each construct also shows high internal reliability.

Table 3 presents descriptive statistics for different constructs measured in the study. Mean, standard deviation, minimum and maximum scores, skewness, and kurtosis values are provided for each construct.

Correlation Coefficients

Table 4 reveals the correlation coefficients between each pair of variables in the study. A positive correlation indicates a positive relationship, while a negative correlation indicates an inverse relationship. The correlation coefficients presented in Table 4 provide valuable insights into the relationships between key variables. The positive correlations between digital competencies, technology integration, and support are consistent with existing literature emphasizing the interconnectedness of these factors (Chai et al., 2018) and (Alohali et al,.2018). Notably, the moderate to strong positive

Table 1. Cronbach's Alpha Coefficient for Digital Competencies Self-Assessment Survey

Area of digital technology proficiency	Number of items	Cronbach's alpha
Pedagogical use of digital technologies	13	0.89
Digital citizenship and ethical use	4	0.82
Assessment and evaluation using digital technology	5	0.76
Professional development and learning	3	0.71
Universal design for learning	3	0.88
Digital resource evaluation	3	0.73
Student collaboration and communication	4	0.63

Table 2. Cronbach's Alpha Coefficient for Implementation of Vision 2030 in Education Survey

Construct	Number of items	Cronbach's alpha
Availability of digital resources	4	0.85
Training and support provided to teachers	6	0.92
Use of digital technologies in teaching and learning	20	0.93

Table 3. Descriptive Statistics for All Constructs Measured in the Study

Construct	Mean	Standard deviation	Min. score	Max. score	Skewness	Kurtosis
Digital competencies	4.23	0.77	2.11	5.00	–0.47	0.23
Technology integration	3.78	0.93	1.56	5.00	–0.14	–0.42
Challenges	3.43	0.92	1.22	5.00	0.40	–0.26
Support	3.98	0.78	1.88	5.00	–0.33	–0.53
Implementation of Vision 2030 in education	3.28	0.52	2.13	4.38	0.08	–0.63

Table 4. The Correlation Coefficients Between Each Pair of Variables in the Study

Variables	Digital competencies	Technology integration	Challenges	Support	Implementation of Vision 2030 in education
Digital competencies	1.000	0.563	–0.238	0.690	0.471
Technology integration	0.563	1.000	–0.320	0.788	0.584
Challenges	–0.238	–0.320	1.000	–0.480	–0.420
Support	0.690	0.788	–0.480	1.000	0.599
Implementation of Vision 2030 in education	0.471	0.584	–0.420	0.599	1.000

correlation between the implementation of Vision 2030 and technology-related variables suggests that the Vision 2030 initiative positively influences technology integration in Saudi Arabian schools.

Regression Analysis

Relationship Between Challenges Faced by Teachers and Their Digital Competencies

Table 5 displays the regression analysis results examining the relationship between challenges faced by teachers and their digital competencies. The regression analysis underscores the impact of different challenges on teachers' digital competencies. Technical challenges emerge as a significant negative predictor, indicating that addressing technical issues is crucial for improving digital competencies (Ertmer et al., 2012). While pedagogical and administrative challenges show no statistical significance, attitudinal challenges demonstrate a negative impact, emphasizing the need to address teachers' attitudes toward technology integration (Al-Harbi & Alshumaimeri, 2019) and (Teo et al., 2008).

Relationship Between Support Received by Teachers and Their Digital Competencies

Table 6 presents the results of the regression analysis examining the relationship between support received by teachers and their digital competencies. In Table 6, the positive relationship between professional development and digital competencies suggests that investing in ongoing training positively influences teachers' digital capabilities. Interestingly, infrastructure improvements also positively impact digital competencies, emphasizing the importance of a supportive technological environment (Fraillon et al., 2019). However, policy changes exhibit a negative relationship, highlighting the need for targeted interventions.

Discussion of Quantitative Results

The study findings suggest that teachers in Saudi Arabia exhibit high levels of digital competency and technology integration, aligning with previous research. Challenges in integrating technology persist, emphasizing the need for additional support and resources. The positive correlation between

Table 5. Regression Analysis

Variables	Beta	CI95%	SE	t	p
Constant	3.92	[0.12, 0.57]	6.84	0.000	
Technical challenges	−0.28	[−0.44, −0.12]	0.08	−3.18	0.002
Pedagogical challenges	−0.15	[−0.30, 0.01]	0.08	−1.89	0.060
Administrative challenges	−0.07	[−0.22, 0.09]	0.08	−0.89	0.374
Attitudinal challenges	−0.20	[−0.36, −0.04]	0.08	−2.46	0.015

Table 6. Regression Analysis

Variables	Beta	CI95%	SE	t	p
Constant	3.47	[0.21, 0.66]	5.26	0.000	
Professional development	0.47	[0.32, 0.62]	0.08	5.92	0.000
Policy changes	0.13	[−0.02, 0.28]	0.08	1.77	0.078
Infrastructure improvements	0.22	[0.07, 0.37]	0.08	2.89	0.004

support and technology integration, as well as digital competencies, reinforces the critical role of aid in enhancing teachers' digital capabilities.

Technical challenges emerge as a significant barrier to digital competencies, emphasizing the importance of addressing infrastructure issues (Alkhathlan, 2019) and (Ertmer et al., 2012). Surprisingly, the study indicates a positive correlation between implementing Vision 2030 and technology integration, suggesting a favorable impact on Saudi Arabian schools.

Results of Qualitative Data

Table 7 summarizes the coding and emerging themes from teacher interviews, providing quotes that reflect each piece.

The qualitative data from interviews with teachers reveal multifaceted insights into their experiences. Teachers recognize the importance of digital competencies and describe practical ways of integrating technology into their pedagogical practices (Voogt et al.,2017) and (Graham et al., 2012). Challenges, mainly technical and administrative, are echoed, highlighting the need for individual and institutional solutions.

Administrators emphasize the critical role of digital infrastructure, teacher training, and Vision 2030 in shaping the landscape of digital technology integration. The focus on providing resources, ongoing support, and aligning efforts with national visions underscores the systemic approach taken by educational leaders.

Qualitative Results Discussion

As Saudi Arabia endeavors to embody virtual transformation in training, qualitative analyses have unraveled a rich tapestry of demanding situations teachers and directors face, alongside the promising possibilities and techniques developed with the support of these stakeholders.

Table 7. Coding and Emerging Themes by Interviewed Teachers

Code/Theme	Definition	Quotes from participants
Digital competencies (DC)	Refers to...	T5: "A teacher must be familiar with various digital technologies and understand how to use them effectively in the classroom."
Technology integration (TI)	Refers to...	T12: "I use PowerPoint presentations to deliver my lessons, and I also ask my students to create multimedia projects to demonstrate their understanding of the material."
Pedagogical challenges (PC)	Refers to...	T1: "It is hard to balance the need for technology with the need for meaningful engagement and interaction with students."
Technical challenges (TC)	Refers to...	T4: "Sometimes the Wi-Fi does not work, or the projector will not turn on, and it can be frustrating to troubleshoot these issues during class."
Administrative challenges (AC)	Refers to...	T10: "There are a lot of rules and regulations about what software we can use, and it can be hard to get approval to try new things."
Professional development (PD)	Refers to...	T5: "I attended a workshop on using social media for teaching, and it gave me many ideas for connecting with my students outside of class."
Infrastructure improvements (II)	Refers to...	T9: "Having reliable Wi-Fi and enough computers for each student would make a huge difference in my ability to use technology effectively in the classroom."
Impact of Vision 2030 (V2030)	Refers to...	T7: "The Vision 2030 significantly impacts our teaching practices. We are encouraged to integrate more technology into our classrooms to prepare students for the future. We are also given opportunities for professional development to improve our digital competencies."

Table 8. Coding of Emerging Themes by Interviewed Administrators

Code/Theme	Definition	Quotes from participants
Digital infrastructure and resources (DIR)	Refers to...	AD9: "We need to provide our schools with the necessary digital infrastructure and resources, such as high-speed internet and devices, to enable teachers to integrate digital technologies in their teaching practices effectively."
Teacher training and support (TTS)	Refers to...	AD7: "We need to invest in the professional development of our teachers to enhance their digital competencies and provide ongoing support to help them integrate digital technologies in their teaching practices."
Vision 2030 implementation (V2030)	Refers to...	AD12: "Digital technologies play a key role in achieving the goals of Vision 2030 in education, such as enhancing the quality of education and improving students' skills and competencies."

Challenges From Teacher and Administrator Perspectives

Teachers, the frontline executors of educational techniques, described multifaceted and demanding situations. Pedagogical challenges surfaced prominently, with teachers expressing concerns about stability regarding technology integration and pupil engagement. Technically demanding situations emerged as a recurrent theme, with teachers lamenting problems, including unreliable Wi-Fi and equipment malfunctions, disrupting the flow of virtual-enabled education (Hixon et al., 2012b). Administrators, by contrast, grappled with bureaucratic and logistical obstacles, which included navigating policies governing software program use.

Opportunities and Strategies Proposed

Amid demanding situations, the participants illuminated various possibilities and strategies that could propel Saudi Arabian education into a digitally enriched future. Professional improvement, identified as a critical driver of learning, emerged as a powerful approach. Teachers preferred focused education to improve their digital capabilities, highlighting workshops and courses as valuable opportunities (Hixon et al.,2012a). Administrators echoed this sentiment, emphasizing the need for sustained investment in instructor training packages. Infrastructure enhancements were underscored as pivotal to overcoming technical challenges. Participants predicted that dependable Wi-Fi and adequate computer systems for college students might streamline learning and enhance overall mastery. Digital infrastructure and resource accessibility, encapsulated by the digital infrastructure and resources (DIR) theme, emerged as an essential area of possibility (Voogt et al., 2018). Administrators articulated the need for network access, positioning these as crucial components for powerful technology integration.

The impact of Vision 2030 loomed large in participants' narratives, shaping not only challenging situations but also opportunities. The impact of Vision 2030 (V2030) theme captured the advantageous effect of the initiative on teaching practices. Teachers and directors mentioned the benefits of integrating additional technology into school classrooms, aligning with Vision 2030's broader goal of preparing students for a virtual world.

Connection and Synthesis Between the Results

The quantitative and qualitative findings together provide a comprehensive understanding of the current state of digital technology integration in Saudi Arabian education. While the quantitative data offer statistical insights, the qualitative data add depth and context to teachers' and administrators' experiences.

RESEARCH DISCUSSION

The juxtaposition of quantitative and qualitative findings in the Saudi Arabian education system affords a nuanced perspective. It offers insights into the contemporary integration of virtual technology, the challenges teachers face, and the possibilities for synergy with Vision 2030 (Law et al., 2008).

Comparison of Quantitative and Qualitative Research Findings

Quantitative evaluation underscores teachers' proficiency and the integration of digital technology, revealing progress along the stages of digital abilities and technology integration. However, this quantitative achievement is met with a qualitative narrative that reveals the underlying challenges teachers and directors confront (Mishra & Koehler, 2006). Table 3, presenting descriptive records, showcases the impressive ratings for digital competencies (4.23) and technology integration (3.78), signaling high levels of talent and integration. However, the qualitative analysis reveals a more complex picture, with teachers describing pedagogical, technical, and administrative obstacles. The dissonance between the quantitative results and qualitative challenges highlights the need to surpass numerical indicators to understand digital integration dynamics in Saudi Arabian teaching.

Challenges

The recognized challenges have profound implications for attaining the goals of Vision 2030 in the education system. Technically demanding situations, unreliable Wi-Fi, and device malfunctions not only prevent immediate classroom enjoyment but pose a more significant challenge to meet Vision 2030's goals. A sturdy digital infrastructure is essential to successfully integrating generation in training (Mitchell & Alfuraih, 2018). By addressing these technical problems, the aims of Vision 2030, which envisions a technologically empowered education system, are protected. Pedagogical challenges, emphasizing the delicate balance between technology use and meaningful pupil engagement, reflect a nuanced challenge that warrants interest. Vision 2030, emphasizing reworking education to prepare college students for a knowledge-based economy, necessitates a continuing fusion of technology and pedagogy. Teachers grappling with this delicate equilibrium may find it challenging to align their teaching practices with the visionary dreams of the initiative.

Administratively demanding situations and other aspects revealed by the qualitative analysis add layers of complexity. Bureaucratic hurdles, which include rules and policies governing software program use, might also hinder the swift adoption of progressive technological equipment (Niess, 2005). For Vision 2030 to materialize, administrative frameworks must be agile, fostering an environment where teachers can experiment with new technologies without being constrained by red tape.

Opportunities

The qualitative analysis illuminates promising opportunities that align with Vision 2030's transformative aspirations despite significant challenges. The strong correlation between teaching and technology integration and virtual abilities underscores the pivotal role of support mechanisms. In this case, Saudi Arabia should invest in expert improvement, which is emerging as a notable strategy that facilitates the development of synergies between teacher empowerment and Vision 2030 dreams (OECD, 2020). Workshops, publications, and ongoing support can bridge the gap between skills and challenges, permitting teachers to navigate the digital landscape effectively.

Infrastructure enhancements, recognized as essential by each instructor and administrator, offer a tangible opportunity for synergy. Vision 2030's emphasis on technological improvements aligns with the call for dependable Wi-Fi and reliable devices. Addressing these infrastructure needs is not only a remedy for technical demanding situations; it is an investment in the infrastructure backbone required to realize Vision 2030's dream of a digitally innovative training system. The impact of Vision 2030 theme within the qualitative analysis corroborates the positive impact of the initiative on

technology integration. Inspired by Vision 2030's goals, teachers express a dedication to integrating extra technology into lecture rooms. If harnessed efficiently, this attitudinal shift can be a driving force in overcoming challenges and understanding the initiative's broader goals.

CONCLUSION AND RECOMMENDATIONS

Saudi Arabia's Vision 2030 is a blueprint for the Kingdom's overall improvement, with an imperative guiding principle focused on reworking education. Incorporating digital technologies into the academic setting is at the heart of this goal. This study used quantitative and qualitative analyses to examine endeavors to achieve digital technology integration in the Saudi Arabian education system (Rogers, 1962). The quantitative data paints a positive image of the skill level of Saudi Arabian teachers regarding virtual capabilities and technology integration. Mean ratings throughout numerous constructs, pedagogical use, virtual citizenship, and assessment represent a commendable talent level. This quantitative narrative aligns with broader global developments, underlining teachers' adaptability and ability to leverage virtual equipment to improve learning outcomes. However, the qualitative arm of the study introduces a nuanced narrative. Challenges emerge, echoing the feelings of teachers and directors grappling with pedagogical, technical, and administrative hurdles. Balancing the needs of a generation with meaningful engagement, overcoming technical glitches, and navigating bureaucratic obstacles constitute the day-to-day battles confronted by teachers. However, amid challenges, a silver lining emerges in the form of possibilities and strategies proposed by participants, shedding light on the resilience and determination of the teaching community.

The intersection of quantitative talent and qualitative challenges provides strategic insights for Saudi Arabian teaching. The strong correlation between support mechanisms and technology integration becomes a focal point. As the study underscores, addressing demanding situations calls for strategic interventions that transcend proficiency metrics. The symbiotic relationship between technology integration and Vision 2030 unfolds, urging stakeholders to navigate challenges strategically to attain the broader academic aspirations encapsulated in the Vision. To harmonize virtual aspirations with Vision 2030, there is a need to implement centered approaches as vital guideposts. Firstly, investing in complete teacher education programs guarantees teachers are not merely intelligent but adept at pedagogically integrating technology (Ferrari, 2013). Ongoing professional development and community-building mechanisms foster a tradition of continuous learning and collaboration. Infrastructure improvements are paramount, addressing the qualitative demand for reliable internet connectivity and access to updated devices. The foundational role of infrastructure cannot be overstated because it is the bedrock upon which digital integration stands. Administrative measures are essential for streamlining bureaucratic methods and incentivizing directors to support digital tasks. Establishing a centralized hub for knowledge sharing and the popularity of innovation propels a cultural shift toward embracing technology. Thus, Saudi Arabia's Vision 2030 imagines a varied and expertise-based financial system with an education system at its core. As the state charts a path closer to virtual transformation, aligning recommendations with Vision 2030's key targets becomes vital. The proposed guidance, teaching education packages, infrastructure enhancements, and administrative measures align with the overarching goals of Vision 2030.

CONFLICTS OF INTEREST

FUNDING STATEMENT

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