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التفاعل الرقمي في التعليم الثانوي: تجربة ألمانيا وآليات الاستفادة منها في أنظمة التعليم في دول الخليج

*Digital Interaction in Secondary Education: Germany's Experience and Mechanisms for Benefiting from It in Gulf Education Systems**

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الملخص:

ساهم التقدم السريع في التكنولوجيا الرقمية بشكل كبير في تحويل التعليم الثانوي حول العالم، وقد تصدّرت ألمانيا هذا التحول من خلال جعل قطاع التعليم فيها معتمدًا بشكل مكثّف على الوسائل الإلكترونية. يناقش هذا البحث تجربة ألمانيا في دمج الأدوات الإلكترونية، والمنصات التعليمية عبر الإنترنت، وأدوات التعليم التفاعلي بهدف رفع مستوى تفاعل الطلاب وتحسين درجاتهم. ويستعرض النقاش المشاريع الرئيسية مثل مشروع DigitalPakt Schule، الذي تم من خلاله تمويل البنية التحتية الإلكترونية، إلى جانب تبنّي تقنيات الذكاء الاصطناعي، والفصول الافتراضية، وأدوات التعلم التكيفي في المدارس الثانوية. كما يتناول البحث نهج ألمانيا في تدريب المعلمين، وتعليم المهارات الإلكترونية، والسياسات المتبعة لتبنّي التعلم الإلكتروني. وتُحلّل الدراسة أيضًا الفوائد والتحديات المحتملة من تبنّي نماذج مماثلة في دول الخليج العربي. فبينما حققت دول مثل الإمارات العربية المتحدة، والمملكة العربية السعودية، وقطر تقدمًا كبيرًا في مجال التعليم عبر الإنترنت، لا تزال هناك تحديات مثل الوصول إلى الإنترنت، واستعداد المعلمين، وإصلاح المناهج. واستنادًا إلى التجربة الألمانية، يوصي البحث بعدة خطوات لتعزيز التفاعل الرقمي في التعليم الثانوي بدول الخليج، منها: تعزيز الدعم الرسمي للمشاريع الإلكترونية، زيادة الاستثمارات في البنية التحتية الرقمية، إنشاء برامج تدريب للمعلمين، وتفعيل التعلم المرتكز على الطالب من خلال منصات تفاعلية. يوفر تحليل النجاحات والإخفاقات الألمانية نموذجًا يُمكن لصناع السياسات والمربين في الخليج الاستفادة منه في تطوير سياسات تعليمية فعالة. وتُشير النتائج إلى ضرورة إقامة شراكات وثيقة بين الحكومات والمدارس ومزودي التكنولوجيا لبناء البنية التحتية اللازمة للتعلم الرقمي. وتُسهم هذه الدراسة في تعزيز فهمنا لبيئات التعليم في ظل التقدم العالمي في التعليم الرقمي وإمكانية تطبيقه في سياقات تعليمية مختلفة.

الكلمات المفتاحية: تجربة ألمانيا في التعليم، التعليم الثانوي في الخليج، التفاعل الرقمي في التعليم.

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Abstract:

The rapid progress made by digital technology has heavily contributed to the transformation of secondary education around the globe, and the country has taken the lead by making its education sector electronic-intensive. This paper discusses the experience of Germany incorporating electronic tools, online platforms, and interactive education tools for the improvement of the engagement level and grades of the students. The discussion covers the main projects like the DigitalPakt Schule, under which the country is funded for electronic infrastructure, and the adoption of artificial intelligence, virtual classrooms, and adaptive learning tools for secondary schools. The country's approach to teacher training, electronic skills training, and the policies for adopting e-learning are also discussed. The study also analyzes the potential benefits and pitfalls of adopting similar models in the Arabian Gulf. While United Arab Emirates, Saudi Arabia, and Qatar have made significant strides towards online education, challenges such as online access, teacher preparation, and curriculum reform continue. Based upon the German experience, this paper prescribes the following steps for the enhancement of electronic interaction for secondary education across the Arabian Gulf: the improvement of the support from the authorities for online projects, the improvement of investments in online infrastructure, the establishment of teacher training projects, and the facilitation of student-centered learning through interactive platforms. Analyzing Germany's successes and setbacks provides a model for policymakers and educators in the Arabian Gulf to develop effective education policies. The findings suggest the need for close partnerships among governments, schools, and technology providers to establish the necessary infrastructure for digital learning. This study contributes to our understanding of educational environments in light of global advances in digital education and its applicability across diverse learning contexts.

Keywords: Germany's experience in education, Secondary education in the Gulf, Digital interaction in education.

Chapter 1: Introduction

Overview:

Integrating digital technologies into education has become essential for modernizing teaching and learning processes globally. In this context, Germany has adopted general policies aimed at improving electronic communication in secondary education, the most notable of which is the "Digitalpakt Schule" program launched in 2019. under this initiative, €5 billion was allocated to enhance digital school facilities, with €500 million provided by the Länder (KMK, 2019). This significant contribution reflects Germany's efforts to create a more advanced learning environment through technology in its education system. Similarly, the Arabian Gulf states, led by the UAE and Saudi Arabia, have embarked on educational reforms to integrate technology into their educational systems. In 2012, His Highness Sheikh Mohammed bin Rashid Al Maktoum launched the "Smart Learning Program" which introduced "Smart Classes" to provide gave each student with a tablet and a 4G Internet connection (UAE Cabinet, n.d.). Likewise, in Saudi Arabia Vision 2030', has led to investments in infrastructure to enable the adoption of AI in classrooms (KMK, 2019). However, despite these efforts, challenges remain, including insufficient capacity building for teachers, limited access to technology in certain areas, and the lack of integrated frameworks for digital adoption.

1.1 Research Questions:

- How has Germany enhanced electronic interaction in secondary education?
- What policies and technological advancements have facilitated digital learning in Germany?
- What is the current state of digital education in the Arabian Gulf region?

- What challenges hinder the effective implementation of digital learning in Gulf countries?
- How can the Arabian Gulf benefit from Germany's experience in electronic education?

1.2 Research Objectives:

- To explore Germany's strategies for enhancing electronic interaction in secondary education.
- To analyze the policies and technological advancements that have supported digital learning in Germany.
- To evaluate the current state of digital education in the Arabian Gulf region.
- To identify key challenges hindering the effective implementation of digital learning in Gulf countries.
- To suggest practical mechanisms through which the Arabian Gulf can benefit from Germany's experience in electronic education.

1.3 Research Gaps:

Blume (2022) points out that Germany has introduced far-reaching measures to enhance electronic interaction for secondary education. "DigitalPakt Schule" is an initiative under which approximately 43,000 schools are to be equipped with high-speed internet connectivity and efficient digital learning infrastructure (KMK, 2019). However, infrastructure development is only the beginning; the true potential of electronic education can only be realized through a multi-faceted approach that includes teacher training and curriculum adaptation.

The Global Campus for Human Rights (2024) discusses the progress made in online learning across the Arabian Gulf. In 2012, Mohammed bin Rashid Smart Learning Program introduced the latest innovations into UAE schools, enhancing interactivity and access to educational resources (KMK, 2019). Despite these advancements, the

report highlights that the adoption of Artificial Intelligence (AI) in education is hindered by the absence of integrated frameworks, which may limit the transformative potential of such technologies (Almulla & Ali, 2024).

Almulla and Ali (2024) explain the modern-day digital education scenario in the Gulf as one where setbacks match advancement. Despite the commitment towards adopting the tools being evidenced by the high budgetary allocations, including the UAE committing 14.8% of its federal budget and Saudi Arabia committing 18.9% of its annual expenses towards education, the investment is not being complemented by its implementation (KMK, 2019). In the opinion of the researchers, unless setbacks such as teacher preparedness and localization of the digital content are addressed, the investments will not yield the desired level of education.

OECD (2020) identifies the main challenges hindering the adoption of digital learning in GCC countries: lack of teacher training, unavailability of localised digital content, and the absence of comprehensive technology-adoption policies. The report also underscores the critical role of infrastructure enabling technology integration (OECD, 2020). However, successful implementation largely depends on educators' readiness and the relevance of the content to the local context.

Blume (2022) research study suggests that the Arabian Gulf could benefit significantly from the German experience. Germany's focus on a comprehensive strategy, including infrastructure enhancement, teacher professionalization, and curriculum reform, provides a viable model. However, the challenge lies in adapting the German strategy to the Gulf states' unique cultural, economic, and policymaking contexts (KMK, 2019). Future research could explore the feasibility of contextualizing Germany's digital education policies to address the specific challenges faced by Gulf nations, ensuring that investments in the field lead to

meaningful learning opportunities. Addressing these research gaps is crucial for developing actionable recommendations to improve electronic interaction in secondary schools in the Arabian Gulf, drawing on the successes of the German experience.

1.4 Limitations:

The following limitations are noted regarding the methodology employed in this paper:

- **Indirect Analysis**: The absence of original, directly collected data may lead to the loss of unique insights that could have been gained through primary qualitative data from individuals. Additionally, some of the original sources may be biased, either due to the authors' personal opinions or the institutional biases inherent in the publications (KMK, 2019).
- **Limitations**: The research assumes that findings from Germany can be directly applied, which may not be fully relevant to the Arabian Gulf due to potential cultural differences, variations in economic status, and differences in political systems. Therefore, the study remains cautious, and valid conclusions are drawn only within the specific context of the research.

Chapter 2: Literature Review

The integration of computer technology into secondary schools has drawn the attention of international community, with Germany leading the way through its innovative digital pedagogy for the digital environment (OECD, 2020). In the Arabian Gulf, however implementation has encountered numerous setbacks (KMK, 2019). Existing research offers a comprehensive understanding of Germany's digital-education experience, the current state of digital learning in the Gulf region, the primary challenges involved, and how the Gulf states can benefit from Germany's model.

Germany has adopted a strategic approach to online education, emphasizing infrastructure investment, teacher professional development, and AI-enabled learning tools. One notable initiative is the DigitalPakt Schule, the €5 billion initiative project launched in 2019 to equip schools with high-speed internet connectivity and online platforms (OECD, 2020). This initiative was further expanded during the COVID-19 pandemic with an additional €500 million allocated for online learning. However, despite these investments, research data suggests that infrastructure alone is not sufficient for the success of Germany's digital education initiative. Educator professional development is key to the effectiveness of the German digital education initiative. Research data from KMK's Teaching Competence Framework for Teaching Digitally presents outlines the fundamentals of equipping educators with the necessary to effectively use digital tools (KMK, 2020). Blume's (2022) research study highlights the shortcomings in the application and use of digital tools in the classroom, emphasizing the need for ongoing professional development. Germany has also integrated AI-driven learning platforms, such as *LearnLab*, personalize student learning experiences (Burchert & Kerres, 2021). While, AI enhances student engagement and supports individualized learning, there is still limited research on its long-term impact on academic performance.

Arabian Gulf countries, such as the United Arab Emirates (UAE) and Saudi Arabia, have made significant investments in digital education. The UAE's *Mohammed bin Rashid Smart Learning Program*, launched in 2012, introduced smart classrooms with interactive technologies and high-speed internet (UAE Cabinet, n.d.). Similarly, Saudi *Vision 2030* prioritizes digital learning through initiatives such as *Tatweer,* which focuses on integrating e-learning tools into the curriculum (Saudi Vision 2030, 2022). However, despite these investments, research by Almulla and Ali (2024) indicates a gap between financial investment and practical

implementation. Although, Gulf countries allocate substantial budgets of approximately 14.8% of the UAE's federal budget and 18.9% of Saudi Arabia's annual expenditure, localized digital content tailored to the linguistic and cultural needs of the region remains insufficient (OECD, 2020). The heavy reliance on Western-designed educational materials limits their effectiveness in Gulf classrooms. Moreover, the Organization for Economic Co-operation and Development (OECD, 2020) highlights disparities in digital education access. Students in rural areas often struggle with limited internet access, creating educational inequalities. Many students risk being left behind without targeted policies to bridge this digital divide.

There are numerous challenges facing the implementation of AI tools and digital learning in Gulf Countries. One of the most significant hurdles is inadequate teacher training. Although these governments have invested in digital tools, many educators lack the technical skills and pedagogical strategies necessary for effective integration into classroom practice (Al-Fanar Media, 2024). Soliman (2021) further notes that traditional, lecture-based teaching methods still dominate classrooms in the Gulf, leading to underutilization of digital resources. While AI in education holds significant potential for personalizing learning experiences, its adoption presents unique challenges. Notably, Gulf countries lack clear regulatory frameworks for data privacy and the ethical use of AI (Tortoise Intelligence, 2023). Without robust policies, concerns about student data security and algorithmic bias may hinder the widespread adoption of digital tools. Another significant challenge is curriculum adaptation. Although digital tools are widely available, many Gulf education systems continue to treat e-learning as supplementary resource rather than a core component of the curriculum (Blume, 2022). A more comprehensive policy approach is needed to ensure the full integration of digital learning.

Germany's experience can also be applied on the Gulf States and the necessity for an overall strategy that includes investment in infrastructure, teacher education, and curriculum reform. Germany's DigitalPakt Schule shows the importance of providing schools with digital tools only when the teachers can use them (KMK, 2019). Another lesson is the need for localized digital frameworks. Germany has adopted AI through data privacy policies and ethical AI use (Burchert & Kerres, 2021). This can also be applied to the GCC countries through local adaptation to their cultural and economic context.

Germany has also focused on digital equity by equipping all urban and rural schools with high-quality online resources. The GCC countries can also achieve this through investments in superior connectivity solutions and teacher professional development opportunities, with the objective of equating the deployment of digital education (OECD, 2020). The literature reviewed highlights the progress made by both the Arabian Gulf and Germany in the field of online education. However, the true improvement becomes apparent when examining aspects such as implementation, teacher preparation, and curriculum transformation (KMK, 2019). The German experience offers valuable insights for improving the education sector in the Gulf countries. Future Research, should focus on evaluating the long-term effectiveness of online learning projects and the potential for adapting German policies to the specific context of the Arabian Gulf (KMK, 2019). Addressing these loopholes will allow policymakers to strengthen the online education system, making it more robust and inclusive.

Chapter 3: Research Methodology

This chapter outlines the approach adopted in examining the available German models of supporting electronic interaction in secondary schools and assessing their relevance to the Arabian Gulf context. It covers the study design, data collection and analysis, data extraction and

collation, synthesis of findings, the rationale behind the chosen methodological approach, as well as ethical considerations and limitations (OECD (2020).

3.1. Area of Study:

The study conducts a comparative analysis of digital education policies in Germany, with potential applicability to the context of the Arabian Gulf nations. Germany was selected due to its highly developed digital education system, characterized by well-established policies, substantial investments in digital infrastructure, and dedicated teacher training programs. Based on their progress in digital education and, developed countries in the Arabian Gulf—such as the United Arab Emirates, Saudi Arabia, and Qatar—are considered suitable for comparative evaluation Although these countries have made significant progress in integrating technology into their education systems, challenges remain in areas such as policy cohesion, teacher training, and infrastructure development. Given the depth of Germany's historical commitment to digital education, there are valuable lessons in what this country has learned and implemented as best practices that can be adapted to the Arabian Gulf context. Germany has successfully implemented policies that place significant emphasis on digital literacy, e-learning platforms, and interactive teaching methods, supported by the collaborative efforts of the government and educational institutions. Conversely, the Arabian Gulf nations are at various stages of implementing their digital education frameworks and are facing challenges related to technology availability, digital inclusion, and policy standardization. In view of this, the study aims to examine how Germany's successful policies can be adapted to the educational context of the Arabian Gulf region, particularly by taking into account the socioeconomic and technological factors that influence both policy implementation and practical adoption.

3.2. Study Population and Participants:

The educational policymakers, administrators, teachers, and students in the study population include individuals from both Germany and the Arabian Gulf nations. This is because the research relies on secondary data; therefore, participants are represented through government reports, policy documents, and academic studies. Official reports and publications from ministries of education, international organizations such as UNESCO and the OECD, and academic literature on the digital education boom are primarily used in the study. Additionally, data from non-governmental organization (NGO) think tanks focusing on education policy research are also considered to support the analysis.

3.3. Sampling Size:

Since the study relies on secondary data, the sample size is determined by the number of documents and reports relevant to the subject matter. It involves an extensive review of at least 50 scholarly articles, policy papers, and reports concerning digital education policies, implementation strategies, and outcomes. The following sources are included in the selection criteria:

- Ensure that all publications included in the analysis are from the last ten years to guarantee relevance and up-to-date policy insights.
- Include peer-reviewed journal articles, government policy documents, and institutional reports.
- Focus the studies on digital education policies, infrastructure, teacher training, student engagement, and policy outcomes.
- Incorporate reports from reputable organizations, such as UNESCO, the OECD, and regional education ministries.

The study establishes clearly defined criteria for source selection to ensure the collection of reliable, valid, and representative data on the key factors shaping digital education policies in Germany and the Arabian Gulf nations. Furthermore, this approach facilitates comparative research across different educational systems by maintaining a rigorous and coherent methodology.

3.4. Study Variables:

Both dependent and independent variables are defined in the study to assess the impact of digital education policies across different contexts.

Independent Variables:

- **Government policies for digital education** in Germany and the Arabian Gulf countries, including legislative frameworks and policies related to digital learning in both contexts.
- **Digital technology and infrastructure:** The extent of investment in internet connectivity in schools, digital classrooms, and technologies aimed at improving the school environment.
- **Digital tools, teacher training, and professional development programs:** Policies or initiatives designed to enhance educators' ability to effectively use digital tools in teaching.
- **Digital learning resources available:** The accessibility of e-learning platforms, digital textbooks, and other e-learning tools.
- **Access and connectivity:** The level of access to stable internet and digital devices for both students and teachers for educational purposes.

Dependent Variables:

- **Digital literacy levels:** The extent to which students and teachers possess the necessary tools and skills to work effectively in the

digital environment, and how well they are able to use digital tools for teaching and learning.

- **Impact of digital education on student engagement and learning outcomes**: Assessing student participation, motivation, and academic performance in relation to digital education.
- **Effectiveness of implementing digital education policies**: Evaluating the extent to which the aforementioned policies achieve the intended educational goals.
- **Rates of adoption of digital learning tools in classrooms**: Analyzing how extensively teachers and students are utilizing technology to perform tasks that were previously completed without it.
- **Challenges in adopting and sustaining digital education strategies**: Identifying the factors that hinder the adoption and sustainability of digital education policies.

This study analyzes these variables to assess the effectiveness of Germany's digital education policy and the key factors that would influence successful adoption in the Arabian Gulf nations. The findings from this analysis will serve as valuable decision-making tools for policymakers seeking to strengthen digital education strategies and seamlessly integrate digital tools into regional education systems.

3.5. Research Methodology and Design: Secondary Data Analysis:

The research method adopted in this study involves the collection and analysis of secondary data. Data will be sourced from academic and peer-reviewed journals to fulfill the objectives of the study. This includes identifying and reviewing relevant and intact papers, documents, and literature related to digital education initiatives in Germany and the Arabian Gulf. As a result, this secondary data collection allows the study to identify patterns, strategies, and challenges associated with the

adoption of digital education, thereby eliminating the need for primary research (KMK, 2019).

3.6. Data Collection Process:

The data collection process involved gathering relevant information from authoritative and credible sources. Inclusion and exclusion criteria were established as follows (KMK, 2019):

Inclusion Criteria:

- **Time Frame:** Publications from the period 2015 to 2025 will be included to ensure the analysis reflects recent trends and current policy developments.
- **Geographical Focus:** The study will focus on digital education initiatives in Germany and policy plans and reports from the Arabian Gulf countries.
- **Source Credibility:** Only peer-reviewed journal articles, official government reports, and publications from recognized educational organizations will be considered.

Exclusion Criteria:

- **Outdated Information:** Publications prior to 2015 will not be used, except in cases of seminal works that provide foundational insights.
- **Irrelevant Geographical Context:** Developments related to non-German and non-Arabian Gulf geographical territories will be excluded.
- **Non-Authoritative Sources:** Sources lacking authoritative authorship or not adhering to recognized publishing standards will not be considered.

3.7 Data Retrieval and Organization:

The data collection method utilized sources from online academic databases such as JSTOR, PubMed, ERIC, as well as official government

and institutional websites. Relevant keywords included "Digital Pakt Schule", "digital education in Germany", "Mohammed bin Rashid Smart Learning Program", and "digital education in the Arabian Gulf" (KMK, 2019).

The following illustrates the themes used to guide the data search, which were organized to support comparative analysis (KMK, 2019):

- **Government Policies and Financing**: An analysis of initiatives such as Germany's *DigitalPakt Schule* and the UAE's *Mohammed bin Rashid Smart Learning Program*.
- **Technological Advancements**: Discussion of emerging innovations, including artificial intelligence and virtual learning environments.
- **Teacher Training and Readiness**: Evaluation of programs aimed at enhancing teachers' ICT competencies and preparedness.
- **Challenges in Adopting Digital Education**: Identification of barriers such as infrastructure limitations and fragmented policy implementation.

3.8. Data Synthesis: Themes Synthesis:

A data synthesis approach was employed to lay the foundation for a formal comparison of the German and Arabian Gulf digital education strategies, combining best practices with context-specific concerns (KMK, 2019). The following thematic analysis was applied to the data collected for the synthesis:

- **Familiarization**: Immersing oneself in the data to understand its depth and scope.
- **Coding**: Identifying key features and patterns relevant to the research questions.

- **Theme Development**: Grouping the codes into broader themes that represent the underlying nature of the data (OECD, 2020).
- **Reviewing Themes**: Refining and adjusting the themes to ensure they accurately reflect the data.
- **Defining and Labeling Themes**: Clearly establishing the scope and focus of each theme.

3.9 Rationale Behind Methodology:

Several factors justify the choice of qualitative secondary data analysis:

- **Resource Efficiency**: Utilizing existing data eliminates the time and resource constraints typically associated with primary data collection.
- **Comprehensive Perspective**: Access to a wide range of existing studies and reports facilitates a more holistic understanding of the subject matter.
- **Ethical Considerations**: Using publicly available data reduces ethical concerns related to participant consent and data privacy.

3.10 Ethical Issues:

The research addressed ethical issues during the collection of secondary data analysis in the following ways:

- **Controlling Bias**: Ensuring that data was sourced from credible and reliable outlets to prevent the introduction of bias or the skewing of findings.
- **Sub-headings**: Properly labeling all sub-topics to clearly establish their relationship to the main topic.

- **Napoli's Cultural Fit Model**: The adoption of Napoli's Cultural Fit Model to ensure the organization's alignment with the interpretation of data and its objective suitability.

Chapter 4: Data Analysis Method

This chapter elucidates how the various secondary data collected from academic sources, policymakers, and institutional publications will be analyzed. The analysis is qualitative and thematic, allowing for a detailed examination of German digital education policies and their feasibility for adoption in the Arabian Gulf region (OECD, 2020).

4.1. Thematic analysis:

A thematic analysis has been applied to identify recurring trends and patterns in the available literature (KMK, 2019). This approach is suitable for synthesizing qualitative data from multiple sources and formalizing the comparison of German digital education policies with those of Arabian Gulf countries.

- **Familiarization with Data**: Reviewing German and Arabian Gulf digital education projects to understand overall developments.
- **Generating Initial Codes**: Sorting relevant data into initial themes.
- **Searching for Themes**: Identifying dominant recurring ideas, such as government policies, technological innovations, teacher professional development, and the challenges of implementation.
- **Reviewing Themes**: Refining and verifying the themes against the data to ensure accuracy.
- **Defining and Labeling Themes**: Clearly defining and labeling each theme for the purpose of comparative analysis.

4.2. Comparative Analysis:

The study aimed to identify aspects of the German digital education model most applicable to the Arabian Gulf context by comparing the two

regions. A comparative analysis method has been used to analyze the differences and similarities between the German educational frameworks and those of the Arabian Gulf, focusing on key areas of importance (Almulla & Ali, 2024):

- Government support and financing structures.
- Technology infrastructure and access.
- Teacher training and computer skills.
- Challenges in adoption and implementation.

4.3. Data Interpretation:

The findings were interpreted within the context of policy effectiveness, infrastructure development, and educational outcomes. The study evaluated how Germany's success factors can be tailored to the Arabian Gulf, taking into account regional challenges such as policy fragmentation, digital accessibility gaps, and cultural differences (KMK, 2019). This structured analysis provides best practices and policy recommendations for enhancing digital education in the Arabian Gulf.

Chapter 5: Results

This chapter presents the conclusions of the secondary data analysis, comparing the German practices for enhancing electronic interaction in secondary schools with the current situation of electronic learning in the Arabian Gulf. The results are organized around the identified themes from the overall data synthesis: government policies, recent innovations in the field, teacher training, challenges, and proposed mechanisms for adopting the best German practices in the Arabian Gulf (Almulla & Ali, 2024).

4.1. Government Policies and Financing:

Germany's **DigitalPakt Schule** initiative has played a crucial role in advancing digital education. Launched in 2019, it allocated €5 billion in

federal funding to modernize digital infrastructure in secondary schools, with additional contributions from the Länder (KMK, 2019). Schools could apply for funding to upgrade internet access, provide digital devices, and integrate educational technology (Almulla & Ali, 2024).

In contrast, the Arabian Gulf region has also made significant investments in digital education. The UAE's **Mohammed bin Rashid Smart Learning Program**, launched in 2012, provided students with tablets and high-speed internet (UAE Cabinet, n.d.). Similarly, **Saudi Vision 2030** prioritizes digital transformation in education, allocating $500 million for AI-driven learning environments (Saudi Vision 2030, 2021). However, despite these investments, challenges persist in ensuring consistent implementation and long-term sustainability.

4.2. Technological Advancements in Digital Education:

Germany has integrated **Artificial Intelligence (AI)**, virtual classrooms, and adaptive learning technologies into secondary education. AI-powered tools support personalized learning, while cloud-based platforms enable seamless interaction between students and teachers (Almulla & Ali, 2024). EdTech companies like **Cornelsen** and **better marks** offer AI-driven mathematics and language learning applications that tailor content to student performance (Blume, 2022). The Arabian Gulf has also embraced advanced technologies. The UAE has introduced AI tutors and digital assessment tools, while Qatar's e-learning platforms emphasize blended learning models. However, these initiatives are often fragmented, lacking a unified framework to ensure consistent implementation across schools.

4.3 Teacher Training and Digital Competency Development:

Germany emphasizes teacher preparedness through mandatory digital competency training programs. The **Competence Framework for Digital Learning (Kompetenzrahmen Digitale Bildung)** was developed

to standardize teacher training on blended learning, AI in education, and digital curriculum integration (OECD, 2020).

In contrast, while Gulf countries have invested in teacher training, disparities exist in implementation. Many teachers in Saudi Arabia and Kuwait report insufficient digital literacy, which hinders their ability to use technology effectively (Almulla & Ali, 2024). Without structured professional development, digital tools may remain underutilized.

4.4 Challenges in Digital Education Adoption:

Despite significant progress, both Germany and the Arabian Gulf face **barriers to the adoption of digital education**. Table 1 highlights key challenges in each region.

Challenges	Germany	Arabian Gulf
Infrastructure	Rural schools struggle with poor internet connectivity	Uneven access to technology, particularly in remote areas
Teacher Readiness	Variability in digital training uptake	Many educators lack comprehensive digital skills
Content Localization	AI tools developed for Western curriculum	Digital content is often not adapted to local culture
Policy Implementation	Strong policies but inconsistent execution	Ambitious policies but fragmented execution
Equity Issues	Socioeconomic disparities affect access	Wealth disparities impact access to digital learning

Sources: Blume (2022), Almulla & Ali (2024), OECD (2020).

While Germany has robust digital infrastructure in urban schools, rural areas lag in internet connectivity, similarly, the Arabian Gulf experiences inequitable access to technology, particularly in underprivileged communities (Almulla & Ali, 2024).

Chapter 6: Discussion and Recommendations

5.1 Discussion:

The findings highlight Germany's success in integrating digital tools, AI-driven learning, and structured teacher training programs into secondary education. The **DigitalPakt Schule initiative** has significantly improved digital infrastructure, ensuring that most schools have high-speed internet and access to e-learning platforms (KMK, 2019). Additionally, AI-based adaptive learning tools have enhanced student engagement and personalized instruction (Blume, 2022). However, challenges remain, particularly in rural areas with inconsistent internet connectivity. In comparison, the Arabian Gulf has made significant strides towards online education, with the UAE and Saudi Arabia heavily investing in AI-enhanced and smart classrooms (Almulla & Ali, 2024). Nevertheless, teacher preparation, fragmentation of policies, and localization of the curriculum are the primary hurdles to the mass adoption of online tools (Almulla & Ali, 2024). The country has yet to devised a strategic plan for the nationwide rollout following heavy investment.

5.2 Recommendations:

The adoption of the following measures by the Arabian Gulf could leverage Germany's digital education advancements to create a more inclusive and interactive secondary education sector.

- **Develop a National Digital Education Framework** – Arabian Gulf countries should establish a unified policy framework to ensure consistency in digital education initiatives (Almulla & Ali, 2024).
- **Enhance Teacher Training Programs** – Implement mandatory digital literacy certifications for educators, modeled after Germany's Competence Framework for Digital Learning (OECD, 2020).

- **Improve Technological Infrastructure** – Expand 5G and broadband access in remote areas to ensure equitable digital education (KMK, 2019).
- **Invest in AI-Driven Learning** – Utilize personalized AI tools to support student engagement and adaptive learning.
- **Localize Digital Content** – Adapt curricula and digital learning platforms to align with regional cultural and educational needs.

Chapter 7: Conclusion

Therefore, integrating digital technology into secondary schools has emerged as the primary catalyst for innovative processes and enhanced learning outcomes. Electronic interaction has been bolstered in the country through various measures such as the DigitalPakt Schule, formal teacher education, and AI-supported pedagogy (KMK, 2019). These measures have enhanced the level of digital infrastructure, increased student engagement, and supported the adoption of interactive study methods. However, despite the progress made, challenges remain. Some rural areas of the country still experience unstable internet access, and the need for continuous teacher education persists. In contrast, the UAE and Saudi Arabia, within the Arabian Gulf sub-region, have made substantial investments in online education. Saudi Vision 2030 and the Mohammed bin Rashid Smart Learning Program have significantly contributed to the transformation. However, fragmentation of policies, teacher unpreparedness, and the lack of localization of online materials have hindered the overall achievement of this transformation (Almulla & Ali, 2024). These deficiencies highlight the urgent need for adopting a more cohesive, well-planned, and context-appropriate online education strategy. This study suggests that the Arabian Gulf can greatly benefit from the German experience by adopting formal policies, enhancing teacher digital professional development, increasing infrastructure for technology adoption, and investing in AI-supported learning tools. An

infrastructure for country-wide digital education, supported by localized curriculum resources and robust execution plans, is the key to its success. By leveraging Germany's best practices and adapting them to the unique socio-cultural and economic context of the Arabian Gulf, policymakers and educators can build a technologically empowered, inclusive, and sustainable secondary education system that meets the needs of the modern digital age.

References:

- Al-Fanar Media. (2024). Challenges in digital education in the Gulf region. https://www.al-fanarmedia.org
- Almulla, M., & Ali, R. (2024). Digital education in the Arabian Gulf: Progress and obstacles. Gulf Academic Press.
- Almulla, M., & Ali, S. (2024). Challenges and opportunities in digital education: A comparative study of Saudi Arabia and Kuwait. Journal of Educational Technology, 12(3), 45–67.
- Blume, C. (2022). Artificial intelligence in education: The role of AI-powered tools in digital learning environments. Educational Research Review, 10(2), 112–130.
- Blume, S. (2022). The DigitalPakt Schule initiative: Advancing digital education in Germany. Springer.
- Burchert, J., & Kerres, M. (2021). AI-driven learning platforms and digital education in Germany. Journal of Educational Technology, 18(4), 45–62.
- Global Campus of Human Rights. (2024). The state of digital education in the Arabian Gulf region. https://www.gchumanrights.org
- Kultusministerkonferenz (KMK). (2019). DigitalPakt Schule: Strategies for digital learning in German schools. https://www.kmk.org

- Kultusministerkonferenz (KMK). (2019). The DigitalPakt Schule initiative: Strengthening digital education in Germany. KMK. https://www.kmk.org
- Kultusministerkonferenz (KMK). (2020). Competence framework for digital teaching: Guidelines for educators. https://www.kmk.org
- Organisation for Economic Co-operation and Development (OECD). (2020). Bridging the digital divide in education: Global and regional perspectives. OECD Publishing.
- Organisation for Economic Co-operation and Development (OECD). (2020). Competence framework for digital learning: Enhancing teacher preparedness in the digital age. OECD Publishing. https://www.oecd.org
- Saudi Vision 2030. (2021). Digital transformation in education: Integrating AI-driven learning environments in Saudi Arabia. Saudi Vision 2030 Program. https://www.vision2030.gov.sa
- Saudi Vision 2030. (2022). Education reform and digital learning initiatives in Saudi Arabia. https://www.vision2030.gov.sa
- Soliman, H. (2021). Traditional teaching methods and digital education challenges in the Gulf region. Middle East Journal of Education, 12(3), 78–95.
- Tortoise Intelligence. (2023). AI in education: Ethical considerations and policy gaps in Gulf countries. https://www.tortoiseintelligence.com
- United Arab Emirates Cabinet. (n.d.). The Mohammed bin Rashid Smart Learning Program: Transforming UAE's education system. https://www.uaecabinet.ae
- United Arab Emirates (UAE) Cabinet. (n.d.). Mohammed bin Rashid Smart Learning Program: A national initiative for digital education transformation. UAE Government. https://www.uaecabinet.ae