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The Strategy of Implementation Integration Intelligent Tutoring System in Iraq Education System

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Abstract

The topic of integrating Intelligent Tutoring Systems, specifically for education in Iraq within this article is an urgent area of interest due to the necessity to modernize and enhance education infrastructure. The paper discusses the opportunities and challenges, as well as the level of readiness for ITS in Iraq given its educational environment and technology infrastructure. This study examines how ITS can be a solution to the unique problems of Iraqi education like the low quality of schools in rural areas with poor accessibility, minimizing shortage of teachers and providing personalized learning methods to fill up knowledge gaps caused by years of war. This article starts with an overview of ITS technology and its applications in education, then sheds some light on the current situation of the Iraqi education system detailing its strengths and weaknesses as well as reform efforts. The subsequent part takes a deeper dive into the promises ITS suggests in the Iraqi setting, illuminating how these systems could enable learner-driven instruction and improve teacher effectiveness while offering guidance to evidence-based educational policymaking. The study also provides examples of some ITS trials, particularly at a university level within Iraq and with International partners. I hope by learning from those examples, we can validate the possibility and the impact of the use of ITS in the Iraqi educational scene. The article also reviews the barriers to the uptake of ITS in Iraq such as infrastructure limitations, digital illiteracy and cultural and linguistically sensitive content.

Keywords: Intelligent Tutoring Systems, Personalized Learning, Adaptive Learning, Iraqi Education.

1. Introduction

In recent times, Intelligent Tutoring Systems (ITS) is considered the most powerful form of educational technology that provides personalized learning and adaptive instruction to learners [1]. They are based on computer psychology paradigms, feeding the video streaming platform with AI inputs and adapting such a system to each learner's affective states; in other words, providing tailored feedback, guidance, and instructional strategies [16]. ITS differ from traditional e-learning systems in that they can respond to student knowledge levels, pacing preferences, and even individual variation among different learners simultaneously, which makes them especially beneficial for a wide range of educational scenarios [17].

Emanating from a country struggling to rebuild and revamp an educational system following years of conflict, Iraq, the adoption of ITS in the wake of this enterprise provides benefits along with challenges [2]. In Iraq, the education sector has become more challenging due to destroyed infrastructure, inadequate resources and a lack of qualified teachers in many rural and conflict-hit areas [18]. These challenges have contributed to a wide range in the quality and availability of education across India, therefore flexible solutions are needed immediately [19].

ITS promises a lot in terms of overcoming some of these challenges. The solution, he says, is that the ITS would allow for personalized instruction to assist in adjusting learning gaps and serving

the multiple needs of Iraqi students who have faced disrupted education stemming from conflict [20]. Also, in areas plagued with teacher shortages, the ITS may act as an important complement to guarantee that students have access to quality educational materials even in low-resource settings [21].

Yet, the application of ITS in Iraq is not faced without its challenges. There is a large gap in terms of the level of development in the areas of technology infrastructure such as internet connection or information machines within urban and rural regions [22]. In addition, the cultural appropriateness of current ITS platforms and the content needs to conform to Iraqi curricula and in Arabic / Kurdish are other issues cited [23].

Nevertheless, the government together with educational institutions in Iraq are enthusiastic about applying EdTech to improve learning. It has started some initiatives/pilot programmes in recent years and it seems that the country is awakening to their potential, as well as to those offered by ITSs and other technological solutions [24].

This paper is an attempt to present a thorough analysis presenting the prospect of integration of ITS in Iraqi education. In particular, it will be an impression of the Iraqi education system at present, a discussion on the benefits and challenges that ITS implementation brings, as well as introducing existing initiatives and suggesting blueprints for effective integration. It does so in search of participation in a conversation currently preoccupying educational reform in Iraq and the wider debate on the use of educational technology in post-conflict developing world contexts.

2. The Iraqi Education System: Context and Challenges

Recent decades also witnessed serious dilemmas facing the Iraqi education system including infrastructure destruction, shortage of resources, and brain drain [3]. These Silverman Affiliations Factors that explain the current state of educational quality and access, particularly in rural and conflict-affected areas are associated with a decline in output. Fully grasping how Intelligent Tutoring Systems (ITS) could be embedded requires deeper explorations of these challenges.

Figure 1: Challenges Facing the Iraq Education System

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2.1 Historical Context

Iraq had one of the best education systems in the Middle East, with high literacy rates and virtually free basic education available to everyone [25]. But years of conflict, sanctions and political instability have together had a devastating effect on its educational facilities as well as human resources [26].

2.2 Infrastructure Damage

Damage to school buildings and educational facilities during years of war & conflict. More than 5,000 schools were damaged or destroyed in Iraq from 2003 through at least the first half of 2018, according to a report released by the Iraqi Ministry of Education [27]. Beyond just physical destruction, this has also caused over half of the children to attend double-shift primary schools [28].

2.3 Resource Shortages

The education system in Iraq has long been underfunded. In 2020, only a small percentage of GDP was dedicated to education, well below the regional average [29]. The lack of financial resources has led to shortages of necessary educational materials, obsolete curricula and inadequate technological capabilities in the schools [30].

2.4 Brain Drain

A significant number of qualified educators and academics have left the country due to the ongoing instability [31]. Their exodus has culminated in a notable shortage of experienced teaching staff and impacts on the standards of education, particularly within higher education [32].

2.5 Inequities in access and quality

The challenges confronting the Iraqi education system are not uniform. This was an avenue for the developers and policymakers to provide education for all the people in rural as well as conflict zones, which have faced disproportionately high quality and access barriers [33]. In parts, notably where ISIS had control in the past, a whole generation has been either disrupted or limited availability of formal education, this cohort is just re-entering school [34].

2.6 Gender Disparities

Although Iraq has achieved advances in closing the gender gap in education, significant disparities remain particularly in rural areas. Moreover, cultural norms, early marriage and security issues still limit the ability of girls to attend secondary and higher education levels [35].

2.7 Technological Challenges

For example, in Iraq, there are substantial challenges to technology integration in education other than the learning environment. The introduction of digital learning solutions is hindered by inconsistent electricity supply, limited internet connectivity and a lack of computer equipment in many schools [36]. In addition, the digital divide between urban and rural areas is very serious, which has intensified educational inequality [37].

2.8 Psychosocial Impact

The prolonged conflict has caused students and educators alike to suffer severe psychosocial consequences. The inability of many students to learn due to trauma and the lack of psychosocial training for teachers [38]

To respond to these multiple challenges, the Iraqi government and international organizations recently implemented a range of reform initiatives and programmes with the overall aim of reconstructing and developing the educational system in Iraq [39]. This is the question that looms even larger when one considers potential adoptions of Intelligent Tutoring Systems, as an answer to these challenges and as a project which faces its very own formidable problems in light of the Iraqi education system.

3. Potential Benefits of ITS in Iraqi Education

There are some potential benefits of using ITS as we list in (figure 2), which we can summarize as follows:

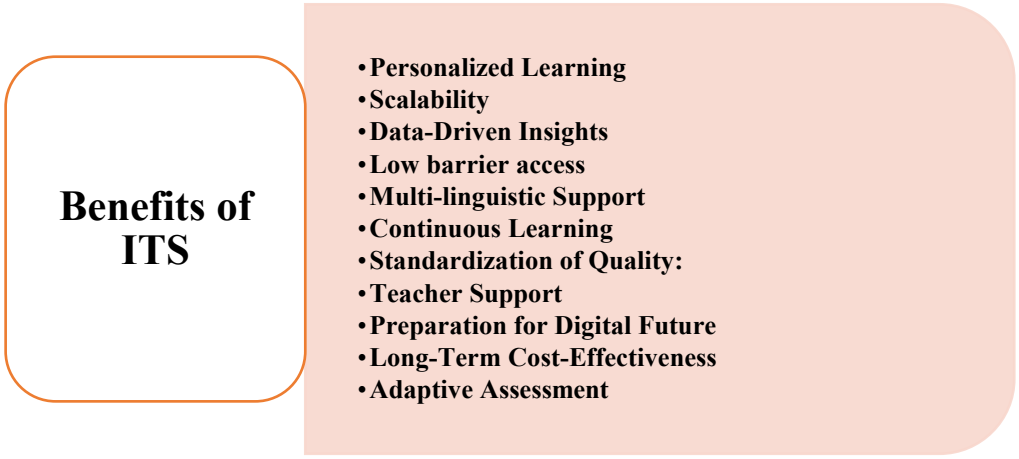

Figure 2: Potential Benefits of ITS in Iraqi Education

3.1 Personalized Learning: ITS can deliver individualized instruction that caters to the unique learning needs of students which is vital in Iraqi classrooms where students have diverse gaps amongst themselves [5]. One key factor is the ability for students to move through content at their own pace, and be afforded extra time (or less) on concepts that they either struggle with or are easy to them.

3.2 Scalability: With huge teacher shortages, ITS can allow the delivery of high-quality educational content to a large cohort of students simultaneously [6] this expandability is particularly necessary in rural or conflict-affected areas, where the number of trained teachers is often minimal.

3.3 Data-Driven Insights: ITS provides data on student performance, enabling educators and policymakers to use information when making decisions about curriculum and instruction [7]. The data can help to identify trends, evaluate the success of pedagogical practices and lead educational reforms.

3.4 Low barrier access: ITS can provide educational opportunities for students living in remote areas, further enhancing the existing scope and availability of education. These were students with disabilities, those residing in remote areas, and students unable to attend school regularly because of security matters or other reasons [40].

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3.5 Multi-linguistic Support: In a country as linguistically diverse as Iraq, ITS could provide instruction in different languages like Arabic and Kurdish, besides potentially other minority languages. This feature would ensure that students could learn in their first language, a key component of effective early education [41].

3.6 Continuous Learning: By engaging with ITS, students can learn 24/7, beyond the traditional school day or academic year It benefits, in particular, children who have been out of schoolrooms because of conflict or displacement to catch up on out-of-school teaching [42].

3.7 Standardization of Quality: Whilst eTender maintains the personal approach, ITS does have the added potential that it can provide a higher standard in certain areas of Iraq than is currently delivered with eTender. It could also serve to address quality disparities between urban and rural areas or even between governorates [43].

3.8 Teacher Support: ITS can support teachers with various teacher support such as assessment, monitoring and teacher-training materials This assistance may be particularly important in large classes or dealing with a heterogeneous student population [44].

3.9 Preparation for Digital Future: By introducing ITS in education, Iraq students should have an opportunity to learn digital literacy skills that are required more and more by the modern workforce. Such exposure to educational technology can assist in preparing students for the future work life in a digital global economy [45].

3.10 Long-Term Cost-Effectiveness: ITS infrastructure needs a substantial initial spend, but in the long-term what it costs per learner per year can make a cost-effective delivery mechanism at scale for quality education. This is of particular importance considering that Iraq only has a finite amount of money to spend on educating its children [46].

3.11 Adaptive Assessment: ITS can give quicker and more adaptive loop checking compared to traditional methods. This allows for real-time progress tracking and real-time modification in the learning pathway to replace periodic standardized assessment tests which may not be always effective [47].

This can help ITS to deliver on several prospective impacts that we have already discussed, many of which are directly relevant to the Iraqi education system. Nevertheless, achieving these outcomes in practice depends on a range of real-world complications that will be addressed in later sections of this article.

4. Overview of ITS Implementation in Iraq

Although ITS implementation in Iraq is still fledgling, there have been several promising initiatives and developments:

4.1 University-level Pilots: ITS has been piloted at various Iraqi universities in the computer science and engineering disciplines, and early indications show improvements in student engagement and performance [8]. The University of Baghdad has successfully implemented the ITS to teach programming languages such as has reported positive results in terms of student learning experience and satisfaction [48].

4.2 International Collaboration: The partnerships with international organizations and universities have contributed to the transfer of knowledge in ITS development and deployment, as well as capacity building [9]. Through incorporating educational technology within Iraqi Higher

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Education, the Iraq Education Initiative (with UNESCO) has incorporated components, including ITS [49].

4.3 Ministry of Education Initiatives: The ITS Since the launch of the Ministry of Education's digital transformation and mechanics in Iraq, the Iraqi Ministry of Education has started looking to see how ITS may fit within a broader digital innovation strategy. The implementation of ITS in subjects like math and science has been field-tested through pilot programs done on selected secondary schools in Baghdad [50].

4.4 Private Sector Participation: Not only is there private sector involvement in the development of commercial ITS platforms, but some private educational institutions in Iraq have also recently begun deploying those same solutions. The successful deployment of a mathematics ITS in Erbil using these kinds of inputs specifically, being tested on real students at one secondary private school and another group of primary-age students [51] has led to improved student outcomes including increased interest in learning about the material.

4.5 Mobile Learning Initiatives: In line with the high use of Smartphones in Iraq, few initiatives were made for mobile-based ITS applications. An example of this in higher education is the "Iraqi Math Tutor", an adaptive learning application for math instruction [52].

4.6 Teacher Training Programs: ITS implementation several teacher training programs are initiated to support ITS deployment Iraqi Ministry of Higher Education, in cooperation with international partners to provide help and assistance conducted workshops related to the use of ITS tools for university staff [53].

4.7 Research and Development: Some Iraqi universities have already initiated research on ITS development and deployment. Research and Development The University of Technology in Baghdad recently established a research group to develop culturally acceptable ITS for the Iraqi region. [54].

4.8 Refugee Education Programs: World Vision and IRC with Iraqi refugees and IDPs have piloted non-formal education programs. Such systems have previously served as catch-up education for students who were displaced from their educational setting [55].

4.9 Blended Learning Models: Some Iraqi educational institutions have started to introduce blended learning models with ITS. Combining traditional face-to-face instruction and ITS to support independent learning on the part of the learner can also serve as an effective bridge to the gradual integration of more technology-enhanced education models [56].

4.10 Industry Partnerships: Collaborations between Iraqi educational institutions with technology companies regarding developing and launching ITS solutions, An example of this includes the work by an Iraqi software company in partnership with the Ministry of Education to create an Arabic-language ITS for primary school English language instruction [57].

Although these initiatives showcase an increasing breadth and depth of ITS implementation in Iraq, it is clear that many are at cautionary or testing phases. This paper discusses the distant goal of widespread ITS for all universities in Iraq and the many significant challenges that need to be overcome.

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5. Challenges to ITS Integration in Iraq

While Intelligent Tutoring Systems (ITS) offer significant potential benefits for the Iraqi education system, their integration faces several challenges:

5.1 Infrastructure Constraints: Failure to ensure complete supply for the implementation of ITS, particularly in rural areas, failure to provide multiple sources of energy and accessibility to internet connectivity is a heavy obstacle [10]. ITS is expensive and many schools require the hardware (e.g., computers or tablets) required to use ITS [58].

5.2 Digital Literacy: To make better use of the ITS platforms, students and teachers need training due to a lack of digital literacy [11]. The differences concerning the technological skills of educators and students would result in disparate rates of deployment and use of ITS [59].

5.3 Cultural and Language Factors: Delivering culturally appropriate ITS content in Arabic and Kurdish is fundamental for effective integration [12]. Localization is more than a simple translation: it means adapting to local education protocols and cultural conventions [60].

5.4 Financial Constraints: Barriers Initiation costs related to ITS, like purchasing the necessary hardware, software and training of personnel can be large However, the possibility of a challenging situation to obtain sufficient government support is high since Iraq suffers from insufficient educational budget and because many other sectorial issues need urgent funding attention [61].

5.5 Resistance to Change: Certain educators, administrators, or parents might be resistant to the idea of technology-based learning and believe that they have potentially diminishing skills in traditional forms of teaching [62].

5.6 Security Concerns: Security Risk for example, in a country with recent hostilities years back might be concerned about the security of digital systems and data privacy of student data. Security is important but tough to achieve for ITS platforms [63].

5.7 Scarcity of Local Expertise: No local experts in the field of ITS development and implementations might prevent having systems designed to meet the Iraqi environment. This gap requires international expertise and in accordance, these may not always do justice to local needs [64].

5.8 Curriculum Alignment: Misaligned with Iraqi national curriculum and educational standards, due to the dynamic nature of ITS content that necessitates frequent updating and adapting [65].

5.9 Scalability and Maintenance challenges: While the ITS is a force multiplier and reaches thousands of students if not more, scaling the ITS pilot projects to the national level has its implementation bottlenecks. Further, like any IT system, ongoing resources and expertise are required to keep ITS systems functional and up-to-date [66].

5.10 Evaluation and Quality Assurance: Evaluation of the Usefulness of ITS in Iraq and the Quality of the Content The evaluation aspect is surely one of the challenging parts when it comes to using ITS; assessing how effective these systems in an Iraqi context would measure its heuristic validity, how quality education content provided through these systems would represent another type of challenge [67].

5.11 Digital Divide: An increase in the potential disparity between education levels with the implementation of ITS, if not well controlled. Urban students or those from more privileged backgrounds likely have greater access to the required technology, leading to a wider urban-rural divide [68].

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5.12 Teacher Role Adaptation: The integration of ITS affects a change in the role of teachers, where they move from being the primary content presenters to technology-flexible learning facilitators. This can present a difficult challenge, necessitating significant professional development [69].

5.13 Psychosocial: In a post-conflict environment such as Iraq, the Syrian crisis and Gaza many students have had severe hardships experiencing trauma/experiences interrupted education, etc. ITS must be empathetic to these experiences and include elements that cultivate students' psychosocial health in the design [70].

5.14 Sustainability: Sustainability of ITS initiatives beyond initial funding and neglect is a major challenge ITSs must address in the long run This includes long-term maintenance, upgrading, and continuous application to changing educational requirements [71].

These challenges can only be adequately addressed by working together, agreeing on what standards should apply at the various levels, including those to be accompanied in technology-based outputs and activities; involving teachers who have an understanding of the new technologies; and reaching international meetings. Given the challenges facing ITS integration in Iraq, overcoming these is best addressed by devising strategies which are derived from the realities of the teaching and learning environment of Iraq.

6. Recommendations for Future Work

The recommendations and future directions that are expected to facilitate the successful incorporation of Intelligent Tutoring Systems (ITS) into Iraqi education are:

Investment in Infrastructure: Improvements in electricity and internet access are a key prioritization for the successful implementation of ITS [13]. Both urban and rural areas would be targeted to make sure detach was equitably distributed.

Teacher Training: Teachers should be trained in comprehensive professional development programs to prepare them for getting ITS integrated into schools [14]. Their designs must emphasize not only the technical skills needed but also the pedagogical strategies for success in blended learning.

Local Content Development: Supporting the development of ITS content by Iraqi educators and technologists may enhance cultural fit and sustainability [15]. This includes establishing educational technology development centres of excellence for Iraqi universities.

Conclusion

The eradication of educational problems and enhancement of learning outcomes in Iraq is contingent on the incorporation of Intelligent Tutoring Systems (ITS) into education. In summary, as discussed in this article, many of the challenges that challenge the Iraqi educational system can be solved by using ITS built for personalization of learning, being scalable despite teacher shortages and providing insights from data about improvements in education.

While ITS implementations are still at an early stage, the situation in Iraq is encouraging. University-level pilots, mobile learning initiatives and International collaborations are some of the areas where India has started to realise the power of ITS in changing the face of education in this country. Our party's early work will do, as a long case study and base upon which we can expand our reach in future.

The integration of Intelligent Tutoring Systems (ITS) into Iraqi education is a promising solution to address educational challenges and enhance learning outcomes. ITS is designed for personalization, scalability, and data-driven insights, making it a valuable tool for improving education. India has already seen the power of ITS in India's university-level pilots, mobile learning initiatives, and international collaborations. However, scaling up ITS in practice is challenging due to barriers such as infrastructure, digital literacy, culture, languages, and finances.

Proper implementation requires time, money, resources, policy-making, and a supply-meets-demand relationship. The solution should be integrated into curriculum development, teacher professional development, and structural changes to address social determinants of education. Iraq is rebuilding and looking to the future, and ITS will be instrumental in teaching Iraqi youth the skills needed for the 21st century. However, ITS are not a magic bullet for educational troubles and must be carefully implemented alongside traditional teaching methods.

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