

Teachers' Use of Digital Assessment Tools to Promote Educational Sustainability: A Qualitative Study in King Abdullah II Schools for Excellence in Northern Jordan

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Abstract

The growing use of digital technologies in educational assessments has opened new possibilities for teachers to track students' learning, give timely feedback, and facilitate evidence-based instructional decisions. The current qualitative research assesses teachers' experiences and opinions on the use of Digital Assessment (DA) tools and their role in ensuring Educational Sustainability (ES) at King Abdullah II Schools for Excellence (KAISE) in northern Jordan. A qualitative descriptive method was used. A total of 30 teachers were selected purposefully from KAISE in northern Jordan. The data was obtained using semi-structured individual interviews and analysed through thematic analysis. Through the analysis of the study five major elements were identified: (1) DA as a means of determining students' learning demands; (2) FDA as a tool for making continuous changes in the method of instruction; (3) DA as a new way of conducting final evaluation; (4) contextual factors influencing the choice of DA by teachers; and (5) DA as an element of sustainability in education. Subjects observed DA as a valuable measure of keeping track of students' academic progress, giving relevant feedback, accumulating information about learning, and planning the educational process. The significance of FDA was pointed out by the participants as a means of associating assessment results with immediate instructional action. However, the participants identified a number of barriers, such as the lack of technological infrastructure, the need for personnel training, time constraints, and unequal opportunities of access to digital resources.

Keywords: digital assessment, educational sustainability, formative assessment, diagnostic assessment, summative assessment, King Abdullah II Schools for Excellence, teachers, qualitative research, Jordan.

Introduction

The fast-paced technological developments of the last few decades have made remarkable impacts on various fields of study, including education, by altering how the teaching and learning processes are conducted. In this regard, education is increasingly required to embrace new ways of thinking about the design, delivery, and assessment of the teaching and learning processes in order to increase the quality of learning and respond to the needs of learners (Harwell & Zhao, 2021). The most notable change in this direction has been the development of DA, which has altered traditional forms of assessment by incorporating interactive and efficient evaluation techniques. DATs provide instant feedback, increased objectivity, and a personalised learning experience, particularly in situations where online learning and blended learning practices are becoming more common (Al-Enzi, 2019).

More profoundly, DA is much more than just an advanced technology; it is a revolution in pedagogy that meets the needs of education today. The use of electronic testing, digital portfolios, and computerised assessments, among other methods, is more flexible, confidential, and efficient when it comes to evaluating students' knowledge (Serpil, 2023). In addition, these techniques also help in nurturing the vital skills of the 21st century – critical thinking, digital literacy, self-regulation, and collaboration (Jurane-Bremane, 2023).

In light of technological advancements, Education for Work (EWW), or the fourth Sustainable Development Goal (SDG 4), which joins the goal of ensuring inclusive and equitable quality education and promoting lifelong learning opportunities for all, has become central to achieving universal basic education. According to UNESCO's 2025 Agenda,

achieving this goal effectively and sustainably requires adaptability and practical application. Therefore, the goals of EWW aim to develop skills for work, focusing on equipping children with the knowledge, skills, ethics, and attitudes necessary to overcome global challenges in building the future. Fischer et al. (2025) recommend that assessment in education is a fundamental element for achieving sustainable development. It works directly to develop, measure, and assess sustainability competencies over time.

With respect to the sustainability concept, educational institutions are required to maintain continuous progress towards quality, equity, adaptability, and efficiency, as well as optimal utilisation of their resources. This view makes assessment one of the most essential means of evaluating learning results and making decisions aimed at enhancing the efficiency of the educational process (UNESCO, 2025). From this standpoint, DA is viewed as an important tool for ES from a number of aspects. First, it contributes to the increase in the quality of learning due to the provision of instant feedback that allows the implementation of the self-regulation process (Hu et al., 2025). It also helps to ensure the principle of equity as it provides flexible access to assessments for various students (Hernández-Campos et al., 2025). In this context, this research will concentrate on KAIISE schools, which are known for being a distinguished form of educational system in Jordan that seeks to develop high-achieving students in a unique and creative learning atmosphere. Creativity and problem-solving skills are highly valued by KAIISE, which makes the use of effective DA strategies even more important because of the higher level of education that they provide. In this case, teachers should be able to apply DAs successfully.

There are some major gaps that have been identified even in the wake of extensive research into the area of DA. First, there is a lack of emphasis on the use of DA for fostering ES and meeting Goal 4 of the SDGs. Second, empirical research linking DA practices to sustainable educational development outcomes remains scarce, particularly in developing countries. Third, there is a notable lack of studies examining this relationship within specialised educational contexts such as schools for gifted and high-achieving students, including KAIISE in Jordan. Overcoming the above-mentioned gaps is crucial for comprehending how DA can help not only in measuring performance but also in transforming education in general. In addition, new international trends in science show that artificial intelligence (AI) and learning analytics play a key role in creating sustainable educational systems through personalisation, monitoring, and data-based decision-making (Masalimova et al., 2025). However, the degree of use of DATs in achieving the mentioned purposes by teachers is not sufficiently studied yet.

Accordingly, the main objective of this study is to explore the extent to which DATs are utilised at KAIISE and to examine their role in supporting sustainable educational development from teachers' perspectives. Specifically, the study investigates the use of DATs in diagnostic, formative, and SA practices. It also examines whether teachers' perceptions differ according to gender, region, and years of teaching experience.

To achieve these objectives, the study is guided by the following research questions:

1. How do teachers in Jordanian Excellence Schools describe their use of digital tools for diagnostic assessment?
2. How do teachers describe their use of digital tools for FA and feedback?
3. How do teachers use digital tools for SA?
4. What benefits and challenges do teachers experience when using DA tools?
5. How do teachers perceive the contribution of DA tools to sustainable teaching and learning practices?

Scientific and Practical Contributions

The present study has made both theoretical and practical contributions to the area of DA and ES. Theoretical contributions include an extension of existing knowledge through the

incorporation of DA into the context of SDG 4, providing a holistic viewpoint where DA adoption is viewed from the system level as being influenced by institutional, infrastructural, and contextual aspects rather than the attributes of teachers individually. Another contribution is that of differentiating formative, summative, and diagnostic forms of DA, pointing out the underdevelopment of the latter as an important gap.

The practical value of the research is that it reveals evidence-based recommendations for policymakers and educationalists on the issues to focus on, such as improving teachers' skills in conducting diagnostic assessments using digital tools as well as addressing the issue of regional inequalities in terms of infrastructure and professional support. Systemic changes are needed for the consistent use of DA techniques, such as resource allocation and professional development.

Theoretical Framework

The current research is based on the combination of three different but interrelated theoretical approaches that together provide an explanation for how DA affects ES. In contrast to the traditional notion of assessment being viewed as a method of measuring something, the approaches presented in the paper view it as a process of transformation.

The first theory is DA Theory, where assessment is seen as a continuous process using technology, focusing on learners as opposed to a one-off experience (Bennett, 2015; Shute & Ventura, 2013). DA helps in continuous feedback, personalisation of learning experiences for learners, and helps teachers to make decisions using technologies in education.

The second vision by UNESCO is education for sustainable development (ESD). ESD puts importance on the formation of skills such as knowledge, professional skills, moral courage, and abilities that can help people handle the economic, ecological, and social challenges faced by the modern world. It is related to SDG number 4, which focuses on ensuring access to quality education for all people throughout their lives (UNESCO, 2025). Consequently, assessment cannot be solely focused on critical thinking and decision-making.

Thirdly, there is the ES Framework perspective, where sustainable education is viewed as the ability of the education system to sustain quality, equity, efficiency, flexibility, and continual improvements in the long run. In this regard, assessment systems provide important data that can help in making improvements to instruction and education planning and policy. With DA, it becomes possible to produce this important data on a continual basis.

Combining the above views will lead to a conceptual framework for the current study. In this case, DA is viewed beyond a mere technological innovation to be a multi-dimensional process, which links the use of technology in assessment to educational quality and improvement.

Literature Review

Digital Assessment

The swift pace of technological advancement has revolutionised modern-day education through changes in teaching, learning, and assessment practices. In this general transformation brought about by technology, the nature of assessments has changed from traditional pen-and-paper tests to more adaptable and technology-driven assessments that provide constant feedback and instruction for decision-making (Harwell & Zhao, 2021). This transformation indicates a change from using assessment as a tool for gauging learning outcomes to assessment being part of the learning process.

DA is the use of technology tools, which include online tests, ePortfolios, computerised scoring software, and other online assessment platforms, to assess students' level of knowledge and competency (Serpil, 2023). As opposed to conventional assessment techniques, DA allows for providing instant feedback, creating personalised learning paths, and tracking student development on an ongoing basis. Additionally, DA supports the

development of such important competencies of the twenty-first century as digital literacy, critical thinking, collaboration, and self-regulation of learning (Jurane- Bremane, 2023).

There are empirical studies which clearly show the positive influence of DA on education. According to Ayasrah et al. (2024), DA allows teachers to evaluate their students in real time and control the development of their academic progress. Similarly, Smadi et al. (2026) and Shogran et al. (2022) found that DA is more time-efficient and cost-effective than traditional methods because it reduces teachers' workload in grading, facilitates immediate feedback, supports flexible assessment scheduling, and provides secure long-term storage of assessment data. Overall, these investigations imply that DA increases the efficiency of teaching as well as its effectiveness due to the increased accessibility and promptness of feedback.

Notwithstanding the wide agreement about the potential strengths of computer-based assessment, previous studies have shown that the realisation of the mentioned benefits is far from automatic once digital technology is introduced. According to Harwell and Zhao (2021), a successful digital transformation presupposes a paradigmatic change in terms of educational philosophy rather than mere substitution of paper-based exams by their computerised analogues. Similarly, according to Serpil (2023), the efficacy of DA is largely determined by the way in which technologies are incorporated into teaching practice, while according to Jurane- Bremane (2023), improvement in higher-order skills is possible only if the process of assessment is embedded into the learner-oriented educational environment.

All of these research findings suggest that DA is not only a technology-based innovation but also a pedagogical approach that needs to be appropriately designed and planned. Even though past research has stressed that DA has the ability to enhance the effectiveness and efficiency of both learning and assessment processes, it has also indicated significant differences in implementation results among various educational settings. These differences indicate that mere availability of technology is not enough for DA implementation.

Moreover, most of the current literature tends to emphasise the benefits of DA that come with efficiency, automation, and speed, while relatively ignoring the larger contributions that DA makes towards ES. Thus, there is no empirical study that would elaborate on the process of how DA helps to achieve ES goals through continuous improvement, equal opportunities, and evidence-based decision-making. This is a key point to start talking about DA in the broader framework of ES, particularly within the case of Jordan.

Teachers' Perceptions and Practices toward Digital Assessment

Instructors hold an essential position when it comes to deciding whether DA will be successfully implemented or not. Although the technological framework forms a base for everything, instructors' views, skills, and readiness to use technology in the process of classroom assessment will decide whether digital transformation will be effective or not. Thus, modern research tends to move away from the technical features of DA technologies to human and organisational ones.

Prior research focused on teachers' willingness to embrace educational technologies from the perspective of technology acceptance and change in pedagogy. Tondeur et al. (2017) claimed that teachers' attitudes and orientation towards pedagogy play an important role in their decision-making related to the use of digital technologies in teaching and assessment. Likewise, Trust and Whalen (2020) stated that institutional support, professional development, and collaborative learning communities are key factors that enable teachers to make successful transitions to digital learning settings, especially in times of disruption in education.

Based on the findings above, Al-Fraihat et al. (2020) showed that digital learning systems are effective not only because of technology but also due to organisational support, users' satisfaction with the systems, usability of such tools and teachers' confidence in digital

technologies. All the findings above suggest that implementation of DA should rely on an ecosystem that comprises technology and professional support.

In mathematics education, for instance, Alshammari and Alharthi (2021) established that there were moderate levels of DA implementation among the educators, which differed significantly depending on their professional qualification and teaching experience. In this respect, it can be noted that DA is not implemented consistently by the teachers but rather varies from one to another depending on certain factors.

The more recent developments, however, involve the sudden growth of AI and learning analytics, and have led to a significant change in the approach to DAs. Instead of being used as mere mediums for conducting assessments, modern digital technologies are offering intelligent services including but not limited to automatic scoring, adaptive assessment, personalised feedback, prediction, and continuous tracking of the learner's progress. According to Luo et al. (2025), an assessment system that uses the power of AI technology helps make timely instructional decisions based on the learners' performance and learning needs identified by the predictions made. In the same way, AI-based assessments help save time for the teachers through automatic grading, providing timely and personalised feedback, and creating learning analytics.

In addition to these results, the authors of the study conducted by Masalimova et al. (2025) found that education systems based on AI have several advantages, including personalised learning, continuous assessment, and institutional efficiency. The qualities discussed above show that AI is not just a technological revolution, but a tool that contributes to educational quality and sustainable development of education systems. In turn, Alneyadi and Wardat (2024) found that the application of technologies like ChatGPT positively impacts students' academic performance, involvement in studies, and problem-solving skills because of individual feedback and adaptive learning. Moreover, Aldalalah et al. (2025) proved that TPACK-based digital environments are effective for cognitive achievements and development of practical skills because of successful DA that requires a combination of technological, pedagogical, and content knowledge.

Despite the positive results that have been achieved through the help of AI in assessment, some issues should be noted, but unfortunately do not have enough empirical research. These include questions about teachers' autonomy, the overuse of automation, the problem of algorithm transparency, proper use of students' information, and privacy issues. These problems have been paid little attention in scientific studies (Deepshikha, 2025).

Generally, there is an observable change in terms of the focus in teacher perception research concerning DA. While previous works emphasised issues of technology acceptance and readiness, contemporary researchers have started to shift their attention to interactions between teachers and AI-based assessment and learning analytics solutions. Nevertheless, at the same time, not many researchers have studied the role of teachers' practices of DA in terms of achieving ES objectives, especially in the context of the Arab educational system. In addition, it is still unclear how contextual factors, including gender, experience, and educational environment, affect teachers' utilisation of DA technology. This issue becomes an important reason for this study, which aims to explore teachers' perceptions of DA and its contribution to ES in KAIIE in Jordan.

Methodology

Research Design

The qualitative descriptive research design was employed to facilitate a comprehensive understanding of teachers' experiences and perceptions about DA practices. The qualitative descriptive research design was appropriate for this study since it intended to adhere to the explanations of the subjects and how they encountered their experience instead of carrying out a hypothesis test or conducting a statistical analysis of the occurrence of the examined

practices. This design enabled the researchers to determine the DA tools that different teachers used, as well as how and why they used them and what contextual factors facilitated or constrained their use.

Research Context

The research was performed at the KAIISE, which is situated in northern Jordan. The northern region was chosen for the study with the aim of obtaining a homogeneous geographical and educational setting, which also contains schools for gifted and high-achieving students. It is worth mentioning that the existing research has already studied teachers at the KAIISE in the northern governorates, which added meaning to the choice of this area for the study. Moreover, the choice of this area makes it possible to investigate DA practices in a less limited educational setting and allows variation among teachers in terms of gender, teaching experience, and academic specialisation

Participants and Sampling

The sample was composed of 30 instructors who are currently employed at the King Abdullah II Schools of Excellence located in the northern part of Jordan. As presented in Table 1, the sampling comprised purposeful sampling in which the teachers were chosen based on the criterion of having previously employed technology for the assessment of students. The process of selection considered, as part of the criteria of maximum variation, the female/male ratio of the participants, the length of experience that teachers had accumulated in their profession, and teaching conditions. The research involved only 30 participants because the aim of qualitative research is the development of detailed accounts of people's experiences rather than statistical generalisation. Each participant was assigned a pseudonym starting from P1 to P30 for confidentiality reasons.

Table 1. Proposed Characteristics of the Qualitative Sample

Characteristic	Category	Number
Gender	Male	12
	Female	18
Teaching experience	Less than 5 years	4
	5–10 years	6
	More than 10 years	20
Total		30

Inclusion Criteria

Eligible participants were defined as those who were (1) involved in teaching in one of the KAIISE in Northern Jordan, (2) responsible for the assessment of students, (3) experienced in the use of at least one DA tool, (4) interested in taking part in an individual semi-structured interview, and (5) signed an informed consent form.

Instrument

Semi-Structured Interviews

The data was gathered through means of semi-structured interviews. The interview guideline was based on the three main aspects of DA analysed in the prior study: Digital Diagnostic Assessment (DDA), DFA, and Digital SA. The guideline was expanded to investigate teachers' insights, benefits, challenges, and opinions about ES.

The basic interview questions were: 1. What digital tools do you utilise when assessing your students' past knowledge and skills? 2. What digital tools do you use for formative assessment? How helpful do you find these tools? 3. How do you incorporate digital assessment tools into your lessons? 4. How does digital assessment affect your feedback to the learners? 5. How do you utilise online rubrics, portfolios, peer assessment, or record keeping? 6. What digital technology do you apply to SA? 7. What are the main benefits of digital evaluation for you? 8. What obstacles do you face when adopting DA? 9. How does your instructional design rely on digital evaluation? 10. How

do you think digital assessment promotes sustainable development ? 11. How can you increase your knowledge about digital assessment through training and other resources ?

Data Collection Procedures

The necessary institutional approvals were obtained prior to the commencement of data collection by the researchers. Potential subjects were given information pertaining to the objectives of the study, the details about the voluntary nature of participation, and confidentiality protocols and rights concerning withdrawal from the study at any time. Twenty-eight interviews were conducted with the 28 subjects interviewed. As planned, those interviews took about 30-45 minutes. With the prior consent of the subjects, the interviews were tape-recorded and then transcribed. The transcripts were checked against the original tapes in order to confirm their accuracy. Identifying information was omitted in the transcripts. The subjects were only referred to with such codes as P1-P30, respectively. Data collection took place until rich and recurring data was attained to answer the research questions.

Data Analysis

The interview transcripts were analysed in accordance with six stages of thematic analysis. First, at the familiarisation stage, the researchers read the transcripts many times to have a comprehensive understanding of participants' experiences and detect preliminary trends in the data. The second stage was concerned with systematically coding significant parts of the transcripts by using descriptive and interpretative codes, such as identifying students' needs, progress monitoring, immediate feedback, instruction correction, rubric application, digital portfolio creation, peer assessment, digital tests, question bank formation, technological limitations, professional development, institutional assistance, and sustainability. The next stage involved combining similar codes in order to form candidate themes. The following stage was concerned with verifying each candidate theme by comparing it with the coded data and the interviews' transcripts to ensure that it is cohesive and consistent with the whole data set. The fifth step included clear definitions of each theme with a name reflecting its core meaning with respect to the research objectives. Finally, findings were presented through thematic descriptions, subthemes, and quotations from some participants.

Trustworthiness

To ensure the validity of the findings obtained through qualitative methods, four principles were employed, which include credibility, transferability, dependability, and confirmability. Credibility was achieved by carrying out thorough analysis of the collected data and verifying the data through procedures such as member checking. Transferability was ensured through presenting a highly detailed data collection strategy to enable understanding of the applicability of findings in the study. Dependability was achieved through the development of an audit trail, which was used to record the whole process of data collection, including coding and identifying themes while doing analysis. Finally, confirmability was achieved through documenting the process used while analysing the data and relying on the interviews conducted with the participants, thereby minimising the potential influence of the researcher's assumptions and ensuring the findings remained closely connected to the data.

Results

The thematic analysis generated five major themes as shown in Table 2.

Table 2. Major Themes and Subthemes

N.	Theme	Subthemes
1.	DA for understanding students' learning needs	Prior knowledge ; strengths and weaknesses ; participation monitoring ; identification of learning difficulties
2.	FDA and continuous feedback	Immediate feedback ; progress monitoring ; rubrics ; peer assessment ; digital portfolios ; instructional adjustment
3.	DA in summative evaluation	Digital examinations ; question banks ; checklists ; project assessment ; assessment efficiency
4.	Contextual conditions influencing DA	Infrastructure ; professional development ; time ; teacher confidence ; institutional support
5.	DA and ES	Evidence - informed teaching ; documentation ; communication ; continuity ; reduced paperwork

Theme 1: Digital Assessment for Understanding Students' Learning Needs

According to teachers, DA is essential in obtaining data about the prior knowledge, strengths and weaknesses, as well as learning needs of students. Interview participants mentioned their appreciation of digital records because of the opportunity to track students' participation and performance development. For instance, an interviewee made the following comment: P7: "Digital records help me know my students better. With the help of digital records, I get continuous updates concerning their participation and performance. This allows me to review their past results, pay attention to the strengths and weaknesses of my students, and identify specific students who need additional support. In addition, it helps me adjust my lesson plan according to students' current needs, rather than rely only on my general opinions about their performance."

Teachers reported that digital information can help recognise students who need extra assistance and assist in decisions made in regard to lesson planning. However, diagnostic assessment is generally considered to be less advanced than FA. Participants indicated that they made much more use of information in digital records and electronic achievements than in the use of more advanced methods of diagnosis.

Theme 2: Formative Digital Assessment and Continuous Feedback

Formative evaluation using the digital approach was another theme that stood out clearly during the investigation. In this regard, the participants pointed out the positive aspects of using the digital approach in obtaining current data on the students' performance and allowing teachers to react instantly to their needs. As stated by T1, "Well, FA using digital technology allows me to obtain current data on how well my students grasp the lesson. If I observe that some of them face certain difficulties, I will alter my approach and provide more examples." T2 further agreed, "Yes, it allows me to detect instantly the students who struggle." These interviews indicate that DA provided an opportunity for teachers to detect misconceptions of learners, track their progress, and give them immediate feedback during the process of learning. As T3 put it, "Well, I can tell where students make mistakes and give them feedback right away," and T4 added that, "If I see that learners don't understand certain aspects, I can go back and try explaining them in another way." Therefore, the use of DA facilitated the regulation of teaching strategies because it provided an opportunity to change explanations depending on learners' needs.

Moreover, participants pointed out that FDA can help to increase the number of learning opportunities. T5 stated: “Yes, as the students can have more learning opportunities through which they can practice, I can offer them some other activities depending on their needs.” Meanwhile, T6 commented: “Yes, if I observe that certain students are still having difficulties, then I can offer them more examples or exercises.” The statements suggest that DA was not perceived only as a way to assess learning outcomes but also as an opportunity to provide additional learning opportunities.

The introduction of rubrics became an additional aspect of FDA. The respondents pointed out that rubrics made it possible to define expectations and assessment criteria, as well as monitor the students' progress through their learning process. For instance, T7 said, “The rubric makes clear what is expected from the students; therefore, what should be improved,” and T8 stated, “Well, the students can see the criteria and know what they have done right and what they should do more.” Likewise, T9 mentioned, “Yes, the rubric helps students realise how they are being assessed,” and T10 emphasised, “I am using the rubric to track their progress since I can see which criteria they have managed and which should be improved.” These results coincide with the findings of the previous study during which rubric-related practices proved to be one of the strongest aspects of FDA.

Theme 3: Digital Assessment in Summative Evaluation

Uses of digital technology for SA were reported by participants, including electronic exams, electronic question banks, checklists, project assessments, and electronic records of achievements. Out of all of these assessment methods, electronic question banks stood out as most advantageous because of their ease in preparing various kinds of tests without increasing the workload associated with the preparation of the test. As T11 put it, “Well, the electronic question bank allows me to prepare various kinds of tests. I can select different questions rather than making everything from scratch.” In the same way, T12 said, “Yes, this is true since this makes the process faster in that I am able to create different versions of the test from the question bank based on what I would like to test.” The participants also appreciated the usefulness of electronic exams. T13 said, “Well, the electronic exams make the entire process easy because all the questions and answers are digitalised,” while T14 commented, “Well, this is much easier since all the information is available through the system.”

Digital checklists were also cited as an effective method for managing assessments. As one of the interviewees stated, “This checklist allows me to check whether all the requirements are covered in my students' assessment.” Another teacher shared the following view, “Well, it gives me an opportunity to see whether all the requirements are done.” Project assessment was also made possible with the help of digital technology. One of the interviewees said, “I can evaluate the separate components of students' projects by using digital devices.” Another teacher added, “Yes, it facilitates the recording of students' performance during the project completion process.”

Finally, the participants cited the use of electronic records of achievements as an effective means of recording students' assessments. According to T19, “Electronic record has all the students' results recorded in one place, making it easy to trace their achievements,” whereas, according to T20, “Um, it is easier to have the records of the students' assessments electronically to refer to them when necessary.” In general, the answers from the participants suggest that the digital technology played an important role in facilitating various SA methods, especially electronic question banks due to their flexibility.

Theme 4: Contextual Conditions Influencing Digital Assessment

Theme number four revealed that DA was heavily dependent on the context factors, including technology infrastructure, professional development, workload, and institutional support. In terms of technology infrastructure, the participants talked about the significance of having a good internet connection, appropriate devices, proper digital platforms, and technical support.

Participant T21 mentioned, "Well, DA is tough without a reliable internet connection. We need the stable internet and proper devices to make use of it." Likewise, participant T22 stated, "Sure, we do need a good platform for that, but what we also need is somebody who can help us solve our technical issues."

The role of professional development in ensuring the effective implementation of DA was also noted. Participants agreed that training should encompass both the technical and pedagogical considerations in DA. According to T23, "Um, teachers need training not only in the technical aspect of using the technology but also in effectively using it for assessment purposes." In T24's opinion, "I think that the professional development should demonstrate the practical use of DA rather than just the technical use."

The participants also agreed that introducing DA as well as handling digital evidence can take more time for the teachers initially. As stated by T25, "In the beginning, it takes more time as you need to learn the whole system and gather all the digital evidence." This was also echoed by T26, "Yes, there is extra work at first, mainly if you don't know how to use the tool."

Lastly, institutional support proved to be critical for implementing DA techniques. Teachers stressed the importance of the school directors' role in providing students and teachers with technologies, training, technical assistance, as well as cooperation with other teachers. So, T27 said, "The school director has to assist teachers with providing them with technology and arranging training when needed." T28 expressed his thoughts this way: "Yes, it is important to have technical support, but also we benefit from cooperating with other teachers because we can exchange our ideas and experience." T29 mentioned, "Yes, when the administration supports teachers in cooperation and provides all the necessary means, DA becomes much easier." Finally, T30 added, "It is important for us to have support from the school – whether it is training, technology, or some assistance in case of technical problems." Thus, it may be concluded that the implementation of DA requires not only teachers' activities but also adequate technological support, appropriate professional development, reasonable workload, and institutional support.

Theme 5: Digital Assessment and Educational Sustainability

The participants associated DA with sustainability in education and pointed out three key areas through which DA could help achieve sustainable assessments. The first area was evidence-based teaching since the participants believed that DA offered teachers evidence, which informed their teaching decisions. T1 said, "Well, the data from the assessment offers me evidence about the learning of my students so that I can make appropriate decisions about teaching." Also, T2 stated, "Yes, I can use the results to make decisions whether I need to modify my teaching or not."

Sustainable documentation was the second issue that was discussed. T3 argued that it is important to keep track of students' assessments in electronic form. He noted that "the advantage of keeping these digital records is that we can keep track of the students' assessment records from the beginning." T4 explained that "everything is recorded electronically, which makes it easy to refer to previous students' assessments."

The third theme revolved around minimising paper dependence. According to the participants, electronic assessment minimised the use of paper during assessments while maximising efficiency. For instance, T5 indicated that "we don't have to print so many papers as everything is recorded electronically in our assessment and also the results." In similar terms, T6 argued, "Well, digital record keeping minimises the use of paper and facilitates keeping of the assessment records." Nonetheless, participants were of the opinion that the mere presence of advanced technologies does not ensure sustainability of learning and assessment. For example, T7 argued that "Technology is helpful, but um it doesn't mean that we have sustainable assessment."

In general, these results indicate that DA can have sustainability implications due to evidence-based teaching practices, documentation in an electronic format, and less use of paper, although ultimately the sustainability of DA is dependent on implementation.

Discussion

The results of the current qualitative research allow for a better understanding of the role of DA in modern school education at KAIISE in Northern Jordan. Participants view DA as more than simply a set of technological devices, recognising that it is educationally important in so far as digital technologies help to make education more inclusive, responsive, continuous, and informed by evidence. The teachers regard DA as a part of a more extensive pedagogical process, through which data about students' learning is acquired, interpreted, recorded, and used for making teaching decisions. Thus, the interpretation of DA makes it possible to link it to ES, pursuing the two key aspects of education quality and equity, which represent the main components of SDG 4.

The qualitative outcomes indicate that the incorporation of DA in the institutions sampled is still ongoing rather than completely established. While educators reported an array of uses for DA from diagnostic to formative and summative, their narratives also indicated very different levels of depth and sophistication in DA use. However, merely having technology in educational institutions does not mean that educational practices will change accordingly. The introduction of digital practices in the classroom will depend on the interplay between technological infrastructure, organisational support, teachers' readiness, and the pedagogical objectives behind using digital technology.

This concept is crucial in the KAIISE, in light of the fact that teachers interact with talented and successful children whose needs may require continuous assessment, tailored assistance, different instructional techniques, as well as assessment methods for multi-dimensional learning. In this context, DA can be seen as a means of bridging the gap between data related to students' achievements and the teaching process. However, the interviewees' experience shows that this effectiveness is not stable, as it depends on the circumstances in which educators operate.

Digital Assessment as an Emerging Component of Educational Sustainability

An important conclusion from the series of interviews is that the view of teachers regarding DA is rather broad. In their opinion, DA is not merely a technological alternative to traditional forms of assessment but rather refers to the improvement of the educational process itself. Interviewees described DA as a tool for obtaining timely information about students, tracking their progress, planning instruction, documenting their performance, and facilitating communication about learning. These functions demonstrate that the usefulness of DA is associated with its ability to make assessment much more continuous and directly linked to teaching itself.

This discovery is important in terms of ES since sustainable education relies on systems that are responsive to learners' needs continuously instead of only depending on isolated assessment events. Information can be collected, stored, retrieved, and used more effectively thanks to digital technologies. In this connection, the results of the study support the argument put forward by Masalimova et al. (2025) about DA being instrumental for adaptive learning, data-based teaching, and making sustainable education possible. The results of this research add to that argument by demonstrating that teachers themselves consider DA information meaningful as long as it is translatable into teaching actions.

The results also echo Alneyadi and Wardat (2024), who argued that innovations in technology improve education by enhancing the quality of feedback and increasing learners' engagement. The analysis done throughout the current research confirms the conclusion reached by scholars since teachers revealed the importance of relevant feedback, constant monitoring, and the ability to identify the hurdles students face during the teaching process. Hence, it can

be assumed that DA can contribute to ES to a larger extent if it is executed in the cycle of assessment, analysis, as well as feedback and teaching adjustments.

Formative Digital Assessment as the Most Pedagogically Embedded Practice

Among the three dimensions highlighted in the interviews, the third one—the concept of FDAs—was highlighted as the most embedded practice in teachers' day-to-day teaching. The respondents described FA as being particularly useful in providing continuous feedback, tracking students' behaviours, identifying misunderstandings, and altering the teaching process based on the data received. It could be said that FA has its unique place among other types of assessment, as it makes it possible to connect the information obtained with teaching directly and immediately.

The role of FA can be accounted for as it allows continuous decision-making regarding instruction. Teachers do not have to wait till the completion of their course /unit to find out if students have been able to acquire knowledge about the subject matter taught in class. Instead, it is possible to collect evidence via the available electronic tools which are possible to use during the learning process. This interpretation is consistent with Black and Wiliam (2018), who emphasise the central role of FA in generating evidence that can be utilised to improve teaching and learning.

The interviews indicate that implementation of digital rubrics and digital notes by teachers, as well as peer assessment and progress-monitoring records, signals a movement away from assessment as a final task to assessment as a core aspect of learning. Teachers found rubrics useful as they allowed them to set clear criteria when assessing students. At the same time, the peer assessment method was deemed effective because it made students reflect on their progress and exchange information with one another.

The importance of this research to education sustainability is due to the fact that it shows how formative digital evaluation contributes to the process of constant development rather than portraying a snapshot of this process. FDA makes it possible to identify students' problems sooner, respond to their needs and keep track of their development throughout the academic year. Hence, FDA can be viewed not only as a means of determining learning, but also as a way of supporting learning development in the long run.

The results are in line with the observations made by Alneyadi and Wardat (2024), who studied how educational effectiveness could be improved using digital technologies via feedback and learner engagement. In this study, the teachers agree that the usefulness of digital technology is especially significant when such technology offers prompt feedback and suggestions for action on how to plan instruction.

The Relative Weakness of Digital Diagnostic Assessment

Compared to FA, the use of DDA was not that advanced or systematically applied in teachers' practices. The study participants made reference to some use of electronic/computerised means, previously collected info about the students' academic records, and the use of e-activities in order to find the strengths and weaknesses of the learners; however, they reported less frequent application of innovative digital diagnostic means.

Different reasons came up from the qualitative variety of observations. To start, certain teachers expressed their concerns over their inadequate professional training in the use and interpretation of digital diagnostic forms. Secondly, diagnostic assessment was not always seen as a constant part of the teaching process but sometimes as an introductory procedure. Finally, the respondents pointed out the unavailability of special digital diagnostic tools and means.

These results are in line with Al-Subaie and Khudair's (2023) research, which noted that diagnostic assessment was not given much attention in educational institutions, where it has not been widely used. The current qualitative data provide some context for this situation in the understanding that the problem may not be teachers' lack of awareness about the

importance of diagnosis in education, but rather low availability of training, resources, and routines enabling diagnosis to be practised regularly.

The discovery made here has considerable significance for schools that cater to gifted and talented pupils. The use of diagnostic assessment will help in recognising differences in pupil profiles - previous knowledge, capabilities, weaknesses, and instructions. Nevertheless, unless diagnostic assessment is incorporated into the ongoing assessment system, its possible contribution to effective teaching and adaptation in correspondence with pupils' needs is hampered.

In line with this, the results indicate that DDA should be viewed as a continuous teaching-learning process rather than an isolated event before teaching. This change will ensure that assessment data can be used during the entire learning journey, and that the correspondence between learners' needs and teaching response will improve.

Digital Summative Assessment and the Persistence of Traditional Assessment Structures

The participants' experience suggests that digital SA is evolving more slowly than FA. Educators mentioned the use of electronic testing, customizable question banks, checklists, and assessments of the project, but they affirmed that traditional testing approaches are still affecting the situation.

The pattern here is partly explicable by the fact that SA is systemic and institutional in nature. SAs are often integrated into formal policies, grading systems, time schedules, and procedures, thereby making them more difficult to change than FA happening in a classroom. For this reason, teachers might consider the integration of technology into informal assessment practices easier than the introduction of technology in SA governed by institutional rules.

This theory is supported by the results of research conducted by Perry et al. (2022), which show that numerous educational practices still rely on paper-based assessment. It prevents the transition to purely digital forms of assessment as outlined in the current research paper. This paper also gives a qualitative view on this topic.

Participants nevertheless identified several advantages of digital SA, particularly in relation to digital question banks, automated or simplified scoring, record keeping, and the organisation of assessment materials. Digital question banks were viewed as useful for generating diverse assessments, while checklists were perceived as flexible instruments for systematically monitoring performance.

However, the teachers' experiences seem to imply that the use of technology for digital SA needs technical reliability and concern for issues such as exam security and student accessibility should be supported by institutions and policy. Therefore, the changeover from paper to digital SA should not only be seen as a technological change but an organisational one.

Technological Infrastructure and Institutional Support as Conditions for Sustainable Adoption

One very critical issue that resulted from the interviews was the contextual factors that influence DAs. In many cases, teachers would discuss how infrastructure, technical support, institutional support, and training are very crucial. It is evident that whether teachers adopt DAs is not necessarily because of the availability of these technologies but because of whether they have the required contextual factors. Practical barriers such as unreliable internet connectivity, availability of appropriate technology, technical disruptions, and limited technical support were identified by participants. Participants also noted that teachers need assistance not only in terms of using the technology but also in terms of creating valid assessments using this technology.

The results thus imply that a broader framework for digital transformation should be developed, where institutional readiness is one of the key elements in determining the success

of the process. This finding is in line with the argument by Aldhafeeri and Khan (2016), who claim that the variance in using educational technology among various regions is strongly related to the difference in available resources and support. The participants have highlighted the fact that technological conditions and support may vary from school to school in the northern region, even though the current study has not considered geographic diversity as a factor. This implies that technological infrastructure must be seen as a fundamental requirement for the sustainability of education. Lack of investments in training and maintenance alongside investment in technology may result in fragmented implementation.

Teacher Professional Development and the Role of Institutional Readiness

Another important lesson from the interviews has to do with the teachers' professional preparation. It is not that the participants needed training on how to use digital technology but rather the knowledge on how DA can fit into teaching, how the information obtained during assessment can help tailor the teaching process and how different digital tools can be used to meet specific educational goals. Implications of this finding could be for teacher professional development; both technological competence and assessment competence are required. Teachers need not only know how to use certain technological tools, but also know when their use makes educational sense, what type of information can be gathered using those tools, and what to do with such information.

The results suggest that merely having a high level of teaching experience does not necessarily mean that the DA process will be more effective. Participants who had many years of experience reported problems comparable to those of the participants with less experience, especially in cases where there was no proper professional development. This conclusion corroborates the conclusions made by Poole and Preciado (2016) and Nikou and Economides (2018). Technology adoption is significantly influenced by professional learning experiences rather than teaching experience.

Consequently, the current study recommends that DA needs to be regarded as a subject for ongoing professional development. It is necessary to provide teachers with constant possibilities to try DA, think about its efficiency, exchange experiences with colleagues, and get feedback from specialists in educational technologies and assessment.

Gender and Equitable Access to Digital Assessment

While the qualitative approach is not concerned with statistically significant gender differences, the respondents' narratives did not reveal any gender-based obstacles to the use of DA. Males and females shared similar opportunities, benefits and issues regarding the use of digital technologies. Such a trend could be considered an indication that in the participating educational institutions, the availability of DA tools does not depend much on the gender dimension. Rather, participants stressed the significance of preparation and technological context more often.

In line with Yu et al. (2022), who claim that gender-based discrepancies in technology uptake may be addressed by providing everyone equal access to professional training, the above-mentioned interpretations also appear valid since the current qualitative study findings point out that when teachers receive similar opportunities, gender becomes less relevant in terms of their DA skills.

The key point here is that digital transformation must be sustained through equitable professional development and access rather than presuming that teachers' own attributes are the main obstacles in technology use.

Regional Context and Variability Within Northern Jordan

Though this current study deliberately focuses on KAIISE of Northern Jordan only, it came to light through the interviews that there might not be consistency of DA processes in all other schools from this particular area. There were some variations in infrastructure, technical support, digital materials, and training sessions.

The above contextual variability serves as an insightful explanation as to why there is a regional pattern in the initial quantitative study. This is because the current research indicates that regional variations should not just be considered as a difference in numbers but as a difference in context. This result concurs with the findings of Aldhafeeri and Khan (2016), who had suggested that lack of resources and technical support are among the key reasons for differences in technology use in education. These aspects might play their role in the development of DAs in northern Jordan within the scope of advanced technology use.

Teaching Experience and the Changing Nature of Technology Adoption

Further, the results from the qualitative research indicate that the number of teaching years, in itself, is not a crucial factor that determines whether DA will be used. The need for training, technical support, and institutional support was similar for both teachers with varied teaching experience. Experienced teachers are known to have extensive knowledge of pedagogy, although this may not be reflected in DA scenarios. This supports the theory posited by Poole and Preciado (2016) and Nikou and Economides (2018), which contends that technology adoption should be considered more from the perspective of opportunities, readiness, and professional learning, rather than demographics. A significant implication here is that professional development should not be designed only for novice teachers. The professional development of experienced teachers is also likely to require ongoing chances to refresh their understanding of DA and reflect on conventional assessments in view of new technologies.

Digital Assessment as a Systemic Rather Than Individual Phenomenon

Together, the themes that emerged from the interviews lead to a main interpretation: DA in KAIISE is influenced more by system- and institution-related factors rather than teachers' personal traits. The recurrent emergence of issues like infrastructure, technical support, institutional policies, professional development, assessment structure, and access to digital technology from teachers' accounts is indicative of the reasons why certain DA practices are integrated into classroom practice; however, other DA practices remain less integrated.

The significance of this perspective lies in the fact that it takes the blame for digitisation off individual teachers and onto the entire education system. It does not make much sense to expect individual teachers to use DA without proper technological, pedagogical, and administrative support.

There must be a system-level institutional approach that combines educational leadership, professional development, technology infrastructure, and assessment policy. This is a more appropriate approach for an educationally sustainable model because it aims to create something that can be sustained in the long term rather than depending upon the interest and/or ability of certain teachers.

Digital Assessment and Educational Sustainability in KAIISE

The main conclusion from the analysis is that DA can bring tremendous opportunities for sustainable education at KAIISE; however, its success will depend on the integration of the technologies into the pedagogic environment.

From the participants' experiences, it is evident that DA can be used to promote sustainability in education as it facilitates the continuous gathering of evidence, feedback, and documentation, making decisions based on evidence, communication, and reducing dependence on paperwork. The functions described above are related to the general objectives of education, as explained by Masalimova et al. (2025).

On the other hand, the results provide an indication that digitalisation is not the same as sustainability. This means that just because a school makes use of an electronic system of assessment, it cannot be labelled as being digitally sustainable.

For gifted and high-achieving learners, these aspects may become even more important. DA can help to facilitate the process of individual learner profiling, track the paths of their learning progress, give differentiated feedback, and design proper learning activities.

Nevertheless, all of this is possible only if assessment is an integral part of lesson planning and not just a technological tool.

Integrative Interpretation

Generally, the research results show a gradual shift from the traditional approaches to more digitally informed assessment processes at KAIISE in northern Jordan. The shift is mainly reflected in FA because the teacher can make use of digital information in order to give feedback and adapt instruction. In the case of diagnostic assessment, it has not been well developed mainly because of the lack of training and poor integration into ongoing classroom activities.

This further suggests the use of DA tools as a practical part of an educational ecology. The teacher's ability is important, but it works in conjunction with infrastructure, organisational readiness, training, technical support, and assessment policy. This is true, for example, according to Yu et al. (2022), Aldhafeeri and Khan (2016), Poole and Preciado (2016), and Nikou and Economides (2018), who all note the importance of contextual and organisational factors for educational technology adoption.

For this reason, the drive towards sustainable DA must take a strategic turn from providing technology to building capacity. There is a need for schools to go beyond the mere provision of digital technologies. Rather, they need to create the context within which teachers can apply the assessment technologies.

From this perspective, DA must be seen not as an end to be achieved, but as an educational tool that allows schools to become more responsive, encourage learning, adopt practices based on evidence, and pursue the quality and equality aspects of SDG 4. It is thus clear that the results justify the view that DA's effective integration into KAIISE relies first and foremost on technology, pedagogy, teacher skills, and institutional support. This kind of alignment is a necessary basis for turning DA from a nascent tool into a sustainable one.

Limitations of the study

This study is limited in scope. It only considers teachers teaching in KAIISE in the Northern Region of Jordan. This implies that results of this study cannot be generalised to other teachers in Jordan in statistical terms. It is important to note that this study largely considers teachers' experiences. Future studies must involve other forms of data collection, including classroom observation and students' opinions.

Conclusion

A qualitative investigation on the teachers' use of DA at KAIISE in Northern Jordan revealed five interrelated themes. These are DA for determining students' learning needs; FDA and feedback; DA in SA; contextual factors that affect DA; and DA as a factor in sustainability of education.

The results indicate that teachers find DA especially useful when it is incorporated into instructional decision-making processes. FA seems to create the strongest link between assessment data and instructional practices, allowing teachers to assess the learning process and adapt their instruction accordingly. However, DA success will depend on more factors than just the presence of technology. In addition to that, there are many other conditions that should be met, including teacher readiness, professional development, technological infrastructure, institutional leadership, time, and accessibility.

In the case of the KAIISE in Northern Jordan, then, the sustainable use of DAs must be considered not only as a technology but also as a pedagogic and organisational change that will enable better evidence-based practice, better documentation of learning processes, and differentiation of education provision, and contribute to more sustainable educational practices.

Recommendations

In accordance with the results found from the qualitative research, the research suggests continuing professional development programs be created in DA and technological resources in KAIISE in Northern Jordan. In addition, it is important to improve teachers' skills in FDA, use digital rubrics and portfolios, and develop DA guidelines for gifted students. Moreover, schools should offer sufficient technical support and ensure equal access to DA tools for all students. Additionally, teachers should be encouraged to utilise information from assessments to practice differentiated instruction and establish learning communities to revolve around DAs. Lastly, further research should also focus on classroom observation and an examination of real-life DA artefacts.

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