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Developing a prototype computer-assisted instruction for non-instructional design specialist educators in the sultanate of Oman

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ABSTRACT

With the rise of online teaching, particularly in the post-COVID-19 era, the demand for effective and quality instruction has grown substantially. This study aimed to address a critical gap in instructional design (ID) competencies among university lecturers in Oman who were not experts in the instructional design process. To respond to this need, the research developed a modular professional development course using Articulate Storyline. The course was structured around the key ID phases: analysis, design, development, implementation, and evaluation (ADDIE). Using a developmental research methodology, the study designed and implemented a Computer-Assisted Instruction (CAI) prototype as an accessible online professional development tool. The course was intended to support university lecturers in building fundamental instructional design skills and applying them within their instructional context. Data were collected through surveys to measure participants' self-reported perceptions of ID knowledge and skills. The findings revealed that not only did the intervention significantly enhance participants' understanding and application of ID principles, but it also enabled them to design instruction that is effective, efficient, and engaging. The study contributes a scalable framework for deploying CAI-based microlearning environments in higher education settings. Furthermore, it highlights the potential of digital tools for sustained professional development and recommends future exploration of adaptive learning technologies.

Contribution/Originality: This study addresses a critical gap in instructional design competencies among university lecturers in Oman who are not experts in the ID process. By developing a modular professional development course using Articulate Storyline, it provides a scalable framework for deploying CAI-based microlearning environments in higher education settings.

1. INTRODUCTION

During and after COVID-19, various sectors, including education, have undergone significant changes. Higher education institutions, being among the most affected (Castellanos & Delgado, 2024; Imran, Almusharraf, & Abbasova, 2025; Rahman et al., 2024; Wilkinson & Male, 2025), have begun to experience a digital transformation through online and blended learning delivery methods. Currently, online learning has become a vital resource for over 1.5 billion students (UNESCO, 2020). Although the adoption of online and blended learning, as the fastest-growing market in the education industry, has shown a significant increase in recent years, the emergence of the COVID-19 pandemic further accelerated this trend. For example, in the US, more than one-third of students have enrolled in at least one online course (Palvia et al., 2018), and 98% of higher education institutions shifted to online

modes (Cooke, 2025). Additionally, 56.5% of students preferred the continuation of blended learning after the pandemic (Mudenda et al., 2023). These statistics indicate a sustained preference for integrating online and blended learning approaches in teaching and learning processes (Antwi-Boampong, 2021). However, this educational continuity has become a questionable remark, particularly in terms of the quality of teaching and learning outcomes (Maqbool, Asif, Imran, Bibi, & Almusharraf, 2024). This raises questions regarding whether the shift to an online delivery format can truly uphold the same standards and quality of the traditional format. In fact, the nature of online and traditional learning is different from each other (Means, Toyama, Murphy, & Baki, 2013). These distinctions highlight the need for developing innovative strategies that effectively address the challenges in online learning environments. Literature highlighted some of these challenges (Ahmad, Nugak, & Abd Rahman, 2024; Greenhow, Graham, & Koehler, 2022; Khanal, 2024). Among other challenges, a significant concern is the limited instructional design (ID) expertise among instructors, which impacts the quality of online learning experiences, especially in terms of efficiency, effectiveness, and engagement (Branch & Merrill, 2012; Merrill, 2002, 2012). This gap often leads to other issues in e-learning content creation and technology integration (Kebritchi, Lipschuetz, & Santiague, 2017).

According to Molenda, Reigeluth, and Nelson (2003), instructional design is a branch of knowledge that is related to instructional strategies. It is the systematic process of translating principles of learning and instruction into plans or specifications for instructional materials or activities. Reiser (2012) and Reiser and Dempsey (2012) argued that ID can be used for developing education. With ID skills and knowledge, instructors will carefully analyze their learners' needs, learning tasks, design and develop their instruction, and implement and evaluate their instruction periodically. Furthermore, ID principles significantly enhance students' engagement and performance by structuring learning experiences (Abuhassna, Adnan, & Awae, 2024; Merrill, 2012; Wagino et al., 2024).

However, some instructors lack familiarity with the ID process (Halupa, 2019; Khodabandelou & Samah, 2012), which may impact their overall quality of teaching practice. As ID integrates principles drawn from a diverse range of disciplines -including educational psychology, educational technology, and cognitive and computer science- it provides a holistic and interdisciplinary approach (Stefaniak & Reese, 2022) to developing effective instructional interventions. ID course in the form of Computer-Assisted Instruction (CAI) is considered useful and efficient at higher education institutions (Abuhassna & Alnawajha, 2023). Through online or offline ID courses, instructors can gradually integrate certain ID knowledge and skills to improve the quality of their teaching. Furthermore, upon learning ID, instructors will become instructional designers who incorporate established learning theories into their teaching practice. ID training also helps them design their courses efficiently and effectively (Merrill, 2012). If an ID training is designed as a prototype where instructors incorporate their creativity in designing quality learning materials, it can increase the opportunity to participate in the lesson, meet learning needs promptly, and save time and costs (Abbak, 2019). Designing an effective online course requires a high level of instructional design knowledge and skills. In this regard, high-quality course design is an essential task for instructors, which recent research has also highlighted as important (Abuhassna & Alnawajha, 2023; Chartier, 2021).

In the Omani context, a discernible gap in ID knowledge and skills among higher education institutions' instructors has emerged as a significant impediment to effective instruction (Al-Amrani, 2024; Porcaro, 2013; Siraj & Maskari, 2019). Despite the increasing implementation of emerging technologies, particularly after COVID-19, in higher education settings, many instructors in Oman have not received adequate training in instructional design to develop effective course materials (Al Musawi & Al Hashmi, 2004). This deficiency is compounded by the persistent reliance on traditional teaching methods that do not address the current generation of learners (Garrison, 2011). Consequently, the lack of ID knowledge and skills among instructors undermines the potential for fostering effective, efficient, and engaging learning experiences. Additionally, it poses broader challenges, such as innovation in teaching and instructional quality (Kebritchi et al., 2017). Addressing these issues necessitates targeted professional development programs that train instructors to design and deliver high-quality courses (Hodges, Moore, Lockee, Trust, & Bond, 2020).

In light of the current situation, the study aimed to design and develop a professional development initiative in the CAI format to empower instructors in their career development at Sultan Qaboos University. The CAI was guided by the ADDIE instructional design model (Branch, 2009) as the theoretical framework of the study. The CAI was integrated with multimedia elements to make the ID course interactive. During the review of the literature, we found no CAI course designed for Omani lecturers. Therefore, they need to be trained to integrate ID into their courses to ensure effective instruction delivery. Effective ID training is considered crucial to improve the quality of teaching practices among instructors. Such training can enhance lecturers' knowledge of ID, which is beneficial for course development.

2. METHOD

This study adopted developmental research based on Ellis and Levy's (2010) recommendations. Richey and Klein (2013) and Richey and Klein (2014) stated that design and development is a type of research that proposes to create new knowledge of existing practice. The aim of the study, therefore, was primarily to develop a prototype of the CAI for the ID course to be delivered as a PD program and secondarily to implement the PD program to train Omani higher education instructors on the theoretical and practical perspectives of ID. Based on Ellis and Levy's (2010), a unique developmental research process has six major steps. These steps are presented in Figure 1.

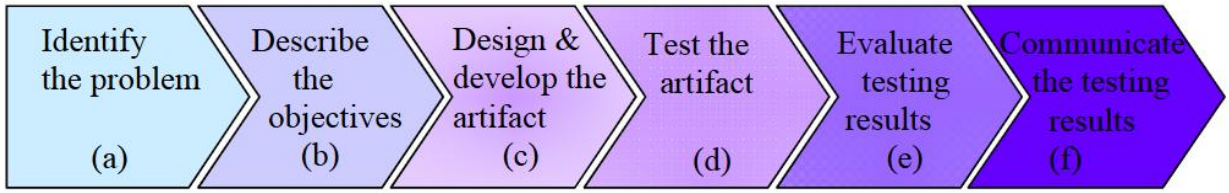

Figure 1. The 6-phase design and development research approach.

Source: Ellis and Levy (2010).

2.1. Step 1: Identify the problem

The initial step of the research involved identifying the problem. In this study, the initial step was executed through a comprehensive literature review followed by a concise interview. Based on the literature, we systematically examined the existing research on CAI, ID, and PD, particularly in the Omani context. The literature review revealed critical gaps in both theoretical and practical applications of CAI for ID courses. It also highlighted deficiencies in the current Omani higher education context and emphasized the need for innovative and continuous professional development training to enhance university lecturers' knowledge and skills in ID. Furthermore, a brief interview was conducted with five subject matter experts from the Department of Instructional & Learning Technologies (ILT) at SQU to substantiate the literature review findings. Despite its brevity, the interview provided valuable insights and supported the identified gaps and problems in the literature. This dual-method approach confirmed the validity of the identified problem. As mentioned earlier, the main problem of this study was the lack of an appropriate CAI prototype-based PD program specifically designed to enhance the ID competencies of Omani higher education instructors.

2.2. Step 2 Describe the Objectives

In line with the proposed framework Ellis and Levy (2010) the second step involved describing the objectives. According to Richey and Klein (2013) and Richey and Klein (2014) objectives are encapsulated in the research questions. In this regard, research questions were established to shape the study. In developmental research, the focus is on the design, development, testing, or evaluation of an educational artifact. For the purpose of this study, the primary objective was to develop a CAI prototype for ID courses that could be delivered effectively in online learning environments. The study also sought to enhance higher education instructors' knowledge and skills in ID by providing them with a PD program. Together, these objectives address the research question. The following is the

research question of the study: How can the Articulate Storyline authoring system be effectively leveraged to design and develop a CAI program for teaching instructional design?

2.3. Step 3 Design and Develop the Artifact

In accordance with Ellis and Levy (2010) guideline, the third step in the developmental research is to design and develop the artifact. In the literature review, there are some established guidelines for the design and development (Dick, Carey, & Carey, 2016; Gagne, Wager, Golas, Keller, & Russell, 2005). For this study, a prototype version of CAI for the ID course was used as the artifact. In order to design the artifact, we used a three-step framework, including building a conceptual framework, designing the system architecture, and building a prototype for testing and evaluation (Ellis & Levy, 2010). We used Articulate Storyline to design and develop the artifact. The use of innovative tools such as Articulate Storyline facilitated the creation of engaging, efficient, and effective learning materials (Daryanes et al., 2023; Hadza, Sesrita, & Suherman, 2020). The adoption of Articulate Storyline for this study was due to its capacity and flexibility for rapid prototyping and iterative development. Furthermore, it is a useful tool in developmental research, which can create an interactive learning experience by integrating multimedia elements. The Articulate Storyline's interface and its customizable features empower instructors to enhance their learners' overall learning experiences. The main objective of the artifact was to gain knowledge and skills in instructional design through interactive instructional content. This would help instructors to design and develop effective courses.

2.3.1. Course Content

To maximize the utility of the artifact for instructors, the course content was meticulously designed to incorporate the main concepts of instructional design. The main topics include analysis, design, development, implementation, and evaluation. An additional module (Introduction) was structured to provide a comprehensive overview of the field. This carefully created content was delivered over a five-week PD training program, ensuring that participants actively engaged in each phase of instructional design. Table 1 provides a detailed breakdown of the topics, content, and duration allocated for each module. The topics were selected based on their importance in ID knowledge and skills.

Table 1. Course schedule, modules, and topics.

Week	Topic & title
1	Module 1: Introduction
2	Module 2: Design
3	Module 3: Development
4	Module 4: Implementation
5	Module 5: Evaluation

2.3.2. Course Structure and Organization

Since the course was developed for online delivery, each module was structured to be completed within a one-week period. The main reason for using a modular-based approach was that this structure allowed participants to progress at their own pace (self-directed learning) and enhanced retention.

Each module included the following elements: a module overview page, short instructional videos, a practice assignment, and a short quiz. Modules 1 and 5 also included pre-tests and post-tests. The artifact was organized within the SQU non-academic Moodle learning management system (LMS). Table 2 provides an overview of the elements of the artifact.

Table 2. Module instructional elements, functions, and formats in the course.

Module element	Function	Format
Module overview	Introduction to the module and learning objectives.	Text based page
Instructional videos	Demonstrate and deliver the main content	Short instructional videos with interactive elements
Assignments	Assess the acquisition of concepts and principles	Embedded in the instructional video as interactive content
Pretest	Online test conducted before presenting the modules to measure the level of entry knowledge	Online multiple-choice format
Post test	Online test conducted after completing the modules to assess the level of learning	Online multiple-choice format

2.4. Steps 4 and 5: Test and Evaluate the Artifact

According to Ellis and Levy (2010), in the fourth and fifth steps, the developer verifies that the developed artifact meets the established functionalities and requirements. For this study, we tested and evaluated the CAI prototype to determine its effectiveness, efficacy, and usability in enhancing ID knowledge among Omani higher education instructors. Data were collected using a survey to gather in-depth user feedback on learning performance. The participants of the study were 47 Omani higher education instructors at SQU who were randomly selected to participate in the testing and evaluation phases.

3. EVALUATION METHOD

3.1. Participants

This research was conducted at Sultan Qaboos University (SQU), a leading public research university in Oman, during the academic year 2023-2024. A total of forty-seven (47) participants, who were lecturers from various colleges within SQU, participated in this CAI course as part of their (CPD) programs. The participants represented a diverse range of academic units, including the College of Education, College of Science, College of Arts and Social Sciences, College of Nursing, and College of Agricultural and Marine Sciences. Most participants identified as female (73%). Participants' ages ranged from 41 to 63 years (M = 46.56, SD = 2.16).

3.2. Data Collection and Instrument

Following the approval of the Research Ethics Committee, we collect data on participants' demographics and pretest responses using Google Forms. After attending the five-module training, participants were asked to complete a post-intervention survey covering areas such as satisfaction, perceived difficulty levels of the modules, and suggestions for additional topics. To assess the reliability of the survey, a statistical test using SPSS was conducted. A Cronbach's alpha of 0.83 indicates strong internal consistency.

3.3. Step 6 Communicate the Result and Conclusion

As the final step of the framework, the researcher synthesizes the results and contributes to the body of knowledge (Ellis and Levy 2010). This phase represents the outcome of the study, where in the significance of the information produced is assessed. In the present study, this step involved statistical analysis of the survey, pre- and post-tests. The data provided valuable insights into instructors' satisfaction with the CAI prototype, as well as their perceptions of the difficulty of the various topics and modules. Inferential statistical analysis was employed to determine the statistical significance of the results.

4. RESULTS

As mentioned earlier, following the literature review, a brief interview was conducted with five ILT department faculty members to support and substantiate the literature review findings on identifying the gaps. All five experts (100%) confirmed that the literature correctly identified the urgent need for training higher education lecturers in

instructional design. Around 80% of experts emphasized that the CAI prototype directly addresses the critical gap. To examine the study's research question, we used developmental research guidelines recommended by Ellis and Levy (2010) to design and develop the artifact. All details of the design, development, and implementation stages were described in the previous section. However, in this section, the evaluation phase is described in more detail. As a reminder, a total of 47 SQU instructors participated in the summative evaluation, which involved pre- and post-assessment. The pre-test scores (M=5.05, SD=2.18) were significantly improved by the post-test (M=7.90, SD=1.29), with a paired sample t-test indicating significant differences, $t(46) = -9.89$, $p < .001$, and a large effect size (Cohen's $d = 1.42$). These results indicate increased knowledge of ID principles, including analysis, design, development, and evaluation criteria. In addition, a post-intervention survey employing a 5-point Likert scale on satisfaction, perceived difficulty levels of modules, and suggestions for additional topics revealed high user satisfaction, moderate difficulty levels, and some suggestions for improvement.

4.1. Satisfaction

According to participants' ratings, the overall satisfaction with the CAI program was high. The data analysis showed that instructors rated their satisfaction with a mean score of 4.24 (SD=0.47), indicating that most participants found the developed program effective and engaging. In particular, 82% of participants selected "agree" and "strongly agree," reflecting a strong and positive attitude toward the design of the CAI prototype. Table 3 illustrates an overall satisfaction mean rating of 4.24 (SD = 0.47).

Table 3. Instructor rating of the modules based on their satisfaction.

No.	Survey statement	Mean	(SD)
1	I am satisfied with the overall design of the CAI program.	4.20	0.45
2	The multimedia content enhanced my learning experience.	4.25	0.50
3	The user interface of the CAI program was intuitive and easy to navigate.	4.20	0.55
4	The instructional materials were clear, and effective.	4.28	0.40
5	The program effectively engaged me in instructional design.	4.30	0.42
6	I would recommend this CAI program to my colleagues	4.26	0.50
Overall		4.24	0.47

4.2. Perceived Difficulty Levels of Modules

Instructors were also asked to rate the perceived difficulty level of each module. Based on the collected data, the modules were rated as moderately challenging, with an average difficulty score of 3.2 (SD = 0.69) on the 5-point scale. Notably, Module 2, which focuses on the design phase of ID, received a slightly higher difficulty rating (M = 3.5, SD = 0.72) compared to other modules, such as Introduction (Module 1) (M = 2.8, SD = 0.49). These results suggest that while the overall ID program was accessible, some complex topics, such as design and evaluation, may require additional scaffolding or supplementary resources.

4.3. Suggestions for Additional Topics

An open-ended section for suggestions regarding additional topics was included at the end of the survey. Qualitative coding of these responses revealed several recurring themes. Approximately 67% of the participants recommended the inclusion of a module on ID in the age of AI. Additionally, some participants requested topics such as augmented reality and artificial intelligence applications in instructional design. Furthermore, 46% of respondents expressed interest in more in-depth coverage of assessment strategies. These suggestions highlight a demand for a broader scope that integrates contemporary technological trends and advanced pedagogical techniques.

5. DISCUSSION

This study contributes to the instructional design community by designing and developing a CAI prototype based on ID principles. This research provides a brief overview of the design, development, and evaluation of a professional development (PD) training course (CAI prototype). The results show high satisfaction rates with the course's content, structure, and delivery. Additionally, it revealed an enhancement in engagement and ID knowledge among participants. The modular-based design of the CAI made the program replicable for Omani higher education practitioners. This aligns with the growing demand for ID solutions, particularly in post-pandemic education systems (Gokbel & Lipscomb-King, 2023; Hodges & Kirschner, 2024; Nabi, Vance, & Getto, 2024). Although we believe that the findings of the current study are applicable in similar situations and contexts, due to its main limitation a small sample size, we highly recommend not generalizing the results to other scenarios or instructors. The obtained results from other studies may differ from what we found in this research. In light of this caution, the researchers believe that there are some important findings from this study that are worth discussing.

First, we believe that the important feature of the designed CAI prototype is to focus on preparing instructors for their effective and efficient course design. Learning the fundamentals of instructional design is expected to enable the lecturers to gain valuable knowledge and skills on how to design and deliver effective instruction (Panda, 2024). In this regard, early on, in the design of the prototype, the team decided to carefully sequence relevant and authentic learning experiences by providing real-world examples and scenarios. Moreover, the assignments in each module were designed as practical exercises drawn from the instructor's teaching experiences. These authentic learning experiences enabled the instructors to apply the learned knowledge in real contexts. In addition, they facilitated reflective practice (Lubbe & Botha, 2020; Yadav & Bhatia, 2024), which is crucial for an instructor's professional development.

Second, we found that if the designer includes a section in the module under the "review" or "background" name, it may play a prerequisite role for the module. This observation aligns with Ritzhaupt, Valle, and Sommer (2020), who claim that incorporating the review section in the designed course would be beneficial to learners. The review section not only effectively reinforces prior knowledge but also creates a solid foundation for new and complex concepts. Moreover, it supports the scaffolding approach to instruction. This approach ensures that learners are adequately prepared to assimilate subsequent information (McGuire, 2024). In summary, incorporating a review section in a module as a design strategy may enhance comprehension as well as a coherent and cumulative learning experience, which are both essential for fostering professional success.

Third, our findings support this notion that "*Implementing ID principles in course design is a successful factor for online courses*"(Oyarzun, Bottoms, & Westine, 2021). The study highlighted that providing sufficient ID knowledge may help instructors to design, develop, and implement effective, efficient, and engaging (Merrill, 2002, 2012) courses. The findings of this study also highlighted the importance of PD programs in addressing the skills gap among instructors. In this regard, our findings help to advance teaching competencies in Oman through the designed course using emerging technologies such as Articulate Storyline. In fact, the designed course increased participants' essential ID competencies, enabling them to create effective, engaging, and efficient courses. By aligning with Oman's vision for educational advancement (Bhandari & Mohite, 2024), the designed course may support the development of a highly skilled teaching workforce. Furthermore, the modular-based structure of the courses can serve as a framework for similar PD programs across institutions in Oman. By integrating theoretical frameworks (such as TPACK) (Schmidt et al., 2009) and practical components, the program is better positioned to adapt to diverse educational contexts to increase overall efficiency and relevance.

Fourth, the results of the study showed that the designed course prepared Omani instructors on how to create effective, engaging, and efficient instruction. This is a potential for empowering them for future challenges, such as adapting to rapid technological advancements (Ayed, 2022; Sarrab, Al Shibli, & Badursha, 2016) and insufficient faculty development programs (Almahri, Salem, Elbaz, Aideed, & Gulzar, 2024). In this regard, the current study

would open pathways for exploring the implementation of emerging technologies, such as adaptive technology and AI, to enhance instructors' teaching quality. Furthermore, the insights gained from the research contribute to the growing body of literature on ID and offer practical solutions for improving teaching practices in higher education in Oman. Hence, we recommend that future research focus on longitudinal studies to assess the sustained impact of ID training on teaching practices and student learning, particularly in the Omani higher education context.

We believe that our study provides a scalable, replicable, and impactful model for advanced PD programs in instructional design, aligning with Oman's vision for educational excellence. Based on this, we recommend expanding the implementation of the CAI course to other higher education institutions in Oman. We also recommend that the Ministry of Higher Education incorporate the course into faculty in-service training programs. Based on the study's outcomes, we further propose the development of supplementary training sessions specifically designed for lecturers who are new to the Omani higher education system, ensuring they acquire foundational knowledge and skills in instructional design prior to starting their teaching roles. Lastly, we advocate for the establishment of regular evaluations to assess the long-term impact of the CAI prototype on teaching practices and student outcomes. Such ongoing assessments would enhance the quality of their courses.

6. CONCLUSION

This study demonstrated a significant step toward addressing the gap in instructional design knowledge and skills among faculty members in Oman's higher education. By developing and implementing a CAI course using emerging technologies such as Articulate Storyline, the study successfully enhanced knowledge and skills in instructional design to create, develop, and implement effective, efficient, and engaging courses. Key outcomes include improved lecture preparedness and the integration of technology into teaching practices. The modular-based design of the course increased scalability. Furthermore, the use of digital tools such as LMS highlighted the importance of sustainable and engaging learning environments in professional development. Beyond immediate outcomes, this study underscored the need for developing professional development programs for lecturers to prepare them for teaching in technology-rich environments, particularly in online learning. This study also opens new avenues for exploration, including the integration of advanced tools such as adaptive learning technologies to enhance teaching practices and learning outcomes.

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Transparency: The authors state that the manuscript is honest, truthful, and transparent, that no key aspects of the investigation have been omitted, and that any differences from the study as planned have been clarified. This study followed all writing ethics.
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REFERENCES

Abbak, Y. (2019). Rapid prototyping instructional design model: Example of a course scenario. *Uluslararası Sosyal Bilimler Eğitimi Dergisi*, *5*(2), 235-244.

Abuhassna, H., Adnan, M. A. B. M., & Awae, F. (2024). Exploring the synergy between instructional design models and learning theories: A systematic literature review. *Contemporary Educational Technology*, *16*(2), ep499. https://doi.org/10.30935/cedtech/14289

Abuhassna, H., & Alnawajha, S. (2023). Instructional design made easy! Instructional design models, categories, frameworks, educational context, and recommendations for future work. *European Journal of Investigation in Health, Psychology and Education*, *13*(4), 715-735. https://doi.org/10.3390/ejihpe13040054

Ahmad, N., Nugak, M. A., & Abd Rahman, S. F. (2024). Exploring challenges and impacts: Insights from school teachers in virtual learning environments. *Arab World English Journal, 10*, 172–190.

Al-Amrani, S. N. (2024). Instructor perceptions of active learning in higher education in Oman and students' commitment to the approach. *Learning and Teaching in Higher Education: Gulf Perspectives*. https://doi.org/10.1108/LTHE-03-2021-0025

Al Musawi, A. S., & Al Hashmi, H. N. (2004). *Educational technology at Omani higher education institutions*. Retrieved from https://www.researchgate.net/publication/291332086_Educational_Technology_At_Omani_Higher_Education_Institutions

Almahri, F. A. J., Salem, I. E., Elbaz, A. M., Aideed, H., & Gulzar, Z. (2024). Digital transformation in Omani higher education: Assessing student adoption of video communication during the COVID-19 pandemic. *Informatics, 11*(2), 21. https://doi.org/10.3390/informatics11020021

Antwi-Boampong, A. (2021). Blended learning adoption in higher education: Presenting the lived experiences of students in a public university from a developing country. *Turkish Online Journal of Educational Technology, 20*(2), 14-22.

Ayed, I. A. H. (2022). *Oman higher education institutions dealing with artificial intelligence*. Portugal: Universidade do Minho.

Bhandari, V., & Mohite, V. (2024). Role of higher education institutions in developing digital competence in Sultanate of Oman: A step towards achieving Vision 2040. *Library Hi Tech*. https://doi.org/10.1108/LHT-12-2023-0639

Branch, R. M. (2009). *Instructional design: The ADDIE approach*. New York: Springer.

Branch, R. M., & Merrill, M. D. (2012). Characteristics of instructional design models. In R. Reiser & J. Dempsey (Eds.), Trends and issues in instructional design and technology. In (3rd ed., pp. 8–16). Boston, MA: Pearson Education.

Castellanos, E. C. O., & Delgado, L. D. G. (2024). Research in higher education institutions of Northwestern Mexico during COVID-19 times. *International Journal of Educational Development, 107*, 103039. https://doi.org/10.1016/j.ijedudev.2024.103039

Chartier, K. J. (2021). Investigating instructional design expertise: A 25-year review of literature. *Performance Improvement Quarterly, 34*(2), 111-130. https://doi.org/10.1002/piq.21345

Cooke, C. (2025). *In-Person vs online learning statistics of 2025*. Retrieved from https://upskillwise.com/in-person-vs-online-learning-statistics/

Daryanes, F., Darmadi, D., Fikri, K., Sayuti, I., Rusandi, M. A., & Situmorang, D. D. B. (2023). The development of articulate storyline interactive learning media based on case methods to train student's problem-solving ability. *Heliyon, 9*(4), e15082. https://doi.org/10.1016/j.heliyon.2023.e15082

Dick, W., Carey, L., & Carey, J. O. (2016). *The systematic design of instruction* (8th ed.). Boston, MA: Pearson Educational.

Ellis, T. J., & Levy, Y. (2010). A guide for novice researchers: Design and development research methods. *Proceedings of Informing Science & IT Education Conference (InSITE), 10*(10), 107–117.

Gagne, R. M., Wager, W. W., Golas, K. C., Keller, J. M., & Russell, J. D. (2005). Principles of instructional design. *Performance Improvement, 44*(2), 44–46.

Garrison, D. R. (2011). *E-Learning in the 21st century: A framework for research and practice* (2nd ed.). New York: Routledge.

Gokbel, E. N., & Lipscomb-King, N. P. (2023). Instructional designers' roles in the post-COVID-19 pandemic era. In Global Perspectives on Higher Education: From Crisis to Opportunity. In (pp. 423–434). Cham, Switzerland: Springer.

Greenhow, C., Graham, C. R., & Koehler, M. J. (2022). Foundations of online learning: Challenges and opportunities. *Educational Psychologist, 57*(3), 131-147. https://doi.org/10.1080/00461520.2022.2090364

Hadza, C., Sesrita, A., & Suherman, I. (2020). Development of learning media based on articulate storyline. *Indonesian Journal of Applied Research, 1*(2), 80-85. https://doi.org/10.30997/ijar.v1i2.54

Halupa, C. (2019). Differentiation of roles: Instructional designers and faculty in the creation of online courses. *International Journal of Higher Education, 8*(1), 55-68. https://doi.org/10.5430/ijhe.v8n1p55

Hodges, C., Moore, S., Lockee, B., Trust, T., & Bond, A. (2020). The difference between emergency remote teaching and online learning. *Educause Review, 27*(1), 1-9.

Hodges, C. B., & Kirschner, P. A. (2024). Innovation of instructional design and assessment in the age of generative artificial intelligence. *TechTrends*, *68*, 195-199. https://doi.org/10.1007/s11528-023-00926-x

Imran, M., Almusharraf, N., & Abbasova, M. Y. (2025). Digital learning transformation: A study of teachers' post-COVID-19 experiences. *Social Sciences & Humanities Open*, *11*, 101228. https://doi.org/10.1016/j.ssaho.2024.101228

Kebritchi, M., Lipschuetz, A., & Santiague, L. (2017). Issues and challenges for teaching successful online courses in higher education: A literature review. *Journal of Educational Technology Systems*, *46*(1), 4-29. https://doi.org/10.1177/0047239516661713

Khanal, J. (2024). Shifting identities: An examination of student perceptions and experiences in face-to-face and online learning in Nepal. *Education and Information Technologies*, *29*, 4287-4315. https://doi.org/10.1007/s10639-023-12020-z

Khodabandelou, R., & Samah, S. A. A. (2012). Instructional design models for online instruction: From the perspective of Iranian higher education. *Procedia-Social and Behavioral Sciences*, *67*, 545-552. https://doi.org/10.1016/j.sbspro.2012.11.359

Lubbe, W., & Botha, C. S. (2020). The dimensions of reflective practice: A teacher educator's and nurse educator's perspective. *Reflective Practice*, *21*(3), 287-300. https://doi.org/10.1080/14623943.2020.1738369

Maqbool, M. A., Asif, M., Imran, M., Bibi, S., & Almusharraf, N. (2024). Emerging e-learning trends: A study of faculty perceptions and impact of collaborative techniques using fuzzy interface system. *Social Sciences & Humanities Open*, *10*, 101035. https://doi.org/10.1016/j.ssaho.2024.101035

McGuire, K. (2024). Fostering scholarly writing development using a scaffolding approach. *Journal of Professional Nursing*, *55*, 70–72. https://doi.org/10.1016/j.profnurs.2024.09.004

Means, B., Toyama, Y., Murphy, R., & Baki, M. (2013). The effectiveness of online and blended learning: A meta-analysis of the empirical literature. *Teachers College Record: The Voice of Scholarship in Education*, *115*(3), 1-47. https://doi.org/10.1177/016146811311500307

Merrill, M. D. (2002). First principles of instruction. *Educational Technology Research and Development*, *50*, 43–59. https://doi.org/10.1007/Bf02505024

Merrill, M. D. (2012). *First principles of instruction* (1st ed.). San Francisco: Pfeiffer.

Molenda, M., Reigeluth, C. M., & Nelson, L. M. (2003). *Instructional design. In L. Nadel (Ed.), Encyclopedia of cognitive science*. London, UK: Nature Publishing Group.

Mudenda, S., Daka, V., Mufwambi, W., Matafwali, S. K., Chabalenge, B., Skosana, P., . . . Mayoka, G. (2023). Student's perspectives, satisfaction and experiences with online and classroom learning during the COVID-19 pandemic: Findings and implications on blended learning. *SAGE Open Medicine*, *11*, 20503121231218904. https://doi.org/10.1177/20503121231218904

Nabi, H., Vance, B., & Getto, G. (2024). *Trends in post-pandemic instructional design: An exploratory analysis of job ads using textual analysis*. Paper presented at the 2024 IEEE International Professional Communication Conference (ProComm), 89–95.

Oyarzun, B., Bottoms, B. L., & Westine, C. (2021). Adopting and applying the Universal Design for Learning principles in online courses. *The Journal of Applied Instructional Design*, *10*(1), 1-11.

Palvia, S., Aeron, P., Gupta, P., Mahapatra, D., Parida, R., Rosner, R., & Sindhi, S. (2018). Online education: Worldwide status, challenges, trends, and implications. *Journal of Global Information Technology Management*, *21*(4), 233-241. https://doi.org/10.1080/1097198X.2018.1542262

Panda, S. (2024). Improving learning through DOL: The importance of instructional design and student engagement. *Journal of Learning for Development*, *11*(1), 1-6.

Porcaro, D. S. (2013). Educational change in Oman: A design research study of personal, institutional, and societal reactions to collaborative knowledge building. *Technology, Pedagogy and Education*, *23*(2), 199-223. https://doi.org/10.1080/1475939X.2013.802993

Rahman, M. A., Das, P., Lam, L., Alif, S. M., Sultana, F., Salehin, M., . . . Lewis, A. (2024). Health and wellbeing of staff working at higher education institutions globally during the post-COVID-19 pandemic period: Evidence from a cross-sectional study. *BMC Public Health*, *24*, 1848. https://doi.org/10.1186/s12889-024-19365-1

Reiser, R. (2012). A history of instructional design and technology. In R. Reiser & J. Dempsey (Eds.), Trends and issues in instructional design and technology. In (3rd ed., pp. 17–34). Boston, MA: Pearson.

Reiser, R. A., & Dempsey, J. V. (2012). *Trends and issues in instructional design and technology*. Boston, MA: Pearson.

Richey, R. C., & Klein, J. D. (2013). Design and development research. In Handbook of research on educational communications and technology. In (pp. 141–150). New York: Springer.

Richey, R. C., & Klein, J. D. (2014). *Design and development research: Methods, strategies, and issues*. New York: Routledge.

Ritzhaupt, A. D., Valle, N., & Sommer, M. (2020). Design, development, and evaluation of an online statistics course for educational technology doctoral students: A design and development case. *Journal of Formative Design in Learning*, *4*, 119-135. https://doi.org/10.1007/s41686-020-00051-5

Sarrab, M., Al Shibli, I., & Badursha, N. (2016). An empirical study of factors driving the adoption of mobile learning in Omani higher education. *International Review of Research in Open and Distributed Learning*, *17*(4), 331-349. https://doi.org/10.19173/irrodl.v17i4.2614

Schmidt, D. A., Baran, E., Thompson, A. D., Mishra, P., Koehler, M. J., & Shin, T. S. (2009). Technological pedagogical content knowledge (TPACK): The development and validation of an assessment instrument for preservice teachers. *Journal of Research on Technology in Education*, *42*(2), 123-149. https://doi.org/10.1080/15391523.2009.10782544

Siraj, K. K., & Maskari, A. A. (2019). Student engagement in blended learning instructional design: An analytical study. *Learning and Teaching in Higher Education: Gulf Perspectives*, *15*(2), 61-79. https://doi.org/10.18538/lthe.v15.n2.283

Stefaniak, J. E., & Reese, R. M. (2022). A holistic approach to teaching instructional design. In The instructional design trainer's guide. In (pp. 1–8). New York: Routledge.

UNESCO, P. (2020). *1.3 billion learners are still affected by school or university closures, as educational institutions start reopening around the world, says UNESCO. UNESCO*. Retrieved from https://bitly.com/

Wagino, W., Maksum, H., Purwanto, W., Simatupang, W., Lapisa, R., & Indrawan, E. (2024). Enhancing learning outcomes and student engagement: Integrating E-learning innovations into problem-based higher education. *International Journal of Interactive Mobile Technologies*, *18*(10), 106–124. https://doi.org/10.3991/ijim.v18i10.47649

Wilkinson, J., & Male, T. (2025). Perceptions of women senior leaders in the UK Higher Education during the COVID-19 pandemic. *Educational Management Administration & Leadership*, *53*(1), 123-140.

Yadav, D. K., & Bhatia, D. (2024). Effect of reflective practices on student learning in higher education—A real life approach. *International Journal of Educational Reform*, *33*(3), 308-322.