Review Article

Exploring the synergy between instructional design models and learning theories: A systematic literature review

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ARTICLE INFO	ABSTRACT
	To enhance education, we conducted a comprehensive investigation into integrating instructional design models (IDMs) and learning theories in this systematic literature review .We methodically selected and analyzed 25 publications from a pool of 1,102 documents using the preferred reportinfg items for systematic reviews and meta-analyses framework to guarantee a rigorous and systematic approach to literature selection. Our results demonstrate the worldwide span of study on this topic, including contributions from prestigious academic institutions and scholarly journals. This examination explores both the benefits and drawbacks of combining IDMs with learning theories. Noteworthy positives include increased student motivation, support for innovative teaching methods, and the development of complex and diverse learning environments. However, several shortcomings were observed. most notably relating to accessibility problems, evaluation difficulties, and questions about the adaptability of such integrated techniques. Our findings have implications for a broad range of stakeholders, including educators, instructional designers, and students functioning in a variety of educational contexts. The increase of learner motivation, the creation of novel pedagogical tools, the refining of teacher training programs, and the promotion of interdisciplinary learning methods are significant areas of focus. In addition, our evaluation uncovered a number of gaps in the current literature, indicating intriguing possibilities for future research. The examination of holistic learning environments, the untapped potential of integrated systems, the incorporation of educational robots into pedagogical tactics, and the refining of schema assessment approaches are notable research fields. By providing these insights, this systematic review not only adds to the current body of knowledge, but also has the potential to shape the future trajectory of educational practices, so acting as a significant resource for boosting learning outcomes in a variety of educational environments.

Keywords: instructional design models, learning theories, systematic literature review, SLR |

INTRODUCTION

In the ever-evolving landscape of education and training, the design of effective instructional strategies is of paramount importance. Instructional design models (IDMs) have long served as blueprints for creating and delivering educational content. These models provide a structured framework that educators and instructional designers can follow to enhance the learning experience (Merrill, 2002; Smith & Ragan, 1999).

They offer a systematic approach to curriculum development, often involving a sequence of steps, from needs assessment and content creation to delivery and assessment. A wealth of IDM exists, each offering unique strategies and principles for optimizing learning experiences (Dick & Carey, 1978; Kurt, 2017).

At the same time, an extensive variety of learning theories emerged within the field of educational psychology. By examining the cognitive, emotional, and social dimensions of learning, these theories attempt to elucidate the process by which people gain information and develop abilities (Bandura, 1977; Ormrod, 2016). Learning theories, including constructivism, behaviorism, and connectivism, have had a significant impact on the comprehension of learning processes and have shaped instructional methodologies (Piaget, 1970; Siemens, 2005). These assessments provide valuable perspectives on the cognitive processes of learners, including information processing, concept adaptation, and knowledge retention. As a result, they significantly influence the development of instructional approaches. Although both IDM and learning theories have made substantial contributions to the field of education on their own, their potential synergy continues to be a subject of fascination. The purpose of this systematic literature review is to investigate the intricate and ever-changing connection between these two fundamental aspects of instructional design. By virtue of the junction of various models and ideas, new insights about the creation of exceptionally successful learning experiences may be generated. Through a synthesis of the extant literature, our objective is to discern areas of agreement, deficiencies, and potential synergies between IDMs and learning theories.

The primary objective of this systematic literature review is to further investigate the possible synergies between learning theories and IDMs, an area of educational research that has received little attention so far. Acknowledging the fact that IDMs provide a pragmatic structure for designing educational experiences and learning theories furnish the psychological foundations of the learning process, it is imperative that these areas be more cohesively integrated. By conducting an extensive examination of the chosen papers, our objective is to detect and rectify any deficiencies in the body of knowledge about the extent to which the relationship between IDMs and learning theories has not been explicitly discussed or used. Our analysis will focus on the ways in which these theories may contribute to and improve IDMs, as well as the ways in which IDMs can effectively use learning theories in a tangible and influential manner. Through this study, it hopes to provide fresh insights that may contribute to the creation of instructional techniques that are more effective and grounded in theory. Such strategies would be capable of enhancing academic achievements across a range of learning situations. The knowledge acquired from this evaluation has the capacity to provide guidance for further investigations, enlighten practices in instructional design, and foster inventive methodologies in education that are supported by theory and empirical evidence.

Research Questions

1. What country, educational institution, authors, most used keywords, and publishing years have contributed the most to integration of instructional design approaches and learning theories?

2. How have IDMs integrated principles and concepts from various learning theories in development of effective educational strategies?

3. What are the strengths and limitations of existing IDMs that incorporate learning theories?

4. What are the potential implications of this synergy for educators, instructional designers, and learners in different educational contexts?

5. What gaps in the literature exist, and what future research directions can be identified to advance integration of IDMs and learning theories for improved learning outcomes?

Our goal is to contribute to the ongoing discourse on instructional design and education by addressing these research questions. We aim to offer insights that inform the design and implementation of more effective learning experiences across diverse educational settings.

METHODOLOGY

Research Design

This systematic literature review follows a structured approach to gather, evaluate, and synthesize relevant research articles and publications. The review adheres to established guidelines and best practices

Table 1. Inclusion & exclusion criteria

Inclusion criteria	Exclusion criteria
Publication from 2010 to 2022	Publication before 2010 were excluded, also publication in 2023 were excluded since 2023 is not yet over
Publication in English language only	Any other languages were excluded
Publications in social science & humanities, arts, & humanities & computer science	Any other subject area was excluded
Articles only	Conferences, books, thesis, blog, & others were excluded.

for conducting systematic literature reviews to ensure a rigorous and transparent methodology (Kitchenham et al., 2009; Tranfield et al., 2003). Specifically, it will be based on the preferred reporting items for systematic reviews and meta-analyses (PRISMA) framework to ensure comprehensive reporting (Moher et al., 2009).

Search Strategy

A comprehensive search strategy was employed using "the Scopus database" as the primary source. The initial search yielded 1,102 documents, comprising articles from the last 10 years up to the present date. PUBYEAR>2009 AND PUBYEAR<2023 AND. The search employed a combination of keywords and controlled vocabulary related to IDMs, learning theories, and their intersection. A sample search string included terms like "instructional design models," "learning theories," TITLE-ABS-KEY (instructional AND design AND models AND learning AND theories) AND. In addition, it applied a set of accurate keywords to make the results more precise, AND (LIMIT-TO (EXACTKEYWORD, "Instructional Design") OR LIMIT-TO (EXACTKEYWORD, "E-learning") OR LIMIT-TO (EXACTKEYWORD, "Teaching") OR LIMIT-TO (EXACTKEYWORD, "Learning") OR LIMIT-TO (EXACTKEYWORD, "Students") OR LIMIT-TO (EXACTKEYWORD, "Models, Educational") OR LIMIT-TO (EXACTKEYWORD, "Educational Model") OR LIMIT-TO (EXACTKEYWORD, "Learning Systems") OR LIMIT-TO (EXACTKEYWORD, "Online Learning") OR LIMIT-TO (EXACTKEYWORD, "Instructional Designs") OR LIMIT-TO (EXACTKEYWORD, "Blended Learning") OR LIMIT-TO (EXACTKEYWORD, "Learning Theory") OR LIMIT-TO (EXACTKEYWORD, "Flipped Classroom") OR LIMIT-TO (EXACTKEYWORD, "Constructivism") OR LIMIT-TO (EXACTKEYWORD, "Activity Theory") OR LIMIT-TO (EXACTKEYWORD, "Active Learning") OR LIMIT-TO (EXACTKEYWORD, "Self-determination Theory") OR LIMIT-TO (EXACTKEYWORD, "Higher Education") OR LIMIT-TO (EXACTKEYWORD, "Distance Education") OR LIMIT-TO (EXACTKEYWORD, "Cognitive Apprenticeship") OR LIMIT-TO (EXACTKEYWORD, "Self-efficacy") OR LIMIT-TO (EXACTKEYWORD, "Instructional Design Model") OR LIMIT-TO (EXACTKEYWORD, "Educational Technology") OR LIMIT-TO (EXACTKEYWORD, "Learning Environments") OR LIMIT-TO (EXACTKEYWORD, "Instructional Model") OR LIMIT-TO (EXACTKEYWORD, "Learning Theories") OR LIMIT-TO (EXACTKEYWORD, "Instructional Methods") OR LIMIT-TO (EXACTKEYWORD, "Flipped Learning") OR LIMIT-TO (EXACTKEYWORD, "Problem-based Learning") OR LIMIT-TO (EXACTKEYWORD, "Project Based Learning") OR LIMIT-TO (EXACTKEYWORD, "Project-based Learning") OR LIMIT-TO (EXACTKEYWORD , "Models, Theoretical")).

Inclusion & Exclusion Criteria

From the initial 1,102 documents, the inclusion and exclusion criteria were applied to identify relevant articles for this review. The criteria specified that articles must be published in peer-reviewed journals or reputable academic sources, AND (LIMIT-TO (DOCTYPE, "ar"). focus on the integration or alignment of IDMs with learning theories and be published in English (LIMIT-TO (LANGUAGE, "English")). And the subject areas were set to social science and humanities, arts and humanities and computer science (LIMIT-TO (SUBJAREA, "SOCI") OR LIMIT-TO (SUBJAREA, "ARTS") OR LIMIT-TO (SUBJAREA, "COMP"))). After applying these criteria, the number of documents was reduced to 204 articles for further analysis.

During this stage of the approach, we downloaded the 204 papers that initially satisfied our inclusion criteria for comprehensive analysis. Nevertheless, a total of 25 papers were obtained and used into the final evaluation (**Appendix A**). The inconsistency was caused by several factors: a considerable proportion of the articles were inaccessible via paywalls, not all articles were available in their entirety in full-text format, and certain articles failed to adequately address the correlation between IDMs and learning theories, which was a prerequisite for the scope of our study. We maintained the integrity of the systematic review process by documenting each occurrence of exclusion along with its precise rationale, so ensuring openness. **Table 1** illustrates the inclusion and exclusion criteria applied in this review.

Data Collection & Synthesis

The final selected articles were organized and managed manually. The researcher then assessed the eligibility of each article based on the inclusion and exclusion criteria. The relevant data from these 25 selected articles were extracted, including the publication year, author(s), research focus, key findings, and methodologies employed.

Quality Assessment

The quality of the selected articles was assessed manually. Quality assessments were conducted to ensure the reliability and trustworthiness of the included literature. So, the final articles were included in this research were 25 articles.

A methodical procedure was used to examine the quality of the articles; each item was evaluated in accordance with a predetermined set of criteria. The aforementioned factors included the pertinence to the research inquiry, the scholarly soundness of the approach, the reliability of the references, the impartiality of the findings, and the overall impact on the domain of instructional design and learning theories. Every item was meticulously read, and critical elements were double-checked to guarantee precision and dependability. Articles failing to satisfy the rigorous standards established for these criteria were omitted from the evaluation. Due to this stringent procedure, only the most reliable and pertinent papers were included, culminating in the ultimate assemblage of 25 articles of exceptional quality for the present study.

Data Analysis & Synthesis

A narrative synthesis approach was employed to summarize and analyze the findings from the selected 25 articles. Theory integrations, patterns, gaps, and future recommendations related to the integration of IDMs and learning theories were identified and reported. The synthesis allowed for a holistic view of the current state of knowledge in this field.

Research Questions

The findings from the systematic literature review, based on the 25 selected articles, were used to address the research questions outlined in the introduction and were reported following PRISMA guidelines (Moher et al., 2009). **Figure 1** illustrates PRISMA framework applied in this research.

RESULTS

In this section, we present the key findings of our research, shedding light on the intricate relationship between instructional design approaches and learning theories. Our study sought to unravel the most influential contributors, discern the strategies employed in merging these two domains, explore the strengths and limitations of existing IDMs, and investigate the implications and potential avenues for further research. The following subsections delve into these aspects, addressing the questions that guided our investigation, and offering insights that hold significance for educators, instructional designers, and learners in diverse educational contexts. By unraveling these findings, we aim to provide a comprehensive overview of the current landscape, highlighting gaps in the existing literature and charting a course for future research that promises to enhance the integration of instructional design and learning theories for improved learning outcomes.

What Country, Educational Institution, Authors, Most Used Keywords, & Publishing Years Have Contributed the Most to Integration of Instructional Design Approaches & Learning Theories?

In our quest to understand the origins and drivers behind the integration of instructional design approaches and learning theories, we turn our focus towards the entities and individuals that have played a pivotal role in shaping this dynamic field. This section seeks to unravel the geographical and institutional landscapes, as well as spotlight the authors whose work has left an indelible mark on this synergy. Moreover, we will trace the timeline of contributions, highlighting key publishing years that have acted as milestones in this evolving domain. By examining these factors, we aim to provide a clearer picture of the prominent actors
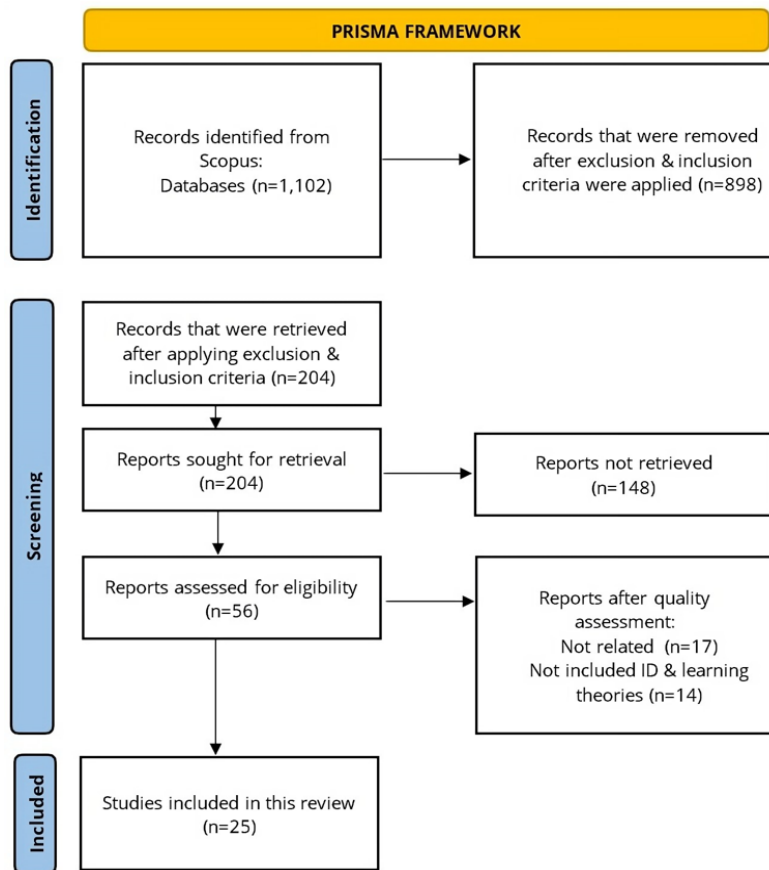
Figure 1. PRISMA framework for this review (Source: Authors)

and moments that have driven the integration of instructional design approaches and learning theories, thus offering valuable insights into the development of educational strategies that resonate across diverse settings and contexts.

Publication distributions by countries

Figure 2 illustrates the publications distributions by countries. The publication distribution by country/territory in the field of instructional design and learning theories reveals a global landscape of research and collaboration. The USA takes the lead with 68 publications, underscoring its prominent role in advancing this domain. China and the United Kingdom follow closely with 17 publications each, demonstrating substantial contributions to the integration of instructional design approaches and learning theories.
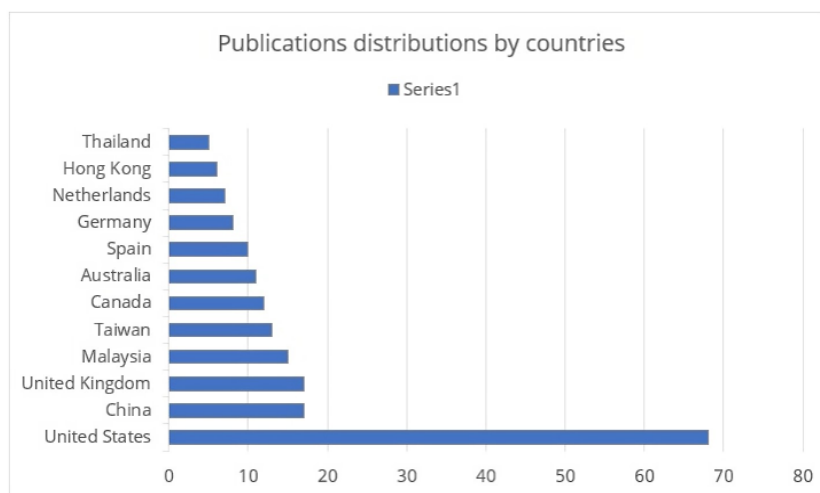

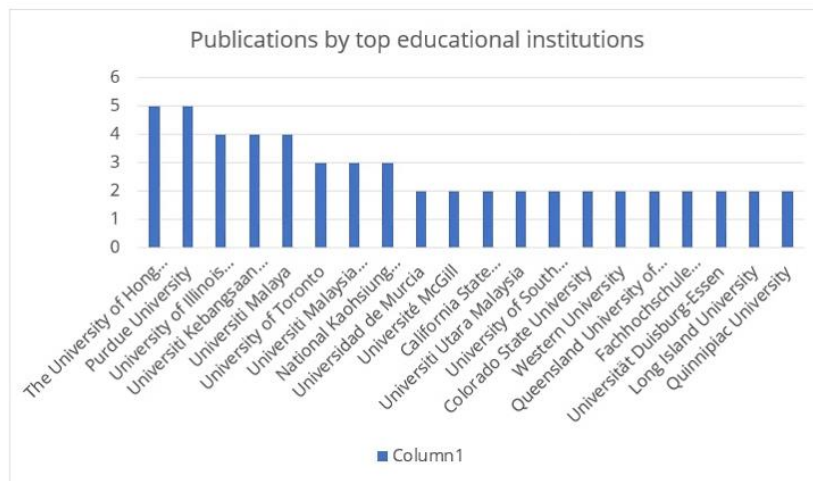**Figure 2.** Publications distributions by countries (Source: Authors)

Figure 3. Distribution of publications by educational institutions (Source: Authors)

Malaysia, Taiwan, Canada, Australia, and Spain also feature prominently with double-digit numbers of publications. These findings underscore the international scope of research in this area, with numerous countries and territories contributing to the body of knowledge, showcasing the rich diversity of perspectives and insights that drive innovation in education and learning strategies.

Publication distributions by educational institutions

Figure 3 illustrates the distribution of publications by educational institutions in the field of instructional design and learning theories. It highlights the contributions of various universities to this evolving domain. The University of Hong Kong and Purdue University each account for five publications, showcasing their active engagement in research in this area. Institutions such as the University of Illinois Urbana-Champaign, Universiti Kebangsaan Malaysia, and Universiti Malaya have also made notable contributions with four publications each. Furthermore, a diverse group of universities, including the University of Toronto, National Kaohsiung University of Science and Technology, and Universidad de Murcia, have each produced two or more publications, underscoring the global reach and collaborative nature of research in instructional design and learning theories. This data reflects the commitment of these institutions to advancing educational strategies and fostering innovation in the field.

Publication distributions by journals

Figure 4 illustrates the publication distributions by journals. The distribution of publications by journals in the realm of instructional design and learning theories reflects a wide array of academic platforms that contribute to the dissemination of research findings. British Journal of Educational Technology and Educational Technology Research and Development each stand out with six publications, signifying their
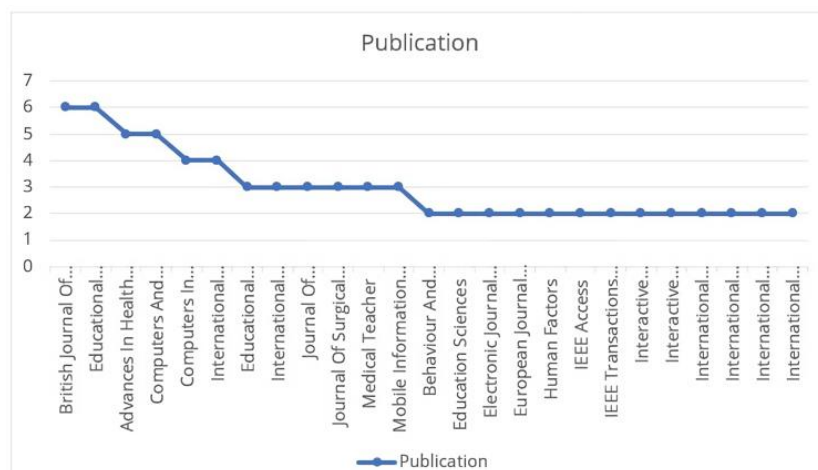

Figure 4. Publication distributions by journals (Source: Authors)

Figure 5. Most common keywords in instructional design & learning theories (Source: Authors)

significance in the field. Journals such as Advances in Health Sciences Education and Computers and Education have also made substantial contributions, with five publications each. Moreover, several journals, including Computers in Human Behavior, International Journal of Engineering Education, and Educational Technology and Society, have published four or more articles, emphasizing their role as conduits for scholarly discourse in the domain of educational strategies and learning theories. This data illustrates the diverse range of journals dedicated to advancing research in the field, highlighting the collaborative efforts of researchers and educators to share their insights and discoveries.

Publication distributions by most used keywords

Figure 5 illustrates the most common keywords in instructional design and learning theories. In the dynamic landscape of instructional design and learning theories, innovative pedagogical strategies have gained prominence, particularly in the context of online higher education. The integration of technology and digital tools in teaching and learning has reshaped traditional approaches. E-learning, instructional design, and the use of multimedia learning theories have become key components in the curricula of higher education institutions, enhancing accessibility and engagement. In response to the challenges posed by COVID-19, the adaptability of pedagogical strategies to online teaching and learning has become increasingly important. The focus has shifted towards a holistic view of education, where design guidelines and the development of courses emphasize not only the content but also the accessibility and technology-infused experiences. This transformation underscores the significance of innovative pedagogical strategies in addressing the evolving needs of students and the modern higher education landscape.

How Have IDMs Integrated Principles & Concepts From Various Learning Theories & Models in Development of Effective Educational Strategies?

The integration of principles and concepts from various learning theories and models in the development of effective educational strategies is a dynamic and evolving field. In this discussion, we will explore how IDMs have incorporated these principles and concepts to enhance the learning experience.

Keller's ARCS model and Malone's motivation model (Velaora et al., 2022) are among the first notable models. These models emphasize the importance of attention, relevance, confidence, and satisfaction in engaging learners. IDMs have integrated these principles to create learning experiences that capture learners' interest, making the material more relatable, boosting confidence, and ensuring satisfaction. Cognitive apprenticeship theory (CAT) (Lo & Tsai, 2022) and Bloom's cognitive theory emphasize the importance of developing higher-order thinking skills. IDMs use these theories to design learning experiences that challenge students to analyze, synthesize, and evaluate information, promoting deep learning. Learning by design (LBD) framework (An et al., 2022) promotes a systematic approach to instructional design. It ensures that educational strategies align with learning goals, and the learning process is structured and coherent. mARC IDM (Radović et al., 2022) incorporates principles that ensure instructional materials are meaningful, active, reflective, and collaborative. This approach fosters engagement and a deeper understanding of the content.

Table 2. Theories, concepts, & models used in integration of principles for effective educational strategies

Theories, concepts, and models	Explanation
Keller's ARCS model & Malone's motivation model	Emphasize importance of capturing learners' attention & maintaining motivation throughout learning process.
CAT & Bloom's cognitive theory	Stress development of higher-order thinking skills & importance of guided instruction & problem-solving.
LBD framework	Promotes a systematic approach to instructional design, ensuring alignment with learning goals & coherence in learning process.
mARC IDM	Integrates principles that make instructional materials more meaningful, active, reflective, & collaborative, enhancing student engagement.
Cognitivist & constructivist learning theories & CA	Focus on knowledge construction, active participation, & problem-solving, encouraging student-centered learning.
Systematic schema-based IDM	Provides a structured approach to organizing information & promoting mental organization, improving retention, & recall.
Activity theory conceptual framework	Emphasizes social & contextual aspects of learning, leading to creation of collaborative & contextually rich learning environments.
SRL	Teaches students how to manage their learning processes, fostering independence, & adaptability.
Flipped classroom model	Integrates problem-based instructional strategies, allowing students to engage with content in an active & independent manner.
Design thinking, constructivist learning theory, & project-based learning	Promote hands-on, problem-solving approaches in educational strategies.
IHPT & Lincoln & Guba's model of trustworthiness	Emphasize creating a positive & trustworthy learning environment, which can enhance student engagement & motivation.
UCD & analyzing user needs & problem analysis	Focus on understanding learners' needs & preferences, leading to tailored learning experiences.
Grounded theory & 4-C/ID	Highlight research-based approaches & cognitive psychology in instructional design, ensuring evidence-based strategies.
Gagne's nine events of instruction	Provides a structured sequence for delivering content, ensuring efficient & effective instruction.

Cognitivist and constructivist learning theories and cognitive apprenticeship instructional model (CA) (Pinto & Zvacek, 2022) emphasize knowledge construction and active participation. By integrating these theories, IDMs promote student-centered learning and problem-solving. Systematic schema-based IDM (Jung et al., 2022) provides a structured approach to organizing information and promoting mental organization. It enhances the retention and recall of information. Activity theory conceptual framework (Ramani, 2022) emphasizes the social and contextual aspects of learning. IDMs utilizing this theory focus on creating collaborative and contextually-rich learning environments. Self-regulated learning (SRL) (Curum & Khedo, 2021) is integrated to teach students how to manage their own learning processes, fostering independence and adaptability.

Flipped classroom model (Diningrat et al., 2020) is an example of how IDMs incorporate problem-based instructional strategies, allowing students to engage with content in a more active and independent manner. Design thinking, constructivist learning theory, and project-based learning (Budhtranon et al., 2021) promote hands-on, problem-solving approaches in educational strategies. IDMs using these principles encourage students to apply knowledge to real-world scenarios. Instructional humor process theory (IHPT) (Pretorius et al., 2020) and Lincoln and Guba's model of trustworthiness emphasize the importance of creating a positive and trustworthy learning environment, which can enhance student engagement and motivation. User-centered design (UCD) and analyzing user needs and problem analysis (Guney, 2019) focus on understanding the needs and preferences of learners, leading to the creation of learning experiences tailored to their specific requirements. Grounded theory (Baldwin et al., 2018) and four-component instructional design (4-C/ID) (Daniel et al., 2018) highlight the significance of research-based approaches and cognitive psychology in instructional design, ensuring that educational strategies are based on solid empirical evidence. Gagne's nine events of instruction (Cheung, 2016) provides a structured sequence for delivering content, ensuring that the presentation is efficient and effective. **Table 2** illustrates the theories, concepts, and models used in the integration of principles for effective educational strategies.

In summary, IDMs have integrated a multitude of learning theories and models, resulting in diverse and adaptable approaches to instructional design. These integrated principles and concepts serve to enhance
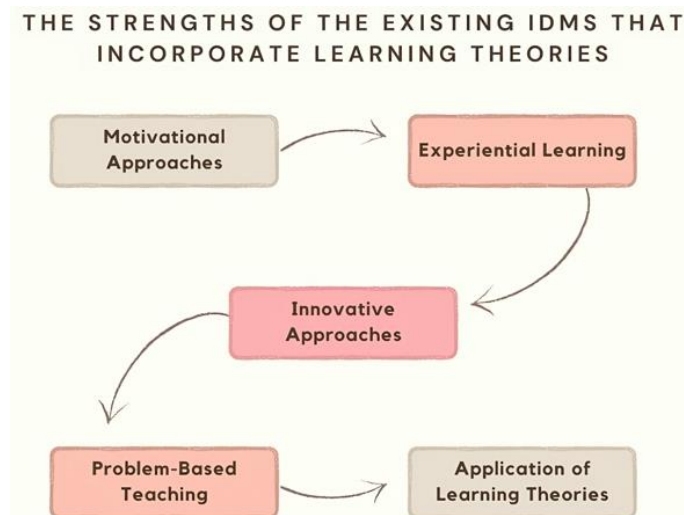
THE STRENGTHS OF THE EXISTING IDMS THAT INCORPORATE LEARNING THEORIES

Figure 6. Strengths of existing IDMs that incorporate learning theories (Source: Authors)

engagement, motivation, and the overall effectiveness of educational strategies, catering to the diverse needs and preferences of learners. The ongoing evolution and adaptation of these models reflect the continuous quest for optimizing the learning experience in an ever-changing educational landscape.

What Are the Strengths & Limitations of Existing IDMs That Incorporate Learning Theories?

IDMs serve as the backbone of effective educational strategies, integrating principles from various learning theories to enhance the learning experience. This discussion delves into the strengths and limitations of these existing IDMs, drawing insights from a wide array of research works. These works encompass a broad spectrum of educational methodologies, from motivational approaches to experiential learning, innovative instructional designs, and technology integration. However, while these models offer substantial benefits in terms of motivation, engagement, and innovation, they also face challenges related to accessibility, generalizability, complexity, evaluation, resources, adaptability, scalability, and consistency. Understanding these strengths and limitations is crucial for refining instructional design practices and optimizing the application of learning theories in education.

Strengths

Motivational approaches: Many of the studies, such as Juan and Chao (2015) and Velaora et al. (2022), highlight the integration of motivational elements through virtual laboratories, simulations, game-based learning, and engaging projects. These approaches strengthen student motivation and engagement in the learning process.

Experiential learning: Radović et al. (2022) emphasize the effectiveness of experiential learning in boosting academic success and engaging students in re-contextualization and reflection processes. This approach is instrumental in enhancing learning outcomes.

Innovative approaches: Research like that of Pinto and Zvacek (2022) and Charbonneau-Gowdy et al. (2021) indicate positive student responses to course modifications and well-structured instructional designs based on current learning theories. These approaches contribute to effective learning design.

Problem-based teaching: Diningrat et al. (2020) integrates problem-based teaching methods with the flipped classroom concept, providing a strong foundation for improved learning outcomes.

Application of learning theories: Studies like Guney (2019) and Zain and Sailin (2020) aim to define and apply important components of flipped learning and interaction design. This supports the practical application of learning theories in instructional design. **Figure 6** illustrates the strengths of the existing IDMs that incorporate learning theories.
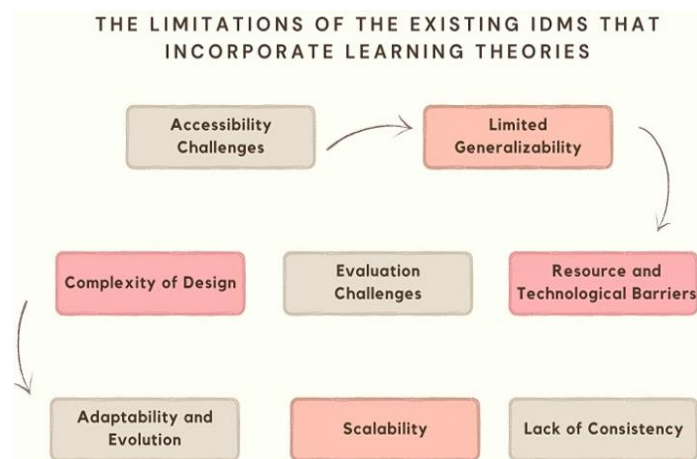
Figure 7. Limitations of existing IDMs that incorporate learning theories (Source: Authors)

Limitations

Accessibility challenges: Curum and Khedo (2021) point out the difficulty in building an effective mobile learning system that caters to diverse learning styles, real-world behaviors, and surrounding situations. This poses a challenge in providing universally accessible educational content.

Limited generalizability: Some studies, like Pinto and Zvacek (2022) and Velaora et al. (2022), show positive results for specific course modifications. However, the generalizability of these findings to different educational contexts may be limited.

Complexity of design: Designing instructional materials that incorporate elements such as schema-based instructional design (Jung et al., 2022) can be complex and time-consuming. This complexity may hinder widespread adoption.

Evaluation challenges: While studies like de Leeuw et al. (2019) aim to develop evidence-based IDMs, the evaluation and comparison of these models with existing methods can be challenging due to the dynamic nature of education.

Resource & technological barriers: Integrating emerging technologies and instructional methods, as seen in studies like Lieser et al. (2018), can require significant resources and technological infrastructure, making implementation difficult in resource-constrained settings.

Adaptability & evolution: As pointed out in Ghani et al. (2018), existing IDMs like ADDIE may need alterations and adaptations over time. This highlights the need for continuous evolution and flexibility in the field of instructional design.

Scalability: Some innovative approaches, such as the sufficiency economic philosophy in educational models (Budhtranon et al., 2021), may face challenges in scalability to a broader educational context.

Lack of consistency: While Cheung (2016) stresses the importance of an instructional design paradigm for a consistent learning experience, achieving such consistency across different courses and institutions can be challenging. **Figure 7** illustrates the limitations of the existing IDMs that incorporate learning theories.

In conclusion, the existing IDMs that incorporate learning theories offer numerous strengths, including improved motivation, engagement, and innovative approaches. However, they also face challenges related to accessibility, generalizability, complexity, evaluation, resources, adaptability, scalability, and consistency. Addressing these limitations and continually refining instructional design practices is crucial for the effective implementation of learning theories in education. **Table 3** illustrates the strengths and limitations of the existing IDMs that incorporate learning theories.

What Are the Potential Implications of This Synergy for Educators, Instructional Designers, & Learners in Different Educational Contexts?

The synergy of the findings from these diverse research articles holds great potential implications for educators, instructional designers, and learners in different educational contexts.

Table 3. Strengths & limitations

Strengths	Limitations
Motivational approaches	Accessibility challenges
Experiential learning	Limited generalizability
Innovative approaches	Complexity of design
Problem-based teaching	Evaluation challenges
Application of learning theories	Resource & technological barriers
	Adaptability & evolution
	Scalability
	Lack of consistency

Enhanced motivation & engagement

Several studies, such as Juan and Chao (2015) and Velaora et al. (2022), highlight the effectiveness of using virtual labs, game-based projects, and innovative platforms in boosting students' motivation and engagement. Educators can use these approaches to create more exciting and interactive learning experiences that maintain learners' attention and enhance their motivation.

Innovative educational tools

Lo et al. (2022) suggests that platforms like MSFT can aid education during crises, offering educators and instructional designers a versatile tool to facilitate learning in various contexts. These platforms can be valuable for remote and online education.

Teacher preparation & confidence

An et al. (2022) emphasizes the significance of teacher preparation and confidence, especially when dealing with new educational technologies like robotics. It implies that educators need support and training to effectively incorporate these tools into their teaching practices.

Complex learning environments

Radović et al. (2022) underscores the importance of complex learning environments in enhancing engagement and learning outcomes. This insight can guide instructional designers to create more dynamic and multifaceted learning experiences.

Interdisciplinary learning

Pinto and Zvacek (2022) found that a T-shaped design positively impacted learning, fostering teamwork and discussion. Educators can incorporate interdisciplinary approaches to encourage students to explore diverse subject matter, fostering well-rounded learning experiences.

Schema-based learning

Jung et al. (2022) underscores the importance of schema principles in facilitating learning across different domains and situations. This insight can guide educators to design curricula that promote transferable knowledge and skills.

Faculty preparedness for online education

Ramani (2022) highlights the need for faculty members to be eager and prepared for online education. This suggests that educators must willingly adapt to new teaching methodologies and be open to reevaluating their pedagogical approaches in an online environment.

Customizable learning options

Curum and Khedo (2021) suggests that adapting mobile material distribution based on instructional design theories can provide learners with more customizable options. Instructional designers and educators can use this information to tailor learning experiences to individual preferences.

Design thinking

Padzil et al. (2021) encourages the incorporation of design thinking in education. This can empower students to develop problem-solving skills and innovative thinking, preparing them to handle modern challenges.

Innovative educational models

Budhtranon et al. (2021) introduces an educational model based on the sufficiency economic philosophy. Educators can explore unique educational models to cater to specific learning needs and contexts.

Problem-based learning

Diningrat et al. (2020) offers a framework for instructors and instructional designers to implement problem-based learning effectively. This approach can foster critical thinking and application of knowledge.

Shift in pedagogical assumptions

Ramani (2022) underlines the importance of faculty members reevaluating their pedagogical assumptions and expertise. This implies that educators need to adapt and embrace innovative pedagogical approaches to remain effective in different educational contexts.

Transformation of higher education

Zain and Sailin (2020) anticipates significant changes in higher education course delivery. This suggests that educators and instructional designers should prepare for and adapt to new modes of instruction.

Digital education models

de Leeuw et al. (2019) proposes a postgraduate medical education model that can serve as a foundation for digital education. This model can guide educators in the development of digital education resources and tools.

Applied mathematical modeling

Cárcamo et al. (2019) encourages the use of mathematical modeling to help students apply their knowledge. This approach can guide educators in promoting practical application of theoretical concepts.

Interactive learning design

Guney (2019) highlights the importance of screen design variables and interaction design. This implies that instructional designers should focus on creating effective interactive learning resources.

Effective language learning

Ghani et al. (2018) suggests that research may direct language learning materials for specialized purposes. This can guide language educators in developing materials that cater to specific language learning needs.

Webinar integration in medical education

Lieser et al. (2018) explores the integration of webinars in medical education. This suggests that educators can use webinars to enhance teaching and learning, especially in medical and healthcare-related fields.

Professional development

Baldwin et al. (2018) highlights the importance of professional development for educators. It underscores the need for training and development to effectively implement instructional technologies and teaching strategies.

Skill development through 4-C/ID

Daniel et al. (2018) emphasizes the need to teach case presentations as cohesive activities. This suggests that educators should focus on holistic skill development rather than isolated elements of knowledge.

Instructional design paradigm

Cheung (2016) proposes an instructional design paradigm for consistent learning experiences. This can guide instructional designers in creating standardized and effective learning materials.

These findings collectively suggest that educators, instructional designers, and learners in various educational contexts can benefit from innovative and adaptive approaches to teaching and learning. The implications range from motivation and engagement to the integration of new technologies and interdisciplinary learning, ultimately enhancing the quality of education in diverse settings. However, they also underscore the need for continuous professional development and adaptation to effectively incorporate these innovations into educational practices.

What Gaps in Literature Exist, & What Future Research Directions Can Be Identified to Advance Integration of IDMs & Learning Theories for Improved Learning Outcomes?

As educational paradigms continue to evolve, the integration of IDMs and learning theories is at the forefront of efforts to enhance learning outcomes. However, the existing literature reveals gaps and uncharted territories that warrant further exploration. This introduction presents a comprehensive overview of the identified gaps and future research recommendations from a diverse array of studies, offering a roadmap for advancing the synergy between IDMs and learning theories. These insights collectively serve as a catalyst for researchers, educators, and instructional designers to shape the future of education, resulting in more effective and learner-centric approaches. The gaps in the literature and potential future research directions to advance the integration of IDMs and learning theories for improved learning outcomes can be summarized, based on the information provided.

Sample size & well-being study

Velaora et al. (2022) highlight the need for future research to examine the influence of holistic learning environments on students' well-being and learning performance using a larger sample size. This recommendation suggests that research should focus on assessing the scalability and generalizability of these environments to accommodate a broader population.

Advanced MSFT system research

Lo et al. (2022) introduce the MSFT system with several key functions. Future research can explore the full potential of such integrated systems in various educational contexts, including their impact on teaching and learning, user experiences, and adaptability.

Integration of educational robots

An et al. (2022) propose integrating educational robots into teacher education programs. Future research can investigate the effectiveness of this integration, including its impact on teacher preparedness, student engagement, and the development of 21st century skills.

Enhancing mARC model

Radović et al. (2022) suggest that the three pillars of the mARC model are crucial for creating a more engaging learning environment. Future research can focus on refining and validating this model, as well as exploring how it can be adapted to different educational settings.

Usage of proven IDMs

Pinto and Zvacek (2022) found that using proven IDMs enhanced course building techniques. Future research can delve into the specific benefits of these models, including their impact on course quality, student outcomes, and educator effectiveness.

Schema-based instructional design measurement

Jung et al. (2022) recommend improving schema measurement, particularly for a broad audience. Future research can concentrate on developing standardized tools and metrics to assess schema-based instructional design's effectiveness in promoting customized learning experiences.

Application of activity theory

Ramani (2022) suggests the potential application of activity theory to e-learning practice and research. Future studies can investigate how activity theory can be used to analyze and resolve challenges in online education, such as faculty training, pedagogy, and technology integration.

Context-aware learning material

Curum and Khedo (2021) recommend adjusting learning material with context-aware responses and design principles to improve algorithm-based mobile learning platforms. Future research can explore how adaptive learning materials impact student learning outcomes and tailor content based on learners' preferences and needs.

Empirical research on online theory-to-practice

Charbonneau-Gowdy et al. (2021) acknowledge the need for additional empirical research in various settings to evaluate online theory-to-practice initiatives. Future studies can replicate and extend this model to assess its feasibility and long-term impact on education, particularly in the context of unforeseen challenges like epidemics.

Development of competitive, creative, & analytical students

Padzil et al. (2021) aim to develop future students who are more competitive, creative, and analytical. Future research can explore the effectiveness of such initiatives in fostering these desired traits in learners and their impact on employability and problem-solving abilities.

Application of teaching paradigm to business disciplines

Budhtranon et al. (2021) propose applying a teaching paradigm to business disciplines. Future research can investigate the transferability of this paradigm to different academic and professional contexts, examining its effectiveness in promoting entrepreneurship and innovation.

Investigation of flipped classroom teaching models

Diningrat et al. (2020) provide a basic framework for flipped classroom teaching models. Future research can conduct more extensive experiments to evaluate the framework's applicability and effectiveness in higher education, particularly its impact on student engagement and learning outcomes.

Ethical & methodological considerations

Pretorius et al. (2020) recommend future research efforts while considering ethical and methodological concerns, particularly in terms of alerting respondents about lecture aims. Future studies can develop ethical guidelines for conducting educational research, ensuring the informed consent of participants and the protection of their rights.

Emphasis on self-directed learning

Zain and Sailin (2020) highlight the flipped learning strategy's emphasis on self-directed learning. Future research can investigate the impact of self-directed learning on students' motivation, information retention, and problem-solving abilities, considering how this approach aligns with various learning theories.

Application of digital education intervention

de Leeuw et al. (2019) raise questions about applying digital education interventions into learners' working lives and evaluating their effectiveness. Future research can explore the practical challenges and benefits of

incorporating digital education into professional contexts, as well as assessing its long-term impact on job performance.

Teaching mathematical modeling abilities

Cárcamo et al. (2019) recommend that teachers should focus on teaching students span and spanning set concepts and mathematical modeling abilities. Future research can investigate the integration of mathematical modeling skills into various educational levels and subjects, assessing their impact on students' problem-solving skills and analytical thinking.

Learning analytics & application of design models:

Ou et al. (2019) suggest the use of learning analytics on students' video lesson utilization in future research. This can involve examining the effectiveness of the design model in fields beyond computer science, offering insights into the applicability of design models in diverse educational contexts.

User-centered design assessment methodologies

Guney (2019) emphasizes the importance of UCD assessment methodologies for researchers, designers, and lecturers in instructional design and technology. Future research can delve into the specific UCD methodologies and assess their impact on instructional and visual designs, ensuring effective learning experiences and user satisfaction.

Recommendation for ADDIE model

Ghani et al. (2018) recommend the use of the ADDIE model for designing e-learning courses and educational programs. Future research can investigate the applicability of the ADDIE model across different subject areas and educational levels, assessing its impact on curriculum development and student learning outcomes.

Feedback on webinar efficacy

Lieser et al. (2018) suggest the need for open conversations to obtain quick feedback on webinar efficacy and e-learning module utility. Future research can focus on developing effective feedback mechanisms for webinars and e-learning modules, enabling continuous improvement and better alignment with instructional goals.

Informal design theory in online course design

Baldwin et al. (2018) propose that informal design theory can help new online course designers. Future research can investigate the effectiveness of informal design theory in enhancing the quality of online courses, promoting the sharing of knowledge among instructors, and boosting their confidence in course design.

Application of whole curriculum plan

Daniel et al. (2018) suggest that the whole curriculum plan can aid in transferring and implementing case presentation curricula and applying 4-C/ID model to complex medical education skills. Future research can focus on the practical application of the whole curriculum plan and 4-C/ID model in medical education, assessing their impact on skill development and student performance.

Impact of IDMs on workplace performance

Cheung (2016) calls for further research to assess the impact of implementing IDMs into teaching programs on workplace (clinical) performance. Future studies can explore the connection between IDMs.

In conclusion, the collective insights from these studies provide a valuable foundation for advancing the integration of IDMs and learning theories to improve learning outcomes. The identified gaps and future research recommendations offer a roadmap for addressing current challenges and expanding the horizons of educational research. By exploring these uncharted territories, researchers, educators, and instructional designers can contribute to the ongoing transformation of education, fostering innovation and effectiveness in diverse learning contexts. As we move forward, a collaborative and multidisciplinary approach will be

Table 4. A comparative analysis of learning theories & IDMs

Aspect	Details
Approaches of different IDMs	IDMs like Keller's ARCS model, cognitive apprenticeship theory, & mARC IDM focus on learner engagement, higher-order thinking skills, & a reflective, collaborative learning process.
Outcomes of IDM application	Improved student motivation, academic success, & engagement in learning processes. Emphasis on experiential learning, problem-based teaching, & application of learning theories to IDMs.
Educational impact across countries	Diverse contributions from countries like the USA, China, & the UK. Institutions globally, including University of Hong Kong & Purdue University, have significantly contributed to field.
Strengths & limitations	Strengths are motivational approaches, experiential learning, & innovative strategies. Limitations involve accessibility challenges, limited generalizability, design complexity, & resource barriers.
Future research directions	Recommended areas include impact of holistic learning environments, effectiveness of educational robots, refinement of instructional design models, & integration of activity theory in e-learning.

essential to further enhance the synergy between IDMs and learning theories, ultimately benefiting learners worldwide.

The integration of IDMs with learning theories offers actionable insights by providing frameworks that blend educational psychology principles with practical teaching strategies. For instance, flipped classroom model leverages constructivist theory, encouraging active learning and student engagement by reversing the traditional learning environment. Similarly, Keller's ARCS Model integrates motivational design into e-learning environments, focusing on attention, relevance, confidence, and satisfaction to engage learners. These integrations demonstrate how IDMs can effectively use learning theories to enhance educational strategies, making them more impactful and relevant to diverse learning contexts.

Furthermore, a comparative analysis of learning theories and IDMs is included in **Table 4**, which was compiled as part of a systematic examination of the literature. This examination encompasses a range of methodologies and results linked to IDMs, their influence in educational environments worldwide, as well as their merits and drawbacks. Moreover, it offers prospective domains for subsequent investigation, providing a comprehensive assessment of the present condition and future potential of learning theories and instructional design within the realm of education.

Table 4 synthesizes the key findings from the document, providing a comprehensive overview of the integration of IDMs and learning theories.

DISCUSSION

In the ever-evolving landscape of education, the integration of instructional design approaches and learning theories has gained considerable attention. This systematic literature review delves into the confluence of these domains to unearth insights that address five critical questions, each essential in comprehending the dynamic relationship between IDMs and learning theories.

Firstly, we embark on a journey to discern the key contributors to this integration by investigating countries, educational institutions, authors, and publishing years that have played pivotal roles in answering.

RQ1: What Country, Educational Institution, Authors, & Publishing Years Have Contributed the Most to Integration of Instructional Design Approaches & Learning Theories?

We found significant insights in various domains when integrating instructional design and learning theories. This topic of study is a diversified international partnership. The USA leads with 68 publications, proving its importance. Following closely with 17 articles apiece, China and the UK demonstrate their significant contributions. Beyond these nations, Malaysia, Taiwan, Canada, Australia, and Spain have achieved significant advances, demonstrating the global expanse of study and the diversity of ideas driving educational innovation. Secondly, this field has also advanced thanks to schooling. The University of Hong Kong and Purdue University stand out with five publications apiece. Four articles from the University of Illinois Urbana-Champaign, Universiti Kebangsaan Malaysia, and Universiti Malaya are notable. A global network of institutions, including the University of Toronto, National Kaohsiung University of Science and Technology, and Universidad de Murcia, has created a considerable body of work, stressing the collaborative and global aspect of this field's study. The distribution of publications among journals shows the variety of academic

outlets that share research results. British Journal of Educational Technology and Educational Technology Research and Development, each having six publications, are important. With five papers apiece, Advances In Health Sciences Education and Computers and Education have also contributed. Several other journals have published four or more papers, demonstrating their importance as educational techniques and learning theories forums. Finally, technological integration, e-learning, and multimedia learning theories are changing pedagogical practices, notably in online higher education. The COVID-19 epidemic has enhanced online learning pedagogy, stressing a comprehensive approach. This debate covers major contributions and developments in the integration of instructional design methodologies and learning theories, illuminating its transnational, institutional, and academic aspects.

Next, we explore how IDMs have harmoniously incorporated principles and concepts from diverse learning theories and models to craft effective educational strategies to answer.

RQ2: How Have IDMs Integrated Principles & Concepts from Various Learning Theories & Models in Development of Effective Educational Strategies?

When examining the relationship between learning theories and IDMs, one should contemplate flipped classroom model, which incorporates constructivist learning theory. A study conducted at Midwestern University found that this model resulted in enhanced student engagement. In a similar fashion, Keller's ARCS model, which is based on behaviorism, increased online course motivation. Furthermore, critical thinking and scientific comprehension were enhanced in a high school science course via the implementation of CAT. Based on cognitive theories, Gagné's nine events of Instruction improved employee performance in corporate training. These instances underscore the efficacy of implementing theoretical frameworks in a variety of academic environments.

The integration of principles from diverse learning theories and models into the development of effective educational strategies is a dynamic and evolving field. This discussion explores how IDMs have successfully incorporated these principles to enhance the learning experience. Notable models like Keller's ARCS model, Malone's motivation model, CAT, Bloom's cognitive theory, LBD framework, mARC IDM, cognitivist and constructivist learning theories, cognitive apprenticeship instructional model (CA), systematic schema-based IDM, activity theory conceptual framework, SRL, flipped classroom model, design thinking, constructivist learning theory, project-based learning, IHPT, Lincoln and Guba's model of trustworthiness, UCD, analyzing user needs and problem analysis, grounded theory, 4-C/ID, and Gagne's nine events of Instruction all play crucial roles in shaping instructional design.

These models and theories are employed by IDMs to create engaging, student-centered, and problem-solving educational strategies. The integration of principles such as knowledge construction, active participation, mental organization, social and contextual learning, self-regulation, and trustworthiness fosters a positive and adaptable learning environment.

Furthermore, user-centered approaches, empirical evidence, structured content delivery, and understanding learners' needs are essential elements in this integration process. Collectively, these integrated principles enrich educational strategies and contribute to the ongoing evolution of instructional design for improved learning outcomes.

Simultaneously, an assessment of the strengths and limitations of existing IDMs that embrace learning theories is conducted to answer.

RQ3: What Are the Strengths & Limitations of Existing IDMs That Incorporate Learning Theories?

IDMs that incorporate principles from various learning theories offer a range of strengths, significantly enhancing educational strategies. These strengths include motivational approaches that use engaging tools like virtual laboratories and game-based learning to bolster student motivation and engagement. Experiential learning, as emphasized by certain IDMs, boosts academic success by encouraging students to engage in reflective processes. Furthermore, innovative approaches, informed by current learning theories, yield positive responses from students, contributing to effective learning design. Problem-based teaching integrated with concepts like the flipped classroom offers a strong foundation for improved learning

outcomes, encouraging active participation and real-world application of knowledge. Additionally, the practical application of learning theories within IDMs promotes student-centered learning and problem-solving. These strengths collectively contribute to a more engaging, effective, and impactful learning experience.

Following this, we investigate the potential implications of this synergy on educators, instructional designers, and learners across varied educational contexts to answer.

RQ4: What Are the Potential Implications of This Synergy for Educators, Instructional Designers, & Learners in Different Educational Contexts?

Upon conducting a systematic assessment to assess the effects of technology improvements on instructional design, we have identified a number of significant factors. To begin with, technological advancements have facilitated the development of learning environments that are much more dynamic and engaging, hence augmenting student motivation and engagement. This is especially visible in the use of game-based learning aids and virtual laboratories. Furthermore, the implementation of blended and online learning models, which have been expedited due to the COVID-19 epidemic, has required an adjustment in teaching approaches that places greater emphasis on the value of digital literacy for instructors and learners alike. Furthermore, the incorporation of cutting-edge educational technology such as artificial intelligence, virtual reality, and educational robots has created novel opportunities for individualized and hands-on instruction, accommodating a wide range of learning preferences and requirements. Despite this, the incorporation of technology also poses obstacles, such as the need for educators to engage in ongoing professional development, the guarantee of fair and equal access to technology, and the resolution of issues pertaining to the digital divide. Further investigation is required to optimize the integration of these technology resources into IDMs, therefore augmenting learning outcomes within an educational environment that is undergoing fast change.

The synthesis of research findings in the field of IDMs incorporating learning theories offers a wealth of implications for educators, instructional designers, and learners across diverse educational settings. These implications encompass a wide spectrum, including the potential for enhanced motivation and engagement through innovative approaches such as virtual labs and game-based projects. Moreover, the introduction of versatile tools like MSFT in education can significantly benefit remote and online learning. The importance of teacher preparation, particularly when dealing with new educational technologies, underscores the necessity of support and training for educators. Complex learning environments are shown to boost engagement and learning outcomes, guiding instructional designers to create multifaceted learning experiences. Encouraging interdisciplinary learning fosters teamwork and discussion, while emphasizing schema-based learning promotes transferable knowledge and skills. The readiness of faculty members for online education highlights the need for educators to adapt to new teaching methodologies in a digital environment. Customizable learning options are made possible by adapting mobile material distribution based on instructional design theories. Encouraging the incorporation of design thinking in education empowers students with problem-solving skills. Additionally, the introduction of innovative educational models, problem-based learning frameworks, and changes in pedagogical assumptions signify the dynamic nature of education. The implications extend to digital education models, mathematical modeling applications, interactive learning design, effective language learning, and webinar integration, all of which influence teaching and learning in specialized areas. Professional development is essential for educators to effectively implement instructional technologies, and a focus on holistic skill development is recommended. An instructional design paradigm for consistent learning experiences ensures standardized and effective educational materials. In summary, these implications offer valuable guidance for educators and instructional designers to create dynamic and engaging learning experiences tailored to various educational contexts.

Lastly, we turn our focus to the lacunae in the literature, identifying future research directions that hold the promise of advancing the integration of IDMs and learning theories to enhance learning outcomes to answer.

RQ5: What Gaps in Literature Exist, & What Future Research Directions Can Be Identified to Advance Integration of IDMs & Learning Theories for Improved Learning Outcomes?

Furthermore, this study underscores the universality with which the synergies that exist between IDMs and learning theories may be implemented in many cultural and educational contexts. The efficacy of these models transcends particular geographical or cultural boundaries, emphasizing their versatility and significance on an international scale. For example, by applying the tenets of constructivism and social learning to culturally diverse contexts, one may foster collaborative learning environments that are sensitive to cultural differences. Nevertheless, local educational resources, beliefs, and standards must be considered to guarantee that these models are applied properly. Further investigation is warranted to examine these frameworks within diverse cultural environments, ascertain optimal methodologies, and comprehend the ways in which these concepts may be modified to accommodate the specific requirements and obstacles encountered by educational systems around the world. By adopting this methodology, a more effective and inclusive global education environment may be established, one that accommodates a wide range of students and educational environments.

As educational paradigms evolve, the integration of IDMs and learning theories aims to enhance learning outcomes. The existing literature highlights gaps and uncharted areas that require further exploration. The identified gaps include the need for larger sample sizes to study holistic learning environments, the exploration of advanced MSFT system applications in various educational contexts, and the effectiveness of integrating educational robots into teacher education programs. Research should also focus on refining and validating IDMs, investigating the benefits of proven models, improving schema-based instructional design measurement, and applying activity theory to e-learning. Additionally, future studies should explore the impact of context-aware learning materials, replicate and extend online theory-to-practice initiatives, develop competitive, creative, and analytical students, and apply teaching paradigms to different disciplines. Further research is needed to evaluate the applicability of flipped classroom teaching models, address ethical and methodological concerns, emphasize self-directed learning, and examine the impact of digital education interventions in professional contexts. Studies should also investigate the integration of mathematical modeling skills, the use of learning analytics in diverse fields, user-centered design assessment methodologies, and the applicability of the ADDIE model across subjects and educational levels. Feedback mechanisms for webinars and e-learning modules should be developed, and the effectiveness of informal design theory in online course design should be assessed. Furthermore, research can explore the impact of the whole curriculum plan and 4-C/ID model in medical education, and the connection between IDMs and workplace performance. These research directions collectively provide a roadmap for advancing the integration of IDMs and learning theories to improve learning outcomes, fostering innovation and effectiveness in diverse learning contexts. Collaboration and a multidisciplinary approach will be essential in this journey.

This systematic exploration aims to provide a comprehensive understanding of the existing knowledge, gaps, and prospects in the integration of instructional design approaches and learning theories. By addressing these critical questions, we intend to offer insights and recommendations that can inform both research endeavors and practical applications in the realm of education.

CONCLUSIONS

Finally, integrating IDMs and learning theories showed the intricate dynamics that form instructional strategies in our systematic literature review. Our tour covered geographical and institutional contributions, noteworthy authors, publishing years, instructional design methodologies, and learning theories. The USA, China, and UK led global research. These nations, along with Malaysia, Taiwan, Canada, Australia, and Spain, demonstrated our worldwide study and the diverse perspectives and ideas that drive education innovation. Hong Kong, Purdue, Illinois Urbana-Champaign, Universiti Kebangsaan Malaysia, and Malaya progressed the field. Their commitment to educational innovation reveals how instructional design and learning theory research collaborate. We reviewed the British Journal of Educational Technology, Educational Technology Research and Development, Advances in Health Sciences Education, and Computers and Education. We found several learning theory-based instructional design frameworks with pros and cons. Keller's ARCS model,

schema-based IDM, activity theory conceptual framework, and Gagne's nine events of Instruction provide educators and instructional designers many strategies to increase learning. Accessibility, generalizability, complexity, evaluation, resources, flexibility, scalability, and consistency are issues. Increased motivation and engagement, innovative educational technologies, and teacher training and confidence help educators, instructional designers, and diverse students. Interdisciplinary, schema-based, and problem-based learning can improve effectiveness, customization, and transferability. The study discovered literature gaps, requiring more investigation. These gaps include complete learning settings, MSFT, educational robots, and IDM development. Schema-based instructional design, activity theory in e-learning, and context-aware learning materials need more research. Future research should explore ethics, methodology, self-directed learning, and professional digital education interventions. These insights, ideas, and future research endeavors help integrate IDMs and learning theories to improve learning. Education will evolve through collaboration and multi-disciplinarity. This investigation of regional, institutional, and author contributions, instructional design approaches, and learning theories has prepared researchers, educators, and instructional designers to innovate and improve education in many learning circumstances. Finally, the synthesis of various study results and ideas will change instructional methods, aiding learners worldwide.

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APPENDIX A

Table A1. Articles

Label	Article	Theories & IDM integration	Strengths/ contributions	Limitations & challenges	Potential implications	Gaps & future research
A1	Velaora et al. (2022)	Keller's (1987) ARCS model and Malone's (1981) motivation model, The holistic education Miller (2007)	Effective methods for improving student motivation, learning results, and well-being include virtual laboratories, simulations, game-based learning, projects, and asynchronous videos.	First, we did not assess students' gaming and instructional video experience, which may have affected their opinions. Second, the self-reported assessments of examined criteria may be restricted by students' capacity to reflect and rate accurately.	Students may (a) experience a virtual lab, game-based project, and asynchronous instructional videos, & (b) self-learn in our online holistic environment. Answering our third, fourth, and fifth study questions, environment positively correlated with all ARCS model components and learning motivation, attention, relevance, confidence, & satisfaction.	To reduce inaccuracies, future study should examine the influence of this online holistic learning environment on students' well-being and learning performance using a bigger sample size.
A2	Lo et al. (2022)	The cognitive apprenticeship theory (CAT), Bloom's Cognitive Theory, A Mobile System of Formative Tests with Handwriting Revision (MSFT)	This study introduces a cross-platform MSFT platform for instructors to handwrite answer sheets, assign faults, and gather data based on Bloom's cognitive domain.	The epidemic caused teachers and students to remain home, preventing on-campus instruction, since 2020's worldwide COVID-19 pandemic, sustainable schooling has relied increasingly on IT.	We think the MSFT platform may aid all levels of education in times of crisis, both now and in the future, particularly in the metaverse.	MSFT system integrates four key functions: providing handwritten grades, correcting student errors, recording teacher remarks, and selecting examples for class presentations in a single window using web apps.
A3	An et al. (2022)	LBD framework	This research examines the design elements of an LBD-based robotics course that effectively prepares online instructors to apply robotics in their classrooms.	This research did not pretest robotics topic knowledge, hence pretest and posttest results were not compared. Teachers gained confidence in their robotics knowledge and scored well on a one-time evaluation.	Research suggests that teachers may first struggle with educational robotics, but LBD approach provides opportunities for observation, preparation, brainstorming, & reflection, eventually gaining knowledge & confidence.	The goal is to integrate educational robots into US teacher education programs to equip students with 21st century skills and knowledge for the profession.
A4	Radović et al. (2022)	mARC IDM	Effective experiential learning design criteria are provided by model. Concept has been shown to boost academic success, engage students in re- & de-contextualization of information, and enhance reflection processes throughout learning.	Using the same course in all three rounds of DBR constrained participant selection due to its cumulative approach.	Research recommendations suggest that the three pillars of the mARC model are crucial for creating a more engaging and complex learning environment.	Research recommendations suggest that the three pillars of the mARC model are crucial for creating a more engaging and complex learning environment.
A5	Pinto and Zvacek (2022)	Cognitivist and constructivist learning theories, the cognitive apprenticeship instructional model (CA), and a T-shaped design,	Students responded positively to course modifications compared to the previous year, indicating that certain alterations were useful.	It is difficult to credit success increases or attitude changes to course module instructional design alone.	Students said that employing a T-shaped design impacted their learning, encouraging teamwork & discussion of outcomes while mastering complicated engineering software.	In addition to the benefits for students, the professor found the usage of proven instructional design models useful for enhancing her course building techniques.

Table A1 (Continued). Articles

Label	Article	Theories & IDM integration	Strengths/ contributions	Limitations & challenges	Potential implications	Gaps & future research
A6	Jung et al. (2022)	A systematic schema-based instructional design model	The purpose of this research is to expand our understanding of schema-based instructional design for various learning settings.	Our study indicates that both online and face-to-face courses should include key schema-related components, such as hierarchization, building, automation, activation, and interactions.	Theoretically, schema principles enable learners to construct, automate, develop, and alter schema, producing a relevant learning process across domains and situations.	Future research should improve schema measurement, particularly autonomously and for a broad audience. Increasing understanding of schema-based instructional design may help create successful customized learning systems.
A7	Ramani (2022)	Activity theory conceptual framework	This paper analyses the nature and dynamics of the ID process in a commercial collaboration between a research institution and an OPM provider using a case study.	This study is based only on a single case study conducted at a research institution in the United States.	Faculty members should be eager to learn. Particularly faculty members who are new to online education. Faculty should not teach online because of pressure from higher management, but because they really want to do so. Faculty members should also be willing to examine their own pedagogical assumptions and expertise. Participating in the creation of online courses is crucial to their pedagogical expertise and growth.	Application of activity theory to e-learning practice & research might potentially be a subject of future study. Because higher education managers & administrators are heavily involved with online teaching, particularly with regard to OPMs, activity theory may prove to be a very useful technique for analyzing & resolving problems in online education like relating to faculty schedule, instructional designers & subject matter knowledge, faculty training in pedagogy & technology when entering online education, etc.
A8	Curum and Khedo (2021)	SRL cognitive load principles for mobile learning. Cognitive load theories. Cognitive information processing theory (Mayer, 2003). Levels of processing theory (Craik & LockHart, 1972). Pedagogy wheel ADDIE universal design for mobile learning. ARCS model of motivational design theories. Mobile human-computer interaction. 4C/ID model (Merriënboer et al., 2002). Merrill's first principles of instruction.	Building an effective mobile learning system which can be accessible anytime and anywhere to allow students to learn depending on their learning style and pedagogical reflections, real behavior and surrounding situations is tough. It has been noted that nowadays.	Mobile learning systems are incapable of using the vast variety of potent capabilities that current mobile devices provide in order to deliver adequately customized mobile learning components.	Adapting mobile material distribution to current instructional design theories, including discrete multimedia elements for optimal learning performances, might provide the learner with more customizable options.	Adjusting learning material jointly with context-aware responses, cognitive modules, and design principles might define a better algorithm across mobile learning platforms and enable learners to focus more on their talents to achieve a positive learning performance.

Table A1 (Continued). Articles

Label	Article	Theories & IDM integration	Strengths/ contributions	Limitations & challenges	Potential implications	Gaps & future research
A9	Charbonneau-Gowdy et al. (2021)	ADDIE, the contemporary theory-based design	The structure involves two steps: 1) creating organized and contextualized instructional designs based on current learning theories, and 2) applying these structures to well-defined e-learning activities.	Our study sought to accomplish the latter by responding to this request constructively. The study may have limitations due to its small sample size and short duration.	This first attempt to put theory into practice online will need many analogous empirical research studies in many settings to determine its feasibility and endurance. The epidemic is impacting schooling in unidentified ways.	Many analogous empirical research initiatives in other contexts will be needed to evaluate this first online theory-to-practice attempt. Education is being impacted by the epidemic in unidentified ways.
A10	Padzil et al. (2021)	Isman IDM (2011)	Flipped classrooms and project-based learning may foster positive and innovative thinking and behavior in students.	This research focuses on students' comprehension of themes to assess the impact of design thinking abilities on knowledge growth via flipped classroom activities.	Incorporating design thinking and emphasizing the design process will equip students to handle modern difficulties.	Alongside this awareness, it is intended that this research will help to the creation of future students who are more competitive, creative, and analytical.
A11	Budhtranon et al. (2021)	Design thinking, SEP, constructivist learning theory, and project-based learning. These instructions and assessments led to student learning outcomes that include the knowledge,	Research developed an educational model for creative project production utilizing sufficiency economic philosophy, which integrates prosperity, community, environment, culture, & risk management for private vocational schools.	Further research is needed to survey government institutions in Bangkok or private vocational colleges outside of Bangkok, since this study is confined to private vocational schools in Bangkok.	This study has these effects. This study developed the conceptual framework for an educational model, which may be used to create new models and handbooks. The technique will be used by pupils at Bangkok's private vocational institutions.	This teaching paradigm may be used to current business disciplines, educational institutions offering new subjects, or establishing entrepreneur groups or incubators.
A12	(Diningrat et al., 2020)	Flipped classroom model by integrating problem-based instructional strategy.	This research integrates problem-based teaching method to provide a strong foundation for the flipped classroom concept.	Many instructors struggled to create coherent instructional designs for flipped classroom learning activities.	The framework offers practical direction for instructors and instructional designers implementing the flipped classroom using the problem-based approach.	The framework is basic, usable, and adaptable in higher education, thus it may help instructors develop flipped classroom teaching models. As the proposed conceptual framework is nascent, future researchers should perform more experiments to investigate its usefulness.
A13	Pretorius et al. (2020)	Instructional humor process theory (IHPT). Lincoln and Guba's (1985) model of trustworthiness.	to investigate the function and influence of purposeful humor in two higher education classes.	The right use of humor may boost student morale and calm them. A comfortable and safe atmosphere leads to student happiness.	A sequential mixed-methods approach with a comprehensive qualitative data-collection method was less appealing to us due to time restrictions. We suggest that students' previous understanding of study & lecture aims may have impacted their replies.	We suggest doing a future study effort, but mindful of ethical and methodological concerns from not alerting respondents about lecture aims.

Table A1 (Continued). Articles

Label	Article	Theories & IDM integration	Strengths/ contributions	Limitations & challenges	Potential implications	Gaps & future research
A14	Zain and Sailin (2020)	Flipped learning approach	To define important components of flipped learning to provide a framework for instructional designers.	Based only on meaningful learning theory and its benefits, turning university lectures into flipped learning is limited. Flipped learning lessons must be tailored to specific topics, learners, instructors, and teaching styles, although sharing the same information.	Results from this project are expected to significantly alter higher education course delivery.	The flipped learning strategy emphasizes self-directed learning rather than direct information delivery.
A15	de Leeuw et al. (2019)	9-step model	Our goal was to (1) develop an evidence-based instructional design model for postgraduate medical professionals after graduation, and (2) compare it to current methods for evaluating and developing PGMDE.	The postgraduate MED model's major drawback is educators' interpretations of each level. This concept suggests a curriculum may be built in a few stages.	The postgraduate MED model is based on existing prevalent models and should give suitable foundations for digital education. More research is needed, and a digital education design assessment tool should be validated.	It is unclear how to apply the digital education intervention into learners' working lives and what results can be utilized for success. Adopting digital schooling is similar to implementing innovations.
A16	(Cárcamo, Andrea et al., 2019)	A design-based research project the emergent models (Gravemeijer, 2004b)	Aimed to raise awareness of a procedure for building a LIT for spanning set and span using emergent model and mathematical modelling heuristics. This suggestion is crucial for promoting Linear Algebra curriculum innovation.	Additionally, emergent models (Gravemeijer, 2004b) helped students transition from preconceived notions to formal reasoning about spanning sets and spans.	The use of mathematical modelling helps pupils apply their vector knowledge.	Teachers should consider the need of teaching pupils span and spanning set ideas, as well as mathematical modelling abilities, to enable effective involvement in society (Lesh & Caylos, 2007).
A17	Ou et al. (2019)	A seven-principal model	This research found that students highly valued the seven-principal model video lessons in the online KBAI course for its video lectures, interactive activities, adaptive feedback from intelligent coaches, and overall value in learning.	Researchers used instructional design ideas to create a model and assessed it using comments from online graduate students.	The research examined student evaluations of computer science video classes only based on a seven-principal approach.	Learning analytics on students' video lesson utilization may be used in future study. The design model's usefulness may be studied in fields outside computer science.

Table A1 (Continued). Articles

Label	Article	Theories & IDM integration	Strengths/ contributions	Limitations & challenges	Potential implications	Gaps & future research
A18	Guney (2019)	CLT, distributed cognition & activity theory, HCI and interface designs, UCD, analyzing user needs and problem analysis	Interaction design aims to provide effective instructional resources that help learners achieve their goals using instructional and visual design approaches.	interactive design for visual learning may include real items, time, and behavior.	screen design variables, density, nodes, links, photos, typefaces, and icons should be part of interaction design.	Researchers, designers, and lecturers in IDT should know UCD assessment methodologies. The methodologies include interface design tactics and successful instructional and visual designs using ID models for learners and interface designs.
A19	Ghani et al. (2018)	ADDIE	ADDIE-based e-learning course development. Comprehensively stated stages and processes may be altered by future researchers.	Adopting an appropriate instructional model is crucial for generating successful education and training materials. This involves a methodical procedure.	This research may direct language learning materials, especially for specialized reasons.	Thus, the researchers recommend using ADDIE model to design and construct e-learning courses and educational programs.
A20	Lieser et al. (2018)	Bybee's (1993) 5Es instructional model, the 4Es model includes the learning dimensions of engagement, exploration, explanation, and extension (Jenkins et al. 2009).	Develop best practices for incorporating webinar technology in medical education and help faculty integrate course goals with webinar activities.	Such a learning community provides more opportunity to foster multidisciplinary, professional, and global partnerships that contribute to the global growth of learning ecosystems.	This article examines how students and instructors interact through webinar. We want to promote teaching and learning in medical education using webinars (Rogers 2000) and synchronous communication, adding a human touch to e-learning (Shotsberger, 2000).	Open conversations are needed to get quick feedback on webinar efficacy, e-learning module utility, and 4Es Learning Cycle applications during or after a webinar. Offer students and instructors opportunity to learn about webinar pedagogy.
A21	Baldwin et al. (2018)	ADDIE model & grounded theory	The paper explores practical ramifications and future research prospects. The ADDIE approach might be adopted (or, in some circumstances, restored) to aid teachers in the design of online courses.	Additional data may restrict the fit and modifiability of this research. Through continual data comparison and theoretical saturation, we aimed to mitigate these difficulties during data collection and analysis.	Professional development might teach teachers how to set successful course goals, assess the learning environment and their students, generate material, choose acceptable media for online courses, and use learning management systems effectively.	Future study might examine if informal design theory can help new online course designers. Sharing this knowledge with instructors producing online courses may boost quality and confidence in them.
A22	Daniel et al. (2018)	4-C/ID & cognitive psychology theory	In this paper, we attempt to make 4-C/ID model more broadly accessible to medical educators: We present an entire case presentation curriculum outline, with a significant level of detail supported by multiple concrete examples.	To date, the 4-C/ID model has not been widely implemented in medical education, despite articles that highlight the benefits of whole task learning	To build complicated skills, the 4-C/ID paradigm requires educators to teach case presentations as a cohesive activity rather of individual elements. Faculty must grasp why entire task methods improve learning for implementation to succeed. Faculty development is necessary.	The whole curriculum plan may aid in transferring and implementing the case presentation curriculum and applying 4-C/ID to additional complicated medical education skills.

Table A1 (Continued). Articles

Label	Article	Theories & IDM integration	Strengths/ contributions	Limitations & challenges	Potential implications	Gaps & future research
A23	Cheung (2016)	Gagne's nine events of instruction	Designing curricular components using an instructional design paradigm ensures a consistent learning experience for all students.	Additional educational paradigms for procedural teaching include Mayer's cognitive load theory-based method, Peyton's 4-step approach, and Merrill's First Principles of Instruction.	This structure, in turn, helps identify the specific program components that are effective and those that require improvement. While this article uses Gagne's theory of instruction.	Further study is needed to assess the effect that implementing an instructional design model into a teaching program has on workplace (that is, clinical) performance, such as the effect on procedural complication rates or speed.
A24	Juan et al. (2015)	ARCS motivation model	The research evaluated green building education efficacy using an ARCS motivation test and a green building exam.	The research suggests that game-based green building education is viable and possibly beneficial, but it has constraints and problems. Continuous improvements are needed to achieve optimum balance between instructional and recreational goals.	Experimental participants showed great learning motivation, indicating the game was practical, amusing, and effective in promoting green building knowledge, resulting in high satisfaction.	With the rise of consumer electronics, instructional video games provided through PC or smartphone are another viable approach to give game-based teaching, including green construction. Thus, green construction principles may be easily and swiftly disseminated.
A25	Azwin et al. (2014)	ADDIE behaviorist, cognitivist and particularly constructivist	This research outlines the creation of a self-access internet-based English module for engineering education's Student Centered Learning (SCL).	Interactivity should consider learners' subject material to maximize language competence for academic and engineering reasons.	To promote active learning in SCL environments, ESL instructors must possess technical competency. Therefore, technology-driven continual professional development is recommended.	Research on ESL educators' instruction in other domains should focus on technical competence to identify the requirements and sources for ICT integration professional development.

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