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Unraveling the transformative role of Artificial Intelligence in design thinking proficiency among instructional designers

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Abstract

This study investigates the factors that influence the integration of Artificial Intelligence (AI) in design thinking among instructional designers. It explores the perceptions of instructional designers regarding the impact of AI on design thinking and the challenges associated with its integration. The research employs quantitative methodology, utilizing an online survey questionnaire distributed to 152 instructional designers. Descriptive and MANOVA tests are used for analysis. The findings shed light on several influential factors including gender, education level, years of experience, awareness of AI implications, subjective expertise, AI actual integration, and self-confidence. Gender differences are observed, with male instructional designers perceiving a higher impact of AI compared to their female counterparts. Education level plays a significant role, with participants holding bachelor's degrees or PhDs demonstrating a deeper understanding of AI's potential in design thinking. The study concludes that addressing gender differences, enhancing education and awareness, supporting early-career professionals, promoting hands-on experience, and building self-confidence is crucial for successful AI integration in design thinking.

***Keywords**:* AI; artificial intelligence; design thinking; instructional design; instructional designers

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1. Introduction

The recent advancements in Artificial Intelligence (AI) development have reverberated across multiple facets of life, permeating fields such as education, business, and beyond, fundamentally transforming the way we think, learn, operate, and thrive in an increasingly intelligent and interconnected world (Hassan et al., 2022; Jiang & Pang, 2023; Kuo et al., 2021; Vendraminelli et al., 2022; Lee et al., 2023).

With no exceptions, AI has transformed Instructional Design (ID) and Design Thinking (DT), making them more efficient, personalized, and innovative in meeting the needs of learners in the current digital age (Markauskaite et al., 2022; Rajaram, 2023; Gonzalez-Mohino et al., 2023). For instance, AI possesses the capacity to transform the field of instructional design and holds the promise of improving learning outcomes and enabling personalized instruction (Farrell, 2020; Jiang & Pang, 2023; Kashive et al., 2020; Lin et al., 2022; Walter, 2024). When it comes to integrating AI into instructional design processes, AI can play a crucial role in enhancing assessment techniques, offering valuable feedback to instructional designers, and elevating their contributions to the development of effective instructional designs. By leveraging AI, instructional designers can use advanced technologies to create more engaging and tailored learning experiences for learners (Farrell, 2020; Kashive et al., 2020; Lin et al., 2022).

Similarly, the emergence of AI has brought forth a realm of possibilities for designers embarking on the design thinking journey. With AI, design thinkers gain access to an array of powerful tools and resources that serve as catalysts for creativity and innovation (Deitte & Omary, 2019; Vendraminelli et al., 2022). Through this partnership between human ingenuity and AI capabilities, designers can unlock new realms of problem-solving and solution generation. As highlighted by many researchers, the utilization of AI has the potential to revolutionize the design thinking process by amplifying designers' abilities to envision, create, and refine groundbreaking solutions (Deitte & Omary, 2019; Palacin-Silva et al., 2017; Tilbe, 2022; Verganti et al., 2020; Vendraminelli et al., 2022; Xu et al., 2020). By embracing AI's potential, designers can navigate uncharted territories, uncover novel insights, and bring forth impactful solutions that address the complex challenges of our ever-evolving world.

Design thinking, as a human-centered problem-solving approach, has gained considerable recognition and prominence within the field of instructional design (Hassan et al., 2022). Its emphasis on empathy, collaboration, and iterative prototyping offers a promising framework for addressing complex challenges and creating meaningful learning experiences (Heldal, 2023; Deitte & Omary, 2019; Foster, 2021; Hassan et al., 2022; IDF, 2022; Liedtka, 2023; Verganti, 2020; Weller, 2019). However, there is a need to evaluate the proficiency of instructional designers in applying design thinking principles and techniques to ensure the effectiveness and quality of their work. In design thinking, AI aids in idea generation, prototyping, and simulation, accelerating the iteration process and facilitating rapid experimentation. AI also enhances user experiences through intelligent interfaces and adaptive interactions.

1.1. Purpose of study

The purpose of this study, therefore, is to conduct a comprehensive evaluation of the transformative role of AI in design thinking proficiency among instructional designers. The findings of this study hold several implications for the field of instructional design and design thinking. By shedding light on the effectiveness of self-reported measures and performance metrics in evaluating design thinking proficiency, the study contributes to the ongoing discussions on assessment practices in instructional design education and professional development. Furthermore, the results will inform instructional design professionals about the strengths and limitations of different assessment approaches, enabling them to make informed decisions in assessing and developing design thinking skills.

1.2. Conceptual background

Design thinking and instructional design are two interconnected fields that play a crucial role in shaping effective learning experiences. Both disciplines have seen significant advancements in recent years, thanks to the integration of AI technologies. Design thinking emphasizes a human-centered approach, aiming to understand users' needs, generate innovative ideas, and develop solutions that address complex problems. On the other hand, instructional design focuses on creating engaging and impactful learning environments by applying systematic instructional strategies and principles.

Design thinking originated in the field of design but has since been applied to various disciplines, including business, education, and technology (Campos Zabala, 2023; Trunk et al., 2020; Jiang & Pang, 2023; Kuo et al., 2021; Foster, 2021; Hassan et al., 2022; Kannengiesser & Gero, 2019; Liedtka, 2023). In this regard, Foster (2021) argues that individuals "may perceive design thinking, a relatively new and complex multistep, iterative process, to be beyond their capabilities or time/resource constraints. This experiential exercise provides a relatively easy, low-investment approach to incorporating an overview of design thinking into any course. Hence, " design thinking... helps us take a step back and remain open-minded, consider alternative points of view, watch for bias, recognize adjacent possibilities, and innovate" (Weller, 2019). Further, design thinking offers a valuable framework, mindset, and set of processes and tools that assist in navigating the intricate and uncertain nature of digital transformation processes, particularly in situations where analytical thinking proves inadequate. (Vendraminelli et al., 2022).

According to the Interaction Design Foundation (IDF, 2022), design thinking is an iterative and non-linear approach that teams employ to gain insights into users, question existing assumptions, redefine problems, and generate innovative solutions that can be prototyped and tested. Moreover, design thinking exerted a significant and positive influence on idea creativity, particularly in terms of novelty and value, as well as on the product creativity of AI applications, specifically about functionality and elaboration (Chang & Tsai, 2021).

Design thinking is a problem-solving approach that focuses on understanding and addressing the needs and challenges of users or customers (Jiang & Pang, 2023; Kuo et al., 2021; Foster, 2021; Hassan et al., 2022; Palacin-Silva et al., 2017; IDF, 2022; Liedtka, 2023). "While traditional problem-solving is a linear and structured approach, design thinking is set by a human-centered innovation process which leads to better products and services" (Kuo et al., 2021).

It is a human-centered and iterative process that combines empathy, creativity, and rationality to develop innovative solutions (Deitte & Omary, 2019; Foster, 2021; IDF, 2022; Jiang & Pang, 2023; Kannengiesser & Gero, 2019; Liedtka, 2023; Verganti, 2020; Weller, 2019). At its core, DT involves a deep understanding of the people for whom a solution is being designed (Foster, 2021; IDF, 2022; Weller, 2019). It emphasizes empathy, requiring designers to put themselves in the shoes of the users to gain insights into their needs, desires, and experiences (Foster, 2021; IDF, 2022; Liedtka, 2023).

According to IDF (2022) and Deitte & Omary (2019), the design thinking process involves multiple stages for instructional designers to create effective solutions. The empathize stage focuses on understanding users' needs, goals, and challenges through observation, interviews, and immersion. In the define stage, designers analyze collected data to identify core problems or opportunities and reframe them into clear statements. Ideation involves generating diverse and numerous ideas through open thinking and collaboration. Prototyping translates selected ideas into tangible representations like sketches or models. Testing involves gathering user feedback to validate and refine the solutions iteratively.

Design thinking is characterized by its iterative nature, meaning that the stages are often revisited and repeated as new insights and feedback emerge. This iterative process allows for continuous learning, adaptation, and improvement of the solution (IDF, 2022). Consequently, design thinking encourages a user-centered mindset, creative problem-solving, collaboration, and an openness to experimentation and learning (Deitte & Omary, 2019; Kuo et al., 2021; Palacin-Silva et al., 2017; Jiang & Pang, 2023). It has proven to be a valuable approach to developing innovative and user-centric solutions across various fields and industries.

The integration of AI in design thinking refers to leveraging AI technologies and tools to enhance and augment the design thinking process. AI can be utilized to support and empower designers in various stages of design thinking, enabling them to generate more innovative and effective solutions (Kuo et al., 2021; Tilbe, 2022; Verganti et al., 2020; Xu et al., 2020). "AI thus reinforces the principles of design thinking, namely: being people-centered, abductive, and iterative. AI enables the creation of solutions that are more highly user-centered than human-based approaches" (Verganti et al., 2020).

There are several academic research papers available on the topic of AI and design thinking. The integration of AI in design thinking aims to augment the capabilities of designers, improve the quality and efficiency of the design process, and unlock new possibilities for innovation (Chang & Tsai, 2021; Kuo et al., 2021; Palacin-Silva et al., 2017; Tilbe, 2022; Verganti et al., 2020). Furthermore, AI complements human creativity and expertise with AI-driven insights, automation, and data-driven decision-making, leading to more effective and impactful design solutions (Kuo et al., 2021; Deitte & Omary, 2019; Palacin-Silva et al., 2017; Tilbe, 2022; Xu et al., 2020). Moreover, design thinking experiences have produced positive outcomes, garnered favorable feedback, and instilled a heightened appreciation for the design thinking approach (Hassan et al., 2022; Jiang & Pang, 2023; Palacin-Silva et al., 2017; Lee, 2020).

Hence, another body of literature investigates factors that contribute to shaping the designers' design thinking itself. For instance, the contextual background of the problem and the users' values and ethics of the solution, such as culture, social, environment, preferences, emotions, and moral implications (Linke, 2017; McKinsey & Company, 2022; Rösch et al., 2023). Another contributing factor is the technology available or feasible to create the solution, such as the tools, platforms, and systems (McKinsey & Company, 2022). Furthermore, a hands-on and real-experience approach to prototyping and testing offers a matching method to rational problem-solving methods (Foster, 2021). Beligatamulla et al., (2019) claim that educators of design thinking have a foundation for a teaching approach that goes beyond different fields and allows for cooperation and continuous improvement of design thinking education. Moreover, concerning awareness of AI implications in design, Guzdial et al., (2019) found that the level of designers' awareness of AI as having possible benefits for their design work depends on how they wanted the AI to help them. Also, Chong et al., (2022) argue that "designers' self-confidence and competence have very different impacts on their collaborative performance depending on the accuracy of AI".

The research problem addressed in this study is the investigation of how AI can enhance the proficiency of instructional designers in applying design thinking principles and techniques. Design thinking has gained recognition and prominence in instructional design due to its human-centered problem-solving approach, which emphasizes empathy, collaboration, and iterative prototyping to create meaningful learning experiences.

While there is existing research on the application of design thinking in instructional design, there is a research gap regarding the specific integration of AI technologies and their impact on instructional designers' proficiency in this context. This gap needs to be addressed. Therefore, the study aims to assess the current proficiency level of instructional designers in utilizing design thinking and explore how AI can augment and enhance their abilities in this area. Additionally, the study seeks to identify the potential benefits, challenges, and opportunities that AI brings to the design thinking processes within the instructional design framework. Ethical considerations and potential limitations associated with the use of AI in this context will also be uncovered in the study.

Within the design thinking process, AI plays a crucial role in various aspects such as idea generation, prototyping, simulation, and enhancing user experiences through intelligent interfaces and adaptive interactions. Therefore, the objective of this study is to investigate the contribution of AI technologies and tools to the application of design thinking principles and techniques by instructional designers. By exploring this relationship, the study aims to provide insights into the transformative impact of AI on the proficiency of instructional designers in design thinking.

This study contributes to a deeper understanding of the potential transformative power of AI and its implications for instructional design. The findings will contribute to the existing knowledge and provide insights into the benefits, challenges, and perceptions associated with integrating AI into the design thinking process. Additionally, the study will examine how demographic factors may influence instructional designers' approach to design thinking.

1.3. Research questions

The current study aims to investigate the transformative impact of AI on the design thinking proficiency of instructional designers. To address this research question, the study proposes several sub-questions:

- RQ1: How has AI influenced the design thinking process (empathize, define, ideate, prototype, test) of instructional designers based on their personal experiences?
- RQ2: What challenges have instructional designers encountered when integrating AI into the design thinking process?
- RQ3: How do instructional designers perceive the impact of AI on design thinking?
- RQ4: What is the influence of demographic factors on the design thinking processes of instructional designers?

2. Methods and materials

2.1. Research design

The current study follows a quantitative methodology approach. The current study incorporates a survey questionnaire to investigate the impact of AI on the proficiency of instructional designers in design thinking. This approach helps to uncover commonalities, differences, and unique perspectives related to the role of AI in design thinking proficiency among instructional designers.

2.2. Participation

The sample of instructional designers in this study was selected through a process that involved the use of an online survey questionnaire and recruitment through personal connections. The researchers aimed to gather data from instructional designers who have experience and knowledge in design thinking and its integration with AI technologies.

2.3. Data collection instrument

Once potential participants were identified, they were invited to participate in the study by completing an online survey questionnaire. The questionnaire was designed to collect data on various factors related to AI integration in design thinking, as well as participants' demographic information, education level, years of experience, and subjective expertise in AI applications.

The use of an online survey allowed for convenient data collection, as participants could complete the questionnaire at their convenience. It also facilitated the inclusion of participants from diverse geographical locations.

2.4. Data analysis

The data analysis for this study was conducted using SPSS (V. 22). The procedures followed include data checking for missing values, and outliers, conducting descriptive statistics such as means, standard deviations, frequencies, and percentages, employing inferential statistics, particularly Multivariate Analysis of Variance (MANOVA).

2.4.1. Validity and reliability

To validate the survey questionnaire used in the study, three subject matter experts were consulted. The feedback and suggestions provided by the experts were incorporated into the questionnaire to enhance its content validity. To assess the reliability of the questionnaire, internal consistency was measured using Cronbach's alpha coefficient. The obtained Cronbach's alpha value was .76, which indicates an acceptable level of internal consistency. This suggests that the items within the questionnaire are correlated and measure the same underlying construct consistently.

2.5. Ethical consideration

The study was carried out with honesty, openness, and intellectual integrity by the researchers. Rigidly, impartially, and without bias or manipulation, data were gathered, analyzed, and interpreted. The study's results are fairly represented in the published conclusions, which clearly recognize any shortcomings or ambiguities.

3. Results

3.1. Participants' demographics

Table 1 presents the data collected from 152 instructional designers, providing insights into their demographics and characteristics.

Table 1

Participants' demographics (N=152)

Demographics	Group	N	%
Gender	- Male	88	57.9
	- Female	64	42.1
Education Level	- Diploma or Short Courses	20	13.2
	- Bachelor's Degree	48	31.6
	- Master's Degree	68	44.7
	- Ph.D.	16	10.5
Years of Experience in ID	- Less than 10 years	112	73.7
	- From 10 to 20 years	26	17.1
	- More than 20 years	14	9.2
Awareness of AI in ID	- No	62	40.8
	- To some extent	64	42.1
	- Yes	26	17.1
Subjective expertise in AI applications in ID	- Limited	42	27.6
	- Basic	38	25.0
	- Intermediate	44	28.9
	- Advanced	28	18.4
The current integration of AI in ID	- No	88	57.9
	- Yes	64	42.1
Self-confidence in integrating AI in DT	- Somewhat confident	18	11.8
	- Moderately confident	74	48.7
	- Very confident	44	28.9
	- Extremely confident	16	10.5

The participants represented diverse backgrounds and characteristics, including gender, education level, years of experience in instructional design, awareness of AI in instructional design, subjective expertise of AI applications in instructional design, current integration of AI in instructional design, and self-confidence in integrating AI in design thinking.

Among the participants, the majority were male, accounting for 57.9% of the total. In terms of educational attainment, 44.7% of the participants held a master's degree. Regarding professional experience, 73.7% of the instructional designers had less than 10 years of experience in instructional design.

About awareness of AI in instructional design, 40.8% of the participants reported not being aware, while 42.1% indicated some level of awareness, and 17.1% reported being fully aware. The participants also demonstrated varying levels of subjective expertise in AI applications within instructional design, with intermediate expertise being the most common at 28.9%, followed by basic expertise at 25%, advanced expertise at 18.4%, and limited expertise at 27.6%.

Regarding the integration of AI in instructional design, 57.9% of the participants had not yet integrated AI into their practices, while 42.1% had already done so. Additionally, the participants exhibited different levels of self-confidence in integrating AI within the design thinking process. Moderately confident was the most common response, accounting for 48.7% of participants, followed by very confident (28.9%), extremely confident (10.5%), and somewhat confident (11.8%).

RQ1: How has AI impacted the instructional designers' design thinking process (empathize, define, ideate, prototype, test)?

The findings presented in Table 2 reveal the participants' perceptions of the impact of AI on their design thinking process across different stages.

Table 2

AI impacts on design thinking

Stage	M	SD
1. User empathy	4.00	0.73
2. Problem definition	4.00	0.75
3. Idea generation	4.05	0.80
4. Prototyping	4.00	0.92
5. Testing and feedback	3.86	0.93
Total perceived AI in design thinking	3.98	0.71

The results indicate that the participants attributed a positive impact to AI in all stages of design thinking. The highest mean rating was observed for idea generation, with a mean score of 4.05 and a standard deviation of .796. This was followed by user empathy and problem definition, both receiving a mean score of 4.00, with standard deviations of .728 and .746 respectively. The stage of prototyping received a mean score of 4.00, with a standard deviation of .921. Lastly, the stage of testing and feedback obtained a mean score of 3.86, with a standard deviation of .931.

These results suggest that the participants perceived AI as particularly beneficial in idea generation, user empathy, problem definition, and prototyping stages of the design thinking process. The slightly lower mean rating for the testing and feedback stage indicates that while still positive, the participants perceived AI to have a slightly lesser impact in this stage compared to the others. The standard deviations reflect the variability in responses, indicating the range of participants' perceptions within each stage.

RQ2: What challenges have instructional designers encountered when integrating AI into the design thinking process?

The findings presented in Table 3 reveal the challenges faced by the participants in various factors related to integrating AI in instructional design. The results indicate that the participants reported moderate to high levels of challenges across all factors. The highest mean rating was observed for limited access to AI tools or technologies, with a mean score of 3.83 and a standard deviation of .912. This was followed by the rise in material costs, which received a mean score of 3.76, with a standard deviation of .988. Difficulty in identifying appropriate AI applications in instructional design was rated as the next highest challenge, with a mean score of 3.68 and a standard deviation of .924. The factors of resistance from stakeholders or learners and lack of AI knowledge and skills obtained mean scores of 3.66 and 3.61, respectively, with standard deviations of .89 and 1.13.

Table 3

Challenges to AI integrating into design thinking

Challenge	M	SD
1. Limited access to AI tools or technologies	3.83	0.91
2. The rise in material costs	3.76	0.99
3. Difficulty in identifying appropriate AI applications in ID	3.68	0.92
4. Resistance from stakeholders or learners	3.66	0.89
5. Lack of AI knowledge and skills	3.61	1.13
Total perceived challenges	3.71	0.67

These results imply that the participants encountered challenges related to limited access to AI tools and technologies, which can hinder their ability to effectively integrate AI in instructional design. The rise in material costs was also reported as a significant challenge, suggesting that financial considerations may pose obstacles to incorporating AI in instructional design practices. Difficulty in identifying appropriate AI applications in instructional design highlights the need for further guidance and support in leveraging AI technologies effectively. Resistance from stakeholders or learners was another challenge identified, suggesting potential barriers to adopting AI-driven approaches. Lastly, the lack of AI knowledge and skills among instructional designers emerged as a challenge, emphasizing the importance of training and professional development in this area.

RQ3: How do instructional designers project the impact of AI on design thinking?

The findings presented in Table 4 reveal the participants' projections regarding the impact of AI on different stages of design thinking. The results indicate that the participants anticipated a positive impact of AI across all stages. The highest mean rating was observed for idea generation, with a mean score of 4.33 and a standard deviation of 0.77. This was followed by prototyping, which received a mean score of 4.25, with a standard deviation of 0.69. The stage of problem definition was rated as the next highest in terms of anticipated impact, with a mean score of 4.12 and a standard deviation of 0.69. Testing and feedback received a mean score of 4.11, with a standard deviation of 0.82. The lowest mean rating was observed for user empathy, with a mean score of 3.84 and a standard deviation of 1.03.

Table 4

Projection of AI impacts on design thinking

Stage	M	SD
1. User empathy	3.84	1.03
2. Problem definition	4.12	0.69
3. Idea generation	4.33	0.77
4. Prototyping	4.25	0.69
5. Testing and feedback	4.11	0.82
Total projected impact of AI on DT	4.13	0.57

These results suggest that the participants perceived AI as having the potential to positively impact various stages of design thinking. Particularly, participants projected that AI would significantly enhance idea generation and prototyping processes. The anticipated impact on problem definition testing and feedback stages also indicates the participants' optimism about the contributions of AI. However, it is worth noting that the stage of user empathy received a slightly lower mean rating, indicating that participants may perceive AI to have a relatively lesser impact on this aspect of design thinking.

RQ4: What is the impact of demographics on the instructional designers' design thinking processes?

A MANOVA test was conducted to examine the influence of participant demographics on the integration of AI into design thinking. Levene's Test was used to assess the equality of variances between groups. The results of Levene's Test revealed that all three p-values were less than 0.001 ($p = 0.000$), indicating that the variances of the groups significantly differed for the total perceived AI impact on design thinking, the total projected AI impact on design thinking, and the total perceived challenges.

Table 5 presents the results of the MANOVA tests, which investigated the relationship between participant demographics and the integration of AI into design thinking. The analysis considered various factors, including gender, education level, years of experience, awareness of AI, subjective expertise in AI applications, confidence in integrating AI, and actual AI integration.

Table 5
MANOVA Tests

Effect		Value	F	Hypothesis df	Error df	Sig.
1. Gender	Wilks' Lambda	.69	15.96	3.000	105.000	.000
2. Education Level		.01	146.65	9.000	255.693	.000
3. Years of Experience		.07	101.88	6.000	210.000	.000
4. Awareness		.74	12.20	3.000	105.000	.000
5. Subjective expertise		.08	53.11	9.000	255.693	.000
6. AI integration		.20	144.12	3.000	105.000	.000
7. Confidence		.04	150.55	6.000	210.000	.000

The findings revealed significant relationships between these demographic variables and AI integration. Specifically, gender ($F = 15.96$, $p < 0.001$), education level ($F = 146.65$, $p < 0.001$), years of experience ($F = 101.88$, $p < 0.001$), awareness of AI ($F = 12.20$, $p < 0.001$), subjective expertise ($F = 53.11$, $p < 0.001$), and confidence ($F = 150.55$, $p < 0.001$) all exerted substantial influences on participants' engagement in AI integration. These findings highlight the importance of considering participant demographics in promoting effective and inclusive AI integration practices in instructional design.

Table 6 presents the results of between-subjects effects tests conducted to examine the impact of various factors on AI integration in design thinking. The findings revealed significant effects for several factors on AI integration in design thinking.

Table 6
Tests of Between-Subjects Effects

Source	DV	F	Sig.	η2
Gender	Total perceived impact of AI on DT	29.18	.000	.214
	Total projected impact of AI on DT	8.755	.004	.076
	Total perceived challenges	4.610	.034	.041
Education Level	Total perceived impact of AI on DT	222.8	.000	.862
	Total projected impact of AI on DT	79.26	.000	.690
	Total perceived challenges	78.63	.000	.688
Years of Experience	Total perceived impact of AI on DT	186.8	.000	.777
	Total projected impact of AI on DT	15.40	.000	.224

Source	DV	F	Sig.	η2
	Total perceived challenges	13.68	.000	.204
Awareness	Total perceived impact of AI on DT	5.84	.017	.052
	Total projected impact of AI on DT	19.46	.000	.154
	Total perceived challenges	1.440	.233	.013
Subjective expertise	Total perceived impact of AI on DT	102.3	.000	.742
	Total projected impact of AI on DT	5.39	.002	.131
	Total perceived challenges	16.30	.000	.314
AI integration	Total perceived impact of AI on DT	145.9	.000	.577
	Total projected impact of AI on DT	10.94	.001	.093
	Total perceived challenges	35.99	.000	.252
Self-confidence	Total perceived impact of AI on DT	475.5	.000	.899
	Total projected impact of AI on DT	25.34	.000	.321
	Total perceived challenges	9.904	.000	.156

Gender had a significant effect on AI integration, as indicated by significant F-values for the total perceived impact of AI on design thinking (F = 29.18, p < 0.001), total projected impact of AI on design thinking (F = 8.755, p = 0.004), and total perceived challenges (F = 4.610, p = 0.034). Males had higher mean scores for the total perceived impact of AI on design thinking (4.05) compared to females (3.87). Similarly, males had slightly higher mean scores for the total projected impact of AI on design thinking (4.16) than females (4.14). Regarding total perceived challenges, males had a higher mean score (3.80) compared to females (3.65).

Education level demonstrated significant effects on AI integration, with significant F-values for the total perceived impact of AI on design thinking (F = 222.8, p < 0.001), the total projected impact of AI on design thinking (F = 79.26, p < 0.001), and total perceived challenges (F = 78.63, p < 0.001). These results indicate that different education levels influenced the extent of AI integration. The mean scores varied based on participants' education levels. Participants with a bachelor's degree (4.18) and a Ph.D. (3.89) had higher mean scores for the total perceived impact of AI on design thinking compared to those with a diploma or short courses (4.00) or a master's degree (3.93). For the total projected impact of AI on design thinking, participants with a Ph.D. (4.49) and a master's degree (4.18) had higher mean scores compared to those with a diploma or short courses (3.91) or a bachelor's degree (3.98). In terms of total perceived challenges, participants with a diploma or short courses (3.80) had the highest mean score, followed by those with a master's degree (3.75), a Ph.D. (3.74), and a bachelor's degree (3.68).

Years of experience in instructional design had a significant impact on AI integration, with significant effects on the total perceived impact of AI on design thinking (F = 186.8, p < 0.001), total projected impact of AI on design thinking (F = 15.40, p < 0.001), and total perceived challenges (F = 13.68, p < 0.001). Participants with varying years of experience showed differences in their engagement with AI integration. The mean scores varied based on participants' years of experience. For the total perceived impact of AI on design thinking, participants with less than 10 years of experience had a mean score of 3.99, those with 10 to 20 years had a mean score of 3.98, and those with more than 20 years had a slightly lower mean score of 3.91. Regarding the total projected impact of AI on design thinking, participants with less than 10 years of experience had the highest mean score of 4.18, followed by those with 10 to 20 years (4.13), and more than 20 years (4.06). For total perceived challenges, participants with less than 10 years of experience had the highest mean score of 3.820, followed by those with 10 to 20 years (3.62), and more than 20 years (3.57).

Awareness of AI in design thinking yielded significant effects only for the total perceived impact of AI on design thinking (F = 5.84, p = 0.017) and the total projected impact of AI on design thinking (F = 19.46, p < 0.001). Participants who reported "No" had the highest mean score for the total perceived impact of AI on design thinking

(4.21), followed by those who reported "To some extent" awareness (3.81), and those who reported "Yes" awareness (3.72).

In terms of the total projected impact of AI on design thinking, participants who reported "No" had the highest mean score (4.27), followed by those who reported "To some extent" awareness (4.07), and those who reported "Yes" awareness (4.00).

Subjective expertise regarding AI applications had significant effects on the total perceived impact of AI on design thinking ($F = 102.3$, $p < 0.001$), the total projected impact of AI on design thinking ($F = 5.39$, $p = 0.002$), and total perceived challenges ($F = 16.30$, $p < 0.001$). Participants with an "Advanced" level of subjective expertise had the highest mean score for the total perceived impact of AI on design thinking (4.53), followed by those with a "Basic" level (3.91), those with an "Intermediate" level (3.88), and those with a "Limited" level (3.79). Regarding the total projected impact of AI on design thinking, participants with an "Advanced" level of subjective expertise had the highest mean score (4.30), followed by those with a "Basic" level (4.26), those with an "Intermediate" level (4.17), and those with a "Limited" level (3.93). For total perceived challenges, participants with an "Advanced" level of subjective expertise had the highest mean score (3.75), followed by those with a "Basic" level (3.82), those with an "Intermediate" level (3.65), and those with a "Limited" level (3.79).

The factor of AI integration itself had a significant effect on the total perceived impact of AI on design thinking ($F = 145.9$, $p < 0.001$), the total projected impact of AI on design thinking ($F = 10.94$, $p = 0.001$), and the total perceived challenges ($F = 35.99$, $p < 0.001$). Participants who have integrated AI technologies had a higher mean score for the total perceived impact of AI on design thinking (4.17) compared to those who have not integrated AI technologies (3.84). In terms of the total projected impact of AI on design thinking, participants who have integrated AI technologies had a mean score of 4.12, whereas those who have not integrated AI technologies had a slightly higher mean score (4.18). For total perceived challenges, participants who have integrated AI technologies had a mean score of 3.79, while those who have not integrated AI technologies had a lower mean score (3.70).

Self-confidence in integrating AI effectively impacts the design thinking process and exhibited significant effects for the total perceived AI in design thinking ($F = 475.5$, $p < 0.001$), total projected impact of AI on design thinking ($F = 25.34$, $p < 0.001$), and total perceived challenges ($F = 9.904$, $p < 0.001$). Higher confidence levels were associated with increased AI integration. Participants who reported being somewhat confident had the highest mean score for the total perceived impact of AI on design thinking (4.44), followed by those who were extremely confident (4.10), very confident (3.99), and moderately confident (3.82). In terms of the total projected impact of AI on design thinking, participants who expressed being extremely confident had the highest mean score (4.35), followed by those who were very confident (4.20), somewhat confident (4.12), and moderately confident (4.07). For the total perceived challenges, participants who reported being very confident had the highest mean score (4.08), followed by those who were somewhat confident (3.84), moderately confident (3.47), and extremely confident (3.50).

4. Discussion

The results of the current investigation shed light on the various factors that influence the integration of AI in design thinking. It is important to note that the findings are based on the specific sample used in this study and may not be universally applicable. However, they provide valuable insights into the relationship between different factors and AI integration.

Gender differences emerged in the perceived impact of AI on design thinking, with male instructional designers reporting higher mean scores compared to females. This suggests a potential difference in the receptiveness or optimism towards AI's potential in design thinking between genders. However, it is crucial to consider the influence of individual biases and contextual factors when interpreting these results (Linke, 2017; McKinsey & Company, 2022; Rösch et al., 2023).

Education level played a significant role in shaping the perception of AI's impact on design thinking. Participants with a bachelor's degree or a Ph.D. reported higher mean scores, indicating a deeper understanding and appreciation of AI's potential. This finding suggests that higher levels of education may contribute to a more informed perspective on the role of AI in design thinking (Beligatamulla et al., 2019).

Years of experience in instructional design also influenced perceptions of AI's impact. Participants with less than 10 years of experience generally reported higher mean scores, indicating a greater openness to integrating AI technologies. However, they also expressed higher levels of perceived challenges, highlighting the potential difficulties they may face in incorporating AI into their design processes. This finding underscores the importance of providing support and resources to help less experienced instructional designers navigate AI integration (Foster, 2021).

Awareness of AI implications in design thinking revealed interesting patterns. Participants with no awareness of AI reported higher mean scores for perceived and projected impact compared to those with some extent or full awareness. This suggests that individuals with limited awareness may have held higher expectations or beliefs about AI's potential impact. However, it is important to consider that awareness levels may influence designers' expectations and perspectives on AI's capabilities (Guzdial et al., 2019).

Subjective expertise in AI applications had a significant influence on perceptions of AI's impact and challenges. Participants with higher levels of subjective expertise, particularly those with an "Advanced" level, reported higher mean scores. This indicates that individuals who consider themselves more knowledgeable or skilled in AI applications have a greater perception of its impact on design thinking and may encounter fewer challenges. This finding emphasizes the value of expertise and hands-on experience in effectively integrating AI into design processes (Foster, 2021).

The factor of AI integration itself had a substantial effect on perceptions of AI's impact and challenges. Participants who had integrated AI technologies reported higher mean scores, indicating a more positive perception of AI's impact. This suggests that firsthand experience with AI integration enhances the perception of its benefits. However, participants who had not integrated AI technologies had slightly higher mean scores for the projected impact, potentially indicating more idealistic views of AI's future capabilities. The availability and feasibility of AI tools, platforms, and systems are also important considerations in design thinking (McKinsey & Company, 2022).

Self-confidence emerged as a significant factor influencing perceptions of AI's impact and challenges. Higher levels of self-confidence were associated with higher mean scores for perceived and projected impact, indicating that individuals who are more confident in their ability to integrate AI effectively perceive it to have a greater impact. Additionally, higher self-confidence was associated with lower mean scores for perceived challenges, suggesting that confidence may contribute to overcoming potential obstacles or difficulties associated with AI integration (Chong et al., 2022).

5. Conclusions

In conclusion, this study aims to contribute to our understanding of the factors influencing AI integration in design thinking and emphasize the importance of addressing gender differences, enhancing education and awareness, supporting early-career professionals, increasing awareness, and understanding, fostering collaboration and knowledge sharing, promoting hands-on experience, and building self-confidence to promote successful AI integration in design thinking processes.

Al-Zahrani, A. (2024). Unraveling the transformative role of Artificial Intelligence in design thinking proficiency among instructional designers. *World Journal on Educational Technology: Current Issues*. *16*(1), 25-39. https://doi.org/10.18844/wjet.v16i1.9075

These findings highlight the multifaceted nature of AI integration in design thinking. Factors such as gender, education level, experience, awareness, subjective expertise, AI integration, and self-confidence all play a role in shaping perceptions of AI's impact and challenges. Understanding these factors can inform the development of strategies to support instructional designers in effectively integrating AI technologies into their design processes. Future research should continue to explore these factors in different contexts and populations to further advance our understanding of AI integration in design thinking.

Several suggestions can be derived to promote AI integration in design thinking. Firstly, addressing gender differences by providing targeted education and awareness programs can help create a more inclusive and equitable environment that encourages both genders to embrace AI technologies. Secondly, enhancing education and training programs across different educational levels can equip individuals with the necessary knowledge and skills for effective AI integration. Supporting early-career professionals through mentorship and resources can help them navigate challenges and build confidence in AI integration.

Increasing awareness and understanding of AI capabilities through workshops and educational initiatives is crucial. Additionally, fostering collaboration and knowledge sharing among professionals with varying levels of expertise can contribute to a collective understanding and advancement of AI in design thinking. Promoting hands-on experience with AI technologies, such as through pilot projects or workshops, can demonstrate their benefits and encourage integration. Lastly, building self-confidence and providing support through continuous learning opportunities and mentorship can enhance individuals' skills and confidence in utilizing AI effectively.

The study's findings are limited by the characteristics of the sample used, which may not be representative of the entire population. The reliance on self-reported measures introduces the possibility of response biases. Additionally, the study's focus on specific factors leaves out other potentially relevant variables.

Future studies should aim to replicate the research with larger and more diverse samples to increase generalizability. Comparative analyses across different sectors or industries can provide insights into contextual variations in AI integration. Furthermore, exploring emerging AI technologies and their applications in design thinking can expand our understanding of their potential benefits.

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