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The Impact of Digital Competency based Training Program Based on Developing Thinking Design Practices among Palestinian Teachers

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Abstract: Objective: This study examines the effectiveness of a digital competency-based training program to enhance Palestinian teachers' design thinking practices through. **Methodology:** The research targeted teachers working under the Ministry of Education, assessing their performance before and after the program using an observation checklist. **Key Findings:** Findings revealed statistically significant differences at the α=0.01\alpha = 0.01 level between pre- and post-training scores, indicating the program's substantial impact on improving teachers' design thinking practices. **Conclusions:** The study recommends integrating digital competencies with the evolving roles of digital educators in competency-based training. Additionally, **Recommendations:** it suggests tailoring digital competencies for teachers by aligning them with performance expectations and instructional practices, considering factors such as experience, specialization, readiness, and engagement in digital content creation.
Keywords: Digital Competency, Design Thinking, Teaching Practices, Training Program.

أثر برنامج تدريبي قائم على الكفاءة الرقمية في تنمية ممارسات التفكير ال تصميمي لدى المعلمين الفلسطينيين

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ملخص: الهدف: هدفت هذه الدراسة الكشف عن فاعلية برنامج تدريبي قائم على الكفايات الرقمية في تطوير ممارسات التفكير التصميمي لدى المعلمين الفلسطينيين. **المنهج:** استهدفت الدراسة المعلمين العاملين تحت إشراف وزارة التربية والتعليم، وتم تقييم أدائهم قبل البرنامج وبعده باستخدام بطاقة ملاحظة ممارسات التفكير التصميمي. **أهم النتائج:** وكشفت النتائج عن وجود فروق ذات دلالة إحصائية عند مستوى α=0.01 بين متوسطيْ درجات المعلمين في التطبيقين القبلي والبعدي لبطاقة ملاحظة ممارسات التفكير التصميمي، **الاستنتاجات:** مما يؤكد التأثير الإيجابي للبرنامج التدريبي في تعزيز هذه الممارسات. **التوصيات:** وأوصت الدراسة بضرورة دمج الكفايات الرقمية ضمن أدوار المعلم الرقمي في تصميم برامج التدريب المبنية على الكفاءة، مع تخصيص كفايات رقمية للمعلمين وربطها بمؤشرات الأداء والممارسات التعليمية المتوقعة، وذلك وفقًا لمتغيرات مثل الخبرة، والتخصص، والاستعداد، ومدى إسهام المعلم في إنتاج المحتوى الرقمي التعليمي.
الكلمات المفتاحية: الكفاءة الرقمية، التفكير التصميمي، الممارسات التعليمية، البرنامج التدريبي.

Introduction

In the digital age, education systems must shift from emphasizing the mere acquisition of knowledge to fostering its application across diverse real-life contexts. This transformation requires equipping students with scientific and engineering skills that enable them to utilize knowledge effectively in various applied fields, such as engineering.

When designing training programs focused on skills and practical applications, multiple educational philosophies guide the structuring of knowledge, skills, and values, as well as the assessment of their outcomes and success indicators. Researchers and instructional designers continuously explore the effectiveness of such programs, ensuring their alignment with learners' characteristics and cognitive structures.

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Globally, there is a growing trend toward competency-based training programs, given their proven efficacy in developing targeted skills and facilitating complex learning. These programs integrate essential knowledge with hands-on training, allowing learners to perform real-world tasks with high proficiency. The rapid advancements in modern technology have introduced new roles and responsibilities, necessitating the empowerment of trainees with relevant skills. Among these essential competencies, Design Thinking practices stand out as a crucial applied science that bridges knowledge acquisition with meaningful problem-solving.

This study focuses on the functionality of knowledge rather than its passive retention. Specifically, it examines the effectiveness of a digital competency-based training program in enhancing teachers' Design Thinking practices.

Study Problem

Given the significance of thinking practices in general and the distinct role of Design Thinking, there is a pressing need to address the lack of effective strategies for equipping teachers with digital instructional design skills. This gap in professional development hinders innovation in teaching methods and limits alignment with the evolving expectations of education in the digital era. Moreover, as education undergoes a transformation in response to digitalization and the Fourth Industrial Revolution, it is essential to empower teachers with competencies that support dynamic, technology- driven instructional approaches.

Accordingly, this study seeks to answer the following research question:

What is the impact of a digital competency-based training program on developing teachers' Design Thinking practices?

From this central question, the study explores the following sub-questions:

- Are there statistically significant differences at the $\alpha \leq 0.05$ significance level between teachers' pre- and post-training scores on the Design Thinking practices observation checklist?
- How does a digital competency-based training program influence the development of teachers' Design Thinking practices?

Study Hypotheses

- There are no statistically significant differences at the $\alpha \leq 0.05$ significance level between the average scores of teachers in the pre- and post-training applications of the Design Thinking practices observation checklist.
- The digital competency-based training program has no significant effect on the development of Design Thinking practices among teachers.

Study Terminology Training Program

A structured framework comprising objectives, instructional experiences, procedures, educational activities, strategies, and assessment tools designed to enhance teachers' digital competencies. This program is systematically developed based on key digital competency domains to support professional growth and instructional effectiveness.

Digital Competency for Teachers

The set of digital knowledge, skills, and attitudes expected from in-service teachers, acquired through professional development programs. These competencies are categorized into three key areas:

1. Digital Resources and Protection
2. Professional Development
3. Education and Digital Assessment

Each area is further divided into six subdomains:

- Creating and modifying digital resources

- Managing, protecting, and sharing digital resources
- Continuous professional development
- Teaching and learning with digital tools
- Self-regulated learning
- Assessment strategies

These competencies serve as the foundation for constructing the training program examined in this study.

Design Thinking

A cognitive and innovative approach to instructional design, particularly in digital education, that enables teachers to develop learner-centered solutions. This process helps educators identify students' needs more accurately, leading to the creation and implementation of effective digital learning solutions.

Design Thinking is structured around five key dimensions:

1. Empathy – Understanding students' needs and perspectives.
2. Problem Identification – Analyzing and defining educational challenges.
3. Solution Ideation – Generating and conceptualizing innovative solutions.
4. Digital Product Creation – Designing and developing digital learning tools.
5. Testing and Refinement – Implementing, evaluating, and improving digital solutions.

These dimensions encompass twenty specific instructional practices, which are measured in this study using a Design Thinking practices observation checklist.

Theoretical Framework

Digital Competency for Teachers

Digital competency is one of the eight core lifelong learning competencies outlined by the European Commission and serves as a prerequisite for personal achievement, professional development, active citizenship, social inclusion, and productivity in a knowledge-based society. The concept of "digital competence" has gained significant attention in intellectual discourse since the early 21st century, particularly as fundamental requirements for lifelong learning began to take shape.

Definition and Scope

The concept of digital competence has been broadly defined as the ability to effectively use information and communication technology (ICT). This includes:

- Proficiency in specific digital technologies, programs, and tools (e.g., word processors).
- Ethical and responsible use of ICT.
- Integration of ICT into teaching and learning.
- Teaching students how to use digital tools for educational and personal purposes.
- Employing technology systematically in education.
- Understanding the historical development and societal impact of digital technology.

Karsenti *et al*. (2020) further define digital competence as a set of skills necessary for the appropriate, safe, and creative use of digital technologies in various domains, including learning, work, entertainment, and civic participation.

From a research perspective, digital competence also includes adaptability to technological advancements, such as developments in data science, artificial intelligence (AI), and the Internet of Things (IoT). This adaptability is critical for decision-makers in teacher training institutions, ensuring that educators are equipped to navigate technological shifts, reduce digital divides, and enhance students' preparedness for future challenges.

Key Dimensions of Digital Competency

Scholars have proposed various models for structuring digital competence:

1. Skantz-Åberg *et al*. (2022) identified five core dimensions of digital competence:
   - Technological competence
   - Educational competence
   - Digital awareness
   - Critical thinking
   - Professional engagement
2. Form (2017) presented an alternative model, dividing digital competence into three interrelated dimensions that collectively contribute to overall competency.

Given the importance of digital competence, multiple research frameworks have emerged to clarify its components, structure, and application.

3. Empirical Studies on Digital Competency

Several studies have examined digital competence in different educational and professional contexts.

Conceptualizing Digital Competency for Teachers

Skantz-Åberg *et al*. (2022) conducted a systematic review of educational databases, analyzing 18 studies on teachers' digital professional competence. They identified seven recurring aspects:

- Technological competence
- Content knowledge
- Attitudes toward technology use
- Pedagogical competence
- Cultural awareness
- Critical thinking
- Professional engagement

Impact of Digital Competency Training

- Sánchez *et al*. (2022) examined the effect of a blended learning course designed to improve Digital Competence for Research (DCR) among undergraduate engineering students. Using an experimental design, their results showed statistically significant improvements in digital skills and attitudes, but no significant change in knowledge.
- Guillén-Gámez *et al*. (2021) assessed digital competence among university faculty, focusing on differences between knowledge and usage of ICT tools. The study found significant differences in teachers' familiarity with Web 2.0 tools, as well as age and gender influencing digital competence levels, while educational level did not play a role.

Digital Competency in Educational Policies

McGarr, Mifsud, & Colomer Rubio (2021) explored the historical evolution of digital competence policies in Norway, Ireland, and Spain. Their analysis of policy documents over 30 years revealed that despite historical differences, there is a growing international convergence on the importance of digital competency for teachers.

Digital Competency and Academic Performance

Mehrvarz *et al*. (2021) investigated how informal digital learning mediates the relationship between students' digital competence and academic performance. Data from 319 students at Shiraz University indicated that:

- Digital competence positively affects informal digital learning and academic success.
- Informal digital learning serves as a mediating factor between digital competence and academic performance.
- The study recommended integrating students' digital literacy into curriculum design.

Evaluating Digital Competence

Sillat, Tammets, & Laanpere (2021) conducted a systematic literature review on methods for assessing digital competence in higher education. Their findings highlighted key challenges in measuring competency, including:

- Reliability and validity of assessment tools.

- The need for comprehensive evaluation models that account for the evolving nature of digital skills.

Digital Competency and Online Teaching Behavior

Li *et al*. (2021) examined how teachers' digital competence influences online teaching behavior in Chinese primary and secondary schools. The study, involving 1,833 teachers, revealed that:

- Higher digital competence correlates with greater online teaching engagement.
- Online teaching intentions mediate the relationship between digital competence and instructional behavior.
- Student learning difficulties in online settings can negatively impact teachers' use of digital tools.

The theoretical and empirical findings highlight the multifaceted nature of digital competency, encompassing technical, pedagogical, and critical thinking skills. Research suggests that improving. teachers' digital competence requires targeted training programs, continuous professional development, and institutional policies that support digital inclusion.

This study builds upon existing frameworks to examine the role of digital competency-based training programs in developing Design Thinking practices among teachers. By analyzing the impact of digital skills on instructional methodologies, the research aims to contribute to the evolving discourse on technology-enhanced education.

Design Thinking

Design thinking is a learning methodology that operates through an interconnected and integrated series of approaches aimed at fostering creativity and innovation. It shapes practical behaviors and employs various tools to address problems effectively. As a powerful and adaptable approach, design thinking directs creativity toward solving practical challenges. To implement design thinking successfully, teachers must cultivate a design thinking mindset, which has traditionally been prominent in industries focused on product and service design but has recently gained increasing attention in the field of education.

Panke & Harth (2018) define design thinking as an innovative problem-solving method that places people at the center of the issue. By maximizing their engagement and understanding of the problem, individuals are more motivated to find solutions, enhance them, and sustain their development. This approach aligns with 21st-century educational objectives, which aim to equip students with skills related to learning, work, and sustainable problem-solving. Developing these skills requires teachers to be proficient in fostering creativity and problem-solving abilities. The shift from teacher-centered instruction to a more learner-centered approach, emphasizing technology and inquiry-based learning, necessitates that educators acquire the knowledge and teaching competencies needed to prepare students for an evolving technological landscape. Beyond technical proficiency, students must also develop an awareness of technology's impact on society. Teachers must, therefore, cultivate their own competencies to support the development of students' creative and innovative skills, ensuring they are well-equipped for active participation in their communities.

Phases of Design Thinking

The design thinking process is primarily structured around three key phases:

1. Inspiration Phase – This involves a deep focus on the problem, considering user needs and behaviors.
2. Ideation Phase – In this stage, new ideas are generated based on the context, and solutions are quickly and cost-effectively

prototyped.

3. Implementation Phase – Here, main ideas and prototypes are evaluated and refined to determine the most suitable solution.

Design thinking is inherently a creative process that encourages idea generation without judgment, mitigates fear of failure, and promotes maximum engagement in problem-solving. The core focus is to make human experience a central tool for innovation and solution development. Design thinking can be applied in any context, achieving suitability through its sensitivity to methods, tools, and emphasis on empathy, creativity, critical thinking, and collaboration (Nunes *et al*., 2021).

Alsayary (2022) describes design thinking as a practical approach to experiential learning that offers an iterative method for solving complex and unstructured problems. Developing a design thinking mindset leads to creative and innovative outcomes. The process involves three essential components:

- Human Focus: Incorporating both convergent and divergent thinking, working in multidisciplinary teams, and utilizing imagination and visualization techniques to develop 21st-century skills.
- Inductive Thinking: Critically assessing available solutions and generating new alternatives through logical reasoning. This approach seeks to explore possibilities by asking, "What could or should be?" rather than focusing on existing solutions.
- Learning Through Failure: Recognizing failure as a necessary part of learning and discovery.

Research on Design Thinking in Education

The growing interest in design thinking as a pedagogical practice has led to numerous studies exploring its various dimensions, skills, and applications in education. Research has examined how design thinking can be integrated into teaching methodologies and curricula to enhance educational engagement and outcomes.

Elwood & Jordan (2022) introduced the Design Thinking and Instructional Lessons (DTAIL) model, structured in three stages:

1. Model Development: Reviewing design thinking literature and creating an initial draft of the model.
2. Empirical Testing: Conducting two design studies with K-12 STEM teachers in public schools in the U.S.
3. Model Refinement: Observing ten teachers as they implemented their lessons and modifying the model based on data analysis.

Findings emphasized the importance of iteration, reflection, and feedback in instructional design. The study highlighted the effectiveness of the DTAIL model in lesson development and identified key components for successful integration of design thinking in teaching: problem-solving spaces, iterative revision, and reflective feedback.

Nunes, Molinari, Fialho, & Santana (2021) conducted an exploratory descriptive study analyzing existing research on teaching design thinking to children. Their findings underscored design thinking's value in empowering students by fostering empathy, communication, creativity, and analytical problem-solving. The study emphasized the role of educators in guiding students toward becoming critical thinkers and innovative problem-solvers.

Elsayary (2020) explored the use of interactive technology in developing design thinking skills among pre-service teachers at a university in the United Arab Emirates. Using an online survey and statistical analysis, the study demonstrated the positive impact of interactive technology on enhancing design thinking capabilities.

Park (2019) examined methods for incorporating design thinking into teacher education, emphasizing its role in helping pre-service teachers create lessons tailored to

diverse learning objectives. The study proposed using design thinking as a structured approach for lesson planning, problem-solving in classroom settings, and refining instructional strategies based on iterative feedback.

Kim & Lee (2020) analyzed the factors influencing teachers' adoption of design thinking, using Rogers' theory of innovation diffusion. Targeting 316 teachers in Seoul and Gyeonggi Province, their study identified key characteristics of design thinking adoption: relevance, utility, complexity, and testability. These factors were found to significantly impact the integration of design thinking into teaching practices.

Defining Design Thinking in Education

Based on the reviewed literature and research, design thinking can be defined as a cognitive process and an innovative approach to problem-solving, where the designer assumes the perspective of the end user to better define challenges and generate effective solutions.

In an educational context, design thinking for teachers can be defined as a structured cognitive process that enables educators to design innovative and student-centered learning experiences. By adopting a student-focused perspective, teachers can accurately identify educational needs and develop creative, technology-integrated solutions that can be adapted to various teaching contexts.

Study Approach

This study employed both descriptive and semi-quasi approaches to investigate the impact of design thinking practices in teacher training. The descriptive approach was used to analyze and interpret teachers' competencies and design thinking practices, while the semi-quasi approach facilitated the practical implementation and assessment of the training program.

Study Sample

The study sample consisted of 32 male and female teachers who were selected based on specific program criteria. Participants had not previously received training in digital skills and were chosen based on their expressed interest in joining the training program. This selection process ensured that the study could effectively assess the impact of the program on teachers' design thinking practices.

Study Tools

To address the study's research questions, the researcher employed a training program based on numerical competencies, along with an observation card designed to evaluate teachers' design thinking practices.

Design Thinking Practices Observation Card for Educators

A structured observation card was developed to assess teachers' design thinking practices across the five stages of the design thinking process. Each stage was broken down into specific performance indicators, which were evaluated using a five-point rating scale:

- Poor (1)
- Fair (2)
- Good (3)
- Very Good (4)
- Excellent **(5)**

The following table presents the distribution of design thinking practices across the observation card's main components:

Table (1): Distribution of design thinking practices on the axes of the observation card.

	axis	number of practices	weight
Thinking Design	Empathy	4	20%
	Understanding and defining the problem	4	20%
	Ideate	4	20%
	Digital Product Creation	4	20%
	Testing and modification	4	20%
	Total	20	

Study Materials

Training Program

The general objective of designing the

training program is to investigate its effectiveness in developing design thinking practices among teachers, the foundations of the training program were determined in the light of:

- The strategy for preparing and qualifying the Palestinian teacher, which aims to prepare the Palestinian teacher with all the knowledge, skills and innovations, to help him perform his role in providing students with the knowledge, skills and values appropriate to the requirements of the twenty-first century.
- The objectives of the competency-based professional development programs adopted by the Ministry of Education and the multiplicity of teacher roles in the fourth era of education, which were defined in the roles of the digital teacher: learner, leader of the learning process, digital citizen, collaborator, content designer, learning facilitator, and learning corrector.
- Requirements for the professional development of the Palestinian teacher in the light of digital competencies and the requirements of digital transformation in education:

which is to provide the teacher with knowledge, skills, experience and tools related to the use of technology and to employ it effectively with students inside and outside the classrooms to achieve learning goals and to raise their digital competencies in: digital resources and protection, cooperation and digital communication Professional development and education, empowering learners and raising their digital readiness, digital assessment

The training program aims to develop the design thinking practices of teachers and the digital readiness practices of their students. Based on the foundations and the goal of building the program, the general and procedural objectives of the program were formulated, as well as the main titles of the content with the proposed time for each title (training session) with a focus on learning tasks and indicators of proficiency acquisition. I have teachers.

Objectives of the training program

- Introducing the concept of digital competencies
- Introducing the roles of the digital teacher
- Using digital technology tools in teaching design
- Equipping teachers with the skills of producing digital products in different formats to achieve learning purposes

Providing teachers with the skills of preparing a time plan (scenario for the digital product)

Directing teachers towards rationalizing the use of technology among learners by involving them in digital transformation processes.

Results & Findings

The first research question was formulated as follows: "Are there statistically significant differences at the significance level ($\alpha \leq 0.05$) between the average scores of teachers in the pre- and post- application of the Design Thinking Practices Observation Card?"

To address this question, the following research hypothesis was proposed: "There are no statistically significant differences at the significance level ($\alpha \leq 0.05$) between the average scores of teachers in the pre- and post-application of the Design Thinking Practices Observation Card."

To test this hypothesis, the researcher conducted a Paired-Samples Test to analyze the differences between the two sets of scores.

Table (2): Paired samples t-test between the pre and post applications of the thinking design practices observation card.

Axis	Test	M	Std	F	Df	Sig
Empathy	Per	6.13	2.060	44.28	31	0.00
	post	13.94	2.299			0.00
Defining the problem	Per	5.75	2.016	74.61	31	0.00
	post	13.56	1.740			0.00
Ideate	Per	6.31	2.206	114.6	31	0.00

Axis	Test	M	Std	F	Df	Sig
	post	14.22	2.044			0.00
Create a digital product	Per	6.38	1.996	127.0	31	0.00
	post	14.31	1.975			0.00
Product testing and modification	Per	6.13	2.060	146.8	31	0.00
	post	14.16	2.050			0.00
Total	Per	30.69	10.00	135.7	31	0.00
	post	70.19	9.529			0.00

The table clearly indicates that the calculated t-test value exceeds the critical t-value of 2.021 at 31 degrees of freedom at the 0.05 significance level and is also greater than the critical t-value of 2.704 at the 0.01 significance level. This statistical result confirms the presence of significant differences between teachers' mean scores in the pre- and post-application of the Design Thinking Practices Observation Card across all its dimensions: empathy, problem understanding and definition, solution visualization, digital product creation, product testing, and refinement. Additionally, the overall score for design thinking practices demonstrated significant improvement. These findings lead to the rejection of the null hypothesis and the acceptance of the alternative hypothesis, which states: There are statistically significant differences at the significance level ($\alpha = 0.01$) between the mean scores of teachers in the pre- and post-application of the Design Thinking Practices Observation Card.

Thinking Design practices	Test	M	Std	F	df	Sig
1.The teacher can assume the roles of the learners	Per	1.63	0.609	33.000	31	0.00
	post	3.69	0.592			0.00
2.The teacher determines their educational needs based on his interaction with them	Per	1.63	0.609	37.131	31	0.00
	post	3.66	0.701			0.00
3.Using learners' characteristics to understand the problem from their point of view	Per	1.50	0.508	28.273	31	0.00
	post	3.34	0.653			0.00
4.Understand all the elements and conditions of the problem (deep understanding)	Per	1.38	0.492	25.181	31	0.00
	post	3.25	0.622			0.00
5.Collecting data about the problem (educational need) systematically	Per	1.56	0.619	28.701	31	0.00
	post	3.59	0.615			0.00
6.Defines the dimensions and objectives of learning in light of learners actual needs.	Per	1.31	0.471	44.542	31	0.00
	post	3.31	0.471			0.00
7.Formulates a specific statement for a specific problem without verbosity or prejudice	Per	1.44	0.504	33.065	31	0.00
	post	3.59	0.499			0.00
8.The teacher prepares a list of tools he has to solve the problem (achieve the objectives).	Per	1.44	0.619	21.772	31	0.00
	post	3.25	0.508			0.00
9.The teacher presents a preliminary proposal for the digital product (content and tools).	Per	1.56	0.619	35.775	31	0.00
	post	3.69	0.592			0.00
10.Offer more than one alternative and compare between them	Per	1.38	0.609	63.000	31	0.00
	post	3.34	0.602			0.00
	Per	1.69	0.592	31.000	31	0.00
11.Chooses among the available alternatives, keeping in mind the requirements	post	3.63	0.554			0.00
12.Introduces the product design steps or design procedures	Per	1.69	0.592	35.775	31	0.00
	post	3.81	0.535			0.00
13.Takes care of accuracy, symmetry and appropriateness.	Per	1.63	0.609	39.994	31	0.00
	post	3.72	0.581			0.00
14.Presents a prototype of the product that can be developed and modified	Per	1.56	0.504	31.204	31	0.00
	post	3.75	0.440			0.00
15.Employs the digital product in a meaningful educational context.	Per	1.56	0.504	63.000	31	0.00
	post	3.53	0.507			0.00
16.Gets feedback on the presented digital product	Per	1.63	0.609	63.000	31	0.00
	post	3.59	0.615			0.00
17.Reviews vulnerabilities in the digital product prototype for modification	Per	1.63	0.609	47.440	31	0.00
	post	3.69	0.644			0.00
18.The teacher modifies the product in light of the considered modifications	Per	1.44	0.504	31.204	31	0.00
	post	3.63	0.492			0.00

Thinking Design practices	Test	M	Std	F	df	Sig
19.The teacher will include any supporting information to enable the use of the product for self-learning	Per	1.63	0.609	63.000	31	0.00
	post	3.59	0.615			0.00
20.The teacher presents the finished product	Per	1.44	0.619	33.065	31	0.00
	post	3.59	0.615			0.00

Effect size

The second research question explored: What is the effectiveness of a training program based on digital competencies in developing design thinking practices? To address this question, the study formulated the following hypothesis: The proposed training program based on digital competencies has no significant effectiveness in developing design thinking practices. To test the validity of this hypothesis, the researcher calculated the effect size (η^2), providing a statistical measure of the program's impact.

Practices	T	t^2	df	η^2
Empathy	44.284	1961.073	31	0.984438
Defining the problem	74.616	5567.547	31	0.994463
Ideate	114.634	13140.95	31	0.997647
Create a digital product	127	16129	31	0.998082
Product testing and modification	146.809	21552.88	31	0.998564
Total	135.742	18425.89	31	0.99832

Discussion

The study findings revealed statistically significant differences at the 0.01 significance level ($\alpha = 0.01$) between the mean scores of the experimental group teachers in the pre- and post-assessments of design thinking practices, with a clear improvement in favor of the post-assessment. This indicates the effectiveness of the training program in enhancing teachers' design thinking skills.

The observed improvement can be attributed to multiple factors, primarily the structured design of the training program and its alignment with the educational tasks, teacher interactions, and evolving training needs in the era of digital education. The key contributing factors include:

1. Alignment with Teachers' Professional Growth Needs: The training program was tailored to address the professional development requirements of the participants, fostering active engagement with the content and ensuring relevance to their instructional practices.
2. Relevance to the Educational Context: By aligning with the priorities of educational institutions and the broader teaching landscape, the program enhanced teachers' readiness to engage meaningfully and acquire digital competencies essential for contemporary education.
3. Innovative and Engaging Training Approach: Unlike conventional training programs, this initiative incorporated interactive and collaborative activities, integrating self-learning strategies and knowledge co-creation. This approach stimulated teachers' participation and encouraged innovation in a dynamic and competitive learning environment.
4. Realistic and Structured Educational Tasks: The program's instructional tasks were designed with authenticity and precision, incorporating structured support and guided learning pathways. This ensured that teachers could apply their learning effectively and confidently, enhancing their practical skills.
5. Integration of Prior Knowledge: The training program strategically built on participants' prior knowledge, fostering meaningful connections between existing experiences and newly acquired skills. Given that design thinking relies more on skill application than rote knowledge, this approach reinforced deep learning and skill mastery.

These findings underscore the importance of

well-structured, competency-based training programs that are aligned with real-world educational demands. The study highlights the need for continuous professional development initiatives that not only equip teachers with theoretical knowledge but also empower them with practical skills to navigate the evolving digital learning environment.

Recommendations

Based on the study's findings, the following recommendations are proposed:

1. Integrating Digital Competencies into Teacher Roles: Digital competencies should be systematically incorporated into the professional roles of teachers within competency-based training frameworks. This integration will ensure that teachers develop the necessary digital skills aligned with modern educational demands.
2. Implementing Realistic, Context-Based Training: Training programs should emphasize hands-on, real-world tasks that reflect the actual working conditions of teachers. This approach will enable trainees to effectively apply acquired skills in their professional contexts, enhancing the practical impact of the training.
3. Personalizing Digital Competency Development: Digital competency training should be tailored to individual teachers based on key variables such as their level of experience, area of specialization, professional readiness, and contributions to digital content creation. This differentiation will optimize skill development and ensure alignment with performance expectations and instructional best practices.

These recommendations aim to enhance the effectiveness of teacher training programs by fostering a more practical, individualized, and competency-driven approach to professional development.

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