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# Using Digital Learning Platforms to Enhance the Instructional Design Competencies and Learning Engagement of Preservice Teachers

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**Abstract:** Given the effects of the COVID-19 pandemic and the associated radical changes to the teaching landscape, employing digital learning platforms in the professional training of teachers has become imperative. The instructional design competencies are among the most important competencies for today's teachers. Therefore, it is necessary to test the effectiveness of digital learning platforms to provide teachers with the required competencies, both cognitive and practical, and to help them improve these competencies. Accordingly, in this study, we aimed to measure the effects of using the Google Classroom platform to develop instructional design competences and learning engagement among preservice teachers in Saudi Arabia. We used a quasi-experimental approach, with a one-group design (pre- and posttest) in this study, which included 61 female student teachers. Three measurement instruments were utilised, namely, the achievement test, the product evaluation card, and the learning engagement scale. The results of our study showed that using Google Classroom as a digital learning platform was effective in helping the preservice teachers acquire and develop their cognitive and practical competencies in instructional design. Our results further revealed high levels of learning engagement at cognitive, behavioural, and social levels among the preservice teachers who participated in learning instructional design through the Google Classroom platform. Our findings emphasise the need for greater investment in digital learning platforms to support preservice teachers' professional training, as these students can benefit from the potential these platforms offer in developing their instructional design competencies.

**Keywords:** instructional design; preservice teacher; digital platforms; Google Classroom; COVID-19; Saudi Arabia



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## 1. Introduction

The information revolution and the associated technological developments have become progressively important components of education during the 21st century. Following the emergence of digital technologies, their role in education has been magnified—and most notably so during the COVID-19 pandemic [1]. Educational institutions have attempted to keep abreast of these technological developments and to move towards digitalisation; however, this requires teachers to be able to utilise, manage, and employ the technologies effectively during the educational process. Teachers also need to update their knowledge and skills so that they can adopt new and constantly evolving technologies. Therefore, preparing and developing teachers professionally to work with digital technologies is a top priority [2].

The COVID-19 pandemic highlighted the importance of finding a way to reach learners. During the pandemic, teachers resorted to instructional design to prepare educational materials and achieve the required learning outcomes efficiently. Instructional design is defined as a systematic process that reflects the translation of the theories and principles of teaching and learning into practical methods for planning, improving, developing, and continuing education [3,4]. Instructional design entails searching for the best educational

methods and models that can contribute to achieving optimal learning outcomes. Amin and Abdel-Azim [5] and Alsaleh [6] confirmed that most teaching competencies for teachers can be categorised under instructional design competency. Teachers as instructional designers develop both cognitive and practical competencies that are reflected in the development of their pedagogies and teaching styles, especially their ability to analyse, design, develop, implement, and evaluate the learning environment. The studies of Alsaleh [6] and Aldail [7] stressed the importance of providing teachers, particularly in-service teachers, with training so that they can gain instructional design skills during professional development and teacher preparation programmes for preservice teachers to enhance their educational and professional competencies.

The importance of using digital learning platforms to support mobile learning in teacher professional development programmes is highlighted by the capabilities they provide which contribute to increasing the levels of interaction and participation between teachers and their students [8–10]. Digital learning platforms are commonly used and provide flexible and interactive e-learning tools. The latest digital technology models support distance education and training by providing interactive and social learning environments [11,12] that enable both synchronous and asynchronous communication [13,14], facilitate access to learning activities, and offer flexibility by allowing learning to occur 'anytime and anywhere' [15]. Many studies have focused on employing digital learning platforms in teaching and learning, highlighting the effectiveness of these platforms in enhancing the learning performance and achievement of students [16–21].

Given the effects of the COVID-19 pandemic and the radical changes in the teaching landscape, it is imperative to employ digital learning platforms to train teachers professionally. Because of the importance of educational design competencies, it is necessary to measure teachers' effectiveness in the use of these digital platforms so that they can learn about and improve their cognitive and practical competencies. Accordingly, teachers' levels of educational engagement with these platforms need to be measured, as the engagement factor has a strong impact and association with improving teachers' levels of achievement and mastery of these competencies. The current study contributes to the literature because it sheds light on the effectiveness of digital learning platforms in providing K-12 teachers with competencies in educational design and supporting their learning engagement. It further augments existing knowledge about digital education in the post-pandemic era. This is particularly important in Saudi Arabia, as the government's policies emphasise digital learning, including teachers' professional development. Indeed, it is expected that, in the future, teachers' professional development in Saudi Arabia will depend heavily on digital learning platforms. It is thus essential to upgrade educational services systems by developing and activating digital technologies, such as employing digital platforms, that can be utilised in university education. Most previous studies have focused on measuring the impact of using digital learning platforms on the development and achievement of various skills among students and teachers [17,18,22,23]. However, the impact of these platforms on developing the instructional design skills of K-12 teachers has not yet been addressed. Therefore, in this study, we aimed to measure the effects of using digital learning platforms such as Google Classroom on developing instructional design and learning engagement competences among preservice teachers in Saudi Arabia.

## 2. Research Questions and Hypotheses

We sought to answer the following two research questions:

Research question 1: To what extent do preservice teachers acquire instructional design competencies when using digital learning platforms?

Instructional design competencies include two components: cognitive competence and practical competence. Thus, two hypotheses were formulated to answer research question 1:

**Hypothesis 1 (H1).** *The use of digital learning platforms has a positive effect on the development of preservice teachers' cognitive competences in instructional design.*

**Hypothesis 2 (H2).** *The use of digital learning platforms has a positive effect on the development of preservice teachers' practical competences in instructional design.*

Research question 2: To what extent do preservice teachers engage in learning using digital learning platforms?

Learning engagement is thought to consist of four components: cognitive, social, emotional, and behavioural engagement. In the current study, we focused on three dimensions of engagement, that is, behavioural, cognitive and social engagement, because emotional engagement is considered to be part of behavioural engagement [24]. Accordingly, we developed three hypotheses to answer research question 2:

**Hypothesis 3 (H3).** *The use of digital learning platforms has a positive effect on the development of preservice teachers' cognitive engagement.*

**Hypothesis 4 (H4).** *The use of digital learning platforms has a positive effect on the development of preservice teachers' behavioural engagement.*

**Hypothesis 5 (H5).** *The use of digital learning platforms has a positive effect on the development of preservice teachers' social engagement.*

## 3. Literature Review

### *3.1. Instructional Design Competency*

Instructional design is a purposeful activity in which a series of strategies and steps are produced to enhance the learning process. Raza et al. [25] defined instructional design as a framework for integrating multimedia features into the curricula in order to create an educational environment that is accessible, interactive, and student-centred. Competency is a term that is widely used in the literature to denote the ability of an individual to carry out activities based on their acquired knowledge and skills. According to Mussa [26], competency refers to an integrated ability that enables an individual to perform certain skills and behaviours related to their tasks with a certain level of effectiveness that can be measured and observed. To this end, instructional design competencies are the knowledge and skills that the designer (i.e., the teacher) is expected to acquire and implement.

As indicated by Alhadithi and Fattah [27] and Alhila [3], instructional design competency consists of three aspects: cognitive, practical, and emotional competence. Cognitive competence means the extent to which a teacher acquires fundamental knowledge of the science of instructional design, including the theories, psychological foundations, standards, principles, and models of instructional design. Practical competence refers to the ability of a teacher to carry out instructional design steps procedurally and practically by producing actual charts, drawings, tables, and concept maps and converting them into a final product that is arbitrated and applicable in the actual field. Finally, emotional competence is the extent to which a teacher acquires positive attitudes towards instructional design and recognises its importance in improving learning outcomes. In this study, we focused on measuring the effectiveness of digital learning platform environments (e.g., Google Classroom) on teachers' instructional design competency in terms of the cognitive and practical aspects only.

Instructional design models and their components differ based on the objectives for which they were designed, but they all share five basic stages, namely, the analysis, design, development and production, implementation, and evaluation stages [3,28]. First, the analysis stage includes several skills, including identifying and analysing the learning problem that needs to be addressed, analysing the educational environment, determining the required human and material capabilities and educational resources, establishing

the general learning objectives and analysing the educational content, and ascertaining the characteristics of the learners and their prior knowledge, as well as their levels of readiness, abilities, and motivation. Second, the design stage involves identifying specific learning outcomes and analysing the learning content, drawing concept maps, clarifying the learning activities, and designing multimedia scenarios and assessment tools. Third, the development and production stage involves the initial production of the multimedia learning products and conducting a formative evaluation on a small sample of learners to determine the effectiveness and suitability of the multimedia learning products prior to their final production. Fourth, the implementation phase comprises the actual implementation of the instructional design in practice with a targeted population sample. Finally, the evaluation stage entails judging the extent to which learners have achieved the specific learning outcomes using the previously designed learning assessment tools. Each stage is evaluated and judged by experts in educational design, and feedback is obtained. Further modifications and developments are made based on the results of the evaluation stage.

### 3.2. Digital Learning Platforms

Digital learning platforms constitute an interactive online learning environment that enables teachers to publish course content and lessons, make assignments, implement learning activities, communicate with learners, help facilitate the exchange of ideas and opinions between teachers and students, and foster learning engagement, which helps achieve high-quality learning outcomes [29]. Digital learning platforms are intended to create an interactive learning environment with diverse information sources and allow for the exchange of educational experiences, opinions, discussions, and meaningful dialogues, so as to expand the circle of digital knowledge [30,31].

Digital learning platforms have many educational advantages. First, they foster the level of learning achievement by providing flexibility in the e-learning environment via the exchange of experiences that stimulate innovation and provide sufficient space for the storage of digital content and the retrieval and management of documents electronically [14,32]. Second, digital learning platforms facilitate the process of interaction between students and teachers and provide them with the opportunity to employ diverse digital resources in teaching and learning activities [33]. This eases the communication between teachers, students, and their peers, which in turn motivates students to interact with the topics raised [22]. Third, digital learning platforms provide digital content in interesting and effective ways, improve the educational environment to stimulate innovation, liberate the restrictions of time and space, and provide digital content that is accessible to all segments of society, including students, at a low cost [34].

Several studies have examined the effects of utilising digital learning platforms on the educational process and learning performance. For example, a study by Althubaiti and Masaad [35] aimed to understand the extent to which learners benefit from digital learning platforms, cognitively and in terms of skills, when learning the English language. The researchers highlighted the positive influence of digital learning platforms on developing students' cognitive learning. Similarly, a study conducted by Moreno et al. [36] examined the effectiveness of employing digital learning platforms in learning activities. The results of the study revealed the positive impact of these platforms on self-learning. Moreover, a study by Azabon et al. [37] sought to identify students' perceptions of the effectiveness of using a digital learning platform called Rwaq in developing self-learning skills. The results showed that the students' perceptions of the advantages of using the Rwaq platform were high.

Meanwhile, Alshugairat and Alrasa'i [38] aimed to measure the impact of using the digital platform Edraak on the achievement of students in mathematics. They showed a positive effect on the students' achievements when taught using the platform. Alissawi and Almusawi [39] conducted an experimental study to identify the impacts of the Edmodo platform on student achievement in a biology course and found differences between the experimental and control groups, with the former achieving better results. Many

other studies have focused on the use of the Google Classroom platform, which is the platform used in the current study, to identify the impacts of its use on achievement and the development of performance skills in academic courses among both students and teachers [17,40–46]. The results of these studies consistently indicated that using the platform had a positive impact on the development of cognitive achievement, performance skills, and learner satisfaction.

### 3.3. Learning Engagement and Digital Learning Platforms

Engagement in learning is related to the level to which learners are stimulated and motivated when learning, provided with an environment that challenges their thinking, and are prompted to study [12,47]. These factors may not only affect learners' levels of achievement, but also their behaviours. Although digital education can be challenging, using technology allows content to be delivered to learners and teachers to connect with learners while simultaneously enabling learning to take place anytime and anywhere [48,49]. Learning engagement is a major factor in success at school, and it predicts better achievement [50]. Alardan [12] indicated that engaged students are characterised by a desire to master their work, self-expression, and the ability to withstand challenges and retain knowledge. By assessing students' levels of engagement, teachers can plan lessons and activities more effectively and invest in learners in specific ways to generate enthusiasm and encourage participation and the desire to learn, which will subsequently motivate learners to be engaged and active participants in learning [47].

Learning engagement is measured using four domains: behavioural, cognitive, emotional and social engagement. Behavioural engagement is defined in terms of participation, interaction, collaboration, achievement, performance, skills development, and the completion of learning activities. It further includes students' efforts, participation, homework completion, and perseverance when performing tasks [51]. Cognitive engagement refers to cognitive interaction and relates to learners' willingness and attitudes towards their work, their skills, and the cognitive strategies that they use to master their learning [52]. Emotional engagement refers to leaners' emotional responses to learning activities and the learning conditions and environment. It further involves assessing learners' interest, happiness, anxiety, and anger when completing activities, as well as learners' responses to challenges by determining the extent to which they insist on persevering and employing problem-solving skills, or whether they practice withdrawal behaviours in the case of failure, and thus withhold their emotional participation [53]. Social engagement refers to the effort a learner makes to interact with others [54]. Svalberg [55] indicated that learners who enjoy positive social engagement will be ready to interact and strive to continue learning, regardless of the difficulties they face. As indicated, we measured learning engagement using three domains (i.e., behavioural, cognitive, and social engagement), with emotional engagement as a component of behavioural engagement.

A strong correlation has been identified in the literature between levels of learning engagement and the cognitive and practical performance of learners [33,56]. To this end, many studies have shown that teaching in digital environments, such as distance learning environments using digital platforms, has a positive effect on increasing the levels of learning engagement among learners and thus contributes to improving learners' knowledge and skill acquisition [57–60]. For example, Aldaghri and Oraif [61] explored the impact of using the Blackboard platform on university students' writing skills. The results of their study indicated that learning via Blackboard positively influenced students' engagement and learning achievements with respect to writing skills. Alardan's [12] study showed that using the Easy Class platform affected the behavioural and cognitive engagement in learning among students. Similarly, Allam [62] indicated that students who studied using the Moodle platform attained more positive results with respect to achievement and skills performance, and their involvement in the learning process was higher than that of those who studied through a regular learning environment.

### 3.4. Preservice Teachers and Studies on the Use of Digital Learning Platforms

Basher [63] examined the effects of the Google Classroom platform on the teaching efficiency and academic achievement of preservice teachers. The study followed an experimental design with two groups: a control group was studied using the conventional approach, while the experimental group was taught using Google Classroom. The findings indicated significant statistical differences in the participants' results in favour of the experimental group, with improved teaching efficiency, including planning, performing and evaluating, as well as an improvement in their overall academic achievement.

Heggart and Yoo [22] conducted a study on the effectiveness of utilising Google Classroom with final-year teacher education students (preservice teachers). They investigated the extent to which the platform might impact future teaching practices and found that Google Classroom enhanced learning engagement and performance among the participants. Their study also proposed a framework to evaluate the pedagogical practices of online platforms.

Gupta and Pathania [15] evaluated the influence of Google Classroom on teacher education and found that student teachers could easily access learning materials, interact with their peers, frequently access learning resources, and had the flexibility to study anytime and anywhere. The results also revealed that the student teachers felt a sense of accomplishment and fulfilment and were particularly pleased to be able to print lectures and activity materials made available by their lecturers. Students also thought that studying via Google Classroom was an enjoyable and beneficial experience and considered it an efficient learning tool.

Yuksel [64], who aimed to determine the influence of the Moodle learning platform on preservice teachers' pedagogical knowledge and performance, followed a quasi-experimental research design with 87 preservice teachers. To collect data, the study used a placement test, a performance test, and three general pedagogical knowledge tests. The results showed that preservice teachers in the experimental group significantly outperformed their peers in the control group on the performance test. This study found that using the Moodle learning platform can help student teachers prepare for learning by increasing their general pedagogical knowledge.

Khodur [44] examined the effectiveness of using Google Classroom in developing teaching skills and the trend towards online learning among field training students (preservice teachers) in Egypt. The researcher used a quasi-experimental approach for two groups: an experimental group was taught using the Google Classroom platform, and a control group was taught using the traditional method. The sample comprised 52 field-training students in their third year at the Faculty of Physical Education for Boys in Al-Haram. The findings indicated that using Goggle Classroom had a positive impact on the development of teaching skills and attitudes towards online learning among field-training students.

In general, all previous studies have explored the impact or effectiveness of using digital learning platforms to improve teaching skills among preservice teachers. Therefore, the current study is unique in that it is one of the first to shed light on the effectiveness of using Google Classroom as a digital learning platform in acquiring and developing instructional design competencies and learning engagement among preservice female teachers in Saudi Arabia. Thus, this study will contribute to the growing literature regarding the use of digital learning platforms in teacher education and the teaching profession.

## 4. Materials and Methods

The current study followed a quantitative approach, which is based on examining an educational phenomenon from the participants' point of view [65]. Therefore, our study followed a quasi-experimental approach with a one-group design (pre- and posttest). A descriptive analytical method was used to interpret the study's results and determine the instructional design competencies and learning engagement of the participants. Figure 1 illustrates the methodological steps of this study.

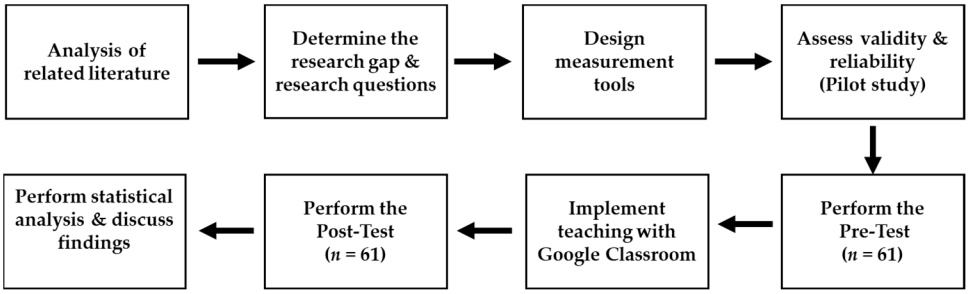


**Figure 1.** Research methodology.

### *4.1. Study Sample*

The study sample consisted of 61 female student teachers from the College of Education at King Faisal University in Saudi Arabia. The preservice teachers were in their third year of their bachelors' degrees and were 20–21 years of age. The participants were selected as the intended sample, as they were enrolled in Educational Software Design, which was an elective course. The participants were taught instructional design competencies via an online approach, using Google Classroom as the digital learning platform.

### *4.2. Data Collection and Analysis*

We obtained approval from the Scientific Research Ethics Committee at King Faisal University to conduct this study (approval number KFU-REC-2022-OCT-ETHICS217). The data were collected during the 2022 academic year. At the beginning of the first semester, the participants' instructional design competencies (as specified in the course) were determined. The participants were introduced and oriented to the Google Classroom platform and shown how to register to use the various tools in Google Classroom to learn and communicate with their teachers and peers. The entire course content had been uploaded onto the platform, including all the activities, duties, and assignments they needed, and the participants were taught for 14 academic weeks. In week 1, the participants undertook a pretest, which comprised an achievement test and the engagement scale, in order to measure their responses prior to the experiment with Google Classroom. At the end of week 14, the participants took a posttest to compare those results with the pretest results, thus identifying the effectiveness of using Google Classroom on the student teachers' development in terms of their cognitive and practical competencies in educational design and the degree of their engagement in learning. In both the pretest and posttest, informed consent was obtained from all participants involved in the study, which ensured the privacy and confidentiality of their responses. Both the achievement test and the engagement scale were administered virtually via electronic links that had been sent to potential participants' emails.

The statistical software SPSS version 23 was used to analyse the results of the study and to answer the research questions. Pearson's correlation coefficient and Cronbach's alpha were used to check the validity and reliability of the study instruments. The results were interpreted using descriptive statistics that included the mean (M) and standard deviation (SD), along with the independent sample *t*-test to detect the significance of the differences in the participants' responses between the two groups.

### *4.3. Measurements, Validity, and Reliability*

To achieve the purposes of this study, three measurement instruments were used, and their validity and reliability were tested on a pilot sample ($n$ = 20), which was considered representative of the study population, but was not included in the study sample.

#### 4.3.1. Achievement Test

To assess the preservice teachers' cognitive competence in instructional design, an achievement test with 30 questions was designed to measure the knowledge gained on the

topic of instructional design (test total score = 30). The achievement test was scientifically formulated according to a specification table corresponding to the course learning outcomes. The test comprised five competencies: analysis, design, development, implementation, and evaluation. Each competency included a set of multiple choice questions covering the analysis (6 items), design (7 items), development (6 items), implementation (5 items), and evaluation (6 items). To measure the content validity, the achievement test form and the answer key were presented to a group of experts ($n$ = 5) who specialised in curricula and teaching methods, as well as measurement and evaluation, and their suggestions for modifications were considered. To measure its reliability, the achievement test was administrated to a pilot sample of 20 students, and the reliability was calculated through the Kuder–Richardson Formula 20 [66]. The reliability coefficients for the six competencies ranged from 0.81 to 0.84, and the reliability coefficient for the total test score was 0.88, which indicated a high and acceptable level of reliability.

#### 4.3.2. Product Evaluation Card

A product evaluation card was developed to measure the preservice teachers' practical competence in instructional design, with the aim of measuring the performance aspects of instructional design. The evaluation card was used to rate the participants' final product quality, where 1 = not sufficient, 2 = sufficient, and 3 = excellent. It consisted of 30 practical skills covering analysis (6 items), design (7 items), development (6 items), implementation (5 items) and evaluation (6 items). After developing the evaluation card, the content validity was examined by obtaining the opinions of a group of preservice teachers ($n$ = 5, excluded from the study sample) to assess the clarity and accuracy of all the items, and their suggestions for modifications were addressed. The evaluation card was then applied to a pilot sample of preservice teachers ($n$ = 20, not part of the study sample). To ensure its validity, Pearson's correlation coefficient was calculated between the items and skills and between the skills and items with the total score of the evaluation card. Pearson's correlation coefficients between the items and the total score of the related skills and between the items and skills with the total score of the evaluation card ranged between 0.98 and 0.99, and were statistically significant at $p < 0.01$. The reliability coefficients were then calculated based on the evaluated skills and the total score of the skills using Cronbach's alpha. The reliability coefficient of Cronbach's alpha for the total score of the evaluation card was 0.97, and the reliability coefficients for the skills ranged between 0.90 and 0.95, which indicated a high and acceptable level of reliability.

#### 4.3.3. Learning Engagement Scale

The preservice teachers' learning engagement was measured via a survey questionnaire that consisted of 22 items, which had been adopted from previous studies and adjusted for the purpose of this study. The survey questionnaire consisted of three domains, namely, cognitive engagement, which included 8 items that had been adopted from Gunuc and Kuzu [67] and Lee et al. [68]; behavioural engagement, which included 8 items that had been adopted from Gunuc and Kuzu [67] and Lee et al. [68]; and social engagement, which included 6 items adopted from Poon et al. [69]. A total of 22 closed-ended statements were included in the scale, and the participants were asked to rate their responses according to a five-point Likert scale (1 = strongly disagree, 2 = disagree, 3 = to some extent, 4 = agree, and 5 = strongly agree). The content validity of the questionnaire was verified by presenting it to a group of experts ($n$ = 10) who specialised in educational psychology to check the language, clarity, and appropriateness of all the items. All their suggestions for modifications were considered, and the questionnaire was finalised. To measure the validity and reliability of the survey questionnaire, it was administered to a pilot sample of preservice teachers ($n$ = 20, not included in the study sample). The validity was measured by calculating Pearson's correlation coefficient between the items and the domain to which they belonged, and between the items and the domain with the total score of the scale. All the Pearson's correlation coefficients were statistically significant at $p < 0.01$ and

$p < 0.05$, respectively. Pearson's correlation coefficients between the items with the total score of the scale ranged between 0.542 and 0.857, all of which were significant at $p < 0.01$ or $p < 0.05$. The correlation coefficients between the total score of the domains with the total score of the scale ranged between 0.93 and 0.99, which was significant at $p < 0.01$. In terms of reliability, the internal consistency was calculated using Cronbach's alpha coefficient for each domain and for the total scale. Cronbach's alpha for the scale was 0.96, and for the cognitive, behavioural, and social domains, it was 0.91, 0.91, and 0.90, respectively. All the coefficients indicated that the engagement scale had a high level of reliability.

## 5. Results

In this study, we aimed to investigate the effectiveness of using digital learning platforms to develop instructional design competencies and learning engagement among preservice teachers. The results of this study are presented in line with the two research questions.

To answer research question 1, (To what extent do preservice teachers acquire instructional design competencies using digital learning platforms?), two hypotheses were formulated. H1 assumed that using a digital learning platform (Google Classroom, in this study) had a positive effect on developing preservice teachers' instructional design cognitive competence. This hypothesis was tested by administering the achievement test to the participants before and after the experiment with Google Classroom. We calculated the independent sample *t*-test to determine the statistical differences in the participants' mean responses. The results shown in Table 1 indicated that there was a statistically significant difference ($p < 0.5$) in the mean scores of the participants between the pretest ($M = 9.75$) and posttest ($M = 24.72$). This confirmed the positive effects of using Google Classroom to develop cognitive competence in instructional design among preservice teachers. H1 was therefore confirmed.

**Table 1.** The independent sample *t*-tests for the achievement test (n = 61).

| Test | *M* | *SD* | *df* | *t*-test | *Sig* |
|---|---|---|---|---|---|
| Pretest | 9.75 | 2.211 | 60 | 34.674 | 0.000 |
| Posttest | 24.72 | 2.083 | | | |

In terms of measuring practical competences in instructional design, H2 assumed digital learning platform use (herein, the use of Google Classroom) has a positive effect on developing practical competence regarding instructional design. This hypothesis was tested by administering the product evaluation card to all the participants after the Google Classroom experiment. The practical evaluation required all the participants to develop actual instructional design products, which were then evaluated according to the product evaluation card at three levels (i.e., 1 = not sufficient, 2 = sufficient, and 3 = excellent). To test this hypothesis and to determine whether the preservice teacher participants had acquired and developed practical skills in instructional design, descriptive statistics were calculated via *M* and *SD*. The results in Table 2 indicate that a high mean score was achieved by the participants for all five skills included in the evaluation card: analysis skills, $M = 2.92$; design skills, $M = 2.8$; development skills, $M = 2.78$; implementation skills, $M = 2.77$; and evaluation skills, $M = 2.70$. This result confirmed the positive effects of using the digital learning platform Google Classroom in developing the preservice teachers' cognitive competence in instructional design. H2 was thus confirmed.

To answer research question 2 (i.e., To what extent do preservice teachers engage in learning using digital learning platforms?), we assessed three components of learning engagement: cognitive, social, and behavioural engagement. Accordingly, three hypotheses were provided to answer this research question. We assumed a positive effect when using a digital learning platform (herein, Google Classroom) to develop preservice teachers' cognitive, behavioural, and social engagement in learning via H3, H4, and H5, respectively. The three hypotheses were tested by administering the learning engagement scale to all the participants, before and after the Google Classroom experiment. We calculated the

independent sample *t*-test to ascertain the statistical differences in the participants' mean responses. The results (Table 3) indicated that there were statistically significant differences ($p < 0.05$) in the mean scores of the participants between the pre- and posttests for cognitive engagement ($t = 15.60$, $p < 0.05$), behavioural engagement ($t = 10.75$, $p < 0.05$), and social engagement ($t = 14.02$, $p < 0.05$). This confirmed the positive effects of using the digital learning platform Google Classroom in developing learning engagement across all three domains of cognitive, behavioural, and social engagement. All three hypotheses (H3, H4 and H5) were thus confirmed.

**Table 2.** Descriptive statistics of the product evaluation card (N = 61).

| Competence | *M* | *SD* |
|---|---|---|
| Analysis | 2.92 | 0.108 |
| Design | 2.81 | 0.120 |
| Development | 2.78 | 0.146 |
| Implementation | 2.77 | 0.142 |
| Evaluation | 2.70 | 0.138 |
| Total | 2.80 | 0.071 |

**Table 3.** The independent sample *t*-tests for the learning engagement scale (N = 61).

| Scale | Test | *M* | *SD* | *df* | *t*-Test | *Sig* |
|---|---|---|---|---|---|---|
| Cognitive engagement | Pretest | 2.44 | 0.586 | 60 | 15.60 | 0.000 |
| | Posttest | 4.47 | 0.506 | | | |
| Behavioural engagement | Pretest | 2.54 | 0.520 | 60 | 10.75 | 0.000 |
| | Posttest | 3.85 | 0.511 | | | |
| Social engagement | Pretest | 2.51 | 0.603 | 60 | 14.02 | 0.000 |
| | Posttest | 4.40 | 0.533 | | | |
| Total scale | Pretest | 2.52 | 0.525 | 60 | 14.01 | 0.000 |
| | Posttest | 4.22 | 0.481 | | | |

## 6. Discussion and Implications

Given the importance of teachers gaining educational design competencies and the increasing interest in using online learning via digital platforms in qualifying teacher programmes, we examined the effectiveness of Google Classroom as a digital learning platform in helping preservice teachers in Saudi Arabia acquire and develop instructional design competencies. The results of our study showed that cognitive instructional design competencies can be attained and improved by learning using Google Classroom. Furthermore, we confirmed the effectiveness of this digital learning platform in developing cognitive competence in educational design. In other words, digital learning platforms exhibit characteristics, features, and tools that can be employed to teach this important competence to teachers. The digital learning platform enabled the teachers and those in charge of training to use the Google Classroom tools to display, present, and follow up on the preservice teachers' learning [15]. For example, in our study, the required learning outcomes were explained to the study participants, which made them more focused on achieving them. The content was presented from simple to complex and in the form of small, sequential interactive units, which helped the participants learn cognitive skills. The content was multimedia-enhanced via the use of video clips, pictures, animations, and sound, which triggered the motivation to learn. The participants were also provided with a set of activities and instructions, immediate feedback, and appropriate reinforcement. Google Classroom provides the option of self-assessment, which had a positive impact on increasing the participants' interaction and knowledge acquisition levels [41]. This result is supported by a number of studies on the impact of digital platforms in increasing users' levels of cognitive achievement [17,38,43,45,70].

In terms of practical competence in instructional design, we found that the preservice teacher participants were able to obtain and develop practical skills in instructional design

by using Google Classroom as a digital learning platform. Digital platforms offer the possibility of designing assessment tools through quizzes and performance evaluation forms, providing continuous feedback to learners to identify their strengths and weaknesses, monitoring learners' progress in learning, and providing immediate feedback through a range of tools [15,20,32,70]. They also provide reinforcement tools and tools that support collaborative and participatory learning and increase motivation. Our result has been confirmed by many studies, which have revealed the effects of using the Google Classroom platform on the development of learners' performance skills [17,40,43–46]. An important application of these results is the need for those responsible for qualifying preservice teachers to know the capabilities and affordances of the tools available on digital learning platforms when designing and developing instructional design courses in order to ensure that the learning process is supported. This can be achieved by, for example, integrating content material that is enhanced with multimedia and visual representations [40,41], providing enriching learning resources and activities [14], facilitating the assessment of learning tasks through the provision of clear and thorough criterion-based rubrics [19], providing immediate, detailed, and corrective feedback, working on activating alternative assessment tools, such as self and peer assessments, within the digital platform [43], and activating tools that support cooperative and participatory learning among students to increase learning motivation and thus support the mastery of learning.

The results of our study showed preservice teachers' positive engagement in learning instructional design skills when using Google Classroom. Cognitive engagement is the identification of mental efforts, thinking methods, and cognitive experiences [71]. Google Classroom enabled the preservice teachers in our study to organise and present the content by dividing it into small units, which enhanced their connections with the content and helped them overcome the complexity of some parts of the subject matter, thus enabling the participants to engage cognitively in the learning process [15,72]. Behavioural engagement includes perceived responses to learning tasks, as well as active participation and interaction with the content [51,71]. Digital platforms provide a safe environment for learners and teachers, in which immediate, customised feedback is provided individually and collectively [15]. This boosts learners' self-confidence, which leads to increased behavioural engagement, that in turn allows them to master their learning [12,56]. Social engagement refers to the active interaction of learners when building knowledge in a social context [73]. As an interactive learning platform, Google Classroom provides tools for dialogue, cooperation, interaction, the exchange of views, and discussions between learners and their peers, as well as teachers and learners. It thus facilitates synchronous and asynchronous communication, which contributes to social engagement [74]. In our study, the flexibility offered by Google Classroom for the participants to access content and interact with others, anytime and anywhere, led to an increase in their social engagement. The Google Classroom platform also provides teachers with the opportunity to exchange information with their colleagues, comment on it, and manage dialogues and discussions, thus helping to increase cognitive and social engagement [12,22]. These positive results are aligned with those of a number of studies, which have shown high levels of learner engagement when learning online via digital learning platforms [32,57–59,61,62]. The findings of our study thus emphasise the need for greater investment in the adoption of digital learning platforms in preservice teachers' professional training, so that they can benefit from the potential of these platforms to develop their instructional design competencies [8,15].

## 7. Conclusions, Limitations, and Future Work

The quality of education depends largely on the development of teachers' competencies. Instructional design competencies are among the most important competencies for teachers today [6]. The acquisition and development of these competencies begins with preparing teachers during their studies in teacher education programmes. Given the significant adoption of digital learning platforms in teacher preparation programmes as a type of online education, our study sheds light on the effectiveness of these platforms in

developing instructional design competencies among preservice female teachers in Saudi Arabia. Our study results further showed that the use of Google Classroom as a digital learning platform was effective in helping the participating preservice teachers acquire and develop both their cognitive and practical competencies in educational design. Our results also showed high levels of learning engagement of the preservice teachers at cognitive, behavioural, and social levels when learning instructional design via the Google Classroom platform. This study highlights the importance of employing digital learning platforms when training teachers in instructional design competencies, and we therefore call on those in charge of professional development programmes and teacher preparation programmes to increase their investment in digital learning platforms so that teaching competencies can be improved and teachers can be supported in their professional growth.

Several limitations should be considered when interpreting the results of this study. First, in terms of sampling, we used the convenient sampling approach and selected participants who had access to our courses, namely, female student teachers. Male student teachers were not included, so we recommend a prospective study in which male student teachers are included in the study sample. In addition, we believe it would be beneficial to conduct a study that compares the instructional design competency levels between preservice teachers and in-service teachers in regards to the use of digital learning platforms, and to investigate the moderating effect of the teaching experience factor. Second, in terms of the methodology, our results were determined using a semi-experimental design with one group, and the generalisation of the results is thus limited. It may therefore be useful to carry out similar future studies that are descriptive and have a larger sample size to better generalise the results. In addition, to confirm the results of this study, we suggest that a future semi-experimental study be conducted with two groups, comparing the results of the experimental group with those of a control group in terms of the acquisition and development of instructional design competencies. We further recommend that future research be conducted to examine teachers' perceptions regarding the motivating and inhibiting factors pertaining to the use of digital learning platforms. Such research could comprise qualitative studies to provide a richer understanding of the data. Notwithstanding, we believe our study significantly enriches the knowledge base regarding existing instructional design competencies in teacher professional education.

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