ACADEMIC JOURNALS
expand your knowledge

Educational Research and Reviews

Full Length Research Paper

The effectiveness of an instructional design training program to enhance teachers' perceived skills in solving educational problems

Nada Alsaleh

Instructional Technology Department, School of Education, King Saud University, Saudi Arabia.

This study aims to identify the effectiveness of a training program on the ADDIE instructional design model to enhance teachers' perceived skills in solving educational problems. The ADDIE training program is proposed to help teachers identify their educational problems and find systematic solutions to them. To evaluate the effectiveness of the proposed training program, action research with the quasi-experimental design was employed. Four groups, in total 77 in-service teachers, undertook a short-term training program on the ADDIE model. Data were collected through a pre and post self-assessment questionnaire that consisted of five sections regarding the primary ADDIE skills (analysis, design, development, implementation, and evaluation), and open-ended questionnaires to understand teachers' expectations and attitudes toward this training program. The findings indicate that the post-self-assessment questionnaire scores were significantly higher than the pre self-assessment questionnaire scores. This study revealed that the ADDIE training program was highly effective in terms of improving teachers' ability to solve educational problems from teachers' perspectives. However, teachers indicated that they need more and longer-term training programs on these skills as well as longitudinal studies measuring these skills. Teachers suggested that this program be made a compulsory program for every pre and in-service teacher.

Key words: Instructional design, ADDIE model, problem-solving skills, teacher professional development.

INTRODUCTION

Being a 21st-century educator is not an easy task. Recent social, economic and political developments have had a significant impact on education, in general, as well as on the roles teachers play in the classroom. These changing roles, rising demands, and standards from society and policymakers necessitate the employment of high-quality teachers (Gajdos, 2016). Researchers and

educators agree that the quality of teachers has a significant impact on learning and achievement of students. Harder (2005) claimed that effective teachers must have both content knowledge, skills and an effective teaching methodology.

Despite the general acceptance of professional development as necessary for improving teachers' skills

and education, analysis of professional development research has consistently highlighted the inefficiency of most programs (Bayar, 2014). There is no question that a variety of factors contribute to this inefficiency. Nonetheless, Guskey (2002) proposed that most interventions fail because they do not take two important factors into consideration: (1) what motivates teachers to participate in professional development, and (2) the mechanism by which teachers usually improve. Bayar (2014) argued that any successful professional development program should meet the needs of teachers and schools, ensure the involvement of teachers in the preparation of professional development events, provide incentives for active participation, and ensure long-term commitment and high-quality trainers.

Research efforts that focus on pre and in-service teachers argue that being a professional teacher means special integration of high-level knowledge of content with general problem-solving skills (Guskey, 2002; Bayar, 2014; Wati, 2011; Ma et al., 2018). A teachers' professional life is not without daily problems and difficulties, whether it is in the content they teach, curriculum design, or managing different needs of students. Therefore, training teachers in the skills necessary to deal with these problems becomes an essential part of professional development. According to Gajdos (2016), one of the fundamental skills teachers need to learn is efficient problem-solving. Problem solving skills are strongly linked to general cognitive and metacognitive processes such as problem interpretation and representation, reasoning, information gathering, assessment, solutions development, decision-making, preparation, reflection and evaluation (Gajdos, 2016).

An iterative process model from Instructional Design (ID), such as ADDIE, can function as a cognitive organizational framework for teachers' development. Harder (2005) argued that the principles of ID provide a framework for teachers' planning, and for strategic management of their teaching tasks and problems, which can effectively enhance their career. Additionally, he states that ID is a good teacher development tool because it is applicable across domains and disciplines.ID can provide a framework and models for teachers continuing training and professional development.

The aim of the current study was therefore to investigate the effectiveness of the ADDIE instructional design model training program in improving the skills of teachers in solving educational problems, and to determine teachers' expectations and attitudes toward this training program.

LITERATURE REVIEW

In almost any modern initiative to improve education, high-quality professional development is a central component. Educational leaders are becoming increasingly aware that the quality of their schools cannot be better than the teachers and administrators who work within them. While the content and structure of these proposed professional development programs vary widely, many share a common purpose, which is to modify professional behaviours, values, and perception of school staff and administrators toward an articulated aim. Guskey (2002) defined professional development programs as "systematic efforts to bring about change in the classroom practices of teachers, in their attitudes and beliefs, and in the learning outcomes of students" (p.381).

What attracts teachers to professional development is their expectation that it will expand their knowledge and skills, contribute to their growth, and improve students' performance. However, teachers tend to be quite realistic as well, what they hope to gain through professional development are specific, concrete, and practical ideas directly related to their classroom's day-to-day operation (Guskey, 2002). Opfer and Pedder (2011) argued that teachers' professional development should help teachers build upon their knowledge, improve their performance in the classroom and resolve challenges.

In-service teachers are used to taking different types of professional development programs. These programs can be short-term for few days or long-term and can extend for several weeks or months. Another type of professional development program is mentoring programs for novice teachers, where they can learn from interacting with experts; however, the mentoring process requires time and a degree of interaction not typical in novice teachers' experience (Bayrakci, 2009). All these activities vary widely in their ability to enhance teachers' learning and development. Some are administered piecemeal rather than comprehensively or systematically, thereby affecting effectiveness and applicability (Harder, 2005).

In addition, teachers have varying needs, circumstances, and the need for teaching development; teachers who know the substance of teaching or pedagogy may not be able to apply it to their teaching practice. Ma et al. (2018) argued that pedagogical knowledge and comprehension are prerequisites, but they do not guarantee that teachers can teach well. It also does not mean they know which concepts are difficult for students, what representations are best for certain ideas, or how best to develop conceptual understanding (Ma et al., 2018). Any professional development intervention must be transparent, reliable, accurate, and appropriate to the needs of teachers for effective teaching; and it must comply with the essence of the teaching role and the teaching skill requirements (Harder, 2005).

In order to be able to respond to a variety of challenges facing them, teachers need a wide range of skills. That is why several experts argue that a key component of professional development is problem-solving (including decision-making) (Gajdos, 2016). Teaching is a dynamic

problem-solving task in terms of its cognitive and procedural criteria (Smith and Ragan, 1999). It involves flexibly adapting to a diverse set of circumstances, and the application of a specific body of knowledge. Effective teachers adapt to the needs of learners and respond to information about the progress of learning and the accomplishment of tasks. To satisfy these demands, teachers need an effective cognitive structure to regularly change teaching that allows new contingencies to be easily added to their existing mental representations (Dick et al., 2001).

Gajdos (2016) stated that teachers know that the ability to solve problems is dependent on the creation of cognitive organizational structures that direct what teachers think and how they pose problems. Cognitive organization of values and knowledge is an important strategy for building trust and skills. According to Gajdos (2016), "Problem solving skill is strongly connected to such general cognitive and metacognitive processes as perception and representation of the problem, reasoning, gathering information, analyzing, creating solutions, decision making, planning, reflecting and evaluating"(p.4).

Teachers not only need to solve problem skills during the immersive instruction process in the classroom, but also when reviewing the prior lesson and preparing for the next. In this regard, the whole pedagogical cycle, beginning with preparation and ending with self-evaluation, is seen as evaluating, behaving, thinking, determining and solving problems. Gajdos (2016) argued that teaching is increasingly seen as a technical practice involving careful analysis of each scenario, choice of goals, creation, and evaluation of suitable learning opportunities, assessment of their effect on the success of students, attention to learning needs of students and personal or collaborative reflection on the entire process.

In conclusion, the effectiveness of the pedagogical problem-solving process depends on personal and technical factors such as: 1- The combination of different pieces of knowledge, such as professional theoretical knowledge, practical knowledge, knowledge of (the) self, knowledge of the problem-solving process, and knowledge of the current situation. 2- The combination of different skills, for example: general thinking skills, professional skills, and problem-solving skills, 3- motivational factors like emotions, beliefs, and attitudes (Ma et al., 2018).

Harder (2005) argued that problem-solving skills can be the connection between knowledge and procedural knowledge; therefore, a clear opportunity in instructional design (ID) is appropriate for professional development events and can respond to the needs of teachers. Dabbagh et al. (2000) claimed that ID is a structured problem-solving process defined by the problem context, the instructional designer's knowledge and skills, and the quality of resources available. As stated by Harder (2005), ID is a process that can direct the planning and

management of education. The concepts are based on learning theory and extend through age, contexts, level of skill and domains of content (Reigeluth, 1999). ID is a systematic distillation of best practices in teaching planning, including an emphasis on strategically choosing learning events that further the achievement of learning goals. ID supports learning as it involves structured, logically grounded educational activities and approaches that facilitate learning, engagement and success (Smith and Ragan, 1999).

ID's primary objective is to use systematic design procedures to design efficient and effective solutions for educational problems (Gustafson and Branch, 2002). A systematic approach requires coordination of all educational activities, because even good teachers can create major differences between targets, strategies and assessments without such a systematic approach (Gustafson and Branch, 2002). Although several ID models and methods have been developed, they all include, in one form or another, the core elements of research, design, development, implementation and evaluation (ADDIE) to ensure consistency between the objectives, strategies, evaluation and effectiveness of the resulting instruction. As stated by Smith and Ragan (1999), these five faces or skills consist of:

Analysis

The analysis phase is the cornerstone of all phases of educational design. During this phase, the instructional designer defines the problem, the gap in the reality (needs), the causes and possible solutions to it. This phase consists of a needs analysis, audience analysis, context analysis, and task analysis; all this information will help to set the possible solution and goals.

Design

It is the process of translating the analysis information into clear, actionable steps, by setting initial plans to the educational product. This phase is the production of the road map that the designer will use to develop the solution. The design also includes the methods and procedures related to how the solution will be implemented. In this phase, the instructional designer should design: the educational aims, the sequence of learning, the educational strategies, the instructional technology and the assessment tools.

Development

This is the phase of transforming the design into a real product. In this phase, the instructional designer transforms the solution components to physical products

that are available for practical use. It goes through several stages: manufacturing of prototypes, piloting of prototypes and final product iterations.

Implementation

At this phase, the product is used in a real environment, in other words, implementing the solution in the educational environment and on an audience. The implementation process may be done experimentally first to a group of experts in that specialty or a small group of participants, before implementing it extensively in the community. The implementation phase also consists of some important procedures, such as collecting formative and final evaluation data, and monitoring the effectiveness of the product, providing technical support, and managing and publishing the product (solution).

Evaluation

At this phase, the data collected in the implementation phase are used to judge the efficiency and effectiveness of the design, before using the data to develop and improve the product. In this phase, the instructional designer focuses on evaluating the efficiency of the solution and the design plan itself, and suggests a development plan if necessary. ADDIE's principles are based on learning theory and they are applicable across age, settings, skills and content domains (Druckmanand Bjork, 1994; Reigeluth, 1999). According to Dabbagh and Blijd (2010), this systematic design models a distinct instructional or pedagogical method involving the investigation and exploration of content, theory, and process related to the project at hand. Introducing users to the literature of the ID models, principles and processes take place within the context of solving a real-world performance problem and developing functional prototype solutions. Using ID models, such as ADDIE, allows teachers to perform different roles to evaluate challenges, find potential approaches and directions, and strives to jointly develop a professional product that meets the needs described. Teachers deal with many of the characteristics that represent complex problem solving such as a high level of ambiguity and navigating among multiple solution and solution paths (Dabbagh and Blijd, 2010).

While there is a body of theoretical and empirical literature on ADDIE as an instructional design model (Rahman et al., 2014; Ahmadigol, 2015; Abidin and Tho, 2018), it addresses aspects of using ADDIE's model to design educational products such as courses and software, with less focus on the role of this model in teacher professional development. The present study adds to this literature in that it utilizes the ADDIE model to develop teachers' professional skills, particularly with

regard to solving educational problems. This study argues that coaching teachers on ADDIE skills provides them with systemic knowledge and the awareness to help find systemic solutions for educational problems.

Research questions

Can ADDIE training programs enhance teachers' problem solving skills?

What are teachers' expectations of the ADDIE training program?

What are teachers' attitudes toward the ADDIE training program?

ADDIE training program

Although there are many models of ID, the ADDIE model has been chosen because it is standardized and common for almost all models of ID and has been widely used for learning design. The ADDIE model helps instructional designers and teachers create an efficient and effective instructional template by adapting the ADDIE model processes to any educational product (Druckman and Bjork, 1994). In this study, teachers are coached on applying ADDIE phases and skills on educational problems of their choice in order to find solutions for them. The phases of the ADDIE model and their skills are shown in Figure 1.

Analysis

In this phase, teachers were asked to define their problem and analyse all the surrounding factors that can assist in understanding the situation, the causes, and suggest methods of treatment as well. After the teachers discussed these with their groups, they chose the best solution to design. In this phase, the teachers were coached on these sub-skills of analysis:

1. Analyze the needs (or problems) associated with the educational content.
2. Identify appropriate solutions to solve the educational problem presented (setting the main goal).
3. Sort the educational content into its main components (concepts, facts, generalizations, skills and values).
4. Analyze students' psychological and social characteristics, and the individual differences affecting the learning process.
5. Analyze the students' background related to educational content.
6. Analyze the educational environment and its various components (facilities, equipment, time, and materials),
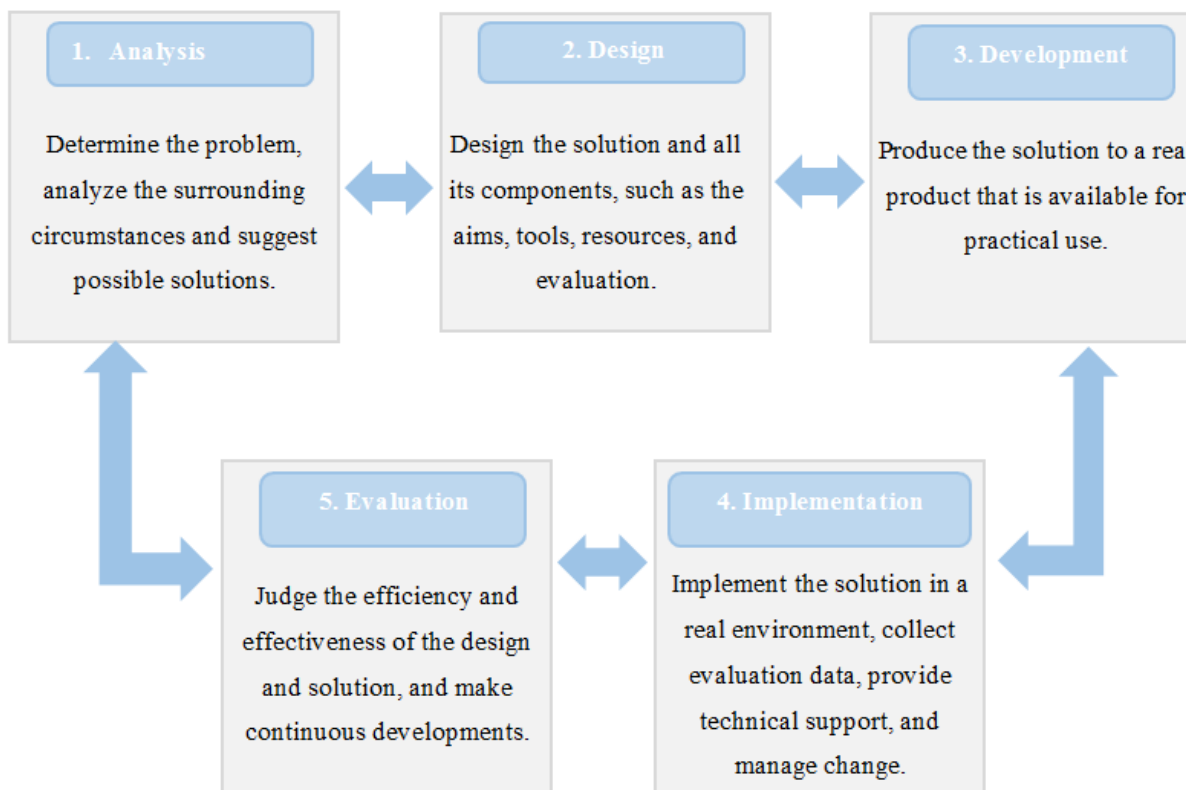
Figure 1. The Skills of the ADDIE's phases.

and compare them with the requirements necessary to teach the content.
7. Identify various educational sources (or references) of the required knowledge.

Design

At this phase, the solution is designed and the detailed specifications of the solution are defined on the storyboard. The teachers, with their groups, were asked to draw their plan's storyboard with all the needed details:

1. Design a clear and detailed educational plan for implementation.
2. Formulate realistic, verifiable behavioural goals for the content in light of the potentials available in the environment.
3. Formulate diversified behavioural goals in the three areas: cognitive, emotional, and skills as required by the content.
4. Use the principles of teaching and learning theories in the design process.
5. Rearrange and organize educational content according to the sequence that is appropriate for achieving the educational goals.
6. Design appropriate learning strategies to achieve

content goals.
7. Design educational activities that promote real learning and demonstrate how it relates to reality.
8. Choose the appropriate instructional technologies to achieve the goals of the content.
9. Design a variety of different assessment methods (oral, written, and practical tests) commensurate with the content and its objectives.
10. Build a clear and detailed rubric that clarifies the assessment criteria.

Development

In this phase, teachers were asked to use the necessary tools, such as computers and their applications, to develop the design model (storyboard). For example, teachers produced the materials and tools needed for the design of their solution. The teachers were also able to go back to the design phase and modify the design after their observations in the development stage. In this phase, the teachers were coached to:

1. Develop and update various educational resources (or references).
2. Produce appropriate instructional technologies to deliver educational content, such as a paper game or

learning software.
3. Understand the design and production quality criteria for instructional technologies.
4. Provide clear and complete instructions about educational content, accompanying activities and requirements (assignments).

Implementation

In this phase, the teachers were supposed to implement the solution in the real world and collect the evaluation data; however, due to the short time of this training program, and the lack of time of real implementation, the teachers were asked to write detailed implementation plan, in terms of the process, procedure, and timeline. They were also asked to write the expected challenges and suggest supporting plan. The teachers were coached to:

1. Commit to the teaching plan that had been designed. Encourage students' participation.
2. Commit to using the strategies and technologies identified in the plan.
3. Listen to participants' inquires, and provide them with continuous and appropriate feedback.
4. Convince others using the design intervention, and encourage them to adopt it.

Evaluation

In this study, teachers were asked to identify weakness in the design and any challenges, and suggest a development plan. In this phase, the teachers were coached on these skills:

1. Distinguish the difference between the concepts of the assessment and evaluation.
2. Commit to pre, structural and post evaluation.
3. Analyze and document the evaluation findings for use in developing the design's plan.
4. Provide appropriate feedback to participants based on the evaluation results.
5. Suggest appropriate treatment plans for the participants.
6. Encourage participants to use self-evaluation. Evaluate the content and strategies at different stages of the lesson and curriculum.
7. Develop the teaching performance using participants and colleagues' feedback.

METHODOLOGY

This study conducted an action research based on the ADDIE training program using a quasi-experimental one-group design with in-service teachers. The data were collected during the summer in Saudi Arabia in the summer of 2019. This study was conducted over 4 weeks, which is a training program that started every week. The following sections explain the selection of participants, the study procedure and the methods of data collection.

Participants

The participants of this study consisted of 77 female in-service teachers from different schools in different cities in Saudi Arabia. They were teachers teaching various disciplines, including math, science, special education, and English language studies. Participant teachers taught different grades ranging from kindergarten to secondary school. Four training programs were held on different dates, and the teachers registered themselves in one of these programs based on their preferred date and time. This resulted in four random groups made up of 18, 23, 19 and 17 teachers, respectively. Each group participated in the same training program, and the study instruments were applied in all groups. Before the training program began, the trainer (researcher) explained the procedures to the participants and obtained their consent. Participants were informed that their name would be replaced by numbers during the analysis of their data.

Study procedures

Each group was coached on ADDIE skills for one week (20 h), and the same procedures were applied to each group. In each training group, the teachers were divided into sub-groups based on their disciplines. Teachers were asked to discuss and choose an educational problem or challenge they faced. They were then informed that during the training program, they would look for a suitable solution.

The training program consisted of two parts, a theoretical part, where the trainer introduces and explains the main concepts regarding each phase of ADDIE and its skills. The second part consisted of practical training. Teachers chose different problems, such as problems related to the content, curriculum, students' motivation toward a certain subject, or lack of instructional technologies or assessment methods. They were then given time to practice what they learned and apply ADDIE to their problems. After each phase of ADDIE, each group was asked to present their work to the other groups, then gather trainer and peer feedback on their work. At the end of the final day, the teachers presented their solution designs to the other groups. With regard to the research instruments, teachers were asked on the first day of training, to complete the pre-self-assessment questionnaire, and answer an open-ended questionnaire about their expectations of the training program. On the last day of the training, the post-self-assessment questionnaire was completed by the teachers to evaluate the differences in the teachers' problem-solving skills. Teachers were also asked to answer an open-ended questionnaire about their attitudes toward the training program.

Data collection

To answer the study questions, data were collected using quantitative and qualitative tools: a pre and post self-assessment questionnaire, and open-ended questionnaires.

Pre and post self-assessment questionnaire

The self-assessment questionnaire included two main parts: the first part consisted of basic information about the teachers, such as their discipline, number of years teaching, grade they teach, and whether they have attended similar programs before. The second part included 34 statements related to teaching and learning skills, and was categorized under ADDIE's five main phases. The

Table 1. The reliability statistics.

	No. of Items	Cronbach's Alpha
Pre	34	0.929
Post	34	0.911

teachers had to address these statements and indicate their level of skill on a three-point Likert scale: 'excellent=3', 'average=2' and 'weak=1'. All the teachers had at least two years' experience teaching, so they were expected to have basic knowledge of ADDIE skills and use part of these skills during their educational career, even if they did not know these skills were part of ADDIE. The questionnaire was given to the teachers before and after the training program.

The validity of the questionnaire was tested statistically; Pearson's coefficients were conducted (the correlation of each statement with the total axis to which it belongs), and it was highly and strongly correlated. Moreover, the questionnaire was presented to some professors in the College of Education at King Saud University, and their comments were used to improve questionnaire statements and ensure its clarity and validity as well. The clarity and reliability was tested statistically; Cronbach's alpha was completed for pre and post questionnaires to ensure internal consistency (Table 1). The value of Cronbach's alpha for the 34 statements was a = (0.929) and (0.911) for the pre and post assessment questionnaire, respectively, indicating that the questionnaire was internally consistent and reliable.

Open-ended questionnaire

Two open-ended questionnaires were used. The first one was asked at the beginning of the training program and was used to determine teachers' expectations about the program. It consisted of two open questions about the participants' aims and expectations. The second questionnaire was used at the end of the training program to determine teachers' attitudes toward the program. It consisted of three open-ended questions that helped assess the participants' attitudes. The questionnaires were presented to some professors in the College of Education at King Saud University, to check the clarity and validity of the questions.

RESULTS AND DISCUSSION

The main purpose of this study is to investigate the role of the ADDIE model to enhance teachers' perceived skills in solving educational problems. Additionally, the study sought to identify teachers' expectations and attitudes toward the ADDIE training program. This section discusses answers to each of the research questions based on the study's findings.

Analyzing the demographic data may help in a deeper understanding of the participant's responses, and provide more information about the applicability of the ADDIE program on teachers with a wide range of teaching experience in different disciplines. The results illustrate the ability to generalize teaching and coaching ADDIE skills for different teachers and explain how they benefit from it. Table 2 presents the demographic data of the participants.The data show that 43.4% of the participants

have 7 to 12 years of teaching experience, and about 30% have experience in teaching for more than 13 years. Only 26.3% were new teachers who had 2 to 6 years teaching experience. Most of the participants, 83.1%, have a bachelor's degree, and 16.9% have a master's degree. The participant's specializations were varied, with Arabic language, 9.1 and 15.9% Computer science, 14.3% Islamic studies, 11.7% Math and Science, English language and Special education, and 6.5% Social studies, Arts and Kindergarten. With regard to grades, 7.8% teach kindergarten, 32.5% primary, 26% intermediate, and 33.8% secondary. Although nearly 75% of the participants had more than seven years of teaching experience, only five teachers out of 77 had attended a training program in ID before.

First research question: Can ADDIE training programs enhance teachers' problem solving skills?

The first research question concerned the impact of the training program in enhancing teachers' perceived problem solving skills. This was assessed by using the means and standard deviation of the skills and paired-samples t-test to compare the mean of the pre and post self-assessment questionnaire scores. The results are presented in Tables 3 and 4.

Table 3 presents (Table 3) represents the teachers' performance in each skill of ADDIE before and after the training program. The results show that teacher performances in the post questionnaire were better than in the pre-questionnaire. Moreover, the data identified which skills teachers were weakest in before the training program, such as sorting the educational content into its main components, using the principles of teaching and learning theories, building assessment rubrics, developing educational resources, understanding the design and production quality criteria for instructional technologies, convincing others of the benefit of their design interventions and documenting the evaluation findings for development purposes.

Table 4 shows that the sig. is 0 and less than 0.05 for all ADDIE skills, which indicates that there is a significant difference between the pre and post scores toward the post-self-assessment questionnaire. Participants in the training program had improved scores in all areas of ADDIE skills: $t(76)= -10.99$, $p=0.00$, in analysis skills, $t(76)= -9.92$, $p=0.00$, in design skills, $t(76)= -12.65$, $p=0.00$, in development skills, $t(76)= -8.15$, $p=0.00$, in

Table 2. The Demographic Data.

Demographic data	Percentage	Frequency	Percentage
Teachers' qualifications	Bachelor's Degree	64	83.1
	Master's Degree	13	16.9
Total	Total	77	100
	Arabic Language	9	11.7
	Art	5	6.5
	Computer Science	12	15.6
	English Language	7	9.1
Teachers' discipline	Islamic Studies	11	14.3
	Kindergarten	5	6.5
	Mathematics	9	11.7
	Science	7	9.1
	Social studies	5	6.5
	Special Education	7	9.1
Total	Total	77	100
	2 to 6	20	26.3
Teaching experience (years)	7 to 12	33	43.4
	13 to 17	11	14.5
	>17	12	15.8
Total	Total	77	100
	Kindergarten	6	7.8
Grade taught	Primary	25	32.5
	Intermediate	20	26.0
	Secondary	26	33.8
Total	Total	77	100
Attended ID training program before	Yes	5	6.5
	No	72	93.5
Total	Bachelor's Degree	77	100

implementation skills, and t(76)= -10.68, p=0.00, in evaluation skills. Consequently, the participant total score in pre and post self-assessment improved t (76)= -12.86, p=0.00.

The above results show that the training program was able to contribute to improving teachers' problems solving skills from teachers' perceptions. Moreover, the data show that although 75% of the participants have more than seven years teaching experience, they still need support in main teaching and learning skills including ADDIE. In addition, the data show that the least difference between the pre and post-questionnaire was in the implementation skills. This may be due to the fact teachers usually focus on developing their performance in the classroom and in practical teaching skills, rather than improving their planning, developing and evaluation skills. This finding is consistent with Harder (2003)'s results, which showed that teachers focus on some

ADDIE elements, especially the implementation process, but do not focus on all of the ADDIE elements.

Second research question: What are teachers' expectations of the ADDIE training program?

The second research question aimed at identifying teachers' expectations toward the ADDIE training program. To answer this question, the data were collected from the open-ended questionnaire that was distributed to the teachers at the beginning of the training program on the first day. A coding approach based on thematic analysis principles was applied to analyse the qualitative data collected from the open-ended questionnaires. The data were collected, reviewed, and organized under two main themes: aims of attending the training program and expectations of its benefits. The

Table 3. Means and Standard Deviations for ADDIE Skill (n=77).

	Skills	Pre		Post	
		Mean	Std. deviation	Mean	Std. Deviation
1	Analyze the needs (or problems) associated with the educational content.	2.42	0.522	2.95	0.223
2	Identify appropriate solutions to solve the educational problem presented (setting the main goal).	2.40	0.494	2.92	0.270
3	Sort the educational content into its main components (concepts, facts, generalizations, skills and values).	2.32	0.595	2.81	0.399
4	Analyze students' psychological and social characteristics, and the individual differences affecting the learning process.	2.65	0.580	2.99	0.114
5	Analyze students' background related to educational content.	2.55	0.551	2.99	0.114
6	Analyze the educational environment and its various facilities, and compare them to the requirements that should exist to teach the content.	2.62	0.563	2.96	0.195
7	Identify various educational sources (or references) of the required knowledge	2.57	0.594	2.92	0.270
	Analysis skills	2.50	0.339	2.93	0.140
8	Design a clear and detailed educational plan for implementation.	2.36	0.647	2.90	0.307
9	Formulate realistic, verifiable behavioural goals for the content in light of the potentials available in the environment.	2.70	0.488	2.94	0.248
10	Formulate diversified behavioural goals in the three areas: cognitive, emotional, and skills as required by the content.	2.71	0.535	2.95	0.223
11	Use the principles of teaching and learning theories in the design process.	2.08	0.644	2.84	0.365
12	Rearrange and organize educational content according to the sequence that is appropriate for achieving the educational goals.	2.62	0.539	2.91	0.332
13	Design appropriate learning strategies to achieve content goals.	2.60	0.544	2.94	0.248
14	Design educational activities that promote real learning and demonstrate how it relates to reality.	2.53	0.598	2.91	0.289
15	Choose the appropriate instructional technologies to achieve the goals of the content.	2.77	0.456	2.97	0.160
16	Design a variety of different assessment methods (oral, written, and practical tests) commensurate with the content and its objectives.	2.61	0.542	2.94	0.248
17	Build a clear and detailed rubric that clarifies the assessment criteria.	2.03	0.688	2.75	0.491
	Design Skills	2.50	0.356	2.90	0.177
18	Develop and update various educational resources (or references).	2.12	0.648	2.86	0.352
19	Produce appropriate instructional technologies to deliver educational content, such as a paper game or learning software.	2.38	0.608	2.90	0.347
20	Understand the design and production quality criteria for instructional technologies.	2.06	0.592	2.88	0.362
21	Provide clear and complete instructions about educational content, accompanying activities and requirements (assignments).	2.51	0.620	2.92	0.315
	Development skills	2.27	0.461	2.89	0.242
22	Commit to the teaching plan that has been designed.	2.78	0.417	2.95	0.223
23	Encourage students' participation.	2.83	0.441	2.96	0.195
24	Commit to using the strategies and technologies identified in the plan.	2.55	0.597	2.95	0.223
25	Listen to students' inquires, and provides them with continuous and appropriate feedback.	2.86	0.420	2.97	0.160
26	Convince others using the design interventions and encourage them to adopt it.	2.22	0.681	2.88	0.323
	Implementation skill	2.65	0.328	2.94	0.129
27	Distinguish the difference between the concepts of the assessment and evaluation.	2.49	0.599	2.97	0.160
28	Commit to pre, structural and post evaluation.	2.39	0.691	2.92	0.270
29	Analyze and document the evaluation findings for use in developing the design's plan.	2.19	0.670	2.88	0.323

Table 3. Conrtd.

30	Provide appropriate feedback to students based on the evaluation results.	2.66	0.528	2.96	0.195
31	Suggest appropriate treatment plans for the students.	2.57	0.572	2.97	0.160
32	Encourage students to use self-evaluation.	2.43	0.677	2.92	0.270
33	Evaluate the content and strategies in different stages of the lesson and curriculum.	2.31	0.613	2.95	0.223
34	Develop the teaching performance using students and colleagues' feedback.	2.64	0.560	2.95	0.223
	Evaluation skills	2.46	0.407	2.94	0.129

Table 4. Results of paired-samples T-Test for pre- and post-self-assessment questionnaire scores.

		Mean	N	Std. deviation	Mean differences	t	df	sig.
Pair 1	Analysis skills pre	2.50	77	0.33868	-0.429	-10.991	76	0.000
	Analysis skills post	2.93	77	0.14017				
Pair 2	Design skills	2.50	77	0.35559	-0.403	-9.920	76	0.000
	Design skills post	2.90	77	0.17655				
Pair 3	Development skills pre	2.27	77	0.46122	-0.623	-12.654	76	0.000
	Development skill post	2.89	77	0.24161				
Pair 4	Implementation skills pre	2.65	77	0.32750	-0.296	-8.148	76	0.000
	Implementation skills post	2.94	77	0.12920				
Pair 5	Evaluation skills pre	2.46	77	0.40670	-0.481	-10.680	76	0.000
	Evaluation skills post	2.94	77	0.12918				
Pair 6	All pre	2.48	77	0.31854	-0.446	-12.856	76	0.000
	All post	2.92	77	0.14208				

data showed that teachers attended the training program for different reasons, for example, many teachers indicated that they attended this program because it is a new topic and they wanted to learn about it. Data collected from the self-assessment questionnaire indicated this information as well, where only five teachers out of 77 had attended a similar program. This confirms that although ADDIE skills are important, teachers lack knowledge about these skills and their application:

"I attended this program because I want to know what instructional design is, its models, and how to apply them in the real world."
"Instructional design is a new concept for me, and I want to know more about it."

Moreover, some other teachers said that they attended this program for self-improvement and professional development. They wanted to learn how to teach in effective ways, organize their work, succeed in achieving their educational aims, and enhance their work motivation:

"I want to develop myself and my professional work by learning new information."
"I want to learn new ways of teaching."
"I want to learn something that might help increase my motivation toward my work."

It seems that teachers, in general, are concerned about their professional development, and are looking for new ways to facilitate their teaching performance. At the same time, teachers have an ambiguous image of instructional design skills and the ADDIE model, and there is a real need to have this program and learn new applications for these skills.
With regard to teachers' expectations toward the ADDIE

training program, most of the teachers expected to learn something related to design and use typical technical tools, such as computer software or applications. They were surprised when they were informed that the program does not directly use or include any computer software. Some of the teachers' expectations are included:

"I will learn how to design visual infographics."
"How to use technology in the classroom in efficient ways."
"Learn how to design learning software."
"Enhance students' skills in using technology in their learning."
"I want to learn new information in E-learning."

There is a general misunderstanding of ID that links ID and its models to the field of computer science. Participants tend to consider ID models as being used to design computer software, and fail to consider the cognitive skills that these models can enhance. Harder (2005) stressed the goal of using ID with the aim of producing new software or instructional technologies, as well as using systematic design to make instruction more effective and efficient.

Some of the other expectations teachers had were more general; they expected to learn how to design and plan their teaching material, such as lessons, courses, assessment methods, and teaching strategies:

"I want to learn how to plan for my lesson in the right way."
"I want to learn how to improve the learning outcomes."
"I want to know how to teach in efficient ways and learn new strategies."
In terms of this research goal, a few teachers expected to learn something related to problem-solving skills:
"I will learn how to find weaknesses in the classroom and resolve them."
"It will help me make adjustments to some problems that I face in my career."
"It will help me to find solutions to some classroom and students problems."

Although this research focuses on applying ADDIE skills to solve educational problems, practice in these skills can indirectly help in responding to all of the teachers' expectations. As stated by Harder (2003), ID may serve as a cognitive organizational structure for teaching competence development, and may help teachers make connections between new and existing teaching and learning skills.

Third research question: What are teachers' attitudes toward the ADDIE training program?

The third research question aimed to identify teachers' attitudes toward the ADDIE training program. Data were collected from the open-ended questionnaire, which was distributed to teachers at the end of the training program. A thematic analysis was conducted on the data, and the data showed that most of the teachers thought the training program was interesting, useful and important. The teachers indicated that they learned things they did not know before. Additionally, some teachers claimed that the program responded to their needs and exceeded their expectations. The following is some of their feedback:

"One of the most useful programs I have attended; I benefited personally and professionally."
"I appreciate that I registered for and attended this training program; it was the best thing I did this summer."
"I think the instructional design and its models are very important and useful if they are applied in the right way."
"It is a very important program. It responds to our educational reality issues and can help to solve their weaknesses."
"I learned a lot of new things; I have never attended such a program."
"This program provided me with a lot of information that is suitable for my teaching needs."

The teachers seemed very satisfied with the program as it addressed their needs and their reasons for attending this program. This is consistent with the results of Bayar (2014), who concluded that the most successful type of program is when professional development activities specifically address the individual needs of teachers.
In addition, the data showed that the teachers liked the program's aims, content, and structure. The teachers indicated that the program was well designed and comprehensive. Moreover, the teachers liked the activities in the program, trainer support, and the continuous feedback on their learning:

"Despite the short duration of the training program, it was comprehensive and wonderful. I liked the way of sequencing the ideas and simplifying the scientific material. I enjoyed the training program."
"The program was well designed and organized, and the information was relevant, sequentially taught, and clear. And this made it easy for us to understand the new information."
"The program included a lot of activities that are related to the central ADDIE skills, and we had the opportunity to practice them all. The trainer provided us with sufficient feedback."
"I liked the case studies that we worked on in the program; they were all relatable. This made it easy to connect the new knowledge with their applications in the real world."
"It was a good experience to share our educational problems with other teachers from different schools and regions and discuss how to find solutions to them."
    In terms of the teachers' skills, the data showed that the

ADDIE training program enhanced different teachers' skills in addition to problem solving skills; the program helped the teachers evaluate and improve their teaching performance in general. Teachers claimed that they learned to be more organized and better planners. With regard to problem solving skills, teachers indicated that they learned how to face their educational problems and design their solution:

"It was an important and useful program that contributed to the development of the teachers, which increased the quality of the educational process."
"I can now solve any educational problem, through planning and designing the best solution for me and others."
"I can design any course, by identifying the problems and designing the solutions."
"I learned how to evaluate and develop my performance as a teacher."
"I learned many organization and planning skills."

This is in line with the findings of Harder (2003)'s study, where he indicated that ID helps teachers to be more sensitive to meaningful patterns of information, and possess schemas that support problem analysis and guide strategic decision-making.

Other teachers claimed that the program was inspiring and motivational. The program motivated the teachers to develop their educational practices and adopt instructional design skills as a lifestyle. The teachers stated:

"I will not stop here, I will keep searching and studying about instructional design."
"I am very excited to apply what I learned next semester."
"Instructional design motivated me to develop and improve myself and my career."

Teachers' beliefs about teaching missions were changed as well. Some teachers indicated that their educational thinking was changed, and they started to understand how good teaching and learning should be:

"For me, many educational concepts have been changed, I love instructional design after this training program."
"I know the secret behind successful learning; it is good instructional design."

These findings regarding skills that can be enhanced by ADDIE were also seen in Harder (2003)'s quantitative study where he found that even a brief intervention in ID models can enhance teachers' self-awareness and metacognitive reflection about their teaching, and their satisfaction with their knowledge and skills. In addition, Schwier and Campbell (2007) stressed that instructional designers should think deeply about their practice and their professional and personal experiences in an environment of spiritual coherence.

Moreover, many teachers stressed the importance of the role of the trainer in encouraging them to continue using the ADDIE skills. The teachers indicated that they believed in using ADDIE skills because the trainer so strongly believed in the importance of these skills. Moreover, teachers indicated that the trainer was qualified and an expert in this field, as well as in coaching strategies. Some of their feedback was:
"The trainer was very qualified, and believed in the importance of the instructional design, which was reflected in our performance."
"The trainer has good coaching skills, and could deliver the information very smoothly."

This supports the findings in Bayar (2014)'s dissertation, where he stated that one important condition for any successful training program is having high-quality trainers.
The teachers also had some suggestions to generate additional benefit from this program: (1) provide long-term programs on ADDIE skills; (2) ADDIE training programs should be compulsory for every teacher; and (3) conduct longitudinal studies, which provide follow up on case studies and designs:

"I think this program should be a compulsory program for every teacher. I think every teacher should learn about ADDIE and coaching on how to apply their skills in the real world."
"I think the duration of the program was short, I hoped that the trainer would observe our designs and their implementations in the real world."

Conclusion

The researcher believes in the value of ID and its models such as ADDIE in improving teachers' professional development. This study provided empirical findings that support this argument. The findings of the study showed that coaching teachers on ADDIE skills could enhance their skills and especially their skills in solving educational problems. Practicing ADDIE skills provides teachers with systemic thinking that helps them deal with educational issues in systematic ways. Teachers' attitudes toward ADDIE were also very encouraging with regard to continuing to provide this training in any future professional development programs. The researcher requests that the Ministry of Education consider these findings, begins to provide compulsory courses in ID for pre-service teachers and comprehensive ID training program for in-service teachers. With regard to the limitations of this study, future research could be conducted with male teachers and the results compared with the findings of this study. Moreover, longitudinal-trend studies should be conducted to follow teachers'

practices of ADDIE skills in a real environment. This study suggests future research that addresses the effectiveness of ID models in other teachers' competencies as well.

CONFLICT OF INTERESTS

The author has not declared any conflict of interests.

ACKNOWLEGDMENT

REFERENCES

Abidin N, Tho S (2018). The Development of an Innovative Resonance Experiment Using Smartphones with Free Mobile Software Applications for Tertiary Education. International Journal of Education and Development using Information and Communication Technology 14(1):164-176.

Ahmadigol J (2015). A Survey of the Effectiveness of Instructional Design ADDIE and Multimedia on Learning Key Skills of Futsal.Journal of Educational and Management Studies 5(3):180-186. file:///C:/Users/hp-pc/Downloads/J.Educ.Manage.Stud.53180-1862015.pdf

Bayar A (2014). The Components of Effective Professional Development Activities in terms of Teachers' Perspective. International Online Journal of Educational Sciences 6(2):319-327.

Bayrakci M (2009). In-Service Teacher Training in Japan and Turkey: a Comparative Analysis of Institutions and Practices. Australian Journal of Teacher Education 34(1):10-22. http://dx.doi.org/10.14221/ajte.2009v34n1.2

Dabbagh N, Blijd C (2010). Students' Perceptions of Their Learning Experiences in an Authentic Instructional Design Context. Interdisciplinary Journal of Problem-Based Learning 4(1):6-29.

Dabbagh N, Jonassen DH, Yueh HP, Samouilova M (2000). Assessing a problem-based learning approach in an introductory instructional design course: A case study. Performance Improvement Quarterly 13(3):60-83.

Dick W, Carey L, Carey J (2001). The systematic design of instruction. New York, NY: Longman.

Druckman D, Bjork RA (1994). Learning, remembering, believing: Enhancing human performance. Washington, DC: National Academy.

Gajdos J (2016). Teachers' professional development on problem solving: Theory and practice for teachers and teacher educators. Sense Publishers: Springer.

Guskey T (2002). Professional Development and Teacher Change. Teachers and Teaching: Theory and Practice 8(3/4):381-391.

Gustafson K, Branch R (2002). What is instructional design? In RA Reiser and JV Dempsey (Eds.), Trends and issues in instructional design and technology. New York, NY: Prentice-Hall.

Harder P (2003). The effects of instructional design training on university teaching assistants. Performance Improvement Quarterly 16(4):23-39.

Harder P (2005). Instructional Design as a Professional Development Tool-of-Choice for Graduate Teaching Assistants. Innovative Higher Education 30(3):163-175.

Ma N, Xin S, Du J (2018). A Peer Coaching-based Professional Development Approach to Improving the Learning Participation and Learning Design Skills of In-Service Teachers. Educational Technology and Society 21(2):291-304.

Opfer V, Pedder D (2011). Conceptualizing Teacher Professional Learning. Review of Educational Research 81(3):376-407. file:///C:/Users/hp-pc/Downloads/REROpferandPedder0911%20(1).pdf

Rahman MJ, Ismail MA, Nasir M (2014). Development and Evaluation of the Effectiveness of Computer Assisted Physics Instruction'. International Education Studies 7(13):14–22.

Reigeluth C (1999). Instructional-design theories and models: A new paradigm of instructional theory. Mahwah, NJ: Erlbaum.

Schwier R, Campbell K (2007). Instructional designers' perceptions of their agency: Tales of change and community. In Instructional design: Case studies in communities of practice: 1-18. http://131.232.13.9/bitstream/handle/2149/387/Instructional%20Designers%20Perceptions%20of%20Agency.pdf?sequence=1&isAllowed=y

Smith P, Ragan T (1999). Instructional design. Upper Saddle River, NJ: Prentice-Hall.

Wati H (2011). The effectiveness of Indonesian English Teachers Training Programs in Improving Confidence and Motivation. International Journal of Instruction 4(1):79-104.