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INSTRUCTIONAL SYSTEMS DEVELOPMENT (ISD): IMPROVING APPLICABLE ISD MODEL FOR THE PURPOSE OF INSTRUCTIONAL DESIGN FOR TECHNOLOGY ENHANCED LEARNING ENVIRONMENT IN PRESCHOOL EDUCATION

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Abstract

This paper basically explains an implementation of instructional systems development for preschool education. It is explained that what Instructional Design Model means, why it is required and the importance of using it. One of the main issues related to Instructional Design Models is the applicability of models. Some experts criticize the models because of their theory based structure and not being suitable for implementation process. In this paper, an instructional design for technology enhanced learning environment in Preschool Education was implemented by ISD (Instructional Systems Development) model. As first step, because of presence of different models, it is discussed that which model is the best for designing technology adapted learning environment in Preschool level. Within the paper, each step of Instructional Design Model is examined, and its applicability is discussed. At some points, chosen model might have some deficiencies and the solutions to fill the deficiencies take part within the paper. As benefit of the study, an ISD model suitable for technology based learning environment in preschool level is suggested. The practitioners like teachers, instructional designers, instructional technologist might use the model when they will prepare a technology based learning environment for preschool education. The main purpose of this paper is examining the applicability of ISD models for the purpose of Instructional Design for Technology Enhanced Learning Environment in Preschool Education. At the beginning of the paper, the need analysis has been done and the need for using an ISD models has been recognized. The paper is basically related to design and implement a technology enhanced instructional design for preschool education and utilizing ISD models for this purpose. The research method of the study is developmental research. The aim of this study is creation of knowledge related to practicality of ISD models for technology enhanced instructional design in Preschool Education. For developmental research, the main thing is "to systematically examine the products, tools, processes, and models in order to provide reliable, usable information to both practitioners and theorists" (Richey and Klein, 2005). In this study, applicability of different ISD models is examined and evaluated and bring most suitable model forward. The paper serves as a basis for model construction and theorizing for instructional design for the benefit of practitioners of the field.

Keywords: Instructional system development models, Technology Enhanced Learning Environment, Preschool Education

1 INTRODUCTION

The main purpose of this paper is examining the applicability of ISD models for the purpose of Instructional Design for Technology Enhanced Learning Environment in Preschool Education. At the beginning of the paper, the need analysis has been done and the need for using an ISD models has been recognized. The paper is basically related to design and implement a technology enhanced instructional design for preschool education and utilizing ISD models for this purpose.

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1.1 Study method

The research method of the study is developmental research. Developmental research is being defined as "opposed to simple instructional development, has been defined as the systematic study of designing, developing, and evaluating instructional programs, processes, and products that must meet criteria of internal consistency and effectiveness" (Richey, 1994). Especially in instructional technology field, this method seems important. The main aim of developmental research is to emphasize the product development process and the evaluation of product (Richey and Klein, 2005). This paper is written to

- To synthesise of opinions related to the use of models

- To suggest improvements for similar kind of projects

- To make explanations for encountered failures of success while applying the model

- To suggest a revised model that might be best appropriate model for similar projects.

As it is seen above, the aim of this study is creation of knowledge related to practicality of ISD models for technology enhanced instructional design in Preschool Education. For developmental research, the main thing is "to systematically examine the products, tools, processes, and models in order to provide reliable, usable information to both practitioners and theorists" (Richey and Klein, 2005). In this study, we try to examine and evaluate the applicability of models and bring most suitable model forward. The paper serves as a basis for model construction and theorizing for instructional design.

1.2 Related researches

In literature, it is possible to see developing ISD models for different contexts as a result of the lack of current ISD models. There are many examples in mathematics, science, online environments or teacher education about developing new ISD models for best training strategies. Ravitz (1997) developed an ISD model for constructivist online learning environment for K-12 students and teachers. He found some problems with the traditional ISD approach to use it for online learning communities and decided to reconstruct the model. At the end of the study, Ravitz presented a new ISD model contains the components of management, front end analysis, design, development, implementation, evaluation and dissemination. Paquette (2001) examined the new challenges to ISD by the growth of web-based learning and then he presented a new ISD model for Tele learning Systems Engineering. With this new model, new instructional principles were given in the study for web-based learning and learning management. Angeli and Valanides (2005) evaluated the ISD model based on an expanded view of Shulman's pedagogical content knowledge (PCK) and they conducted a research with teacher candidates. As a result of the study they modified the ISD model for ICT courses in elementary teacher education. Ruark (2008) proposed to replace the ADDIE model with an evidence-based practice (EBP) model for training curriculum. So, he developed the Apple Peel model especially emphasizes the tasks, knowledge, skills and attitudes. Ruark argued that using the EBP model will cause better scores in learning and behaviour transfer. Özdemir and Uyangör (2011) made a research to develop a new ISD model appropriate for mathematics education. They analysed many ISD models such as ADDIE, ARCS and ASSURE models and at the end of the study they developed a new ISD model for mathematics education based on ASSURE and Dick and Carey model. Özkan (2012) studied on a research on constructivism and constructivist learning environments. Because of the nature of constructivist approach, he revised the traditional ISD model and gave an example of constructivist ISD model in his study and focused on constructivist learning process as the center of the new ISD model. All these researches show that according to the needs of learning community, ISD models can be revised and new models can be developed by instructional designers.

As it is mentioned above, using an ISD model would be beneficial to enable the member of groups to work synchronized and put an qualified, effective and efficient job forward. After deciding to use an ISD model, the issue is to determine the most appropriate model. To be able to decide most appropriate model, the needs of targeted instructional design are directive. In the following parts of the paper, the needs of technology enhanced learning environment for preschool education and how chosen model meets the needs of it have been elaborated. First, what the ISD model is and why people need to use such models are explained. Then, more specifically, the needs of technology enhanced instructional design have been mentioned and the justification of which ISD model is appropriate for such instructional design. After determining appropriate ISD model, what has been done in each step of the model has been elaborated. That's why; this paper becomes a guide that shows how a technology enhanced instructional design for preschool level should be pursued to be able to work synchronized and acquires successful results by revealing practicality of ISD

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models.

1.3 **Theoretical Framework**

1.1.1 What Instructional Systems Development Model is

Instructional Design Model is kind of visual problem solving process which is useful not to overlook important points while preparing the instruction (Dick, Carey and Carey, 2005). Instructional Design Models basically deliberate the components of instructional design process and emphasize the relationship within them. Each model is reliable resource because they are built upon theories and are tested by researches (Dick, Carey and Carey, 2005). Models are useful to plan, develop, evaluate and manage instructional process effectively (Kemp, Morrison and Ross, 2004)

1.1.2 Types of ISD models

There are six main types of ISD models described in the literature by Şimşek (2013). These are; core, linear, flexible, interactive, intuitive and composite models. Core model is a comprehensive type that gives the main and basic components of ISD models. ADDIE is the most common core model and also Briggs (1997) model with dissemination component is the pioneering model for core models. Linear models are based on standard systems view and the whole process follows consecutive steps. Dick and Carey (2005) model is the most common linear model. Flexible models are against to the linear models in terms of following a sequence. They have components and according to the needs instructional designer can start from any of the component in a flexible model. Kemp, Morrison and Ross (2004) model can be given as a flexible ISD model. Interactive models do not follow a linear or cyclical route. Instead of it, between the components there is always a feedback component in interactive models. US Air Forces model is a type of interactive ISD models. Intuitive models criticize the systematic approach of the ISD models and give the opportunity to instructional designers to create new ideas in instructional process. Tripp and Bichelmeyer's (1990) Rapid prototyping model is an intuitive type of ISD models. Composite models are developed with getting together the core and interactive models. This model first groups the steps related with each other and then makes a sequence between the groups. Seels and Glasgow model is an example of composite models (Şimşek, 2013).

1.4 **Analysing the needs**

1.1.3 The Requirement of Using Instructional Systems Development Model

A systematic approach is needed to be able to form effective learning environment. Designing an effective learning environment is a complex process and it should be considered as project approach (Dick, Carey and Carey, 2005). A project is limited by number of staff, budget and time. All these resources have to be used very efficiently (Dick, Carey and Carey, 2005). That's why; a model which has clear goals is required. If people do not use a model, there might be some disconnection between the components of projects. It turns into labour, time consuming and costly (Kemp, Morrison and Ross, 2004). However, the critical point here is the extent of the project. If it is easy learning task, using an Instructional Design Model might be time consuming and workload. In the critique paper of Gordon and Zemke, which is called "The attack on ISD", they argue that using an ISD model for a learning design is time consuming and it is too complex (2000). This point of view might be right for shallow instructional design such as a unit plan, but for more complex instructional design, using ISD models will be saver. Important points in instructional design will not be overlooked (Dick, Carey and Carey, 2005).

Another benefit of using ISD model is to systematize instructional design. Otherwise, it will be like an art, the designer's ability will be very important. However, there are lots of people who need to design a learning environment, and as novice designers they need to use a model (Dick, Carey and Carey, 2005). In that way, it becomes like a science which might be learned easier.

1.1.4 Specials Needs and Requirements of Instructional Design for Technology Enhanced Learning Environment in Preschool Education

The aim of paper is creating an appropriate model for technology enhanced instructional design for preschool education. Each instructional design might have different needs depending on level of the instructional that will be applied on and chosen learning environment.

First of all, to implement a technology supported instructional design for preschool students, specialists has

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to be different fields such as instructional technology and preschool teacher education. Also, students, teachers in school, manager of school, instructional technologist should work together. Using a model will organize project process and each one in the project will know their roles and responsibilities clearly.

For technology supported learning environments, technological capabilities of learners and instructors will be critical. That's why, analysing their capabilities will be crucial.

Thirdly, the role of teacher in preschool level is very important. Teachers lead students all the time. That's why, for learning environment, instructional guidance for teachers should be prepared. Guidance should include detailed steps that teacher do in class and give advices to teachers.

Generally, the classes in preschool level are creative. Classes might not be similar each other. That's why, the capabilities of classroom, the place that teacher can walk, the students sit are all important points.

For the technological capabilities of teachers, and for the new learning environment, teachers should be educated. In the development process of such learning environment, this step should be overlooked. Otherwise, the capability of learning environment cannot be used effectively and efficiently.

Instructor is the main guide of this process. Because of the age of target group, they will not be allowed to use the computer; there will be no activities for their use. Instructors see the directions from their own computer screen and they project the other screen to the whiteboard. We have four main parts in this children screen. These parts actually reflect the scientific problem solving process. They are given below with their explanations;

2 IMPROVING OPTIMIM ISD MODEL BY CONSIDERING THE NEEDS OF INSTRUCTIONAL DESGN FOR TECHNOLOGY ENHANCED LEARNING ENVIRONMENTS IN PRESCHOOL LEVEL

In this part of the paper, by considering common ISD models which are; ADDIE model, systematic design of instruction model of Dick, Carey and Carey (2005) and effective instruction design model of Morrison, Ross and Kemp (2004), most suitable model for technology enhanced learning environment has been improved.

There are many differences within aforementioned models. To be able to decide the optimum model for the project, it is crucial to know the differences within models, limitations and strengths of each model.

First of all ADDIE model (see Fig. 1), it actually represents the first letter contained in each of the five separate elements of this model: Analysis, Design, Development, Implementation, and Evaluation. It is clearly seen that this model covers five main components of an instructional design.
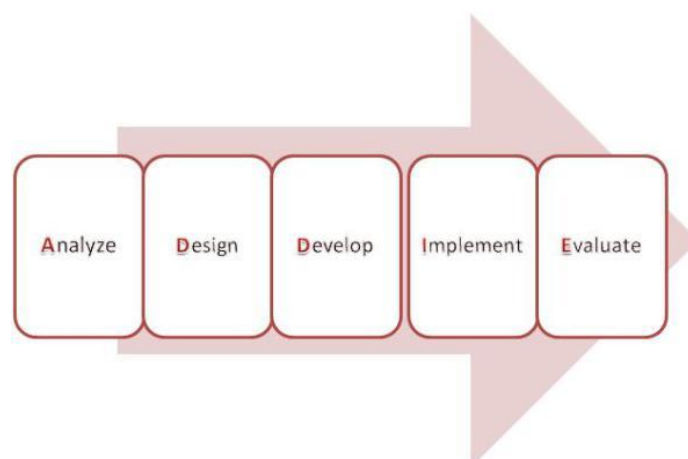
- Fig. 1. ADDIE Model

There are many criticisms for the practicality of this model. Firstly, according to Gordon and Zemke, ADDIE model is ineffective and inefficient (2000). This means that, it does not necessarily lead to the best instructional solutions, nor does it provide solutions in a timely or efficient manner. That's why, according to them, this model is not the way that designers do their work. For technology enhanced learning environments, using such systematic models is not ineffective and inefficient. They might become ineffective

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and inefficient for small projects. Secondly, for some practitioners, this model is very systematic. For ISD models, their applicability is important for the practitioners. To supply this applicability, this criticize has been considered for the model that will be improved. Last criticism is related to its content. This model says what the steps are while preparing an instructional design; it does not clarify how the designers can do it (Çağıltay and Göktaş, 2013). That means, the model does not provide a detailed framework to be able to implement technology enhanced learning environment. For preschool instructional designs, generally teachers are responsible for this and they might not be experienced and they need a model that clarifies more how a designer handles with the design process. According to the needs of intended learning environment design, this model is not the appropriate one.

Secondly, the model of Dick, Carey and Carey, is one of the common and popular model for systems approach. In contrast with ADDIE model, this model is more detailed. It is the biggest strengths of the model that even novice designers can easily understand the model and apply it. This model (Dick, Carey and Carey, 2005) consists of nine procedural steps or linear sequences (see Figure 2).
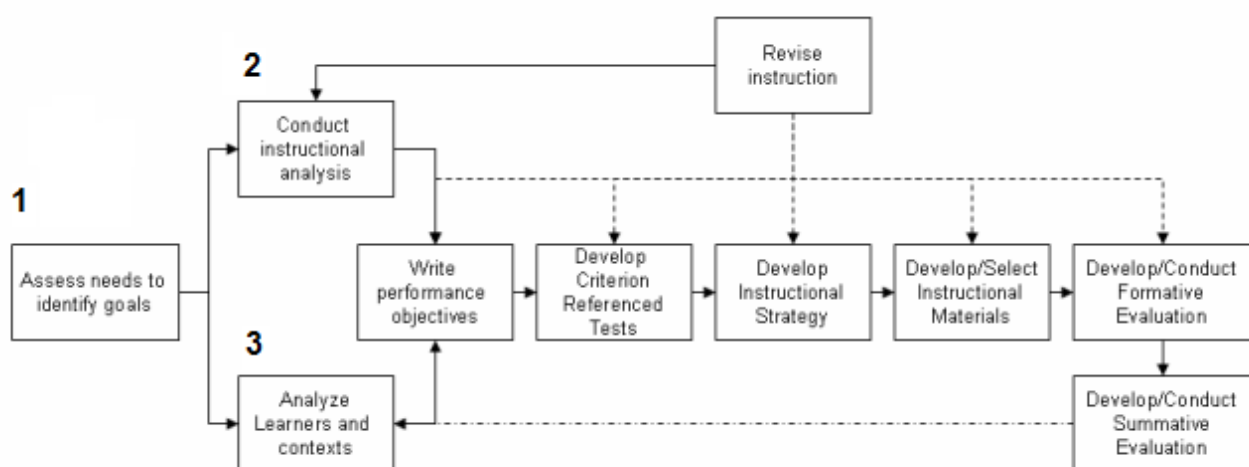

Fig. 2. Dick, Carey and Carey Model

Model is generally classified as "systems oriented model". That's why, for big instructional development projects, it will be beneficial to use such model. In this model, teachers, students, materials and learning environment are all crucial components for learning and each step is crucial that cannot be skipped (Dick, Carey and Carey, 2005). Because of its rigidness, it is logical to use such model for the designers who work in teams. Each member of the team will be aware of each step clearly (Fer, 2009). Another strengthens of this model is its explanation way with examples. For novice designers, such examples are crucial to understand the model adequately. That's why, for technology enhanced learning instructional design, it is really near to be appropriate. However, for this instructional design, model has some deficiencies in application level in terms of the needs. Teacher education and how activities, resources will be presented to learners are not mentioned in model, but they are crucial steps for technology enhanced instructional design because the audience is preschool students. In this age level, the role of teacher is crucial to direct the students effectively; otherwise they will lose themselves during the activities. This model can be used with some supplementation.

Lastly, the model of Morrison, Ross and Kemp, is a circular model. Nine steps are interdependent (see Figure 3). That means this model is different from others in terms of sequencing. It has no target starting point. Designer can start any point and go on (Kemp, Morrison and Ross, 2004). Because of this flexibility, it is seen that more creativity is allowed in this model. This might be an advantage or disadvantage according to the application area and the designers. If the application area is known well before, and the designer has enough experience, this model can be used to induce time for application. However, if novice designer determines using this model and does not have enough experience before, some problems will occur during the process. Some points might be easily overlooked in that case. By regarding mentioned instructional design, there might be many novice designers like preschool teachers. Not to overlook some important steps, using more systematic model will be appropriate.

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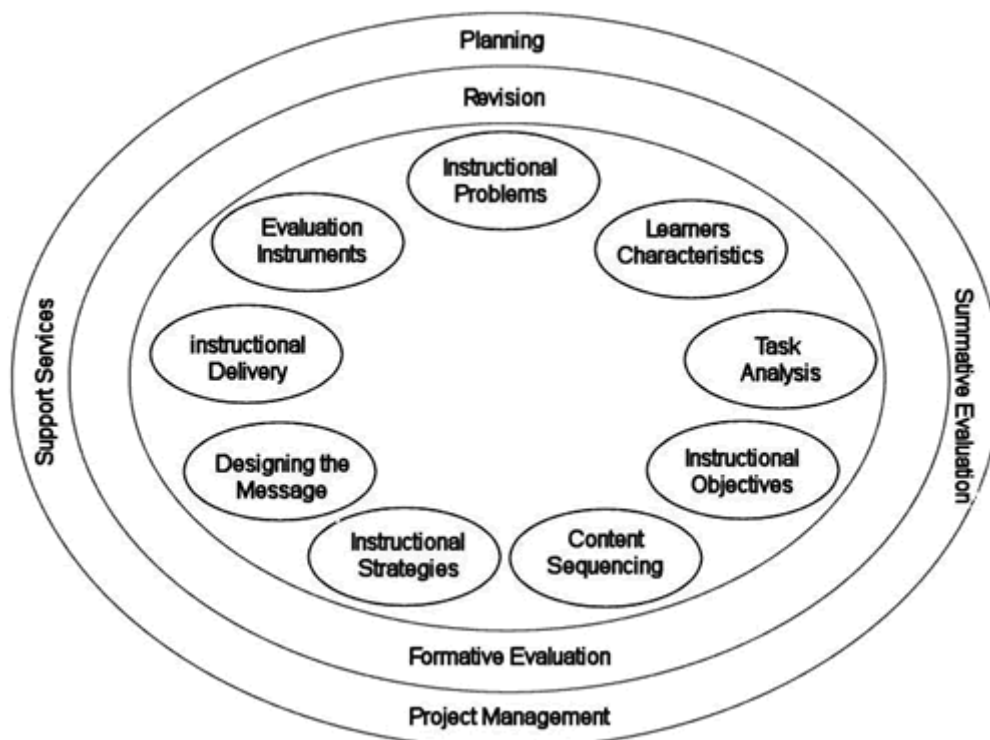*Proceedings of INTCESS15- 2nd International Conference on Education and Social Sciences*

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Fig. 3. Morrison, Ross and Kemp Model

To sum up, the needs of the technology enhanced learning environment design for preschool education and strengths of models have been considered, using Dick, Carey and Carey (2005) model with some supplementation will be appropriate. The model that has been improved is seen below. The details of each step will be clarified later on.

Steps	Suggestions for each step	
Identifying instructional goals	**For students** • Cognitive: Problem solving and critical thinking • Psychomotor: Eye and hand coordination • Affective: Attitude toward technology	**For teachers** Teacher education • Technology acceptance • Technology capability
Conducting instructional analysis	Domains of learning of Gagne (1985) • Verbal information, intellectual skills (affective domain), psychomotor skills (behaviourist domain), attitudes and cognitive strategies.	
Analysing learning environment components	Learners, instructors, physical conditions	
Analysing instructor level of learning context	Technology acceptance, Level of technology usage	
Writing objectives	Performance based objectives	
Developing assessment instruments	Performance based assessment	
Developing instructional strategy	Social, constructivist, behaviourist (because of age)	
Developing and selecting instructional materials	Concrete, visual materials	
Presenting the instruction	Gaining attention, informing learner of the objective, stimulating	

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	recall, presenting the stimuli, providing learner guidance and eliciting the performance.
Designing and conducting formative evaluation of instruction	
Revising instruction	
Designing and conducting summative evaluation	

3 APPLICABLE STEPS OF PRESENTED/SUGGESTED ISD MODEL

3.1 Identifying instructional goals

All instructional processes should begin with identifying the instructional goals according to chosen model. National education principles give the performance and needs for the preschool children and instructional designers determine and choose the best approach to reach the desired qualifications for them. Basically, psychomotor, cognitive and affective development is crucial for these ages. For cognitive development, children's imagination, creativity, critical thinking skills and problem-solving abilities must be developed in preschool learning environments (MEB, 2013). For psychomotor development, the movement that requires eye and hand coordination is important. For verbal development, learning environment should supply the interaction within students and teacher. For affective development, students' attitude toward technology should be supported. The learning environment should make contribution to these instructional goals for preschool education. According to the needs assessment, the instructional goal mentioned above includes all of the components that performance, learner, context and tools. It is important because Dick, Carey and Carey (2005) emphasize that needs assessment should be related directly with the goal. Also the context and tool choices should be the best solution to achieve the goal. Instructional goals for teachers are also important. Teacher education for new learning environment is required so training of teachers is also an issue.

3.2 Conducting instructional analysis

Instructional processes serve human to learn specific knowledge and obtain skills with the knowledge. After defining the main goal. To categorize the knowledge and skills, it will be appropriate to use domains of learning of Gagne (1985). Five domains will help designers to classify their goals, also mentioned in the systematic design for instruction model (Dick, Carey and Carey, 2005). These are verbal information, intellectual skills (affective domain), psychomotor skills (behaviorist domain), attitudes and cognitive strategies.

For the learning context studied in this paper, there are several knowledge and skills in these domains, expected from students to get. These knowledge and skills were prepared according to the National Education Preschool Principles (MEB, 2013). The analysis process based on National Education Preschool Principles is important because it gives an objective approach instead of researcher's subjective opinions about needs of target group (Gibbons, 1989). Some of the knowledge and skills are shown in the Table 1 below.

Verbal Information	Intellectual Skills	Psychomotor Skills	Attitudes	Cognitive Strategies
-They use proper verbs to the subject -They set statements with 6 or more words -They use conjunctions such as "because, after, before etc." -They participate in a chat and talk fluently	-They express their own feelings and also others' -They can control their feelings -They are aware and conscious about social	-They use soft materials and compose shapes with 2-3 parts -They hold the pencil correctly -They can fold the papers. -They can draw	-They choose the right way according to their mind and feelings from the activities	-They combine the geometric shapes and create new shapes -They multiply with the numbers from 1 to 10 with objects -They make cause-effect

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	rules and expectations	square, triangle or rectangle with looking to samples		relations -They read the object graphics

Table 1. Domains of learning and desired knowledge and skills

3.3 Analysing learning environment components

When looked at the Dick, Carey and Carey's (2005) instructional design model, there are some components to analyze the learner from different approaches. This is the same as common ADDIE model (Molenda, 2003), learner analysis step that makes designer to consider about learners characteristics. It is hard to make questionnaires or surveys to this age group (60-72 months), so learner analysis can be best applied with subject area experts and children's instructors or families. In the Table 2 below, learner analysis components and some descriptive sample analyses and references were given to the make this part clear.

Entry behaviors	This age group learns many of the concepts included in this study, at the preschool period of 48-60 months (from subject area experts)
Prior knowledge	For the each topic, their prior knowledge is learned for designing instruction (from their instructors)
Attitudes toward content	They will have a positive attitude to each activity's content (from their families)
Academic motivation	According to Keller (1987), the best way is talking about relevance with real-life, in here the subject was talked with families to analyze motivation level
Educational and ability level	These levels are taken from the Preschool Instructional Principles of National Education
Learning preferences	These are also taken from the Preschool Instructional Principles for 60-72 months children
Attitudes toward training organization	They love to do things with their instructor because of their age, so they have a positive attitude to the training organization
Group characteristics	This part can be analyzed by the instructor, but when it is missed to make a heterogeneity classroom, how to do with the instruction should be analyzed again

Table 2. Learner Analysis

Another component of technology enhanced learning environment is teachers because this might be a new learning environment with teachers. Because of the age group, enhancing learning environment with technology will be a bit difficult and teachers will have some responsibilities. That's why, analysing teacher's level of technology acceptance and technology using capacity will be crucial and it will be improved in next step. For technology enhanced learning environment, the context should be appropriate for computer usage, internet connection, whiteboard and a small enough area for playing. According to Dick and Carey (2005), context should be compatible with classroom environment and adaptive, some components of the web-based media compensates these principles. For example pictures used in instruction can be resized according to the projection's resolution. Another example is geometric algorithm shapes have magnets behind and they are compatible to stick on any whiteboard in any classroom.

3.4 Analysing instructor level of learning context

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This is the missing component of Dick, Carey and Carey or Kemp, Morrison, Ross model, but it is as important as learner analysis because of the new and unknown approaches. There is an approach newly presented to the teachers and they need to use the learning environment properly to achieve affective learning. Therefore, preventing the misconception at first, instructor knowledge level of new learning context should be analysed and if there are missing concepts, pre-service or in-service trainings should be organized to teach the new approach first to the instructors. In previous studies, the importance of teacher ISD education has been stated. Hoogveld et al. (2001), Hoogveld, Paas and Jochems (2003) and Yang and Tang (2004), examined the team study effect and teacher ISD educations. They shared similar results that individual efforts, characteristics and different perspectives of members in an instructor team make the instructional design process better after ISD training. These studies show that educating the instructors also important and experts from different areas should work together in instructional design process.

In this step, instructor knowledge level, technology acceptance case, technology usage capacity should be considered and if there is need to training, it can be organized in development section together with developing materials and using them.

3.5 Writing performance objectives

After defining the instructional goals in analysis part, it is time to write the performance objectives expected from students. Dick, Carey and Carey (2005) mention that this the best-known component accepted by all instructional models and they emphasize the two main component in this section; condition and behaviour. Every knowledge level and skill should be defined in which condition it will be achieved. Kemp, Morrison and Ross (2004) also take into account the Mager and Beach's Model (1967) about classifying objectives and writing in a meaningful manner. This model includes performance type and difficulty level. Using Mager and Beach's model with the condition and behaviour components, this model will have an objectives part, shown in the Table 3 below. Only some of the performance objectives described in instructional analysis part have mentioned here in order to give the structure of the performance objectives component according to different types.

Condition	Behavior	Performance	Learning Difficulty
Given the cause	Say the effect	Speech (Cognitive)	Easy
Asked about their own family rules	Discuss own ideas together	Discussion	Medium

Table 3. Performance objectives

3.6 Developing assessment instruments

For preschool students, learner-centred and performance based assessment approach (Baron, 1998) is used to assess learners whether they have achieved the desired goals or not. Baron (1998) states an effective assessment can enhance student learning performance. Because of the target group is preschool children, assessment strategies were determined to their development characteristics. According to the criterion-referenced assessment strategies (Dick, Carey and Carey, 2005), there may be goal-centred, learner-centred, context-centred and assessment-centred criteria. We determined our assessment strategies combined from all of the criteria.

First, even portfolio is a powerful assessment tool, because of the target group age; it is not included in this study. Main assessment tool is observation of children during the instruction process. Instruction has four main components; problem statements, problem analysis, create solutions and pseudo coding. For each part of the instruction observation forms were prepared with subject area experts and in order to assess the skills during the instructional process. Interviews with teachers and parents is also important to get correct information about their skills, so after each instruction, a structured interview will be applied to teachers, and parents. Assessing the creativity of children, the TCT-DP (the test for creative-thinking, drawing production), prepared by Urban and Jellen (1996) will be applied.

3.7 Developing instructional strategy

Instructional strategy takes shape with the delivery system and content sequence (Dick, Carey and Carey,

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2005). For technology enhanced learning environment, delivery way of the instruction is considered as teacher guided because of the target group. According to the Ministry of Education (MEB, 2013), teacher is crucial to deliver the basic principles and children can discover the new concepts with the guidance of their teacher. Children also need to rely on their teachers and this gives them the motivation of learning. So, in technology enhanced learning environment, instructor is the main person who conducts the process. With this view, behaviourist instructional strategies will be crucial. Also, technology enhanced learning environments will be fruitful for constructivist instructional strategies. Moreover, children's imagination, creativity, critical thinking skills and problem-solving abilities must be developed in preschool learning environments (MEB, 2013). Instructional strategies should be developed by considering cognitive, constructivist and behaviourist learning approaches. Each one should be used in preschool level.

3.8 Developing and selecting instructional materials

Before the instruction process, the last component is developing and selecting instructional materials. Dick and Carey model gives the opportunity to develop or select the appropriate material. For technology enhanced learning environment, generally computer, internet connection and a white board are required. Moreover, preschool students are interested in touching some objects and learning environment should supply this. In these ages, students can usually think in concrete way so the materials should be concrete. If there are some abstract concepts, they should be supported by concrete objects.

3.9 Presenting the instruction

Dick and Carey's systematic design of instruction model helps the designer to define the instructional strategies but a detailed content sequence should also be given as another component. For technology enhanced learning environment, presenting materials should be supported mostly with pictures, because 5 age children do not have reading and writing skills yet and they learn especially from visual materials. According to the basis of instructional message design principles (Fleming, 1993) and main conditions of learning except assessment component (Gagne, 1985), a sample content sequence with the functions such as gaining attention, informing learner of the objective, stimulating recall, presenting the stimuli, providing learner guidance and eliciting the performance.

3.10 Designing and conducting formative evaluation of instruction

If a researcher is developing an instruction, there should be a formative evaluation because of the probable problems during the instructions. Cronbach (1975) states that untested materials may cause decrease in learning so we have to improve our concept of formative evaluation. During the process of designing instruction, many formative evaluations with preschool students and teachers should be done. Observations forms for this evaluation will be appropriate because it is not possible tp apply achievement test to students. It is just possible to observe their performance. Teachers will be crucial for this step. The interviews with teachers will be beneficial. They gave ideas about the usability of materials, effectiveness of materials and so on.

3.11 Revising instruction

According to the results of formative evaluation process, some regulations in instruction might be required.

3.12 Designing and conducting summative evaluation

Summative evaluation process includes outcomes analysis and management analysis (Dick, Carey and Carey, 2005). It requires a large sample and measuring and evaluating the whole process of instructional design. In this step, organizations' needs, resources, design of the learning environment, instructors, learners and learning outcomes should be considered (Dick, Carey and Carey, 2005).

4 CONCLUSION

This paper has emphasized an implementation of instructional systems development process to a technology enhanced learning environment for preschool education. Firstly, the importance of using ISD has been discussed. Then, the main characteristics of Dick, Carey and Carey systematic design of instruction (2005) is considered and according to needs of such learning design, it was chosen as most appropriate model with some updates. Within next parts of paper, the main purpose was discussing the application manner of the model. While implementing the model to a learning environment, the model has shown some limitations. As a designer of such learning environment, this is the main issue to adapt the model according to the needs. That's why, in this study, Dick, Carey and Carey model has been revised according to special

needs of preschool education and technology enhanced learning environment.

REFERENCE LIST

Angeli, C. & Valanides, N. (2005). Preservice elementary teachers as information and communication technology designers: an instructional systems design model based on an expanded view of pedagogical content knowledge. *Journal of Computer Assisted Learning,* 21, 292-302.

Backus, R. E. (1988). Applying instructional systems development to software maintenance education. *Proceedings of the Conference on Software Maintenance, 396-401.* 24-27 Oct 1988, Scottsdale, AZ, USA.

Baron, J. B. (1998). Using learner-centered assessment on a large scale. *How students learn* (Ed. Lambert, N. M. & McCombs, B. L.). Washington, DC: American Psychological Association.

Bellamy, R. K. E. (1994). What does pseudo-code do? A psychological analysis of the use of pseudo-code by experienced programmers. *Human-Computer Interaction,* 9, 225-246.

Briggs, L. (1977). *Instructional design principles and practices.* Englewood Cliffs, NJ: Educational Technology Publications.

Buel, N. L. (1990). *The Implementation of the Instructional Systems Development Model in a Military Training Environment.* ProQuest Dissertations and Theses Full Text.

Burke, P. M. (2010). A simulation case study from an instructional design framework. *Teaching and Learning in Nursing,* 5, 73-77.

Cronbach, L. J. (1975). Course improvement through evaluation. Reprinted in Payne, D. A. & McMorris, R. F. (Eds.), *Education and Psychological Measurement.* Morristown, NJ: General Learning Press, 243-256.

Çağıltay, K. & Göktaş, Y. (2013). *Öğretim teknolojilerinin temelleri: teoriler, araştırmalar, eğilimler.* Ankara: Pegem Akademi.

Dick, W., Carey, L. & Carey, J. O. (2005). *The systematic design of instruction (6th ed.).* Boston: Allyn and Bacon.

Fer, S. (2009). *Öğretim tasarımı.* Ankara: Anı Yayıncılık

Fessakis, G., Gouli, E. & Mavroudi, E. (2013). Problem solving by 5-6 years old kindergarten children in a computer programming environment: A case study. *Computers & Education,* 63, 87-97.

Fleming, M. & Levie, W. H. (1993). *Instructional message design: Principles from the behavioral and cognitive sciences.* Englewood Cliffs, NJ: Educational Technology Publications.

Gagné, R. M. (1985). The conditions of learning and theory of instruction (4th ed.). New York: Holt, Rinehart & Winston.

Gibbons, A. S. (1989). Influence of instructional systems development (ISD) on simulator design. *Aerospace and Electronic Systems Magazine, IEEE,* 4(6), 30-35.

Glazatov, T. R. (2012). Applying instructional design system theory to mobile learning environments. *Journal of Applied Learning Technology,* 2(2), 29-36.

Gordon, J. & Zemke, R. (2000). The attack on ISD: Have we got instruction design all wrong. *Training,* 37(4), 42-53.

Hastie, M., Chen, N. S. & Kuo, Y. H. (2007). Best practice instructional design in the synchronous cyber classroom for early childhood students. *7th IEEE International Conference on Advanced Learning Technologies (ICALT 2007), 288-292.* 18-20 July 2007, Niigata.

Hoogveld A. W. M., Paas, F. & Jochems, W. M. G. (2003). Application of an instructional systems design approach by teachers in higher education: individual versus team design. *Teaching and Teacher Education,* 19, 581-590.

Hoogveld A. W. M., Paas, F., Jochems, W. M. G. & van Merrienboer, J. J. G. (2001). The effects of a web-based training in an instructional systems design approach on teachers' instructional design behavior. *Computers in Human Behavior,* 17, 363-371.

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Keller, J. M. (1987). Strategies for stimulating the motivation to learn. *Performance and Instruction,* 26(8), 1-7.

Kemp, J. E., Morrison, G. R. & Ross, S. M. (2004). *Designing effective instruction.* New Jersey: Wiley.

Kirschner, P. & Gerjets, P. (2006). Instructional design for effective and enjoyable computer-supported learning. *Computers in Human Behavior,* 22, 1-8.

Mager, R. F., & Beach Jr, K. M. (1967). *Developing Vocational Instruction.* Belmont, CA:Pitman.

MEB (2013). Okul Öncesi Eğitim Temel Programı. *Temel Eğitim Genel Müdürlüğü.* Retrieved November 14, 2013 from http://ttkb.meb.gov.tr

Molenda, M. (2003). The ADDIE model. *Encyclopedia of Educational Technology*, ABC-CLIO.

Özdemir, E. & Uyangör, S.M. (2011). Matematik eğitimi için bir öğretim tasarımı modeli. *E-Journal of New World Sciences Academy,* 6(2), 1786-1796.

Özkan, H.H. (2012). Yapılandırmacı odaklı öğretim tasarımı modeli örneği. *Balıkesir University The Journal of Social Sciences Institute,* 15(28), 47-66.

Paquette, G. (2001). Telelearning systems engineering – Towards a new ISD model. *Journal of Structured Learning & Intelligent Systems,* 14, 319-354.

Richey, R. C. (1994). Developmental research: The definition and scope. *Proceedings of Selected Research and Development Presentations, National Convention of the Association for Educational Communications and Technology Sponsored by the Research and Theory Division,* 16-20 February 1994, Nashville, TN. 713-720.

Ravitz, J. (1997). An ISD model for building online communities: Furthering the dialogue. *Proceedings of Selected Research and Development Presentations at the 1997 National Convention of the Association for Educational Communications and Technology.* 19th, Albuquerque, February 14-18.

Richey, R. C. & Klein, J. D. (2005). Developmental research methods: Creating knowledge from instructional design and development practice. *Journal of Computing in Higher Education*, 16(2), 23-38.

ROBOTC (2013), Pseudocode & Flow charts. Retrieved December 28, 2013 from http://www.robotc.net/ education/curriculum/vex/ pdfs/Pseudocode%20and%20Flowcharts.pdf

Rodchua, S. (2007). An effective instructional system design and measurement of quality and practice of web-based distance learning. *Journal of Interactive Instruction Development,* 19(4), 3-8.

Ruark, B.E. (2008). ISD model building: From tabula rasa to apple peel. *International Society for Performance Improvement,* 47(7), 24-30.

Sahin, M. C. (2009). Instructional design principles for 21st century learning skills. *Procedia Social and Behavioral Sciences,* 1, 1464-1468.

Şimşek, A. (2013). Öğretim tasarımı ve modelleri, pp. 99-116. *Öğretim Teknolojilerinin Temelleri: Teoriler, Araştırmalar, Eğilimler,* (Ed. Çağıltay, K. and Göktaş, Y.). Ankara: Pegem Akademi.

Tennyson, R. D. (2000). Fourth generation instructional systems development: A problem solving approach. *Journal of Structural Learning and Intelligent Systems,* 14(3), 229-252.

Tripp, S. & Bichelmeyer, B. (1990). Rapid prototyping: An alternative instructional design strategy. *Educational Technology Research and Development,* 38(1), 31-44.

Urban, K. K. & Jellen, H. G. (1996). Manual: test for creative thinking-drawing production (TCT-DP). *Harcourt Test Publishers Amsterdam*; Harcourt Test Services, 74 p., Frankfurt.

Yang H. L. & Tang, J. H. (2004). Team structure and team performance in IS development: a social network perspective. *Information & Management,* 41, 335-349.