THE DESIGN AND DEVELOPMENT OF AN ONLINE PROFESSIONAL DEVELOPMENT MATERIAL FOR SCIENCE AND TECHNOLOGY TEACHERS ON ASSESSMENT AND EVALUATION

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ABSTRACT

THE DESIGN AND DEVELOPMENT OF AN ONLINE PROFESSIONAL DEVELOPMENT MATERIAL FOR SCIENCE AND TECHNOLOGY TEACHERS ON ASSESSMENT AND EVALUATION

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The purpose of this study is to design and development of an online professional development material for science and technology teachers in order to solve their problems related with assessment and evaluation issues of constructivist learning. For this purpose, design and development research method was used in design, development and validation of this instructional tool. Research has been performed in two parts. In the first part, design and development of online professional development material was carried out. In this part, ADDIE model with rapid prototyping procedure was used in three phases. To gather science and technology teachers' perceptions and attitudes towards prototypes, semi-structured interview schedule, Internet Tutorial Attitude Questionnaire, and a Checklist for Product Evaluation was conducted to 21 science and technology teachers in total. These data were analyzed using both qualitative and quantitative methods to reveal considerations of science and technology teachers about these prototypes and to make adjustments on these prototypes accordingly. In second part, final version of this material was evaluated. In this phase, researcher used self-efficacy questionnaire about alternative assessment and evaluation methods and a checklist for material

validation. These instruments were administered both before and after use of final version of online professional development material. Descriptive data analysis was conducted to reveal differences in participants' perceived-knowledge, beliefs, and applications about alternative assessment and evaluation methods after use of online professional development material. Research results disclosed participants' beliefs and attitudes towards content, design and usability issues of online professional development material. Besides, validation of online professional development material revealed positive changes in participants' perceived-knowledge, their classroom practices, self-efficacy beliefs and their perceptions about appropriateness of alternative assessment methods' usage in classroom.

Keywords: design and development research, online learning, teacher professional development training, assessment, evaluation, constructivist approach

ÖZ

ÖLÇME VE DEĞERLENDİRME KONUSUNDA FEN VE TEKNOLOJİ ÖĞRETMENLERİ İÇİN ÇEVRİM-İÇİ MESLEKİ GELİŞİM MATERYALİNİN TASARIMI VE GELİŞTİRİLMESİ

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Bu çalışmanın amacı, fen ve teknoloji öğretmenlerinin yapılandırmacı öğrenmedeki ölçme ve değerlendirme konularına yönelik sorunlarını çözmek için bir çevrimiçi mesleki gelişim materyali tasarlamak ve geliştirmektir. Bu amaçla, bu öğretici materyalin tasarım, geliştirme ve geçerliliğinin sınanmasında tasarım ve geliştirme araştırma yöntemi kullanılmıştır. Araştırma iki kısımdan oluşmaktadır. Birinci kısımda, çevrimiçi mesleki gelişim materyalinin tasarımı ve geliştirilmesi gerçekleştirilmiştir. Bu kısımda, üç faz halinde hızlı prototipleme yöntemiyle birlikte ADDIE tasarım modeli kullanılmıştır. Bu prototiplere yönelik fen ve teknoloji öğretmenlerinin algı ve tutumlarını ölçmek için yarı yapılandırılmış görüşme soruları, internet öğreticisi tutum ölçeği, ve ürün değerlendirilmesi için kontrol listesi toplamda 21 fen ve teknoloji öğretmenine uygulanmıştır. Bu veriler, katılımcıların bu prototipler hakkındaki görüşlerini ortaya çıkarmak ve bu görüşlere göre prototipler üzerinde gerekli ayarlamaları yapmak için hem nitel hem de nicel olarak analiz edilmiştir. İkinci kısımda, bu materyalin son sürümünün geçerliliği değerlendirilmiştir. Bu fazda, alternatif ölçme ve değerlendirme metodları hakkında bir öz yeterlik anketi ve material geçerliliği için bir kontrol listesi kullanılmıştır. Bu

enstrümanlar çevrimiçi mesleki gelişim materyalinin hem kullanımı öncesi hemde sonrasında uygulanmıştır. Çevrimiçi mesleki gelişim materyalinin kullanımı sonrasında katılımcıların alternative ölçme ve değerlendirme araçları hakkındaki algıları, bilgileri ve uygulamalarında ne gibi değişiklikler olduğunu ortaya çıkarmak için betimsel veri analizi yapılmıştır. Araştırma sonucu katılımcıların çevrimiçi mesleki gelişim materyalinin içerik, tasarım ve kullanılabilirlik konularında ilgi ve tutumlarını ortaya çıkarmıştır. Buna ek olarak, materyalin geçerliliğinin değerlendirilmesi, katılımcıların algılanan-bilgilerinde, sınıf içi uygulamalarında, öz-yeterlik algılarında, ve alternatif ölçme metotlarının sınıf içinde kullanımı konusundaki görüşlerinde pozitif değişimler olduğunu göstermiştir.

Anahtar Kelimeler: tasarım ve geliştirme araştırma metodu, çevrimiçi öğrenme, öğretmen mesleki gelişim eğitimi, ölçme, değerlendirme, yapılandırmacı yaklaşım

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INTRODUCTION

1.1. Background of the Study

All private and public sectors are trying to change and they try to diffuse new technology into their organizations in order to improve their services and products. Turkish Ministry of National Education (MoNE) also has changed the educational system principles based on constructivist approach.

Dindar and Yangin (2007) divide the curriculum program into three groups such as desired curriculum, applied curriculum and reached curriculum as main components of the school curriculum. The desired curriculum is prepared according to the needs and context of the country and considering the educational system. The desired curriculum turns into the applied curriculum meaning what is taught in schools, since all school districts and classes have not got the same context. Moreover, the applied curriculum turns into the reached curriculum meaning what students gained from the applied curriculum since the gains of the students would be different according to their construction of the knowledge. Desired curriculum and applied curriculum differ for some reasons: inappropriate time schedule, insufficient staff and material, crowded classes, inefficient training of staff for the changes and such.

MoNE has prepared face to face professional development courses for teachers to eliminate the differences between the desired, applied and reached curriculums.

Change in education system requires training and informing all the teachers about the change. However, training 600.000 teachers is not easy as it is intended. Maybe, you can reach all of the teachers with in-service trainings. But, the quality of these trainings is also important issue. Ozer (2004) declares that teachers are not satisfied with the quality of the teacher training programs. With online learning programs, it can be reached all of the teachers having basic computer literacy and internet access. Moreover, the quality of the online programs rises in recent years. Many universities give online undergraduate and graduate degrees in Turkey. Online teacher training programs can be solution for effective teacher professional development.

1.2. Statement of the Problem

The curriculum has changed over the years up to now. The first program started with the acceptance of the Tevhid-i Tedrisat law in 1924. The change started according to the suggestions of the John Dewey in 1926. The changes continued many times (1936, 1950, 1963, 1983, 2004) according to students' needs and the context of the time period (Erdoğan, 2007). However, the last change was different from the previous ones since it was based on the learning principles. The behaviorist learning principles were exchanged with the constructivist ones. The main changes were done in materials, students' and teachers' roles. The previous books and materials used in courses served as the source of knowledge. On the contrary, the new ones have been arranged not only with knowledge but also activities that students can construct their knowledge on their own. Moreover, the passive students reversed into active learners in this new curriculum change. The teachers' roles also changed into guide in helping students to construct their own knowledge.

The MoNE gave authority to Education Research and Development Department (EREDED) for evaluation of the new curriculum. The EREDED administered the instruments to inspectors, teachers, school principals, parents and students at the first to sixth grade level in 108 schools in 9 cities. The report revealed deficiencies and benefits of the new curriculum. The main deficiency of the curriculum in report was in assessment and evaluation part of the curriculum (EREDED, 2006).

According to the research results, science and technology teachers found completely clear to understand the topics such as foundation approach of the program, learning-teaching processes, teachers' roles, aim of the course, gains, themes and learning areas and explanations in new curriculum program. However, in two topics such as activity examples and assessment and evaluation, the ratio of the teachers who found completely clear to understand decreases rapidly. The EREDED report (2006) revealed that only 33.1% of the science and technology teachers found the assessment and evaluation of the curriculum completely clear and 67.5% of these teachers found the activity examples completely clear. But, the criterion for the commission was 70% for each these items. Likewise, more than half of the science and technology teachers declared that assessment methods were complicated.

In this report, most of the science and technology teachers think that assessment methods take too much time in new curriculum program. Finally, science and technology teachers declare that they need in-service training about almost all of the areas of assessment and evaluation part of the new curriculum (EREDED, 2006).

According to these results, commission revised that in-service programs should be beneficial for these two areas (assessment and evaluation, and activity examples) to remove not understood parts of the new curriculum program. This teachers' need about taking in-service training about assessment and evaluation let researcher to design, develop, and evaluate an online professional development material for science and technology teachers.

1.3. Purpose of the Study

The aim of this research was to design and development of online professional development material by investigating attitudes and perceptions of the science and technology teachers, and to evaluate this material whether it has effects in teachers' perceived-knowledge, beliefs, and practices. Researcher aimed to develop this online professional development tool in order to give information about assessment and evaluation methods which can be used for constructive learning settings. Teachers'

perceptions about the contributions of this material to their professional development, obstacles that they have confronted while using it and differences between the online professional development training and face-to-face in-service training were revealed. Moreover, their attitudes and perceptions about online professional development material prototypes were investigated to make relevant enhancements to each new prototype to reach final prototype. After developing the final prototype, the effectiveness of this instructional tool was investigated. In summary, it was aimed in this study to design and develop an online instructional material for science and technology teachers to help them for their professional development about assessment and evaluation issues of constructivist learning.

1.4. Significance of the Study

This study mainly investigates effect of online professional development material in teacher training programs. The significance of the study has many aspects. Firstly, the teachers work in all parts of the country after graduation. Some teachers are appointed to rural places such as small villages and towns. These teachers have rare resources for their professional development. Moreover most of the in-service training courses are given in urban places, in cities. So these teachers working in urban places have problems in reaching the in-service training courses. Diffusion of the 3G technology into mobile phones let people connect to internet whenever and wherever they have access to GSM. This study can help these teachers to have in-service training courses. Secondly, the science and technology course is interdisciplinary course. It has relations other courses such as mathematics, health, first aid, history and geography courses. If this study revealed positive outcomes, this can be applied also into other disciplines. Thirdly, most of the teachers perceive computers as beneficial tools but they cannot use it effectively for educational purposes. This study can contribute teachers' computer literacy about use of technology in education. They can be experienced with new computer applications and they can use them both in and out of class.

1.5. Research Questions

The research questions of this study are as follows:

1. What are the perceptions of the science and technology teachers towards the online professional development material?
   1.1. What are the teachers' perceptions about the content and design of the online professional development material?
   1.2. What are the teachers' perceptions about the contributions that they have gained by experiencing in online professional development material?
2. What are the teachers' perceptions about comparison of online and face-to-face professional development trainings?
3. What are the attitudes of the science and technology teachers towards online professional development material?
4. Are there any differences in teachers' perceived-knowledge, perceptions, practices, and self-efficacy about alternative assessment and evaluation methods before and after use of the online professional development material?
   4.1. Are there any differences between teachers' perceived-knowledge about alternative assessment and evaluation methods?
   4.2. Are there any differences between teachers' perceptions about use of alternative assessment and evaluation methods in lessons?
   4.3. Are there any differences between teachers' use frequencies of alternative assessment and evaluation methods before and after use of the online professional development material?
   4.4. Are there any differences between teachers' self-efficacy scores in alternative assessment and evaluation methods before and after use of the online professional development material?

1.6. Assumptions

In this study, the following assumptions are made:

- All the participant students are computer literate or eager to learn and use computers for training purposes.
- Participants responded accurately to all the instruments used in this study.

1.7. Limitations

The following limitations are relevant to the present study:

- The number of participant was limited to science and technology teachers in public and private schools in Ankara.
- The sample size was limited to the science and technology teachers working in schools that APDoNE gave permission to collect data from.
- 17 science and technology teachers attended in validation of final product of online professional development material. This sample would not be enough to generalize findings. For further studies, number of samples can be increased to make generalizations.
- Validation of final product was limited to four weeks. More long duration can be used in following studies.
- Validity of this study was limited to the reliability of the instruments used in this study.
- Validity was limited to honesty of the participants' responses in this study.
- Researcher had multi roles in study. He worked in all phases of ADDIE processes. He tried to diminish researcher effect by using methods: triangulation, peer examination, member checking and digital data recording.

1.8. Definition of Terms

Online Training: "… is one emerging technology-based learning delivery method available that is gaining increased amounts of attention for its cost-effectiveness, efficiency, and accessibility" (Schmeckle, 2003, p. 205)

Teacher Professional Development: "… systematic efforts to bring about change in the classroom practices of teachers, in their attitudes and beliefs, and in the learning outcomes of students" (Guskey, 2002, p. 381)

Alternative assessment and evaluation methods: These are new assessment methods which require use of higher order skills, and focus on students' performance and development. Also, they are realistic and student- centered. Exhibition, demonstration, experimental practices based on hand skills, computer simulations, concept maps, performance evaluation, self-peer assessment and portfolios can be examples for these methods (Oren, Ormanci & Evrekli, 2011).

Formative Assessment: Black and William (1998) define the broad definition of the formative assessment as "All those activities undertaken by teachers – and by their students assessing themselves – that provide information to be used as feedback to modifying teaching and learning activities (p. 140)".

Summative Assessment: Summative assessment constitutes the activities in a course that are used for evaluative purposes and contribute to a course grade.

Self-efficacy: one's belief in one's ability to succeed in specific situations (Bandura, 1977).

1.9. Abbreviations

APDoNE : Ankara Provincial Directorate of National Education

MoNE: Ministry of National Education

BoNE: Board of National Education

O-PDM: Online Professional Development Material

C-PE: Checklist for Prototype Evaluation

C-MV: Checklist for Material Validation

EREDED/EARGED: Ministry of Education, Education Research and Development Department

CHAPTER II

LITERATURE REVIEW

This section includes theoretical background of the study. On a review of research studies for research topic, it provides brief information about learning theories, assessment and evaluation, instructional design and technology, online and face-to-face learning, and teacher professional development.

2.1. Learning Theories

Current learning theories address to behaviorism, cognitivism and constructivism to define how learning occurs. These three theories define learning different. Behaviorism declares learning as acquisition of new behavior through conditioning. Behaviorists stress on the stimulus and response relationship, and observable and measurable behavior. Predicting and controlling behaviors of human being is the main goal of behaviorists (Saettler, 1990).

Behaviorists argue that learning can be fully understood in terms of observable events, both environmental and behavioral. They also claim that learner and environmental factors are important in gaining new behavior. Reinforcement and punishment are the key environmental factors in behaviorist approach to increase or decrease the reveal of desired or undesired behavior response (Driscol, 2002). Additionally, behaviorists do not give much emphasis on memory. Rather, they emphasize that periodic or randomly used practices and reinforcement keep learners prepared to give desired response (Ertmer & Newby, 1993).

Cognitivists declare learning as acquisition of the knowledge by thought and perception. They define how information is grasped, processed and stored in the brain. Sensory input is the collection of the all information coming from human's senses. This information is processed in the brain. This information is stored in short term and long term memory parts of the brain. Chunked information, attention, motivation, rehearsal and expressing the relation of new information with the existing ones increase the retention of the information (Ertmer & Newby, 1993, Driscol, 2002).

Finally, the constructivists define learning as the process of creation of the meaning from persons' own experiences. Duffy and Jonassen (1992) declare that objects and events around the world can not be interpreted only with one meaning. Rather, many meanings and perspectives can be constructed for these objects and events. Construction of the knowledge lies behind this idea. If there is no exact one truth, people can construct different knowledge about an object or event on their own. Brooks and Brooks (1999) expressed five principles of the constructivism: (i) present problems which are relevant to the students' needs, (ii) structuring information around primary concepts, (iii) investigating students' point of view, (iv) adopting instruction to address student suppositions, and (v) assessing students in the context of teaching. Constructivism emphasizes on learning not teaching. It accepts learning as a process. Learners' autonomy, inquiry, beliefs and attitudes are considered. It encourages good communication between the instructor and the learners. Moreover, social co-operation between the learners and with the assistance of the teacher is also important (Moll & Tomasello, 2007).

There are lots of studies confirming effective use and potential gains of constructivist principles in the literature. Many of these researches are about effect of constructivism in students' achievement. Saygın et al. (2006) declared that students taught with constructivist principles were more successful than the ones taught with the traditional principles on biology subject, the cell. Moreover, Ozerbas (2007) made a research comparing the traditional and constructivist instruction approaches on seventh grade students' mathematic achievement and retention of the knowledge.

The results showed that students in constructivist learning environment are better than the ones in traditional learning environment in achievement and retention of the knowledge. The constructivist principles also have impact on students' concept learning and removal of the misconceptions (Hancer, 2005; Cayci, Demir, Basaran & Demir, 2007). Besides effect on achievement, constructivist environments increase the social interaction of the students and their problem solving strategies (Sasan, 2002). Teachers and administrators have positive view about constructivist learning approach (Cinar, Teyfur & Teyfur, 2006). Isikoglu, Basturk and Karaca (2008) express that in-service teachers have positive beliefs about student centered learning. Furthermore, the school level, teaching experience, teaching subject and educational background also have effect on teachers' belief about the student centered education.

Although constructivism is in favor among educators, some cautions about the constructivism also exist. For example, Airasian and Walsh (1997) point out that constructivism does not have an instruction to be applied in classes. Rather, it suggests some methods to be used in construction of knowledge by students. They declare that it is not clear in which subject areas these methods are useful. Moreover, attainment of specific performances and activities arranged by MoNE for students is problematic issue of constructivism (Tam, 2000). Zembat (2007) applied a sample activity offered in constructivist based curriculum to thirty-one eight-grade students about how a geometric transformation like transitions can be constructed. Although students completed the activity successfully, students could not gain the intended performances completely in this study. Another problematic issue in constructivism is definition of knowledge in constructivism. Aydin (2007) claims that constructivism separates the concept of the knowledge from truth. He pointed out that this phenomenon would be resulted with equalization of truth with belief.

2.2. Assessment and Evaluation

Butt (2010) defines assessment and evaluation as activities that teachers set up in order to get more information about students' abilities and attainments. Kerka and Wonacott (2000) declare that assessment and evaluation provides information to both

instructors and students about the progress of learning. They also claim that assessment help teachers to measure achievement of learning objectives of teaching.

It is important to examine assessment and evaluation for several reasons. First of all, instructors determine what and how students learn by assessment (Rockman, 2002). Moreover, it yields results for management, course administration and student support. Assessment gives feedback not only for students but also for teachers about students' learning, and their teaching experiences and performances. Assessment provides quality for evaluation of the effectiveness of the teaching subject and method (Kibby, 1999).

Assessment is administered in three phases of the instruction. It starts at the beginning of the instruction as *placement assessment*, during the instruction as *formative and diagnostic assessment* and at the end of the instruction as *summative assessment*. Teachers administer placement assessment before the instruction to understand whether students have the prerequisite knowledge about the subject or whether they already know the subject. They plan or revise their instruction according to results of the placement assessment. Moreover, teachers want to know whether the subjects can be understood or not while instruction goes on. Accordingly, they can give feedback for students' misunderstandings or give individual or group remedy. Finally, teachers use summative assessment to evaluate the course or unit entirely. They can have chance either to grade students' performances or to apply additional learning activities according to summative assessment results (Gronlund & Waugh, 2006).

Teachers should have some qualifications to administer these assessment types in classes. The report entitled "Standards for Teacher Competences in Educational Assessment of Students" (NCME, 1990) listed seven responsibilities and qualifications of the teachers about student assessment.

They can be listed as;

- Teachers should be skilled in choosing assessment methods appropriate for instructional decisions
- Teachers should be skilled in developing assessment methods appropriate for instructional decisions
- Teachers should be skilled in administering, scoring and interpreting the results of both externally produced and teacher-produced assessment
- Teachers should be skilled in using assessment results when making decisions about individual students, planning teaching, developing curriculum and school improvement.
- Teachers should be skilled in developing valid pupil grading procedures that use pupil assessment.
- Teachers should be skilled in communicating assessment results to students, parents, other lay audiences and other educators.
- Teachers should be skilled in recognizing unethical, illegal, and otherwise inappropriate assessment methods and uses of assessment information

2.2.1. Alternative Assessment and Evaluation

Importance and necessity of assessment and evaluation is common declaration in educational settings since it affects learning and teaching. Teachers use lots of assessment tools to evaluate their teaching and students' performances. However, different paradigms exist with their different assessment activities in education. Before constructivist learning approach, behaviorist and cognitivist approaches had pressure on teaching, learning, and assessment and evaluation procedures. Teachers mostly used objective tests to assess students since their lecture mostly based on conveying facts and information to student. Moreover, it was expected from student to memorize this knowledge to retrieve in evaluation (Ward, Stoker & Ward, 1996).

Change in paradigm in learning with constructivist approaches yield change in assessment and evaluation applications. Constructivism assigns different qualities to

knowledge. They can be listed as: being temporary, developmental, socially and culturally mediated and non-objective (Anderson, 1998).

In constructivist approach, assessment is much more than assigning grades or giving positive-negatives. Assessment leads teacher in determining what kind of interventions can support students in construction of new knowledge and skills (Rahimi & Ebrahimi, 2011). In contrary to traditional assessments, constructivist assessments not rely on measuring whether behaviors and skills acquired by students, but rather it focuses on concept development, deep understanding, and active learner reorganization. There are lots of differences in assumptions of theoretical and philosophical differences between traditional and alternative assessment. First of all, traditional assessment assumes that knowledge has universal and unique meaning. However, alternative assessment assumes that it has multiple meanings. Traditional assessment supposes learning as an individual process whereas alternative assessment sees it as a collaborative process. Moreover, traditional assessment separates process from product while alternative assessment methods focus on both process and product (Anderson, 1998).

After diffusion of new different alternative assessment methods for teachers to use in class environment, there have been studies about their implications for education. Performance task, projects, rubric, concept map, portfolio, poster, structural communication grid, self and peer evaluation, diagnostic tree and interview can be given as examples to alternative assessment methods used by science and technology teachers (Arslan, Kaymakci & Arslan, 2009; Cepni & Coruhlu, 2010). Use of these methods came up with some problems listed below (Gelbal & Kelecioglu, 2007):

- insufficient knowledge of teachers
- crowded classes
- in effective in-service trainings
- hard to prepare, implement and evaluate and time consuming
- not enough resources of schools
- multiple choice large-scale exams

Main problem about use of alternative assessment and evaluation methods is that teachers have low level of knowledge, and perception about these methods (Dogan, 2007; Arslan, Avci & Iyibil, 2008; Yayla, 2011; Kuran & Kanatli, 2009). Arslan et al. (2009) argue that teachers could not apply alternative assessment and evaluation methods as intended since they mostly do not use these methods for evaluation purposes. He stated the reason for this issue as teachers' low level of knowledge about these methods. In another research, EREDED (2006) reported that teachers have misconceptions about alternative assessment and evaluation methods. In this study, it is revealed that teachers give different grades to members of a group work. However, it is expected them to give same grades to all members of the group. Moreover, more than half of the teachers in this study see measurement and evaluation methods complicated. Reasons to these misconceptions and negative perceptions are explained in the report as:

- Teachers would not know the characteristics of the methods.
- They would not know where, when and in which purposes these assessment and evaluation methods should be used.
- How to convert assessment and evaluation results into grades.

Another reason not to use alternative assessment and evaluation methods is crowded classes (Gelbal & Kelecioglu, 2007; Arslan et al, 2009; Dogan, 2010; Kuran & Kanatli, 2009). Dogan (2010) marked that about 72% of the classes in Turkey have class size over 30. These crowded classes prevent teachers from using alternative assessment methods. Gelbal and Kelecioglu (2007) marked that teachers see crowded classes as barrier to apply observation and presentation techniques in class.

Preparation and application of alternative assessment and evaluation methods is another problematic issue on teachers' use of these methods. Teachers see preparation and application of alternative assessment and evaluation methods as hard and time consuming. Cepni and Coruhlu (2010) pointed out that if teacher perceive an alternative assessment and evaluation method annoying and difficult, they do not use it in class setting. Rather, they use methods comparably easy to prepare and apply. Additionally, big portion of the teachers thinks that assessment and evaluation

methods take too much time (EREDED, 2006). Researchers explain reasons for this negative perception as not providing available alternative assessment and evaluation tools for teachers' use. Thus, teachers see it as time consuming process.

Lack of resources also has negative pressure on application of these alternative assessment methods. Dogan (2010) pointed out that teachers complain about insufficiency of resources in classes, and libraries since they see these as barrier to apply alternative assessment methods.

In Turkey, students have replacement test (SBS) at the end of each year of 6^{th}, 7^{th} and 8^{th} grade levels. These tests are based on only multiple choice questions and results of these tests affect their choice of high school. That is, these tests have big influence on students, parents and teachers. According to teachers, students perceive alternative assessment and evaluation activities or homework as loss of time. Students are reluctant to do alternative assessment and evaluation activities since these methods need more time, material, and effort (Arslan et al, 2009).

As discoursed above, there are lots of problems related with diffusion of alternative assessment and evaluation methods into teaching. Researchers suggest different solutions to these problems. Leading solution is arranging in-service trainings for teachers (Gelbal & Kelecioglu, 2007; Dogan, 2010; Kuran & Kanatli, 2009; Akcadag, 2010; Coruhlu, Nas & Cepni, 2009; Dogan, 2005; Yayla, 2011). Gelbal and Kelecioglu (2007) proposed informing teachers to increase use of alternative assessment methods. Moreover, Cepni and Coruhlu (2010) suggest organizing in-service trainings at regular intervals to diminish problems that teachers are confronted in application of alternative assessment and evaluation methods.

Another solution is providing available alternative assessment tools for teachers' use. Arslan, Kaymaci and Arslan (2009) offer giving comprehensive evaluation scales to teachers in order to use in assessment activities. Likewise, Gelbal and Kelecioglu (2007) also find presentation of available assessment activities to teachers as beneficial.

Refinement of resources is another view to increase use of alternative assessment and evaluation methods. Dogan (2010) suggest that schools should have adequate resources to implement constructivist principles. That is, schools should be supported to reach required equipment, to improve laboratory facilities, to access internet, and to enrich library services.

Last concern about this issue was to inform students and parents about constructivist approach and methods. Kuran and Kanatli (2009) offer to inform parents and students about alternative assessment and evaluation methods. Dogan (2010) declares that parents are one of the most important parts of constructivist learning approach. He also states that they should be informed to increase cooperation among school, parent, and student.

2.3. Instructional Design and Technology

In 2008, AECT Definition and Terminology Committee define the education technology field as:

> "… study and ethical practice of facilitating learning and improving performance by creating, using, and managing appropriate technological processes and resources (Januszewski & Molenda, 2008, p.1)"

This explanation is clear to understand the nature (study and ethical practice), purpose (facilitating learning and improving performance) and the way (creating, using and managing technological processes and resources) of the educational technology. They define the way of educational technology in two main terms: processes and resources. *Processes* in this definition are explained as systematic approaches and phases of an Instructional Design (ID) and *resources* are explained as wide range of things to help learners: high-tech information and communications technologies (ICT) systems, digital and analog media, community resources, and people with special knowledge or expertise (Januszewski & Molenda, 2008).

Processes. Branch and Merrill (2012) define ID as "system of procedures for developing education and training curricula in a consistent and reliable fashion (p.8)". There are more than 100 ID models to achieve and maintain these systems (Chen, 2008). Popular ones of these models can be listed:

- ADDIE Model
- Dick and Carey Model
- Morrison, Ross and Kemp Model
- ASSURE Model
- Seels and Glasgow Model
- Smith and Ragan Model
- Gagne, Briggs and Wager Model

All these models define design procedures to make instruction more effective and efficient (Gustafson & Branch, 2002). Figure 2.1 presents Dick and Carey Model, one of the most popular ID models.

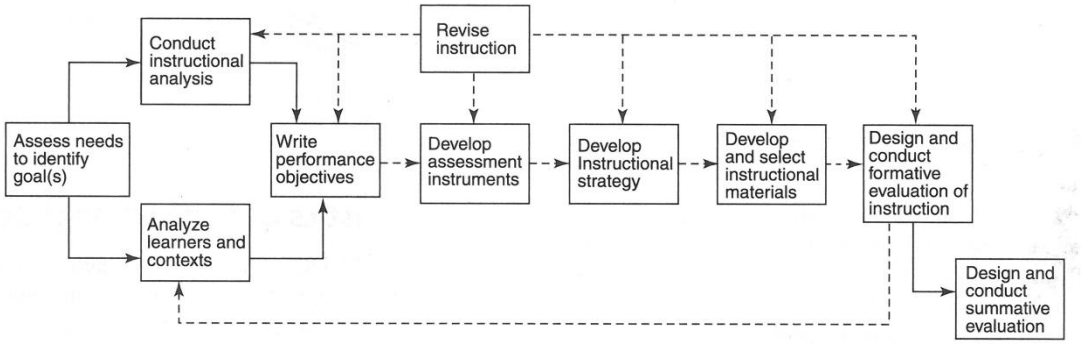

Figure 2. 1 An example of of instructional design models (Source: Dick, Carey & Carey, 2005)

Gustafson and Branch (2002) argued that instructional design models do not differ in core elements. They claimed that most of these design models have components of ADDIE model: analysis, design, development, implementation and evaluation. Analysis phase comprised of needs assessment, learner analysis, content, and context analysis. In needs assessment, designer try to identify the problem, causes of this

problem and any relevant solutions. In the light of these review, designer should determine goals of instruction defining broadly learners, content, context and media. In learner analysis, designers try to specify learner characteristics related with instruction by answering those questions (Dick, Carey & Carey, 2005; Thiagarajan, Semmel & Semmel, 1974):

- What are their general characteristics such as age, grade level etc?
- What are their prior knowledge and skills related with instruction?
- What are their attitudes and motivation towards content and context?
- What are their learning styles?

In content analysis, designers search in literature for which skills, concepts, and topics should be acquired by learners in specific instruction. Researcher should define learning outcomes of the instruction at the end of content analysis. Tessmer and Richey (1997) define context as "multilevel body of factors in which learning and performance are embedded (p.87)". In context analysis, designers investigate physical, social and instructional aspects of these factors. These factors can be (Tessmer & Richey, 1997):

- social support: peer cooperation, team support, teacher support
- learning and teaching support: time allowance, teaching assistance, equipment availability, media, and facilities accessibility
- instructor roles: to be a lecturer or coach
- student roles: to be a receiver or explorer
- physical conditions: level of comfort
- learning schedule: amount and regularity of learning times

Seels and Glasgow (1998) define design phase as "the process of specifying how learning occurs (p. 329)". This phase includes components: determining how learning outcomes will be met, instructional strategies, media, and methods according to data gathered through analysis phase. Moreover, designers should

consider about assessment of learners in this phase according to learning outcomes defined in previous phase (Peterson, 2003).

In development phase, designers construct a product for delivery of instruction to learners (Peterson, 2003). Expert appraisal has important role in this phase. Thiagarajan, Semmel and Semmel (1974) define this process as obtaining feedback from various professional to improve instructional materials about media, instructional method, and language used in instruction. These professionals also give their opinions about appropriateness, effectiveness, and feasibility of the instruction.

Evaluation phase is the last phase that designers investigate about adequacy of instruction and learning (Seels & Glasgow, 1998). In evaluation phase, designer should test some questions (Peterson, 2003):

- Whether teacher reached the desired goals of instruction?
- Whether learning outcomes acquired by learners?
- What is the effect of materials and instruction?
- What necessary changes should be done to provide better instruction?

In addition to analysis, design, development, implementation, and evaluation phases, instructional design models also have similar characteristics. Branch and Merrill (2012) listed these characteristics as:

- to be student-centered
- to be goal-oriented
- to focus on meaningful performance
- to assume outcomes can be measured in a reliable and valid way
- to be empirical, iterative, and self-correcting
- to be a team effort

Learning theories has also influence on instructional design models. Most of the instructional design models derived from learning theories (Gustafson & Branch, 2002; Bichelmeyer, 2003). Behaviorism, cognitivism and constructivism brought lots

of principles about learning. In combination of these principles, instructional designers should consider these issues (Hoadley & Haneghan, 2012):

- learning is multidisciplinary phenomenon
- learning is not limited to class, rather, it happens in all moments of our lives
- deciding learning context in order to increase interaction of students
- increase interactions between experts and novices
- designing learning environment let students benefit from scaffolding of teachers
- creating relevant learning environments
- use of technology to transform thinking and learning

Resources. In definition of Januszewski and Molenda (2008), there were lots of items in the list of resources. They did not insist not only on ICT systems and media such as computers, audio-visual systems, CD-ROMs, Web sites, electronic performance support systems, books, videos and print materials but also community resources and people with knowledge. However, use of these resources in schools is rare. Although there are lots of technology resources present in schools such as computer, TV, video, radio-tape, overhead, projector, printer, scanner, photocopy machine, video and digital camera, and VCD-DVD player, teachers tend not to use these resources except computer, printer and photocopy machine (Baltaci, 2005). He states that teachers only use technological resources for preparing course materials rather using them in all phases of teaching and learning. He claimed reasons for this phenomenon as teachers' deficiencies in integrating these resources to their instruction.

2.4. Online and Face-to-Face Learning Environments

Traditional face-to-face learning environment is a classroom or a place in which learning occurs by keeping students and teacher physically together (El Mansour & Mupinga, 2007). In these settings, it provides personal connections between teacher and students. Thus, teacher can give immediate feedback in order to meet needs of

students satisfactorily (Howard, 2009). Likewise, students can make brainstorm with peers and teacher loudly by using body language or different properties of voice. They also process information through engagement in physical activities (Zhan, Xu & Ye, 2011). Teacher have chance to develop trusting relationships and offer encouragement and advise for external factors affecting their success (Howard, 2009).

In order to understand the position of technology in learning, it should be considered whether or how technology can improve or enhance the way learning occurs by combining with new methods of instruction. Educators started to use computers in 1970s. In these days, computer technology was not serving too much capability to users (Fouts, 2000). However, after the software and hardware developments, computers are used as tutor in educational purposes. Internet also made an important effect on technology use in education. The huge amount of information can be stored in servers to distribute to people all around the world. People have chance to share their ideas and knowledge with the help of internet. The quality and efficiency of communication and storage capabilities of the internet let educators to adopt this new technology to their instruction (Barbosa & Garcia 2005).

Growth in internet technology brought new concepts to education such as online learning (OL), e-learning, web-based training (WBT), and internet-based training (IBT) etc. Although some researchers use these concepts as synonyms (Selim, 2007), they have some differences in core. For example, e-learning explained as delivery of education through electronic forms of information technology to enhance learners' knowledge, skills and performances. However, Means, Toyama, Murphy, Bakia, and Jones (2010) define online learning as "learning that takes place partially or entirely over the Internet (p. 9)". It excludes all types of instructions not having internet-based components from online learning.

Advantages of online learning for learners can be listed as (a) on-demand availability (b) better content delivery (c) personalized instruction (d) content standardization (e) accountability (f) flexibility (g) self-pacing (h) interactivity (i) confidence (j)

increased convenience (k) instructor availability (l) online interactions. Moreover, it has advantages for designers to reduce costs of facilities, travel, training, printed material and labor. Also, it is easy to provide education to large number of students (Bhuasiri et al, 2012; El Mansour & Mupinga, 2007).

There are also disadvantages of online learning: (a) high average rates of dropout (b) low quality of learning attainment: complex conceptual relationships and their related skills (c) increased need for time management (d) feeling of isolation (e) increased dependence on computer support (f) procrastination (Bernard, Rubalcava & St-Pierre, 2000; Wallace & Wallace, 2001). Katie (2012) also stated some threads to online learning as lack of policy guidance of governments, lack of professional development for teachers and inadequate internet access and technology.

Many studies have attempted to investigate the quality of teaching and learning in online classes up to date. Mostly used common method is comparing online courses with face-to-face ones. These comparison studies are quite typical considering emergence of new instructional technologies in education. For example, well-known review of the studies comparing media based and traditional instruction since 1920s found no significant difference phenomena (Clark, 1983). However, some counter arguments also aroused. Kozma (1994) have found effect of the media on learning but Clark (1983) claimed that effects of the media on learning in these studies were so poor.

If we move to near future, effect of online learning in education and comparison of it with traditional face-to-face learning also take place in literature. There are two types of usage online learning in literature. First one is purely use of online learning in education. Second one is use of online learning components combined with face-to-face learning environments (blended learning) to increase quality of instruction. Meta-analysis results comparing these two uses of online learning with face-to-face learning showed significant differences in favor of online learning. There were significant differences between blended learning and face-to-face learning, and blended learning and online learning in favor of blended learning. However, there

was no significant difference between pure online and traditional face-to-face learning environments. That is, blended learning provides more evidence for effective instructions. But, online learning also can be seen as effective as traditional classroom instruction (Abdous & Yoshimura, 2010; Solimeno, Mebane, Tomai & Francescato, 2008; Means et al, 2010). These comparisons would be helpful in deciding use of online learning for different types of instruction. Although it is clear that blended learning environments results better, it is also encouraging to use pure online learning because of being as effective as traditional face-to-face learning.

There is also counter argument that direct comparison of traditional and technology enhanced education would be misleading since learning assessed changes as technology adopted. Comparison studies are also not revealing since they are supposed to use technology to meet the same objectives as traditional ones rather than demonstrating that technology changes or improves the way how learning occurs (Sener, 2004).

2.5. Teacher Professional Development

Guskey (as cited in Rasmussen, 2008) defined the professional development as the processes and activities which increase the quality of the professional knowledge, skills and attitudes of the educators to results in improvement in students' learning. Teacher professional development has lots of advantages for teachers in practice. It introduces new curricula, helps to implement new teaching strategies, and incorporates new ideas (Rasmussen, 2008).

Teacher professional development programs should have some characteristics to gain maximum benefit. Rasmussen (2008) listed these characteristics as focus on teaching specific content, integration of specific teaching practices or pedagogy, engagement of participants in active learning, collective participation of teachers from same grade and delivery of instruction with an extended duration. Frey (2008) also defined three important components for significant professional growth of in-service teachers

engaged in online professional development experiences: using meaningful learning activities, collaborative learning communities, and structure of practicum project.

There are five types of teacher professional development programs given by MoNE in Turkey (Gocebe, 2010). These are listed as:

- Orientation and Foundation Training (Adaylık Eğitimi)
- Development Training (Geliştirme Eğitimi)
- Deficiency Training (Tamamlama Eğitimi)
- Career Development Training (Yükselme Eğitimi)
- Professional Competency Training (Özel Alan Eğitimi):

Orientation and foundation training is given in first year of employment. These trainings mostly utilized to inform new employees about aim and structure of the institution and responsibilities, mission and authority of them (Can, 2004). Moreover, routines of the schools, related rules and regulations of the government about civil servants and teachers, coordination and cooperation among officers are introduced (MoNE, 1995).

Development training is given after completion of orientation and foundation training. These trainings are offered to not only for presenting new information and methods related to teaching profession but also for reviewing of old knowledge. Aim of these trainings is to keep teachers' knowledge and skills up-to-date and to remove deficiencies of teachers' about teaching profession (Gocebe, 2010).

In some cases, some personnel move some new positions in MoNE. These new positions would not be related with their profession or requires new skills for these new comers. Deficiency training aims to cause employees to gain new competencies required by this new position (Can, 2004).

Career development training is offered to meet needs of employees to let them rise in steps of their professional career. These trainings mostly arranged to school

principals, chief vice-principals, vice-principals, and K12 education inspectors (MoNE, 2008).

Professional competency trainings are arranged to prepare employees for special services of MoNE. These trainings include foreign language training, expertizing in various areas relating with education either in the institution or outside the institution (Gocebe, 2010).

2.5.1. Face to Face Teacher Professional Development

Every year MoNE gives in-service trainings: orientation and foundation, development, deficiency, career development and professional competency trainings. Every year around 30000 new teachers joined into education system in Turkey. That means, all year around these teachers are trained in their first year of employment with orientation and foundation training. All of these trainings held face-to-face by local authorities of MoNE.

There are many development trainings held by MoNE. One of the major trainings was about introduction of new constructivist curriculum. This training held between 2004-2007 years. All primary and secondary education teachers working in MoNE took two-day training (MoNE, n.d.). Moreover, 55000 Turk Dili ve Edebiyati teachers were trained to get more effective and contemporary teaching methods. These two major trainings were completed. However, MoNE started a new project named FATİH. This project requires teachers to use technology in classes in efficient way. Thus, a new training was established by MoNE. In these trainings, it is aimed teachers:

- to understand aim, scope and importance of the project
- to install and use of information technology materials
- to use of technology in education
- to have capabilities: searching , designing and editing instructional materials
- to be able to use instructional materials with smart board

- to evaluate effectiveness and efficiency of instructional materials

MoNE aimed to train all teachers in elementary and high schools in Turkey particularly starting with schools equipped with necessary information technology materials and smart boards. Besides these major face-to-face in-service trainings, there are more than 100 on-going development trainings for teachers arranged by local authorities of MoNE every year (MoNE, n.d.).

Professional competency face-to-face trainings also held about foreign language training about English, German, French and Arabic by MoNE. According to demand for these trainings, MoNE arrange face-to-face lectures after application of placement tests. 135 teachers demanded for English and 13 teachers for German course in 2012 (MoNE, n.d.).

2.5.2. Online Teacher Professional Development

Growth of internet directed educators to use online facilities in teacher training to enhance personal development of the pre-service and in-service teachers. There are lots of studies about methods how online personal development courses should be given and what issues should be considered. Lawler and King (2000) states essential elements of development of online teacher education programs as: (a) presentation of accurate, (b) current and substantial content, (c) in-depth dialogue among participants, (d) environment that participants ask, (e) respond and share ideas easily, (f) technology working smoothly, (g) facilitation of collaborative work, and (h) development of assignments.

There are two delivery methods to use online education in professional development (Sun, Tsai, Finger, Chen & Yeh, 2008). First one is the synchronous delivery method in which participants should be online at specific time for instruction (Katz, 2002). It resembles face-to-face instruction. Additionally, synchronous online environment give chance participants to attend the course from diverse places. Second one is the asynchronous delivery method in which students can attend the course without time

limitation (Ryan, 2001). They can attend the course according to their own time schedule. Moreover, the instructor would give feedback through communication tools used in online course such as e-mail, chat and forum.

Watson et al. (1997) inform researchers who is planning to apply teacher professional development courses about two main issues. The first one is that infrastructure of the training environment which should be taken into consideration before application of training. The second one is that adequate institutional and managerial commitment should be established before the application of the projects. Gozutok et al. (2007) indicate two main needs which should be met in online professional development courses. First one of them is need for asynchronous and synchronous communication tools to let participants communicate with others. Synchronous online discussions which support participants about asking questions and taking instant feedbacks from their peers and instructors can be seen an example to these communication tools (Jang, 2008). The second one is that need for basic computer skills of the participants.

Jung (2007) called attention to cost effectiveness of online teacher professional development programs besides its other advantages: flexibility, interactivity, and learner-centeredness. He stated that increased enrollments, courses, and student access to quality programs and resources make online professional development program prevalent. There have been attempts of MoNE to use online and distance education facilities in in-service teacher professional development programs. Six major in-service trainings given in both face-to-face and online formats were completed.

The first one of these trainings was development training of electric-electronic and information technology teachers working in vocational schools in Turkey. It aimed to enrich their knowledge about their profession. This blended training organized as European Union project. There were many shareholders in this project: five universities, two institutions of MoNE, and a non-governmental organization. 42 hours online and 20 hours face-to-face courses were given in this training.

Another blended training was joint venture with MoNE and British Council to keep English teachers' knowledge up-to-date. 74 hours lecture was given in this development training: 60 hours online and 18 hours face-to-face formats.

MoNE signed protocol with Intel in 2003 to give professional development training about use of technology in education. Intel Teach Program is given in face-to-face format until 2007. After this year, both blended and face-to-face formats implemented in these trainings. Intel (2010) declared that 144.370 teachers benefited from this program at the end of August 2010. This project ended in 2012.

First full distance in-service training held jointly by MoNE and Microsoft about computer literacy in 2005. In this project it was aimed to give lectures to nearly 600.000 teachers. Users could get lectures by using training CDs with compulsory connection to the internet. Internet connection kept tracking logs of teachers. After completion of lectures, teachers attended online exams to get certificate.

In scope of introduction of new curriculum, MoNE arranged full online in-service training for six professions: early childhood, classroom, science and technology, history, and Turkish. Shareholders of the training were MoNE and Pamukkale University. This development training was administered between 2008 and 2010. The content of this training was constructivist learning environment, planning, programming, and guidance in constructivist learning, and alternative assessment and evaluation.

Another distance education program was arranged by MoNE and Anadolu University as deficiency training in 2008-2010. The aim of this training was to give bachelor degree to classroom teachers graduated from two-year or three-year vocational colleges. This training accomplished through supporting teachers with books, TV programs and computer aided materials.

After these experiences, MoNE achieve online professional development trainings on its own. Few training courses now are available online in MoNE distance education

portal (uzaktanegitim.meb.gov.tr). There is only one active online training course in this portal. Figure 2.2 presents sample screenshot of this online disaster preparedness in-service training.

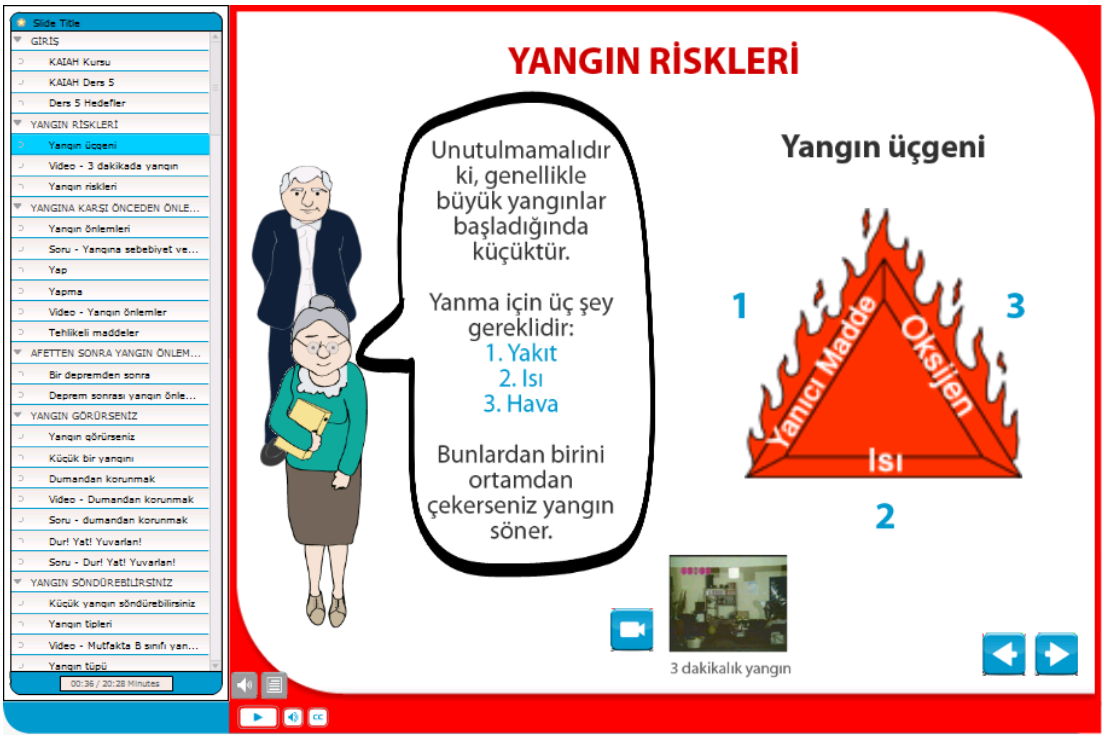

Figure 2. 2 'Disaster Preparedness' in-service training for person and family screenshot

2.5.3. Attitudes and perceptions about teaching professional development

Attitude is defined as summary evaluation of an object of thought (Bohner & Wanke, 2002). Attitudes can be towards anything such as concrete objects, abstract objects, people, groups, events, etc. Attitudes can be turned into behaviors in cognitive, affective and behavioral. Attitudes of people about an object are important since they affect the behaviors of the people towards that object. If a teacher has positive views about technology use in education, we will see that teacher trying to integrate technology to their courses more than teachers thinking the opposite (Bohner & Wanke, 2002).

Sekuler and Blake (1990) defined perception as “the final link in a chain of related events (p.1)”. For example, there is an accident in front of us. The first link is the event. After that our senses grasps and convert this event into physiological events happen in our body. The psychological condition such as consciousness, curiosity and motivation also affects our perception experience. Cognitivists explain learning as perception of the objects and events and storage of these. We can conclude that knowledge is constructed with perception. Perception about some events or object shows person’s knowledge and experience about it.

Because of their importance, many studies focused on teachers’ attitudes and perceptions to evaluate professional development courses. Starkey, Yates, Meyer, Hall, Taylor, Stevens, Toia (2009) found that participants had positive attitudes towards the professional development course. They perceived that professional development course met their needs, contributed in enhancing student’s learning outcomes, and increased the quality of their teaching and assessment knowledge. Gokdere and Cepni (2005) observed that science teachers of gifted students had positive attitudes towards the professional development course after they attend it.

Evaluation of another professional development course about science laboratories resulted in growth of teachers’ attitudes towards using the science laboratory (Kaya, Kucuk & Cepni, 2004). There is another study supporting that biology teachers attended the professional development courses had more positive attitudes towards laboratory courses than not attended ones (Ekici, 2002). Chemistry teachers also had positive attitudes towards the professional development courses. They express that courses should be about teaching methods and new approaches in education and instruction (Tekin & Ayas, 2002). Gentry et al. (2008) synthesized the literature about the technology-based mentoring of the teachers. They met with positive attitudes of teachers toward the technology based mentoring in all studies.

Teachers perceive the professional development courses necessary and not sufficient (Kucuksuleymanoglu, 2006). For that reason, Gonen and Kocakaya(2006) suggest that MoNE should increase the quality and number of the development courses.

Moreover, Mouzakis (2008) pointed out that teachers who have been participated in the blended development course showed positive perceptions of the five main issues such as collaboration, learning process, facilitator's support, material and technology. They have also revealed positive perceptions about satisfaction.

2.6. Summary of the Literature

This chapter reviewed the literature on learning theories, assessment and evaluation, instructional design, learning environments and teacher professional development. It identifies learning theories and their influence on education. Also, it stressed about types and alternative methods of assessment and evaluation, and obstacles that teachers confronted with while in preparation and application of these methods. Instructional design principles and educational technology also introduced to make clear the steps of design and development of an instruction or training. Online and face-to-face learning environments were compared and their positive and negative sides also discussed. Moreover, applications of MoNE in these two different learning environments were reviewed. Lastly, teachers' attitudes and perceptions about face-to-face and online learning environments were revealed.

CHAPTER III

METHODOLOGY

This chapter describes research methodology implemented in the study to reveal attitudes and perceptions of the science and technology teachers towards online professional development material and to evaluate effectiveness of this material. Specifically, research questions, theoretical framework behind the design of the study, research method, data collection, design and development phases of online professional development material (O-PDM), sampling, researcher's role, ethics, issues related with the reliability and validity and quantitative and qualitative analysis methods were discussed in this chapter in detail.

3.1. Research Questions

It is expected from this study to reveal perceptions and attitudes of science and technology teachers towards the O-PDM and to evaluate effectiveness of this online material. In order to figure out the research problems, four main questions and their sub questions are asked.

1. What are the perceptions of the science and technology teachers towards the online professional development material?
   1.1. What are the teachers' perceptions about the content and design of the online professional development material?
   1.2. What are the teachers' perceptions about the contributions that they have gained by experiencing in online professional development material?

2. What are the teachers' perceptions about comparison of online and face-to-face professional development trainings?
3. What are the attitudes of the science and technology teachers towards online professional development material?
4. Are there any differences in teachers' perceived-knowledge, perceptions, practices, and self-efficacy about alternative assessment and evaluation methods before and after use of the online professional development material?
   4.1. Are there any differences between teachers' perceived-knowledge about alternative assessment and evaluation methods?
   4.2. Are there any differences between teachers' perceptions about use of alternative assessment and evaluation methods in lessons?
   4.3. Are there any differences between teachers' use frequencies of alternative assessment and evaluation methods before and after use of the online professional development material?

   Are there any differences between teachers' self-efficacy scores in alternative assessment and evaluation methods before and after use of the online professional development material?

3.2. Theoretical Framework

Staff development in public and private schools is crucial issue to improve quality of education. These programs are designed to change teachers' professional practices, beliefs and attitudes (Guskey, 1986; Clarke & Hollingsworth, 2002). The aim of the teacher change varies. It can be for adaption to changed conditions, local reforms, systemic restructuring, and personal growth and learning (Clarke & Hollingsworth, 2002). Professional development of teachers is complex and it requires consideration not to waste time and effort. However, most of the professional development programs include tutoring for a period of time, mostly one-shot, and they quit. These types of programs were criticized in literature (Guskey, 1986). Critics stated that professional development programs should be ongoing processes that expand to long-period of time (Duyff, 1999; Clarke & Hollingsworth, 2002; Wall & Ahmed, 2008; Mitkovska & Hristovska, 2011).

Guskey (1986) exposed a model showing processes of professional growth. Model was linear and it had three outcomes such as change in classroom practices, in students' learning outcomes and in teachers' beliefs and attitudes.

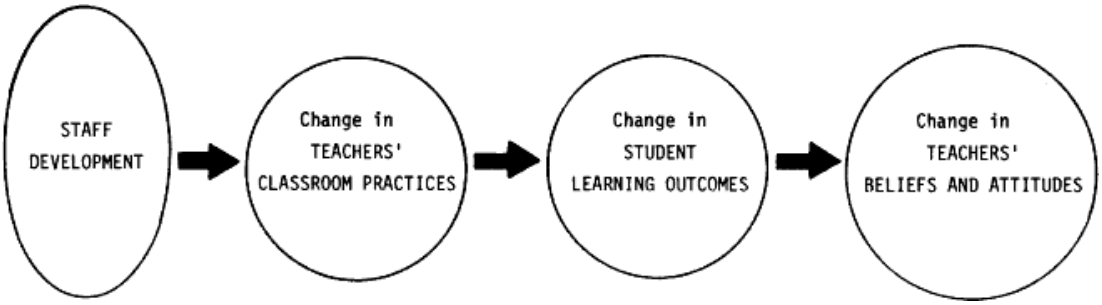

Figure 3. 1 Guskey's model of process of teacher change (Source: Guskey, 1986)

Although most of the previous studies place "change in teachers' beliefs and attitudes" outcome just after staff development process (Clarke & Hollingsworth, 2002), Guskey (1986) located it at the end of the model since he believed this change occur after teacher had seen learning outcomes of students. He argued that teacher's beliefs and attitudes mostly constructed by classroom practices and learning outcomes of students. For example, if a teacher having problems in adopting new assessment methods would have chance to apply a new technique taught in professional development training, this practice would increase his/her beliefs about the alternative assessment and evaluation methods. Moreover, if s/he has taken positive feedbacks from students, this would also reinforce teacher to use new techniques that s/he learned in professional development training. To recap, Guskey (1986) argued that change in beliefs and attitudes occur after classroom practices and seeing students' learning outcomes not just after lecture of professional development training.

Guskey (1986) suggested three considerations to achieve success in professional development. First, he declared that teacher change was slow and difficult process that program researchers and teachers should work collaboratively to simplify and ease the process. Moreover, teachers should be encouraged to monitor students' progress with formative tests. Positive feedbacks from students would increase their

motivation and practices. Lastly, teachers should be supported not only during training but also after initial training. Guskey (1986) pointed out that all teachers can not apply what they have learnt in training to class activities most of the time. Training developers should support teachers during period of experimenting newly learned skills in class.

3.3. Research Method: Design and Development Research

Researchers used different concepts to describe research method while designing and developing, and validating a product or model in instructional technology (Richey & Klein, 2007). These concepts can be listed as design studies, design experiments, design research, design-based research, development/developmental research, formative research, action research etc. (Van der Akker, 1999, Akilli, 2004, Yagodzinski, 2012). Moreover, *developmental research* is mostly used in literature. However, Richey and Klein (2007) propose to use the term design and development research since *developmental research* refers to some areas such as human development, international development and etc. In addition, they defined *design and development research* as:

> The systematic study of design, development and evaluation processes with the aim of establishing an empirical basis for the creation of instructional and non-instructional products and tools and new or enhanced models that govern their development (p. 1).

Reeves (2006) declares the steps should be taken in design and development research methodology in Figure 3.2. First, he advises to identify learning and teaching problems in collaboration of researcher and practitioners. Then, he marked development of prototypes according to existing design principles and technological innovations. After development and testing of first prototype, researcher should refine solutions by making changes in prototypes and design principles until reaching the desired outcomes in an iterative manner. Finally, researcher should report implications of the study based on experiences about implementation cycles and design principles used and learned through out study. (Reeves, 2006)

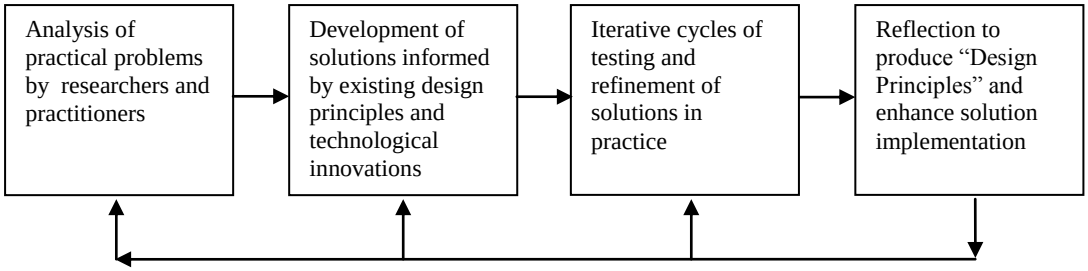

Figure 3. 2 Steps taken in design and development research methodology (Adapted from Reeves, 2006)

In design and development research, there are six major components as learner, context, content, instructional strategies and activities, media and designers themselves (Richey & Klein, 2007).

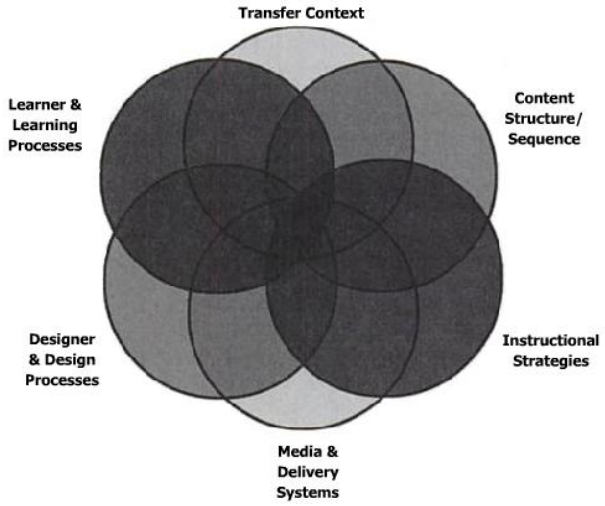

Figure 3. 3 The IDD knowledge base (Source: Richey & Klein, 2007)

Figure 3.3 shows graphical representation of these six components. In this study, learners are the science and technology teachers working in private and public schools. Context was not limited. Learning occurs in schools, at home or wherever they had internet connection. The utilization of internet in our daily life let people access it from computers, wireless phones, tablets and etc. Content used in this study is limited to alternative assessment and evaluation methods and activities since the study seek solution to specific problems of science and technology elementary teachers. Instructional activities can be listed as self-directed study, collaborative

learning, and discussion and forum. Media used in the study is digital text, digital graphics and video. Designers and developers are the researcher, an instructional expert and two colleagues.

Richey and Klein (2007) classified design and development research studies according to extent whether conclusions are context-specific or generalizable. They defined these studies in two types: *Product & Tool Research*, and *Model Research*. Model Research studies usually do not address on development of a product. Rather, they place emphasis on discovering general principles of a model or validation of this model (Yagodzinski, 2012). While Model Research studies were supposed to produce generalized conclusions, Product & Tool Research studies produce context-specific conclusions.

Product & Tool Research studies address analysis and description of product development processes, and evaluation of the final product. These studies are mostly derived from educational needs. Additionally, their results are context and product specific. Baturay (2007) declared that this type of researches do not encompass instructional psychology studies, media comparisons, impact studies and research on profession. Rather, they include "situations in which the design and development process used in a particular situation is described, analyzed, and a final product is evaluated" (Richey & Klein, 2007, p.9). The most important part of this type of studies is the documentation of the design-development processes of new product/tool, evaluation of these processes, evaluation of effectiveness of final product/tool and following the principles of instructional design. Outcome of this type of researches can be listed as lessons learned from development of new product and interpretation of conditions which increase use of this new tool. Besides, there are different types of participants in this type of research: designers, developers, clients, subject matter experts, evaluaters, learners, instructors, organizations. (Richey & Klein, 2007)

In this study, it is decided to use Product & Tool Research methods while creating online professional development material for science and technology teachers. In this

type of design and development research, Richey and Klein (2007) emphasize four research design issues: validity, causal inferences, generalization and interpretation, and anticipating problems.

Techniques used for Validity Concern

Conducting needs assessments to determine product specifications. Needs assessment was utilized with literature review and analysis method. Reports published by MoNE about problems related with assessment and evaluation problems and new constructivist curriculum change were searched. In these reports, detailed information was revealed about deficiencies of science and technology teachers about assessment and evaluation and considerations which should be concerned to fulfill these teachers' needs.

Establishing product prototype. Researcher created three product prototypes to evaluate participants' perceptions about online professional development tool. According to their suggestions, he designed and developed new prototypes to reach final product.

Figure 3. 4 Product prototyping procedure

Verifying interview data. Researcher used interview data in evaluation of first two prototypes. In this period, he also used internet tutorial attitude questionnaire data to verify this interview data. He gave detailed information about triangulation of these data in Section 3.9.

Verifying try-out data: In first and second prototype interview sessions, researcher used member checking procedure to verify coded interview data.

Operationally definition of design constructs. Researcher defined all design constructs in detail in Section 3.4. He clearly explained all processes in developing each prototype.

Use of experts with different areas for review. In this research, there were both instructional design experts and a content expert. Instructional design experts gave feedback about design and development of prototypes. Content expert reviewed the content and gave feedback about in what degree this content can respond to science and technology teachers' needs about alternative assessment and evaluation methods.

Techniques used for Causal Inferences Concern

Relating product design to learner achievement, attitudes and product usability. In this research, researcher related product design with learner perceptions and attitudes. He did not use their achievement levels in design process of prototypes. However, he designed prototypes and made revisions on them according to participants' perceptions about content, design and usability. Their attitudes towards online material also considered in design-develeopment phases of new prototypes.

Determining tool's practicality and effectiveness. Researhcer collected participants' perceptions about practicality and effectiveness of online tool with interview questions. They both reported success and failure of prototypes during interview sessions. Effectiveness of material was evaluated in final phase of the study.

Techniques used for Generalization and Interpretation Concern

Detailed descriptions of design procedures. Researcher explained which actions performed in each three design and development phases in detail. He divided each phase into categories such as analysis, design-development, implementation and evaluation.

Determining lessons learned. After each phase evaluation results, the researcher defined and listed all considerations according to user perceptions and attitudes. He gave detailed information about lessons learned in design and development phases in section 5.1.

Interpreting training effectiveness. In final phase of the study, the researcher tested effectiveness of training. He observed whether there is a positive change in teachers' beliefs and practices after use of online professional development material.

Conducting usability analyses. In this study, researcher did not conduct a usability analysis since he gathered data about usability issues of online professional development material. He investigated usability problems of online tool. According to considerations and perceptions of participants, he tried to diminish usability problems of online tool.

Techniques used for Anticipating Problems Concern.

Testing product feasibility. Researcher tested all three prototypes with different 21 science and technology teachers. In first cycle, four science and technology teachers tested the first prototype and evaluated it. In second cycle, different seventeen science and technology teachers used and evaluated second prototype. In third cycle, fourteen teachers attended in second cycle tested and evaluated the third prototype. In these testing procedures, researcher decided whether online professional development material was used properly by users in different conditions.

Using ID team members to conduct try-outs. Researcher worked with three instructional designer team members to evaluate try-outs. All three members took part in evaluation of three prototypes at least once. Their recommendations and suggestions helped researcher to create final draft of prototypes before implementation.

Minimizing assumptions of existing user knowledge. Both researcher and content expert designed and created content according to short, clear and concise to be comprehended by all levels of participants. User interface of the prototypes is designed in simple to be used by all participants easily. Moreover, researcher created "how to do" videos for some pages to ease use of online tool.

Researcher aimed to produce not only high quality online material but also develop it in an efficient way. One of the techniques to ensure this issue in instructional design studies is rapid prototyping. Jones and Richey (2000) state rapid prototyping as "development of a working model of an instructional product that is used early in a project to assist in the analysis, design, development, and evaluation of an instructional innovation". Although rapid prototyping was used first in the late 1980s by industrial corporations and it is used mostly in computer related industrial areas (Chua, Leong & Lim, 2003; Desrosier, 2011), rapid prototyping technique has been also used in instructional design to develop instructions, educational software, instructional videos, electronic performance support systems, and trainings and improve curricula (Jones & Richey, 2000; Desrosier, 2011).

Most of the studies in literature pertaining rapid prototyping procedure in instructional design studies did not have consistent procedures. However, Jones and Richey (2000) state that they mostly had a tendency towards implementing traditional instructional design phases. These phases can be listed as ADDIE-Analysis, Design, Development, Implementation and Evaluation. Molenda (2003) stated that instructional design projects like electronic performance support systems should be created through phases of ADDIE model. He exposed a monogram distributed by American Society for Training and Development (Grafinger, 1988) featuring the phases of ADDIE and interactions between them (Figure 3.2).

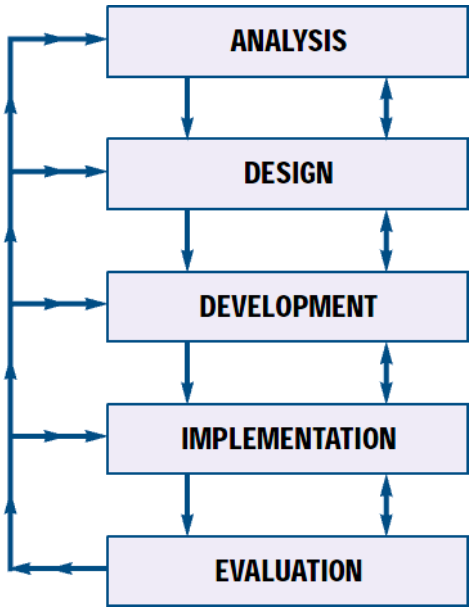

Figure 3. 5 ISD model featuring the ADDIE processes (Source: Grafinger, 1988 cited in Molenda, 2003)

Analysis phase contains establishment of learning goals and objectives, analysis of learners' needs and their learning preferences such as existing knowledge and skills and analysis of the medium which will be used as delivery method of instruction (Shelton & Saltsman, 2008). Design phase involves deciding the detailed content will be lectured to participants, and instructional strategies and presentation techniques will be used in instruction to deliver content. In development phase, the planned system taken into account in design phase changed into the training package ready to apply in real situations (Ellington and Aris, 2000). In implementation phase the product is delivered into end users. Evaluation phase contains two important parts such as formative and summative evaluation. While formative evaluation is present in each phase of the ADDIE model, summative evaluation takes part when instruction or prototype is ready to deploy to users.

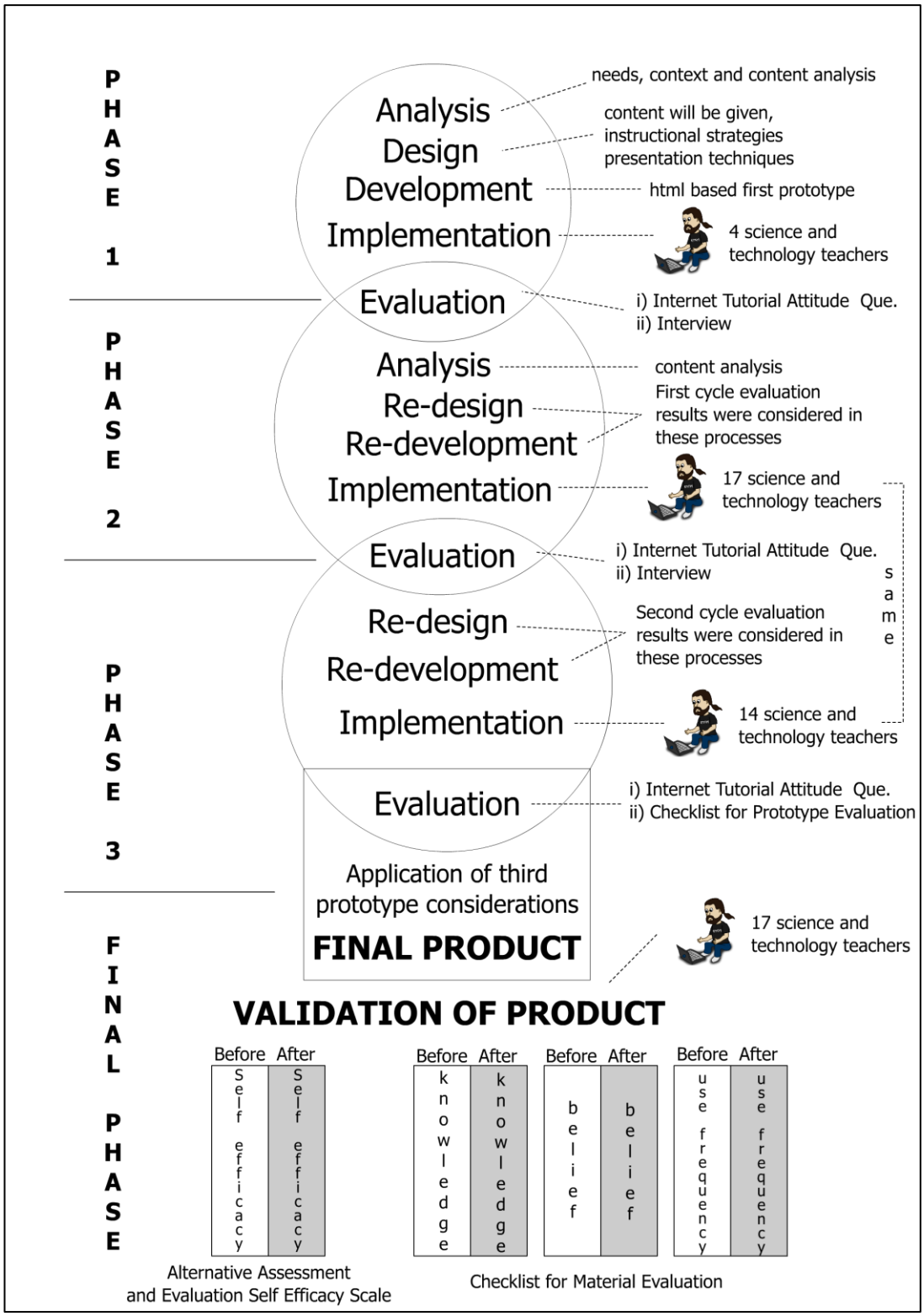

Figure 3. 6 Visual Model of Phases of Design and Developmental Research

In this study, researcher used rapid prototyping procedure with ADDIE model to develop online material. He benefited from rapid prototyping features such as

iterative use, rapid response and modification, reduction in cost and time (Tripp & Bichelmeyer, 1990; Desrosier, 2011). Rapid prototyping is iterative process that you can make changes to prototypes again and again to improve the quality of the final product. Moreover, it creates good communication between the user and developer. Users prompt their needs from the beginning to the end of the project. It is not a linear approach that designer can seize the problems and fix them immediately before distribution of the product. Also, it is cost-effective that it reduces costs of project and time spent for development and distribution of the product (Chua, Leong & Lim, 2003; Desrosier, 2011, Tripp & Bichelmeyer, 1990).

Each prototyping procedure had each phases of ADDIE model. Researcher had decided to end prototyping procedure at the end of third prototype. After little modifications, the prototype converted into final product. At final phase, researcher aimed to distribute this final product to users and validate whether online material fulfills the needs of teachers. Researcher used literature review, expert review, in-depth interview, content analysis, and survey research techniques throughout the prototyping and final study. Researcher made literature review to understand the roots of the problem, variables related with that problem and possible solutions to problem. In all phases of design, development and evaluation, he consulted to experts in instructional design department. He conducted in-depth interviews with participants to reveal their perceptions about online material. Moreover, he used content analysis to create patterns and themes from interview transcriptions. Survey method was also used to evaluate participants' attitudes towards the material and validate final product of online material. The summary of the techniques and methods accompanied in prototyping procedure and final study is given in Table 3.1.

Table 3. 1

Summary of the Prototyping Procedure and the Final Study

FIRST PHASE		
Analysis:	Design and Development:	Implementation and Evaluation:
• needs analysis • context analysis • content analysis	• html based first prototype	• implementation of the material to four science and technology teachers. It took one week period. • evaluation of their perceptions gathered through interviews and internet tutorial attitude scale.
SECOND PHASE		
Analysis, re-design and re-development:	Implementation:	Evaluation and Reflection:
• content analysis • design and development of second prototype according to feedbacks given in the first phase via interview.	• implementation of second prototype to seventeen science and technology teachers different from attendees in the first phase. It took ten days period.	• evaluation of their perceptions through interviews and attitude scores through internet tutorial attitude questionnaire.
THIRD PHASE		
Analysis, re-design and re-development:	Implementation:	Evaluation and Reflection:
• content analysis • design and development of third prototype according to feedbacks given in the second phase via interview.	• implementation of third prototype to fourteen science and technology teachers attended in the second phase. It took one week period.	• evaluation of their perceptions through checklist and attitude scores through internet tutorial attitude questionnaire.
FINAL PHASE		
Diagnose, redesign and development:	Implementation:	Evaluation:
• Some little modifications were made to enhance the online personal development material	• implementation of final product to twenty five science and technology teachers. It took four weeks period.	• Administeration of pre and post self-efficacy questionnaire and checklist for material validation to 17 participants

Researcher started the project with preparation of the proposal and presented to thesis examining committee at the beginning of 2009. In spring semester, he attended training about qualitative research. After this training, he started to work with the project in September 2009. The timeline of the study is given in Table 3.2.

Table 3. 2

Timeline of the Study

2009 - 2010	September – March : Analysis (Prototype I)
	April – September : Design and Development (Prototype I)
2010 - 2011	October – December : Implementation and Evaluation (Prototype I)
	January – April : Analysis, re-design and re-development (Prototype II)
	May – June : Implementation: (Prototype II)
	June – July : Evaluation and Reflection (Prototype II)
2011 - 2012	August – September : Analysis, re-design and re-development (Prototype III)
	October : Implementation, Evaluation and Reflection (Prototype III)
	November : Diagnose, redesign and development (Final Product)
	November – December : Implementation (Final Product)
	January - March : Evaluation (Final Product)

3.4. Procedures of the Research:

The study includes three prototyping procedure and a final study to design and development, and evaluation of the O-PDM. Rapid prototyping was used to design and develop this online material involving analysis, design, development, implementation, and evaluation procedures. Rapid prototyping supports iterative design which includes prototyping cycles. These prototyping cycles have procedures such as analyzing, testing, and making changes according to evaluation results. These procedures and cycles supposed to improve the quality, usability of the product and operations performed by it. In final study, researcher evaluated final product whether it met teachers' needs. The prototyping procedures and final study were explained below.

3.4.1. First cycle

The first cycle consisted of analyze, design, development, implementation and evaluation processes. These five processes seen as traditional used instructional design phases (Jones & Richey, 2000). In the analysis phases, the researcher conducted three analyses such as; needs analysis, context, and content analysis. Researcher, an instructional design expert, and a content expert decided about context and content of professional development training. Researcher designed and developed HTML based first prototype with Expression Web 4.0© software. In the implementation of the material, the researcher asked four volunteered science and technology teachers to use and examine the material. In evaluation phase, the researcher conducted interviews and ITA-Q to these four participants.

Analysis. The analysis phase started with the needs analysis. The researcher was interested with the new curriculum change in Turkey. The pilot study of the new curriculum was conducted in 9 cities and 120 elementary schools. The latter year, new curriculum was applied in the elementary schools of the country. The first comprehensive study was conducted by Education, Research & Development Department (EREDED) in 2006. In this study, data was collected from 108 schools in 9 cities from teachers, school principals, elementary school supervisors, parents and students. The results showed that teachers mostly have deficiencies in assessment and evaluation in lessons such as science and technology, math, Turkish and social science lesson. The researcher focused on the science and technology teachers since science and technology course covers not only linguistic but also logical-mathematical topics. If researcher could solve the problem of the science and technology teachers, the solution would be applied to other subjects.

In details of this report, it was pointed out that %50.6 of the science and technology teachers saw assessment methods were complicated and %88.8 of the science and technology teachers perceived them as time-consuming. Moreover, %55 of the teachers declared that evaluation methods were complicated and % 88.1 of them believed that evaluation was time consuming. Researchers stressed that science and

technology teachers needed in-service training in all areas of the assessment and evaluation methods. The reasons were explained in report as;

- Information given to teachers is not in systematic way and comprehensible
- Assessment and evaluation materials are not given to teachers available (EREDED, 2006)

This directed researcher to prepare professional development training for science and technology teachers to give information about the assessment and evaluation methods and to serve assessment activities for their use in class. It was also intended from science and technology teachers to be able to prepare their own assessment materials.

After needs analysis, researcher consulted to the instructional design experts to determine the delivery medium. Because of its lots of advantages, internet was chosen as medium to be used as delivery method in instruction. These advantages can be listed as *ease of access* that users can reach the content anywhere, *flexibility* that users can select the time for instruction at their convenience, *cost* that researcher can deliver instruction into high number of the teachers with lower costs compared with face to face method.

Analysis phase was concluded with content analysis. In content analysis, researcher worked with a content expert. The content expert had degree from elementary science education department and was doctorate candidate in computer education and instructional technology department. Researcher and content expert searched for the information which should be given in online personal development material. First, they had been agreed on the topics which will be included in online professional development material. Then, researcher made literature review to find short and useful information covering these topics. Content given in O-PDM was gathered through guide books of Ministry of National Education (MoNE), web-site of the Board of National Education (BoNE), and educational sites sharing their content for educational purposes. Content text was written by researcher and

reviewed by the content expert. After revisions were made in content, researcher passed through the design and development phase.

Design and development. In design and development phase, the researcher started with designing the HTML based first prototype. First, he decided to use a free educational template for design of the site. Then, he added content created in analysis phase into related pages. He got revisions from two colleagues in this phase.

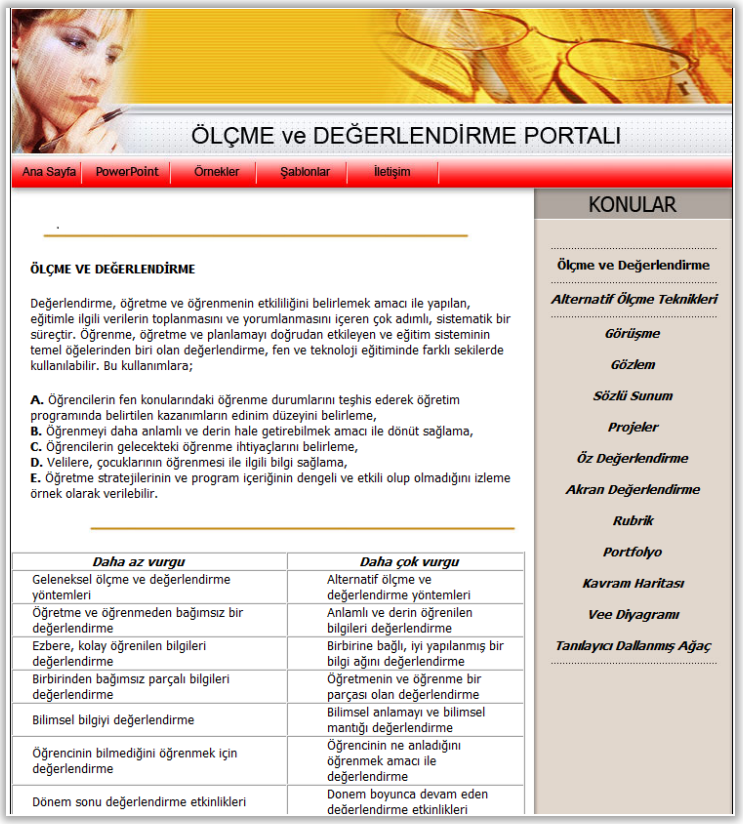

Figure 3. 7 Assessment and Evaluation page of the first prototype

There were two main link bars on the top and right pane. The links for ‘Home’, ‘PowerPoint’, ‘Samples’, ‘Templates’, and ‘Contact’ pages were located on the top pane. The links for ‘Assessment and Evaluation’ and ‘Alternative Assessment Techniques’ pages were located on the right pane. The websites in each link on the right side had short and useful information about link topics. For example, when you clicked on the ‘Assessment and Evaluation’ link, brief explanation about what is

assessment and evaluation and the points should be considered was given (See Figure 3.7).

The links on the top pane had five links. ‘Home’ was directed to the ‘Assessment and Evaluation’ page. ‘PowerPoint’ page had one PowerPoint slide which contains information about preparing a concept map. ‘Samples’ page had 7 sample alternative assessment activities which were selected from the educational sites to provide teachers’ use. In ‘Templates’ page, there were 8 sample template rubrics to evaluate students’ performances (See Figure 3.8). ‘Contact’ page had information about the researcher and the references.

Figure 3. 8 ‘Templates’ page of the first prototype

Implementation. In implementation phase, researcher asked four teachers working in four elementary schools in the province of Ankara to participate in the study voluntarily. All teachers accepted to participate. No preliminary training was

given about how to use O-PDM to these teachers since they reported to be literate about computers and internet. Researcher gave brief information about O-PDM and aim of the study. He wanted participants to use, investigate and criticize O-PDM. It took one week period for teachers to use and analyze O-PDM.

Evaluation. After implementation, users contacted with researcher. He interviewed with participants about half an hour. He asked 10 semi- structured interview questions (See Appendix A). Following interviews, participants filled the Internet Tutorial Attitude Questionnaire (ITA-Q).

In evaluation phase, the researcher recorded the interview in digital format. He listened and transcribed the conversation in MS Word 2007 program. He also entered ITA-Q results into SPSS 18 package program. He used this software program to calculate the quantitative analysis results. The quantitative and qualitative analysis results were given in Chapter 4 in detail. So, only the considerations about re-design and re-development process of the material were given in this part. Considerations according to evaluation of first prototype:

- Content in "Projects" page should be enriched
- There should be examples for each type of alternative assessment methods
- Number of visual PowerPoint presentations should be increased
- Number of samples in "Sample" page should be increased and divided into categories according to grade level and units.
- There should be a new page to share documents
- Number of colors used in design of site should be decreased
- Design of right pane should be revised to make them clear to be seen as links
- Pictures not related with content should be removed.

3.4.2. Second Cycle

The second cycle includes processes of diagnose, redesign and development of the material. Researcher started with content analysis to add new information to O-PDM

according to first prototype considerations. After analysis procedure, he planned for changes and additions in new prototype according to first prototype evaluation considerations. He developed the second prototype accordingly. After design and development, he implemented O-PDM to 17 science and technology teachers. Researcher concluded second cycle with evaluation of O-PDM according to feedbacks given by participants.

Diagnose, re-design and development. According to first cycle considerations, researcher made content analysis about project assessment method and new alternative assessment techniques. After content analysis, he made some changes and additions in content and design of O-PDM.

First of all, he enriched content in "Projects" page with revision of content expert. Then, he added one more alternative assessment and evaluation method: structural communication grid to O-PDM according to content analysis results. He added brief information about how to create, use and grade students with this method. Moreover, he added one example form of structural communication grid into this new page.

Another change in content was in PowerPoint page. Researcher decided to substitute videos for PowerPoint presentations to explain how to prepare alternative assessment method with computers. There was one PowerPoint slide explaining how to prepare a concept map. However, the researcher and a colleague created content for two videos. The first video was about how to install free educational 'CMap Tools' program used for creating concept maps. The second video was about how to create, save and print out a sample concept map by using this educational software program. By creating these videos, it was intended to present teachers that technological tools can be used in preparation of alternative assessment materials to save time and ease the process.

In the first prototype, there were 7 samples presented for teachers. These samples were removed and new 19 assessment samples (concept map, structural

communication grid, and vee diagram) were created by researcher and content expert for the first units of 6th, 7th, and 8th grade levels (See Figure 3.10).

Changes and additions were made in design also. Since there were negative considerations about attention distraction of the pictures in first prototype, researcher decided to create new visual design for second prototype. In this new design, he tried to make it simple and take attention of users to content most. The new design can be seen in default page of the second prototype (See Figure 3.9).

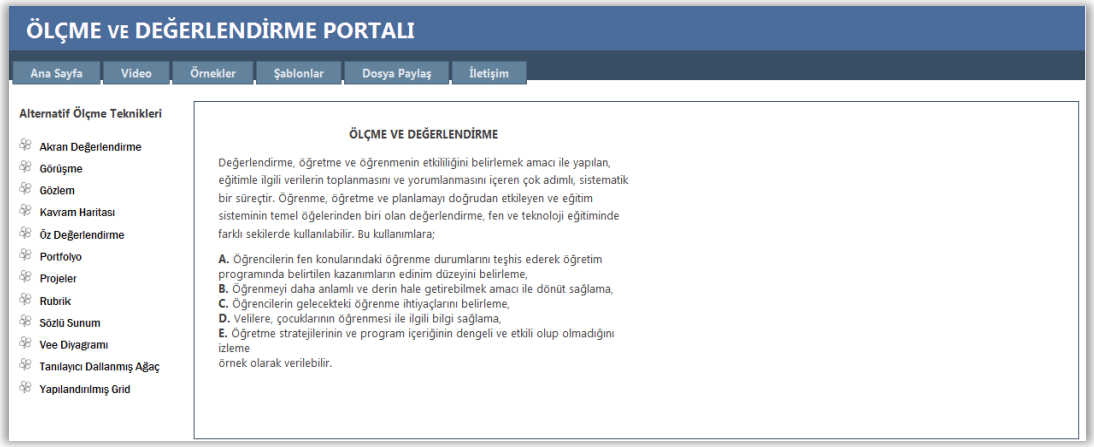

Figure 3. 9 'Main' page of the second prototype

After changing visual design of O-PDM, researcher also changed technical infrastructure of it. He upgraded html based files to aspx based files. Moreover, MS SharePoint platform was used to share content and documents easily among users. New platform brought more interactivity to material. Also, login page was required in this platform to secure shared documents.

Another change in design was location of links of assessment methods. They were moved from right pane to left pane to increase navigation. Also, order of these links was sorted according to alphabetical order.

Another change in design was presentation of samples and templates. In first prototype, users should download samples and templates or open in another webpage

to see the content in it. However, researcher changed presentation of these samples and templates to let users view documents without opening another page or downloading it. He embedded a PDF viewer at right side of ‘Samples’ and ‘Templates’ pages. When user clicked on links on the left side, related document was opened at right side of the page (See Figure 3.10). By applying this new design, researcher intended to increase navigation facilities of O-PDM.

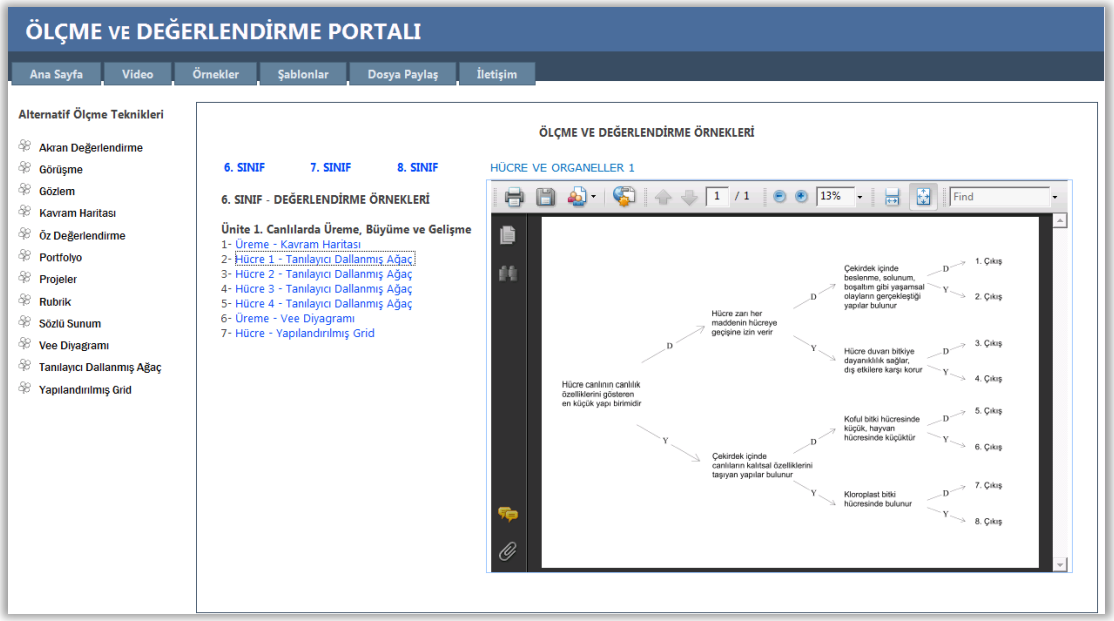

Figure 3. 10 'Samples' page of the second prototype

‘Share Document’ page was created according to considerations of first prototype evaluation. Teachers advised to add a new page that they can share their assessment materials with their colleagues. With this new feature, users could share their own documents. Thus, all O-PDM users could download documents added by their colleagues. Users would have information about name, modification time of document. Moreover, they could see which user uploaded this document. Researcher gave directions about how to use this module at the bottom of this page. Figure 3.11 shows new added ‘Share Document’ page.

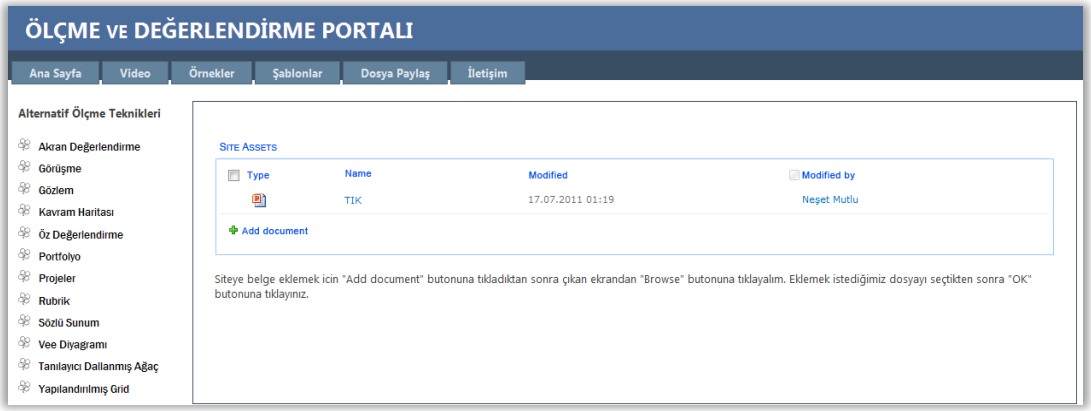

Figure 3. 11 'Share Document' page of the second prototype

Another consideration according to evaluation of first prototype was to adding examples about each assessment method. Researcher created example forms for each alternative assessment types. To locate these example forms into each page, he divided layout of content part of these pages into two columns. Left column had brief information about related assessment method and right column had picture of small sized example form. Small sized example forms were shown in bigger sizes when user hovered mouse over on them. When user hovered mouse out of the example form, size of example form was reduced into previous small measure. Thus, it became easy to see both explanation and example of the assessment method in same page. New design of assessment methods pages can be seen in Figure 3.12.

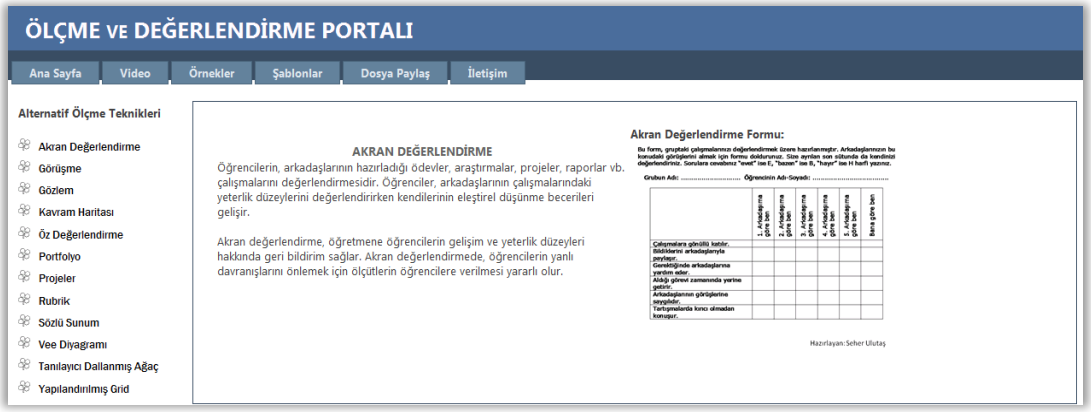

Figure 3. 12 'Peer Evaluation' page of the second prototype

To recap, researcher made changes and additions in content and design according to considerations of the first cycle evaluation process. Table 3.3 shows brief summary of the changes and additions in second prototype.

Table 3. 3

Summary of the changes and additions in content and design of second prototype

According to considerations, changes and additions in content:

• Changes
  ○ PowerPoint page was removed
  ○ Seven samples were removed. New 19 assessment samples (concept map, structural communication grid, and vee diagram) were created by researcher and content expert.
• Additions
  ○ 'Structural Communication Grid' page
  ○ Example forms for each assessment method pages
  ○ Two new videos about concept maps

According to considerations, changes and additions in design:

• Changes
  ○ Visual design was changed
  ○ Aspx files were used instead of html
  ○ MS SharePoint platform was used to increase interactivity
  ○ Assessment methods' links were sorted
  ○ Presentation of the samples and templates documents
• Additions
  ○ 'Share Document' pages
  ○ Visual presentation of the example forms

Implementation. Researcher wanted to implement second prototype to participants attended in first prototype evaluation and increase the number of participants by adding new participants who accept to join second prototype implementation and evaluation processes voluntarily. Firstly, he talked with the participants attended in the previous study. Three of them rejected to attend because of hard workload in school. The forth one moved from teaching to some other profession. So, evaluators of first prototype could not participate in second cycle.

He introduced study and O-PDM to 25 teachers from different 12 schools in the province of Ankara. Researcher asked them to attend voluntarily in second prototype evaluation. 17 out of 25 teachers accepted to participate. Researcher gave each participant site user guide explaining how to enter and use O-PDM (Appendix F). Teachers used O-PDM within ten days.

Evaluation and reflection. After ten days period, researcher called each participant and arranged an appointment date. In appointment, researcher interviewed with each participant about half an hour period. Moreover, each participant filled ITA-Q. Researcher transcribed recorded data in interviews into MS Word software program. He used SPSS 18 package program to analyze quantitative data of ITA-Q. Results of these analyses were given in Chapter 4 in detail. Considerations according to these results can be listed as:

- Interview, peer-evaluation, and self-assessment techniques were seen hard to implement
- The number of samples should be increased. All grade level and all units should have alternative assessment and evaluation samples.
- Number of videos explaining alternative assessment and evaluation techniques should be increased
- Users would not understand that they have to hover on image to enlarge. So, there should be descriptive text about presentation of the sample images.
- Presentation of graphics in bigger sizes was problematic and should be changed to make in efficient way.
- Color scheme of site found pale, formal and non-attractive. Thus, it should be changed to make it more attractive.
- Visual appeal of the site should be increased by adding more colorful graphics.
- Logon to site should be revised. If it is applicable, it can be removed.
- Site address should be changed to make it easier to enter O-PDM.
- 'Share Document' module should be revised to make all parts in Turkish.

- New plug-in should be used to remove users' problems about watching videos.

3.4.3. Third cycle

Researcher used same procedures in this cycle with second cycle. First, he diagnosed parts should be changed and added to O-PDM according to considerations revealed in second cycle evaluation process. Then, he redesigned and developed the material using SharePoint Designer software. In implementation phase, researcher asked participants attended in second cycle whether they can participate in evaluation of third prototype. Fourteen out of seventeen teachers accepted to attend to evaluate third prototype voluntarily. They used and evaluated online material for one week period. After the implementation, researcher evaluated participants' perceptions through C-PE and their attitudes towards material via ITA-Q.

Diagnose, re-design and re-development. According to evaluation results of second cycle, researcher had made some modifications in content and design. He started to this process with enrichment of content. He searched literature to find new alternative assessment type to present in O-PDM. Researcher and content expert decided to add one more alternative assessment method: posters. He added new content for poster method to O-PDM to increase perception of the users about completeness of the content. Researcher put brief information about posters, their usage in educational settings, and two sample posters into this new page.

Researcher continued to re-design and re-development process by applying considerations of second prototype evaluation. One of the main issues in considerations about content was clarity. Although most of the users declared that site content was clear to understand, researcher aimed to increase clarity of content by putting brief information about some main features of O-PDM to inform users how to benefit from online material into main page of material.

Another consideration about content was completeness. Participants found number of exemplar texts low. So, researcher added sample assessment activities for all units of three grade levels. 28 samples for Grade 6, 24 samples for Grade 7, and 28 samples for Grade 8 were created by using content in MoNE course books. All these new 80 samples were reviewed by content expert. After taking considerations of content expert, researcher revised these samples accordingly. Moreover, researcher and content expert created 3 new templates. By using these templates, users had chance to prepare vee diagram, structural communication grid, and diagnostic tree assessment techniques on their own.

Second prototype users advised to increase number of videos explaining alternative assessment and evaluation techniques. Thus, researcher created three new videos for users explaining how to prepare different three types of alternative assessment activities by using computers. Moreover, two videos were created to lecture on how to use "Share Document" and "Share Information" modules. One video was added to project page showing how two students had prepared their project for "Bu Benim Eserim" contest.

Another consideration about content was about interview, peer-evaluation, and self-assessment techniques. Teachers found these techniques hard to implement in class conditions. Researcher and content expert reviewed literature and enhanced content of O-PDM to help teachers to deal with problems about implementing these techniques.

Besides content, researcher has made considerable changes and additions in design also. First of all, visual design of the online material was changed to make it more colorful and eye-pleasing. Researcher centered the site and added background image. Thus, users could see content in high or low screen resolutions without a problem and useless spaces. You can see new visual design of the O-PDM in Figure 3.13.

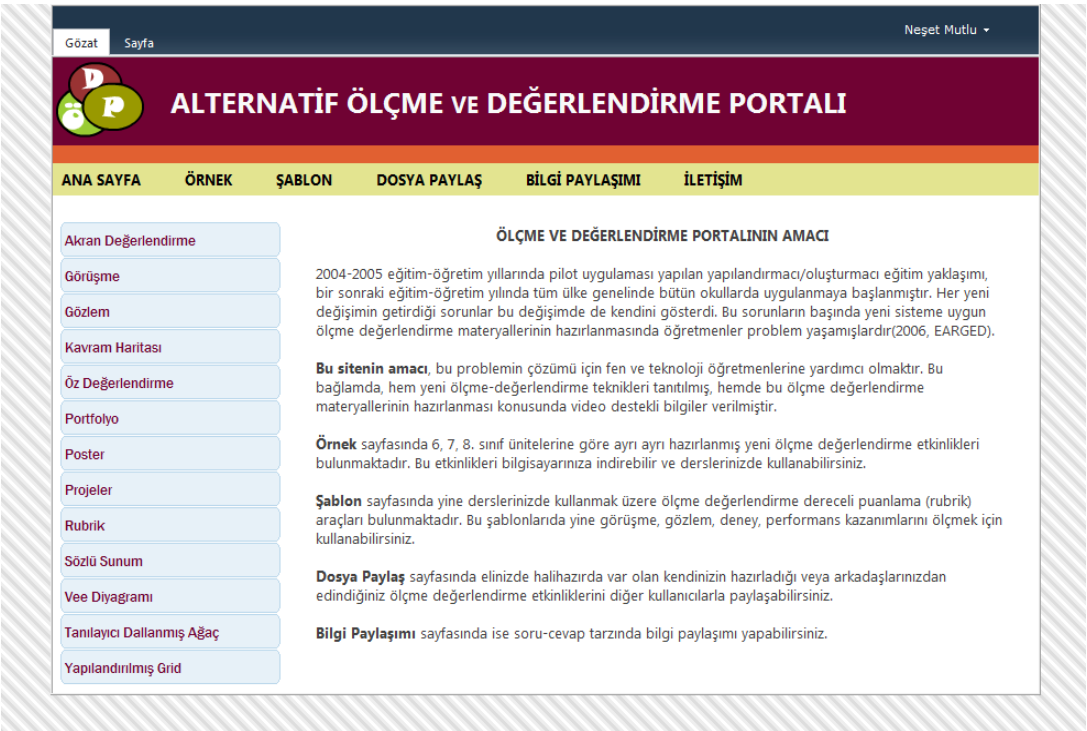

Figure 3. 13 'Homepage' of the third prototype

One of the main design changes was presentation of the samples and templates. According to considerations of second prototype evaluation, users had difficulties in viewing pictures and graphics. Hovering in example forms had come up with some problems in low screen resolution computers. There were also problems about videos. Users complained about plug-in error. So, researcher decided to show all forms and videos in one simple and known presentation type. Also, he tried to find fastest way to show these documents. He used an open source script to overlay forms and videos on top of the current page (See Figure 3.14). In this way, researcher aimed to solve plug-in problems of videos since this script opens videos in JW Player which supports Flash. To use this script, researcher turned all pdf documents into images. User could view documents in image format. Moreover, researcher put links to image viewer to let users download documents in pdf format.

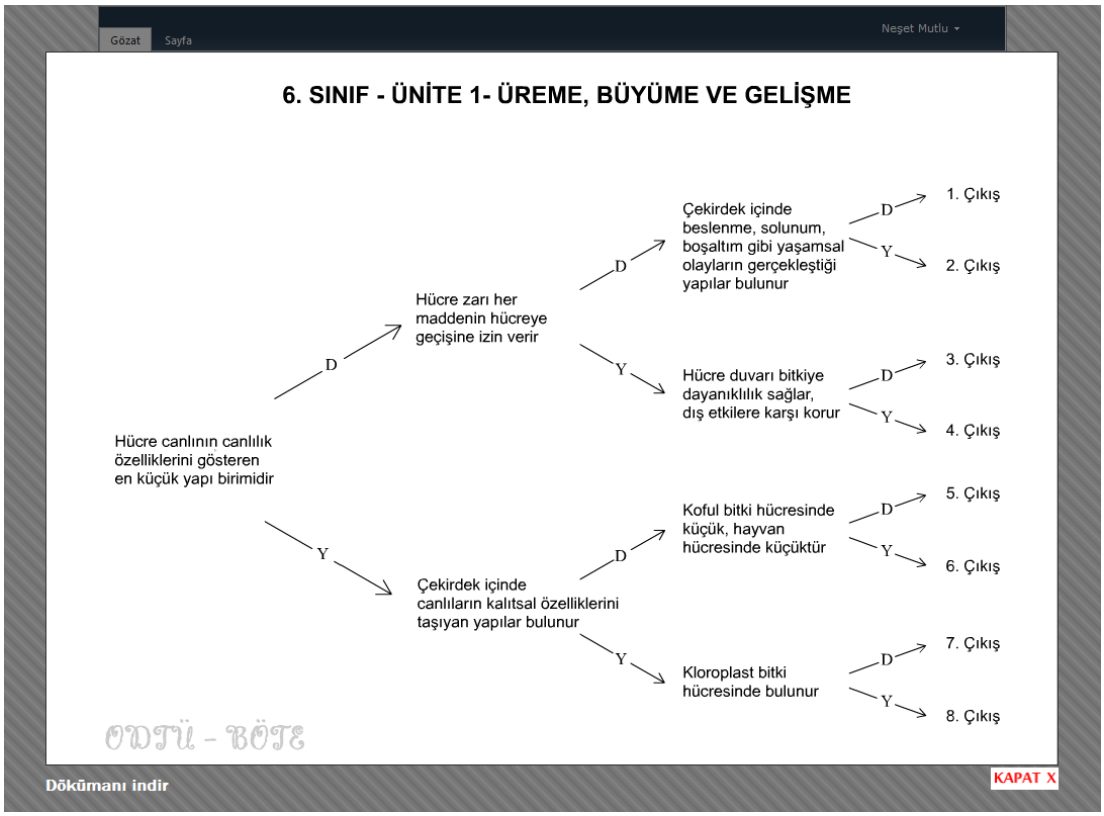

Figure 3. 14 'Sample' page of the third prototype

Besides changes, there were also additions to design of the online material. The first addition was ‘Share Information’ page. Although there was no expression about need for this page in considerations of second prototype evaluation, researcher believed this page to promote teachers communication while using O-PDM. Thus, he created a module in which users can add discussions. Teachers could ask questions or share information with other O-PDM users. To help teachers to use this module, researcher added a complementary video explaining how teachers could benefit from this module. Figure 3.15 shows ‘Share Information’ page.

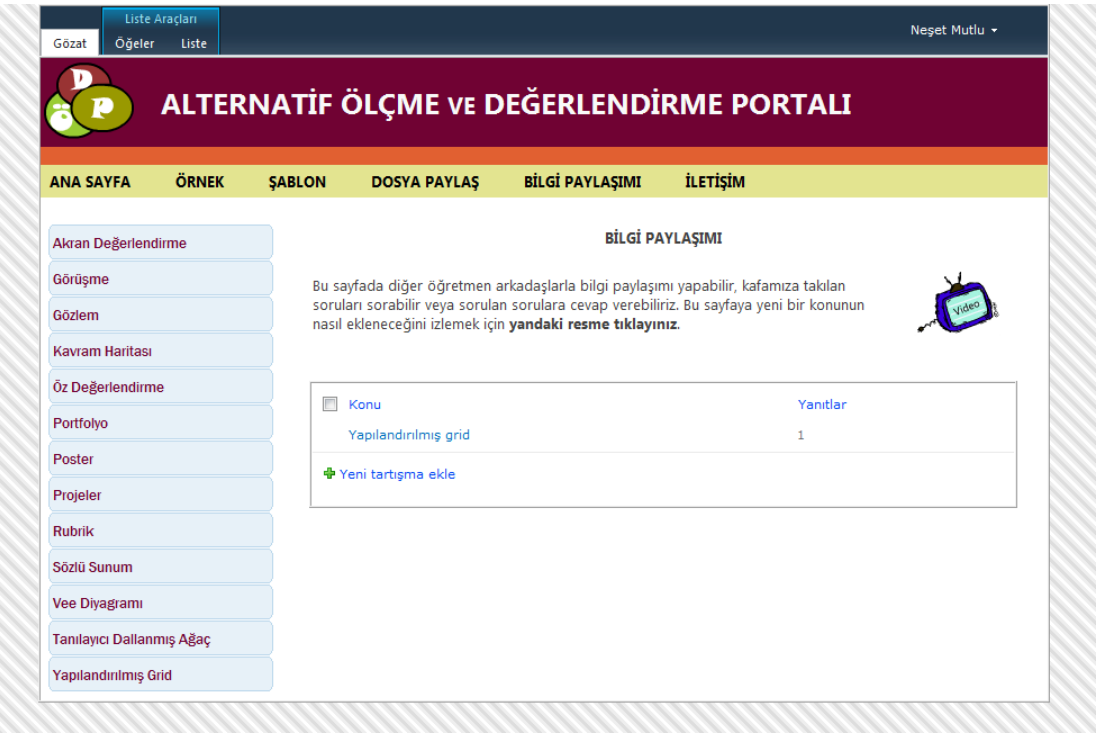

Figure 3. 15 'Share Information' page of the third prototype

Second addition was about Turkish language package to diminish usability problems. One of the usability considerations about second prototype was about language of 'Share Document' module. Module had some English terms (See Figure 3.11). Although researcher had added content about how to use this module, complaints revealed about these English terms. In third prototype, researcher formatted system and installed it with Turkish language package with assistance of an instructional design expert. After Turkish language package was installed, a new video was created to explain how to add document to O-PDM using this module. The last version of Share Document page was given in Figure 3.16.

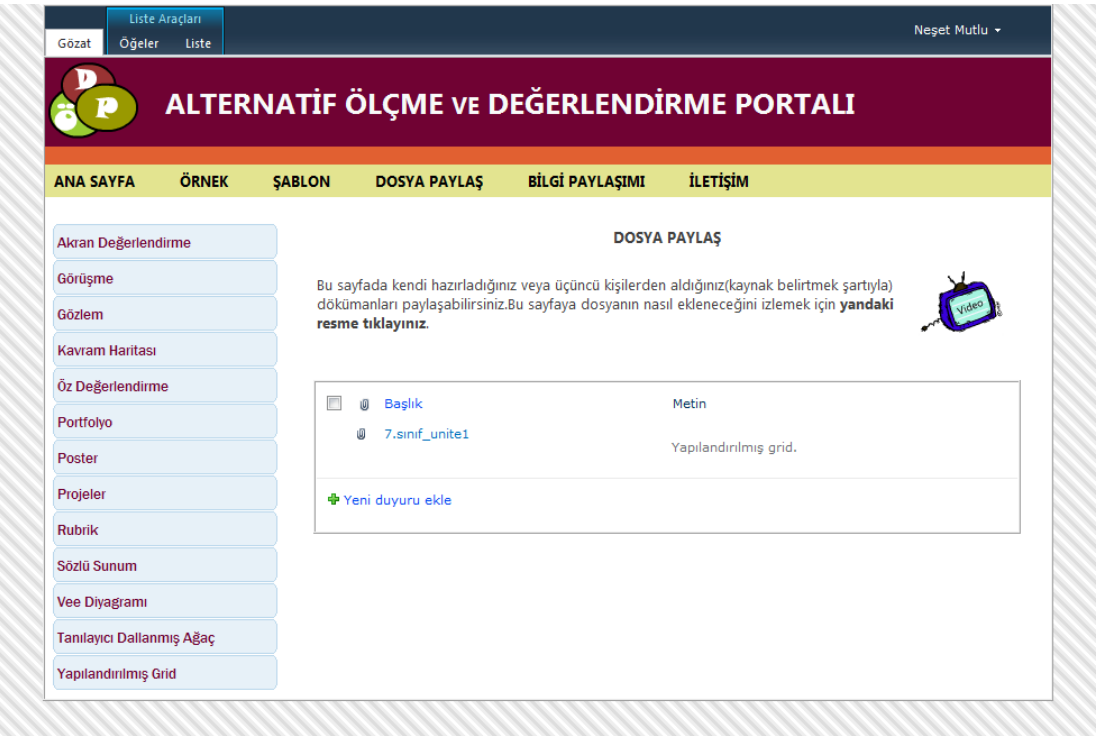

Figure 3. 16 'Share Document' page of the third prototype

There were also considerations to increase usability of O-PDM. These were about name of the site and login page. Domain name of second prototype was 'odh.ceit.metu.edu.tr/odp'. Users found it hard to write in browsers. Thus, researcher changed domain name as 'www.olcme.org'. They also found it hard to enter site with a login page. But without login pages, it was impossible to add "Share Documents" and "Share Information" modules into site. So, login page remained without a change.

To sum up, researcher made changes and additions in both content and design according to considerations revealed from second cycle evaluation process. He could accomplish to reflect all considerations and feedbacks given from second prototype evaluators into O-PDM. However, only one consideration about removal of login page could not be responded. This would cause removal of many features of O-PDM. So, it was neglected. Summary of the changes and additions in third prototype can be seen in Table 3.4.

Table 3. 4

Summary of the changes and additions in content and design of third prototype

According to considerations, changes and additions in content:

• Changes
  o Content presented in "Home" page was changed. Aim of the study and brief information about the pages and features of the O-PDM were added.
• Additions
  o Content for 'Poster' page was added.
  o 28 new samples were created for Grade 6.
  o 24 new samples were created for Grade 7.
  o 28 new samples were created for Grade 8.
  o 3 new templates are added.
  o 5 new videos were created. Three of them were about how to prepare vee diagram, diagnostic tree, and structural communication grid and two of them were about how to use share document and share information modules.
  o 1 new video in which two students are explaining their product created for "Bu Benim Eserim" contest was added.

According to considerations, changes and additions in design:

• Changes
  o Visual design had been modified by changing color scheme.
  o Presentation of the samples, templates, sample forms and videos had been changed.
  o Domain name was changed to make easy to reach O-PDM.
• Additions
  o 'Share Information' module was added.
Turkish language package

Implementation. Researcher decided to evaluate third prototype by implementing 17 participants attended in the previous cycle. He could only reach 14

of them. Three of them were absent in their schools since they left some reasons such as military service, health and transferring to another school. Researcher prepared a new site user guide for participants to open site and logon (Appendix G). 14 participants used online material and evaluated it for a week period.

Evaluation. After implementation, researcher called participants to give him an appointment at their convenience. All 14 participants accepted to attend in evaluation process of third prototype. In these appointments, participants filled completely Checklist for Prototype Evaluation (C-PE) and ITA-Q to evaluate third prototype. Researcher entered all quantitative data into SPSS 18 to calculate frequencies, means and standard deviation scores. The purpose of the researcher in this evaluation was to gather information from participants whether problems aroused from second prototype are solved or not.

Considerations according to evaluation of third prototype were:

- Add content to "Peer Evaluation" page about students' biased behavior.
- The number of alternative assessment samples should be increased.

According to these considerations, researcher made little revisions on O-PDM. He added content to "Peer Evaluation" page to inform teachers about how to deal with students' biased behavior. Second, there were nearly one hundred unique examples in "Samples" page. However participants wanted to be added more samples into O-PDM. Researcher decided not to add new samples; instead, he preferred to increase number of the samples as teachers contributed the site by sharing their documents. 'Samples' page would be enriched as teachers share documents that they have prepared. So, researcher made no revisions in 'Samples' page.

According to C-PE usability results researcher believed that he solved all usability problems revealed in second prototype. There had been problems about presentation of forms and videos. To handle this issue, researcher had changed presentation

format of forms and videos. He also changed plug-in to show videos. According to third prototype evaluations, he believed that changes worked. Two participants insisted on removal of login page. If login page was removed, 'Share Documents' and 'Share Information' modules would not work, also. Thus, researcher decided not to remove login page. To recap, there was no change in O-PDM according to usability issues.

3.4.4. Final Study

Final study was conducted in one month period. After researcher made small changes in third prototype, he decided to finish rapid prototyping procedure. In final study, he tried to validate whether online material fulfills needs of teachers about alternative assessment and evaluation methods. Researcher had chosen 15 schools from different districts of province of Ankara (except schools used in prototyping phases) from the pool of 56 schools to be taken permission from APDoNE with maximum variation sampling method. He talked with 33 science and technology teachers in these schools. 25 teachers agreed to attend study voluntarily. Researcher gave brief information about the study and O-PDM. He gave all participants site user guide to help them reaching O-PDM. All participants had different user names and passwords in these site user guides.

In these first meetings, researcher conducted Self-Efficacy Questionnaire (SE-Q), and Checklist for Material Validation (C-MV) as pre-test. After one-month period, researcher requested appointment with 25 participants. 17 out of 25 teachers returned researcher and gave appointment date. Researcher met with these participants and conducted the same SE-Q and C-MV as post-test. By using pre-test and post-test scores of SE-Q, researcher aimed to monitor teachers' self-efficacy score results before and after application of online material. Also, he collected C-MV before and after the implementation to see whether changes occur in their knowledge about alternative assessment and evaluation methods, their perceptions about use of these methods, and their use frequencies of these methods.

3.5. Data Collection

This study was utilized by using design and development research methodology involving both qualitative and quantitative data collection techniques. Interview forms, checklists, questionnaires were used as instruments. Table 3.5 shows the summary of the research questions and related data collection and data analysis methods.

Table 3. 5

Research Questions, Instruments used and Data Analysis

Research Questions	Instruments	Data Source	Data Analysis
What are the perceptions of the science and technology teachers towards the online professional development material?	Interview Checklist for Prototype Evaluation	Science and Technology Teachers	Content Analysis Descriptive Statistics
What are the teachers' perceptions about comparison of online and face-to-face professional development trainings	Interview	Science and Technology Teachers	Content Analysis
What are the attitudes of the science and technology teachers towards online professional development material?	Internet Tutorial Attitude Questionnaire	Science and Technology Teachers	Descriptive Statistics
Are there any differences in teachers' perceived-knowledge, perceptions, practices, and self-efficacy about alternative assessment and evaluation methods before and after use of the online professional development material?	Self-Efficacy Questionnaire Checklist for Material Validation	Science and Technology Teachers	Descriptive Statistics Descriptive Statistics

3.5.1. Interview

Interviews are the most common used data collection method in qualitative studies. Conversations are performed face to face, by phone or by online with technological enhancements in communication technology. It can be conducted by one by one or in group formats according to aims of the study. These conversations should be in a purpose. Moreover, interviewer should aim to get special information which he cannot observe from interviewees directly. Interviewing have lots of advantages such as getting large amount of information which is breadth and depth, good return rate and having chance of immediate clarification of the information given by respondents. (Meriam, 1998; Richey & Klein, 2007; Marshall & Rossman, 1995)

Interviews are classified as structured, semi-structured and unstructured. Structured interviews designed to ask pre-prepared and same questions to respondents. Merriam (1998) defines this type of interview as "oral form of the written survey" (p. 74). Interviewer asks the questions in the same manner not to affect responses (Gray, 2004). Semi-structured interviews designed to ask non-standardized questions. Although researcher could have pre-prepared interview guide at the beginning of the interview, questions can be changed according to the responses of the interviewee. Researcher has opportunity to probe for answers. This is the strength of this type of interview that researcher can give prompt and ask more questions to dig deeper the situation or answers given by respondents. Unstructured interview type is the most flexible one and can be defined as informal interviews. Researcher does not have any interview guide since this type of interview is conducted when researcher little information about the situation or phenomenon. Merriam (1998) states aim of this type of interview as "learning enough about a situation to formulate questions for subsequent interviews" (p. 75).

The researcher's main purpose in evaluation phases of the prototypes was to find out the learners' perceptions about the O-PDM, alternative assessment and evaluation, and technology use in education. According to these three main issues, researcher could make changes in the content and design of the O-PDM. So, he prepared 10

interview questions for interview form in which two of them had probes. All the questions were prepared open-ended and researcher wanted to have deep information from the participants. This first draft was evaluated with two colleagues and two assessment and evaluation experts. After the revisions, queue of the questions was changed. They are located according to logic from broader questions to specific questions. Firstly, questions about demographics were put. Next, questions about technology use and questions about alternative assessment and evaluation followed. Lastly, specific questions about O-PDM were located. After arrangement of sequence, there have been changes according to considerations of assessment and evaluation experts. One problematic question was changed. Two questions were combined since they were supposed to evaluate similar topics. Lastly, a new question was added. At last draft, researcher had 10 interview questions. Six of these questions had probes (see Appendix A). Aim to prepare this interview guide was to conduct semi-structured interviews for evaluation processes of prototypes.

3.5.2. Internet Tutorial Attitude Questionnaire (ITA-Q)

In many design and development studies, researchers mostly use questionnaires to collect data about demographics, attitudes and beliefs of learners, and evaluation information (Richey & Klein, 2007; Marshall & Rossman, 1995). Marshall and Rossman (1995) listed strengths of questionnaires as:

- Data is easy to categorize and analyze
- Facilitate qualitative researchers in validity checks and triangulation
- Easy and efficient to administer
- Questionnaires created in previous studies help researcher

The questionnaire used in this study was developed by Yigit, Yildirim and Ozden (2000) to test efficiency of a web based internet tutorial. The original questionnaire was conducted to 30 faculty members in Computer Education and Instructional Technology (CEIT) department from various universities with 15 questions. The

reliability coefficient of the scale was 0.93. To use in this study, researcher adopted the questionnaire and he made item revisions on the questionnaire.

Firstly, he deleted the sixth question "Sayfalarda yer alan animasyonlar öğretici ve yeterlidir (The animations in pages are instructive and sufficient)" since it was not relevant with O-PDM developed in this study. Moreover, he changed the fourteenth question as "Sayfalar yeterince hızlı yüklenmektedir (Pages are loaded fast enough)" instead of "Sayfalar ve animasyonlar yeterince hızlı yüklenmektedir (Pages and animations are loaded fast enough)". Thus, total number of the questions was decreased from fifteen to fourteen. Moreover, he used five-point Likert-Type for participants' responses to questionnaire items. The final version of the questionnaire can be seen in Appendix B. Researcher conducted this questionnaire in three phases of prototype evaluation.

3.5.3. Self-Efficacy Questionnaire (SE-Q)

Self-efficacy was defined by Bandura (1997) as "perceived self-efficacy refers to beliefs in one's capabilities to organize and execute the courses of action required to produce given attainments (p.3)". Self-efficacy is important concept since self-efficacy beliefs affect human behaviors (Rosenthal, 1978; Telch et al, 1982; Schunk & Pajares, 2010).

Self-efficacy questionnaire used in this study was created by Yayla (2011). It was five-point Likert-Type questionnaire to assess science and technology teachers' self-efficacy about alternative assessment and evaluation methods. Questionnaire was piloted with 261 senior science and technology department students. Factor analysis results showed three factors such as selection, application and evaluation. The reliability coefficients for these factors were calculated as 0.71, 0.86, and 0.89 respectively.

Researcher made item revisions in this questionnaire. He deleted questions 10, 22, 23, and 25 because assessment and evaluation expert revised that those four items

were not related with the research study. Moreover, he changed order of the questions to increase readability and response rate. The last version of this SE-Q was presented in Appendix D. Researcher conducted this questionnaire in final phase of the study to validate O-PDM. He distributed this questionnaire to gather teachers' current self-efficacy beliefs towards alternative assessment and evaluation methods before implementation of the O-PDM. After they used O-PDM for four weeks period, he conducted the same questionnaire to understand whether there had been any change in teachers' self-efficacy beliefs.

3.5.4. Checklists

Checklists are mostly used in software evaluation to help participants in revealing problems of the software in evaluation process (Goh et al, 2006). It is aimed to reveal strong and weak sides of the software products by using checklists. So, researcher can make required changes and enhancements accordingly (Hosie & Schibeci, 2005).

In this study researcher used two checklists. First checklist was created by researcher according to second prototype evaluation results. He aimed to conduct this checklist in evaluation of third prototype. Second checklist was also created by researcher to identify teachers' pre-knowledge about alternative assessments and evaluation methods, their perceptions about use of these methods and their use frequencies of these methods. This checklist was used in Final Phase of the study to validate O-PDM.

Checklist for Prototype Evaluation (C-PE). Researcher prepared this checklist according to the themes and categories revealed in the second prototype evaluation. He added questions about problematic parts of the material which he found in the evaluation part of the second phase to the checklist. According to results of this checklist, he decided to diminish the problematic and deficient parts of the material. Moreover, teachers had chance to add their opinions to the checklist.

There were three main themes according to qualitative analysis results of second prototype evaluation: content, design, and usability. In content theme, six categories were revealed. The first one was accuracy of the content. Since there was no negative expression about this category, the researcher did not add this category to the checklist. However, the other five categories, appropriateness for practice, clarity, conciseness, completeness, and importance had part in this checklist. Second theme was design. This theme had three main categories multimedia, color scheme, and user interface. The researcher added five questions to the checklist about these categories of design theme. Third theme was usability in which there were three main categories such as navigation, site pages, and multimedia. Researcher added six questions about these categories of usability theme to the checklist. Final version of C-PE used in evaluation of the third prototype was given in Appendix C.

Checklist for Material Validation (C-MV). Aim of this checklist was to identify science and technology teachers' knowledge about alternative assessment and evaluation methods, their perceptions about these methods' use in teaching, and their use frequencies of these methods. By working in collaboration with assessment and evaluation expert, researcher prepared 19 items to this checklist. These items were about not only alternative assessment and evaluation methods but also traditional assessment methods that teachers used in class. The reason for that was to increase the response rate. If teacher had little knowledge and practice about alternative assessment methods, s/he would not want to response to the checklist. But this type of checklist would be filled by all of the participants. There were 6 traditional assessment methods in the checklist besides 13 alternative assessment methods. However, researcher neglected these traditional assessment methods in analysis part since they are out of research purposes. Assessment and evaluation expert and researcher prepared three types of questions to be asked to participants about each method.

- Whether they have information about the given assessment method or not
- Whether use of this technique in class is appropriate or not
- How many times they use given assessment method in class in one semester period

Researcher aimed to conduct this checklist as pre-test and post-test method in final study to validate material. So, he could evaluate whether there would be a change in teachers' beliefs and practice after use of O-PDM. Final version of the checklist was given in Appendix E.

3.6. Selection of Samples

There are two types of sampling strategies. First one is random sampling. This strategy is used mostly in quantitative research methods to generalize a conclusion to whole population. We pick participants from the population randomly by giving each of them to be chosen equal chances. Second one is purposeful sampling. This strategy is used in qualitative research methods to choose the sample according to its/their some specific characteristics decided by researcher. These characteristics change according to researcher's purposes to reach the information that is important for his/her research. Moreover, aim of researcher in qualitative research is not to generalize his findings to whole population. But he/she tries to dig for information and conclusion for selected small group.

Purposive sampling also has different strategies such as maximum variation, homogenous, critical case theory based, confirming and disconfirming cases, snowball or chain, extreme or deviant case, typical case, intensity, politically important cases, random purposeful, stratified purposeful, criterion, opportunistic, combination or mixed and convenience sampling. (Miles and Huberman, 1994, p.28)

In this research researcher used maximum variation sampling strategy. In maximum variation sampling, researcher tries to include all different kinds of participants in his/her research. The aim of this process is not to generalize conclusions but represent wide range of experiences related to the study.

Population of this research was science and technology teachers having problems in assessment and evaluation in constructivist curriculum. But, it was not possible to reach whole population. Firstly, researcher decided to collect data in the province of

Ankara since it is the second city about population in Turkey. Moreover, Ankara has urban and rural districts. Researcher aimed to reach teachers working in different parts of these districts. Diverse schools in these districts would be beneficial in choosing different kinds of samples and understanding all aspects of the problem in research. Researcher selected science and technology teachers to include in the research from both private and public schools.

Sampling for first cycle. After design and development of first prototype, researcher implemented it in fall semester 2010-2011. He requested permission from principals of diverse four schools. Two schools, one public – one private, were located in inner-city of Ankara. One school was in the slums of the province of Ankara and the last one was from a rural town in the province of Ankara. This purposive sampling strategy was aimed to reach different parts of the great city Ankara to include different participants in the study. Researcher asked science and technology teachers in each school to attend the study. Four teachers accepted involvement voluntarily. One out of four teachers was from private school. Two out of four teachers were female.

Sampling for second cycle. Researcher decided to work with both participants attended in the first evaluation and new participants in implementation of second prototype. Thus, he first tried to reach teachers attended in first prototype evaluation. But, he could not. One of the teachers had quit teaching. Other three participants refused to attend.

Researcher decided to find new participants to attend in second prototype evaluation. He had chosen 12 schools from different parts of province of Ankara. One out of these twelve schools was private. He talked with 25 science and technology teachers about the study working these schools. 17 out of 25 teachers accepted to involve in study voluntarily. Among these 17 teachers, three teachers were working in private school and remaining fourteen teachers were working in public schools. Moreover, nine out of seventeen teachers were female.

Sampling for third cycle. Researcher decided to include participants of second prototype evaluation in third cycle. Third prototype implementation process was at the beginning of fall semester 2011-2012. However, researcher could not reach all seventeen participants attended in previous cycle since three of them left their schools for some reasons: military service, health problem, and transfer to another school. The rest, 14 participants, were asked to involve in implementation of third prototype evaluation. All fourteen participants agreed to attend in third cycle voluntarily.

Sampling for final study. After researcher decided to end design and development phases of online material, he followed study to validate O-PDM. Aim to develop O-PDM was to inform science and technology teachers about alternative assessment methods and help them in preparation of these activities.

Researcher implemented final prototype at the end of fall semester 2011-2012 to understand whether O-PDM works. He had chosen 15 schools from different districts of province of Ankara (except schools used in prototyping phases) from the pool of 56 schools to be taken permission from APDoNE with maximum variation sampling method. 2 out of 15 schools were private. He talked with 33 teachers in these schools and asked to participate in the study. 25 teachers agreed to involve in the study voluntarily. They filled C-MV and SE-Q as pre-instruments. After one month period, he called back all the participants to take feedbacks about O-PDM. 17 of them stated that they actively used O-PDM. Researcher conducted post-instruments to these 17 participants. Thus, researcher neglected the pre-test data gathered from remaining eight teachers in analysis.

3.7. Researcher's Role

In quantitative studies, researcher's role in data collection and analysis has no effect on study and results. S/he does not interact with participants. However in qualitative studies, researchers completely involve in the context they study. Researcher is primary tool for data collection. So, researcher should be considerate about observing

and interpreting facts and events without prejudice, using different instruments and ethical issues (Yıldırım & Şimşek, 2004).

Although researcher had background mostly in quantitative research methods, he also experienced on projects using both qualitative and quantitative research methods. His perspective in data collection was pragmatic. In this study, he deemed suitable to use both quantitative and qualitative data collection and analysis methods. He mainly used both methods in analysis, design, development and evaluation of the O-PDM. In final study, he used only quantitative data collection and analysis methods to validate O-PDM. Researcher worked in development of interview form and two checklists. He also took part mainly in collection, transcription and analysis of both quantitative and qualitative data. In whole of these processes, researcher tried to be objective. He used data recording tool in all interviews with permission of the participants not to miss any words or opinions of participants. He was also careful about transcription of interview data not to make mistakes. He took help from colleagues if he had doubt about any transcription.

In addition, researcher had graduated from department of Computer Education and Instructional Technologies. In undergraduate lessons he involved in lots of online and blended courses. He participated in projects as creating learning objects for online courses in undergraduate courses. Moreover, he prepared an online course management system for graduation project with three peers. After graduation, he worked as information technology teacher in an elementary school for a year. Researcher's online course works and his experience in school let him prepare online material to solve problems of science and technology teachers.

In this study, he actively worked in all phases of analysis, design, development, implementation and evaluation of O-PDM. He made investigation and collected content related with research problem to put O-PDM with the help of content expert. He worked with three instructional technology colleague in design and development phase of the online material. Two colleagues gave feedbacks while researcher was developing the prototypes according to evaluations. The other colleague helped

researcher to create multimedia. In implementation phase, researcher worked alone. He conducted all interviews, questionnaires and checklists to participants. In evaluation phase, one instructional technology expert worked with researcher. This expert was also one of the colleague giving feedbacks in design and development phase.

3.8. Ethics

In research studies, ethics is important issue to be given careful consideration. Kimmel (2007) states that ethical issues had involvement in research when researcher started with a research question.

Researcher applied university ethics committee to consult appropriateness of the research study about ethical issues. He reported detailed information about aim of the study, research questions, participants, research method, consent form, and data collection instruments to ethics committee. After he gained permission from the committee, he applied to APDoNE to collect data from public and private schools in the city. This commission gave permission to collect data from 51 public and 5 private schools. These approval reports were presented to school principals and teachers before the implementation of the study.

Researcher informed all the participants correctly about the research during implementation of O-PDM. He gave brief information about the interview sessions, checklists and questionnaires before conducting them. Researcher asked for permission to record digital audio tape just before interview sessions. Participants' names and their personal information were not mentioned in any part of the report. Data gathered from participants were not used out of this research study. Participants had been informed that they had right to close the interview and observation session whenever they feel uncomfortable. Researcher was only interviewer and he tried to evade any behavior to affect the participants' responses. Also, participants were informed that they had right to be informed about the results. If they thought that the conclusions about their words had been wrong, results were changed accordingly. All

participants had read consent form and signed it. Researcher tried to be objective in any part of the research, from the beginning to the end.

3.9. Validity and Reliability

3.9.1. Qualitative Approach

In general, validity means whether findings correspond to reality in research studies. Lincoln and Guba (1985) defined reality as set of mental constructions which is constructed by humans. Therefore, some of the qualitative researchers believe that this notion is not applicable for qualitative studies. However, some qualitative researchers construct their own meaning for validity such as quality, rigor and trustworthiness (Golafshani, 2003). Creswell and Miller (2000) suppose that validity of research can be affected by the researchers' perception of validity in the study.

In this study researcher tried to use many strategies to cope with validity issue. Types of strategies used in this research to ensure validity and reflection of these strategies on the study were given below.

Triangulation. Triangulation is a procedure where researchers seek to find similarities among results by using multiple investigators, different sources, and different methods (Creswell & Miller, 2000; Miller, 1998; Patton, 1990; Shenton, 2004). Researcher tried not only to depend on qualitative results but also quantitative questionnaire results. He conducted ITA-Q after interview procedures. These both instruments were conducted to reveal teachers' perceptions and attitudes about O-PDM. Researcher used both to explain the phenomena.

Prolonged Engagement. Creswell and Miller (2000) define it as "stay at the research site for a prolonged period of time". Researcher worked with totally 38 participants in this study. Actually he spent enough time with participants to explain the study and help them to reach and use O-PDM. He gave e-mail, office address, his mobile phone and office phone numbers them to give immediate feedbacks. If

participants had problems, he visited them as soon as possible on their schools. This formed confidence between participants and researcher.

Data Record. Researcher used digital voice recorders in all phases of interviewing with participants' permission. Before all the interviews, he controlled digital voice recording was in working order. Also he was equipped with paper and pencil in case of equipment failure and rejection of participant to recording. This allowed researcher to catch all words and sentences from participants without confusion.

Peer Examination. Merriam (1998) believe peer examination is one of the strategies to increase validity of a qualitative study. Researcher requests colleagues to give feedback on the findings. Researcher studied with an instructional design expert in coding, categorizing and thematizing procedures of data analysis.

Member Checking. This strategy encompasses the process of bringing raw data and draft interpretation to participants who gave opinion about it. Researcher asks whether the raw data and explanations are accurate or not (Merriam, 1998; Patton, 1990). In this study, researcher took feedback from three participants: one from participants of first prototype interview session and two from participants of second prototype interview session. He sent e-mail having attached raw and coded data files in MS Word file format to these participants. Each participant responded back whether his/her words were correctly transcribed. Moreover, they gave feedback about plausibility of coding.

Reliability issue means basically consistency of results when study is replicated. In social science, it is problematic because of nature of the human behavior. It changes all the time according to context (Merriam, 1998). Merriam (1998) stresses on reliability issue that qualitative researchers should concern about, although some researchers expressed that it is not related with qualitative studies (Stenbacka, 2001). Lincoln and Guba (1985) use "dependability" which resembles the term "reliability" used in quantitative studies. However these two terms differ since they have different

set of assumption. While quantitative notion assumes the universe static and be replicated, qualitative notion assumes social world is constructed every time in different ways (Marshall & Rossman, 1995). So, in qualitative analysis researcher should concern about consistency of the results with the data collected rather than replicability of the findings. To ensure reliability of the study, Merriam (1998) pointed out three strategies such as the investigator's position, triangulation and audit trail.

The Investigator's Position. Researcher should give information about the strategy while selecting participants, description of these participants and the environment that research was conducted in. Moreover, he should give assumptions, theories and own position about the study (Merriam, 1998). In this study, researcher expressed his role and his background in detail in section 3.8.

Audit Trail. Merriam (1998) stated that researcher should explain the data collection and data analysis processes and "how decisions were made throughout the inquiry" (p. 207) in detail to accomplish audit trail in qualitative studies. Researcher firstly gave detailed information about data collection procedure in each phase of the study. Moreover, he explained how themes and categories were constructed in results chapter in detail. He also gave detailed information about how conclusions were made in discussion chapter.

3.9.2. Quantitative Approach

For quantitative studies, there are three different use of validity: instrument validity, internal validity and external validity. Instrument validity can be performed in three ways. First, content and format of the instrument should be related with dependent variables and participants. Moreover, instrument results should be related with results of another instrument which is expected to be measuring the same variables. Last method is to construct validity which means measuring what is supposed to be measured. To provide evidence of instrument validity, researcher considered content and format of the instruments to be related with variables and subjects in study. He

used internet attitude tutorial questionnaire and self-efficacy questionnaires. These questionnaires were created by other researchers and validity of these instruments was provided. However, researcher had made some item revisions on these instruments with collaboration of an instructional design expert and an assessment and evaluation expert. (Fraenkel & Wallen, 2006)

Internal validity is demonstration of evidences that difference on dependent variable is related with intervention or any other variable being manipulated. There are lots of threads for internal validity. These can be listed as:

- selection of subjects and effect of their different characteristics on study
- loss of subjects during study
- effect of location where intervention is completed on study
- effect of data collector characteristics and bias on study
- effect of pre-testing procedure on post-test results (testing thread)
- effect of unexpected events on study (history thread)
- maturation of subjects during study
- negative or positive attitudes of subjects on study
- Predetermined subjects having completely high or low performances
- Unintended implementation of intervention (Fraenkel & Wallen, 2006)

In this study, different subject characteristics such as teaching experience and years of computer use were identified. Loss of subjects has been seen in final phase of the study. Researcher started the final phase with 25 participants. All participants filled the pre-tests and informed about intervention. Hoowever, 8 participants had not taken the intervention in given period. Thus, researcher excluded these participants form the study. Quantitative data gathered from remaining seventeen teachers were used in analysis. To decrease data collector bias on study, only one data collector was used to collect data. Researcher kept in touch with participants if they have any technical problems with intervention to eliminate history effect. Lastly, he did not mention about post-test procedure while participants filling the post-tests to eliminate testing

thread. After four weeks period of implementation of intervention, participants required to fill the post-tests.

External validity refers to generalizability of the study. In this study, researcher had chosen 15 schools from different districts of province of Ankara (except schools used in prototyping phases) from the pool of 56 schools to be taken permission from APDoNE with maximum variation sampling method. Voluntary science and technology teachers working in these schools participated in the study.

Table 3. 6

Validity and Reliability issues

Data Collection Phases	Criteria	Techniques considered
1- Interview	Credibility	• Same data collector was used to conduct interview and to collect data in each session. • Member checking • Prolonged engagement • Triangulation • Peer examination
	Transferability	• Maximum variation sampling strategy was used in sampling • Audit Trail • Thick description of phenomenon was given to let other researchers to decide study to be transfered to other settings
	Dependability	• Peer examination
	Conformability	• Audit Trail • Triangulation • Explanation of researchers' position
2- Checklist for Prototype Evaluation	Instrument Validity	• Second cycle interview data analysis results were used in construction of items • Expert revision of items
	Internal Validity	• Same data collector was used to collect checklist data with paper-based format.
	External Validity	• Maximum variation sampling strategy was used in sampling
	Reliability	• Interpretation of results fulfilled by collaboration with peers and an expert.

Table 3.6 *Continued*

3- Checklist for Material Validation	Instrument Validity	• Checklist items constructed based on content given in intervention • Expert revision of items
	Internal Validity	• Same data collector was used to collect checklist data with paper-based format
	External Validity	• Maximum variation sampling strategy was used in sampling • Checklist conducted as pre-test and post-test in a period of four weeks. In these period, participants did not attend any other intervention and they did not filled any instruments related with study.
	Reliability	• Interpretation of results fulfilled by collaboration of researcher, peers and an instructional design expert.
4- Internet Tutorial Attitude Questionnaire	Internal Validity	• Same data collector was used to collect checklist data with paper-based format • Peer review, expert review and literature reviews were conducted in revision of items of questionnaire
	External Validity	• Maximum variation sampling strategy was used in sampling • Results were triangulated with interview results
	Reliability	• Cronbach alpha reliability coefficients for self-efficacy questionnaire was provided
5- Self-Efficacy Questionnaire	Internal Validity	• Same data collector was used to collect checklist data with paper-based format. • Peer review, expert review and literature reviews were conducted in revision of items of questionnaire
	External Validity	• Maximum variation sampling strategy was used in sampling • Questionnaire conducted as pre-test and post-test in a period of four weeks. In these period, participants did not attend any other intervention and they did not filled any instruments related with study.
	Reliability	• Cronbach alpha reliability coefficients for self-efficacy questionnaire was provided

3.10. Analysis

Researcher collected data through qualitative and quantitative techniques using different data collection instruments in fall and spring semesters of 2010-2011 and fall semester of 2011-2012.

3.10.1. Quantitative analysis

Researcher used descriptive statistics to analyze quantitative data gathered through the study. Frequencies, mean, minimum, maximum and standard deviation scores of data were calculated by using SPSS 18 software package. Before analysis, researcher had applied data screening process by looking whether data had missing values and outlier. Meyer, Gamst, and Guarino (2006) suggest using Missing Values Analysis (MVA) module located in SPSS software package to deal with missing value. In this study, researcher found no missing values in quantitative data according to MVA.

Tabachnick and Fidell (2007) recommend considering cases having z-scores exceeding +-3.29 as potential outliers. Researcher used frequency distribution and calculated z-scores of continuous data to deal with outliers. Z-scores of continuous data were in the range of +-3.29. This made researcher believe that there was no outlier in quantitative data.

After MVA and outlier check, researcher calculated Cronbach's alpha coefficients of ITA-Q and SE-Q. ITA-Q was conducted in evaluation procedures of three prototypes. Cronbach's alpha coefficients were 0.83, 0.91 and 0.71 respectively. SE-Q was administered as pre-test and post-test. There were ten negative items in questionnaire. So, researcher made reverse coding for these negative items in reliability coefficient calculation. Cronbach's alpha coefficients of the questionnaires were 0.84 and 0.82 respectively in pre and post-tests. Pallant(2001) argues that Cronbach's alpha coefficient which is greater than 0.70 meets the criteria. In current study all coeffcients for both attitude and self-effcacy questionnaires were above the cut-off value.

3.10.2. Qualitative analysis

Marshall and Rosmann (1995) described qualitative data analysis as the process of ordering, structuring and giving meaning to the mass of data collected. They divided data analysis process into five such as organizing the data, generating categories, themes and patterns, testing emergent hypotheses, searching for alternative explanations and writing the report.

***Organizing the data*.** In this phase, the researcher read all the data gathered in the data collection phase. Digital audio tapes were transcribed into digital written format in MS Word software package. This let the researcher to hold intact, complete, organized and accessible data (Marshall & Rossman, 1995).

Generating categories, themes and patterns. In this phase, the researcher used codes and memos to reveal the themes and patterns. Coding can be accomplished in two ways open and selective. Open coding involves "breaking down, examining, comparing, conceptualizing, and categorizing data" (Strauss & Corbin, 1990, p. 61). The researcher used open coding procedure while coding the data.

Testing emergent hypotheses. In testing emergent hypotheses phase, the researcher evaluated the validity and reliability of these patterns and categories. Validity of the qualitative data analysis results can be expressed as being accurate reflections of reality. Reliability of the results can be expressed as consistency and dependability of the research findings. (James, Milenkiewicz & Bucknam, 2008). Researcher investigated whether all data was consisted and supporting each other or not in the same theme. He also checked whether the new data support or refute the existing themes. Data gathered from different methods supporting each other let researcher to think his conclusions were valid (Creswell & Miller, 2000; Patton, 1990). Moreover, researcher got help from a team member while making conclusions. They helped each other about misleading data in data analysis. This also contributed validity of the study (Merriam, 1998).

Searching for alternative explanations. In searching for alternative explanations phase, researcher searched for other reasonable and valid explanations and he expressed the most plausible one among these explanations. This also increased the validity of the analysis results.

Writing the report. Finally, researcher presented the data gathered through interviews. Participants' perspectives and perceptions towards the O-PDM constructed the framework of the final report.

CHAPTER IV

RESULTS

The aim of the research was to design and develop online professional development material, and validate this material to understand whether it fulfills science and technology teachers' needs. In this study, both quantitative and qualitative data collection methods were used. In prototyping phases, researcher collected both qualitative and quantitative data by conducting interviews, checklists, and questionnaires. In final phase, he collected an attitude questionnaire and a checklist as quantitative data. Researcher divided this chapter into two categories: results of evaluation of prototyping phases and results of final phase.

In the first part, interview responses and Internet Tutorial Attitude Questionnaire (ITA-Q) scores of science and technology teachers who attended in prototyping phases were presented. In the second part, pre and post scores of these teachers in Self Efficacy Questionnaire (SE-Q) and Checklist for Material Validation (C-MV) were presented.

4.1. Results of Evaluation of Prototyping Phases

In this part, demographics of participants attended in prototyping cycles were presented. After presentation of demographics, researcher gave qualitative results: perceptions of teachers about their background in constructivist learning approach, their practices of technology use in education, their perceptions about online

professional development material (O-PDM), and their perceptions about comparison of online training and face-to-face training.

Researcher worked with 21 science and technology teachers during prototyping procedure. Ten out of twenty-one participants were male and eleven of them were female. All teachers had computer and internet access at home. Participants' teaching experience ranged from 2 to 21 years. Their teaching experience frequency graph can be seen in Figure 4.1. Seven participants graduated from faculty of sciences whereas other 14 teachers graduated from faculty of education.

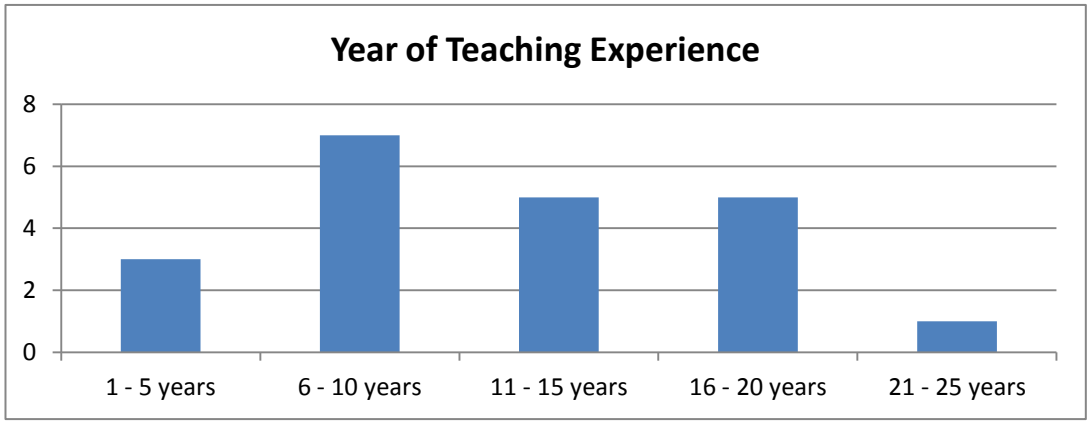

Figure 4. 1 Distribution of the participants according to teaching experience

Participants' computer experience ranged from 3 to 11 years. All 21 science and technology teachers reported that they are computer literate. Their computer experience frequency graph can be seen in Figure 4.2.

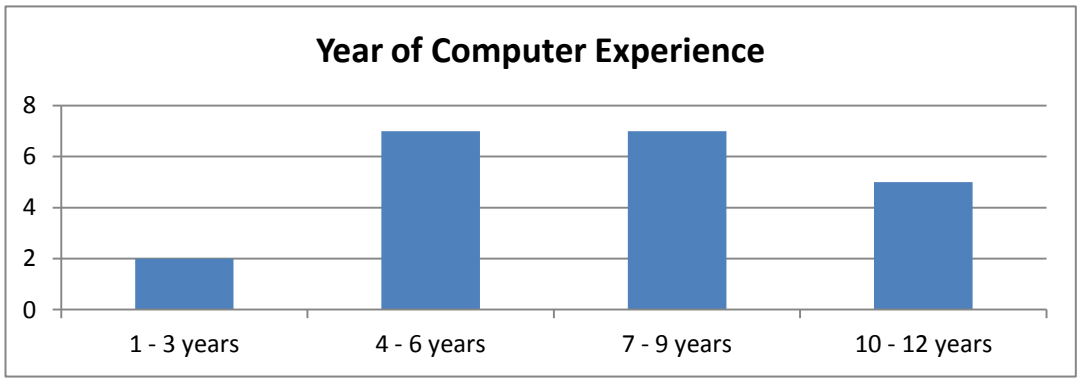

Figure 4. 2 Distribution of the participants according to computer experience

4.1.1. Perceptions of teachers about their background in constructivist learning approach

Twenty one science and technology teachers expressed their perceptions about their background about new constructivist learning approach. First of all, they gave information about whether they took in-service training about constructivist learning approach, and alternative assessment and evaluation methods. Eleven out of twenty one teachers had declared that they attended in-service training about constructivist learning approach prepared by MoNE. Moreover, only five of these eleven teachers stated that alternative assessment and evaluation methods were explained in these trainings. Remaining ten teachers had never attended in-service training about both constructivist learning approach, and alternative assessment and evaluation methods. Five out of these ten teachers marked that they have learned constructivist learning approach in universities that they have graduated. So, they had background about constructivist learning approach and alternative assessment and evaluation methods. Remaining five teachers reported that they could not gain information about constructivist learning approach and alternative assessment and evaluation methods neither with in-service training nor from university that they graduated from.

Next, eleven out of twenty one teachers stated that they need in-service training about alternative assessment and evaluation methods. T2 pointed out that "*Because of placement test, we cannot use these alternative assessment and evaluation methods. However, we cannot assess students' performances by tests in all cases; we need to be trained about how to assess these performances* [1]". T6 experiencing 21 years in teaching complained about not having informed about new constructivist curriculum change and alternative assessment and evaluation methods. He marked that "*In-service training was not arranged by MoNE. But, we needed. How to prepare activities or increase number of these activities. Moreover, I sometimes had troubles in assessment and evaluation* [2]". Three-year experienced teacher pointed out that,

I think that I have deficiencies in assessment and evaluation since I am a new teacher. I mostly use standard assessment methods. There should be seminar about different kinds of assessment techniques [3].

4.1.2. Teacher's practices in technology use in education

All 21 teachers who attended in evaluation of prototyping cycles stated that they use computer and internet for educational purposes. Figure 4.3 presents technology use frequencies of science and technology teachers. Six out of twenty-one teachers stated that they search internet for animations and videos related to course topics and present them students in class with projector. Six teachers pointed out that they use internet and computers for doing search about science and technology course.

Use of PowerPoint presentation in classes was expressed by ten teachers. Three out of these ten teachers marked that they both prepare and present PowerPoint slides on their own. However, seven teachers expressed that they search internet for slides, download and present them to students by projector.

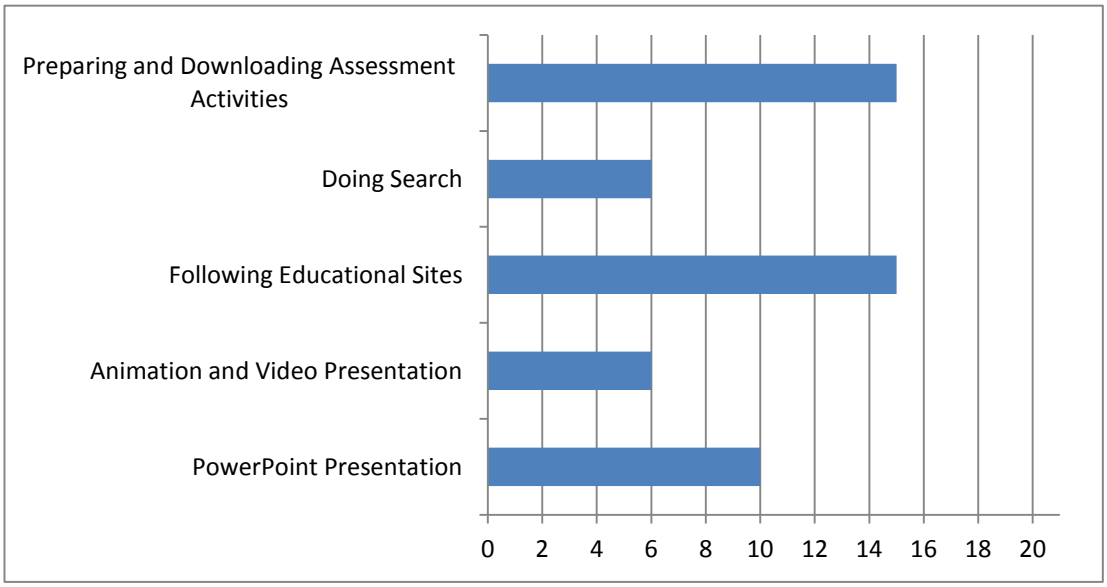

Figure 4. 3 Technology use frequency of science and technology teachers

Technology used mostly by teachers for following educational sites and preparing and downloading assessment activities. Fifteen out of twenty-one teachers declared that they follow educational sites related their subject in internet. Nine of these teachers expressed especially use of 'fenokulu.net' website in their courses. One of the teachers using this website marked that "*Especially I follow fenokulu.net. There is a group in this web site. I am a member of this group and constantly share knowledge with group members [4]*". Another teacher using this website, T13 declared that "*I frequently follow videos and discussions in fenokulu.net. I follow these to update my knowledge according to recent and latest information [5]*".

Fifteen teachers expressed use of computers and internet for preparing and downloading assessment activities. Eleven out of these fifteen teachers stated that they searched internet for assessment activities, exam questions and download them to conduct students. The remaining four teachers marked use of computers to prepare their own assessment activities and exam questions.

4.1.3. Perceptions about online professional development material

First Cycle. Four science and technology teachers attended to interviews in evaluation of first prototype. According to responses of four teachers, two main themes aroused from qualitative analysis results of first prototype evaluation as content and design. Content theme had three main categories as accuracy, clarity, and completeness. Design theme came up with four main categories as choice of color, completeness, multimedia, and visual appeal.

Content. The first category in content theme was accuracy. One out of four teachers declared that "*Information (given in O-PDM) is pertinent with the literature* [6]". Second category was clarity in this theme. Three out of four teachers stated content of O-PDM as clear to understand. T3 marked that "*(Online material) presented alternative assessment and evaluation methods in a clear manner* [7]". The last category in this theme was completeness. All four teachers mention about completeness of content. Three out of four teachers pointed out that they found

project content shallow (T: 1, 2, and 3). They advised that this page should have rich content. These teachers marked that "*Importance of project should be explained more in this page. This page is so lean* [8]", "*Some more information should be added to Project page* [9]" and "*Project page should be revised to be more detail* [10]". All of the teachers gave opinion about that there was not enough examples about techniques. T1 stated that "*There should be more examples while explaining assessment methods* [11]". Similar opinion was given by T4 as "*You explained what the (assessment) technique is. That was good. But, there was no example about it* [12]".

Design. The first category in design theme was choice of color of site. Two out of four teachers expressed opinions about choice of color. They advised to change choice of color of site. T1 and T4 advised that "*I think there are lots of colors in site. Number of the colors can be decreased* [13]", and "*I think you can use slightly different colors in site* [14]".

Second category was completeness of design. Three out of four teachers declared opinions about this category. T1 and T4 articulated problems about links at right pane. They found links should be high-lightened or changed because they did not seem like links. Moreover, T2 and T4 gave opinion about addition of new page that users have chance to share their documents. Lastly, T4 advised to separate samples in 'Samples' page according to grade level. He marked that,

> You should separate samples as 6^{th}, 7^{th} and 8^{th} grade level. Course books distributed by MoNE have these types of samples at the end of units. So, you should present which sample is related with which grade level and which unit [15].

Third category in design theme was multimedia. Teachers gave their views about text design and PowerPoint slide of site. Three out of four teachers expressed opinions about text design of site. All quotations were positive about text readability and size. T3 expressed positive opinion about PowerPoint presentation as "*Preparing concept*

map was very problematic subject. Explanation of this subject with PowerPoint presentation was very effective [16]".

Last category in design theme was visual appeal. Three out of four teachers declared their views about visual appeal of site. Two of three teachers (T: 2, 3) found visual appeal of site successful. However, T1 marked out that "*Picture at the top of site distracted my attention while reading the text at the bottom* [17]".

Second Cycle. Researcher collected perceptions of seventeen science and technology teachers about O-PDM via interviews. According to qualitative analysis of interview data, three main themes revealed such as content, design, and usability in evaluation of second prototype.

Content. There were six categories in content theme. The first category was accuracy of the content. Accuracy of the content was mentioned by five teachers in interview data (T: 3, 4, 13, 15, and 16). All quotations were positive and support that content was accurate. Teachers directly marked that "*There was no wrong information according to my readings* [18]", "*Samples were appropriate to new curriculum system* [19]", and "*All these content is already present in guide book of MoNE and support them* [20]".

Second category was appropriateness in which teachers presented opinions about whether content was appropriate in practice. Most of the teachers found concept map, diagnostic tree, observation, portfolio, project, rubric, structural communication grid, and vee diagram as appropriate for assessment and evaluation process. However, interview, peer-evaluation, self-evaluation, and presentation methods had both negative and positive opinions by teachers. Two teachers declared negative sides of interview method whereas three of them found it as appropriate. One of the teachers declaring negative opinions stated that "*There is no way to make single interviews, because I teach to nearly 200 students* [21]". Peer-evaluation and self-assessment techniques also had negative perceptions. Six of nine teachers declaring opinions about peer-evaluation found it as inapplicable. Five teachers stated that they

did not use peer-evaluation until now. One of them marked that "*Students should not do subjective evaluation. All of them should work together and observe each other. Then, this is not their feature* [22]". The same issue aroused in self-assessment method. Although three of the teachers see self-assessment as applicable, three teachers stated opposite opinion since they think that students would fill the forms subjectively. One of the teacher mentioned that "*We do not use self-assessment method much. We are elementary school teachers. Can elementary school students evaluate themselves? I do not think so* [23]".

Third category was clarity in which participants declare their views whether content was easy to understand. Nine of seventeen teachers stated fourteen times that content was easy to understand. Three of them pointed out that "*Theoretical information was written clearly* [24]", "*I could install the Cmap program when I see its video. Anyway, the lecture directs you* [25]", and "*Your representation of content with short samples increased the comprehension* [26]".

Forth category was conciseness in which participants state their interpretations whether content explains topics without unnecessary words. Four out of seventeen teachers prompted positive opinions about conciseness of the content. T13 prompted that "*In my opinion, the content was good. No useless information is given, and it was not boring* [27]". The same idea was shared by T14 as "*Content was well prepared there was no content which was not useful for teachers* [28]".

Fifth category was completeness in which teachers expressed their perceptions whether content covers all topics related with alternative assessment and evaluation methods. Participants declared opinions about completeness of the expository, descriptive, exemplar and video content. Eleven teachers gave their opinions about expository text given in online content. Eight of them found expository text complete. However, three of them stated some missing parts of the content. They pointed out that "*Firstly more programs should be explained like CMap. Second there was no information about how I can benefit from this site* [29]", "*There should*

be more information about projects since we have project-based curriculum [30]", and "*Which types of questions can be asked and used in exams was missing* [31]".

Three teachers gave opinion about completeness of the descriptive text. All three teachers pointed out that there should be descriptive information about presentation of the sample images. The biggest issue in completeness category expressed by teachers was that exemplar text was not enough. All of the teachers who expressed opinions about completeness of exemplar text believe that more sample activities should be prepared (n=12). T10 stated that "*Activities in 'Sample' page prepared well, number of these can be increased, (activities related) other units can be added* [32]". Another teacher, T7 pointed out that "*As a researcher, you should increase the number of activities and put new sample documents into site as presented in 'Sample' page* [33]".

Nine out of seventeen teachers marked that video content was not complete enough fourteen times in qualitative interview data. All of the teachers agreed on that video content should be increased in some parts of the site. For example, T4 mentioned that "*There can be added more videos explaining how we can prepare assessments easily in diagnostic tree and structural communication grid* [34]". Moreover, T15 pointed out that "*If more videos are added showing how to prepare other assessment methods, we can prepare and add it into site as a supporter* [35]". Only one participant expressed negative opinion about video content as "*I am doubtful that we can use that (CMap) program by watching these videos* [36]".

Final category was about importance of the content. Five out of seventeen teachers gave opinions about importance of the content. All of these five teachers stressed on the importance of the methods such as concept map, projects and vee-diagram and their use of in all other subjects. For example T4 pointed out that,

> "We are talking about science and technology course and you gave examples about science subject, however these methods can be used in social science and mathematics etc. [37]"

Design. This theme contains three categories such as multimedia, color scheme, and visual appeal. In multimedia category, participants mentioned issues about design of video, text and graphic in online material. Almost all of the teachers gave opinions about multimedia design of the online material. Firstly eleven of the teachers gave positive feedbacks about videos. They pointed out that videos in online material were useful and taking attention. T1 believe that "*There is no limit in internet usage, it is very fast and all video staff can be put into (sites). Of course, it must be opened fast enough* [38]". Another teacher T8 expressed that "*Videos are useful and it is easy to retention of information while watching them* [39]". Another issue in multimedia design was text design in which all the participants giving opinion about text design agreed that there was no readability problem in content. They stated that they confronted with no problem in font-size, font-type, font-color, and contrast of the text. However, six out of eight teachers who stated views about graphic design of the O-PDM found it problematic. One of the teachers expressed that:

> When we hover on the graphic, it is in turmoil. There is picture, text under it and spaces near it. What can be done, when you click on it, it should open. There should be 'X' sign to close it. I think, it should cover whole screen [40]

T3 also declared that "*Enlargement of pictures is good for a large-screen computers. However in small-screen computers only half of it appears. I found it difficult to read* [41]".

Color scheme category had views of participants about the appropriateness of the combination of colors used in site. Nine out of eleven teachers found color-scheme of the site pale, formal, and non-attractive. Only two teachers believed color-scheme of the online material as suitable. T11 emphasized that "*You can make it more colorful. I think, it will be more attractive if you do so* [42]". In parallel to that expression, T2 pointed out that "*There should be more attractive, bright colors. But they should be consistent with the text. Colors should not mismatch, they should be compatible* [43]".

Final category in design theme had teachers' judgments about visual appeal of O-PDM. Eight out of seventeen teachers gave opinions about visual appeal. They all agree that visual appeal of site should be increased by adding colorful clipart, icons, and pictures. For example T3 expressed that "*As a user we look to top of the site for links since they are at the forefront. The same can be applicable for the links in the left pane* [44]". Another teacher also recommended that "*Clipart should be added more. You should make (site) iridescent. It would increase the visual appeal of the site* [45]".

Usability. This theme had navigation, 'Share Document' module, and video categories. In navigation category, participants mentioned issues about login, site address and links of the O-PDM. Nine out of seventeen teachers gave opinions about login of the site. All of these teachers expressed problems in logging into site. T14 mentioned that "*It was hard to login into site with password* [46]". Moreover, six of the teachers found the site address (http://tss-home.tss.ceit.metu.edu.tr/odp) too long. T12 expressed that "*Site address could be shorter. Because, it was difficult to write it (to browser)* [47]". The last issue about navigation category was links. Three out of four teachers who gave opinions about links stated that links work well. However one of them found one broken link in the site.

In second category, perceptions of the participants according to usability issues of 'Share Document' module were presented. Eight teachers gave opinions about usability of this module. All of the teachers agree on that the module should be with Turkish language package. Although the directions about how to add a document into site had been given in Turkish, some English words in module perceived as irritating and incomprehensible for teachers. T3 expressed that,

> I did not use 'Share Document' module much. Most of the teachers cannot use it because of English terms. It should be in Turkish. If you do so, teachers share documents more easily [48]

Lastly, participants' views about usability of videos in online material were located in multimedia category. Eight teachers gave views about usability of videos. Three out of eight teachers stated no usability problems about videos in online material. However, remaining five teachers had problems in installation of the plug-in to watch videos. Table 4.1 shows summary of themes and categories revealed in second prototype evaluation.

Table 4. 1

Themes and categories revealed from the interview data in second cycle evaluation

CONTENT:
• Accuracy • Appropriateness • Clarity • Conciseness • Completeness • Importance
DESIGN:
• Multimedia • Color Scheme • Visual Appeal
USABILITY:
• Navigation • 'Share Document' module • Video

4.1.4. Checklist for Prototype Evaluation (C-PE) Results

C-PE was used in evaluation of third prototype. Items of checklist were created according to qualitative results of second prototype evaluation. Fourteen participants attended in third prototype evaluation and filled the checklist. There were four main parts in C-PE. The first part of the checklist was to understand whether content was applicable to assessment in practice. Frequency table for appropriateness of the methods in assessment and evaluation was given in Table 4.2. According to results, all of the participants believe that concept map, diagnostic tree, poster and

presentation were appropriate for assessment in practice. The other assessment methods such as interview, observation, self-evaluation, vee-diagram, portfolio, project, rubric and structural communication grid assessment methods had been expressed as appropriate for practice by eleven to thirteen numbers of the participants. Only nine of the participants believed peer evaluation as appropriate. This was considerably low score in contrast to other assessment methods.

Table 4. 2

Appropriateness of the methods in assessment and evaluation

	Yes	**No**	**Not sure**
Peer evaluation	9	2	3
Interview	13	1	0
Observation	12	1	1
Concept map	14	0	0
Self evaluation	11	2	1
Diagnostic tree	14	0	0
Vee diagram	13	1	0
Portfolio	13	0	1
Poster	14	0	0
Project	13	0	1
Rubric	11	1	2
Presentation	14	0	0
Structural communication grid	13	1	0

Second part of the checklist was evaluating clarity, conciseness, importance, and completeness of the content. Table 4.3 shows frequency of teachers evaluating properties of content of third prototype. Analysis results showed that all of the participants agree that content given in third prototype is clear, concise, and important. Most of the participants (n=10) think that expository, video and descriptive text is complete. However, eight participants out of fourteen expressed

that exemplar text was complete. Number of the participants finding exemplar text complete was the lowest considering other items.

Table 4. 3

Properties of the content of online material

	Yes	**No**	**Not sure**
Content is clear	14	0	0
Content is concise	14	0	0
Content is important	14	0	0
Expository text is complete	10	2	2
Descriptive text is complete	10	3	1
Exemplar text is complete	8	3	3
Video content is complete	10	3	1

Third part of the checklist evaluates design issues of the O-PDM. There were items about color scheme, pictures and graphs, user-interface, and use of videos. Table 4.4 presents frequency of teachers evaluating design issues of third prototype. All of the participants agreed on appropriateness of the pictures and graphs, and use of videos in O-PDM. All of the participants except one expressed that color scheme was appropriate. Appropriateness of the user interface was declared by twelve participants.

Table 4. 4

Design issues of the online material

	Yes	**No**	**Not sure**
Color scheme in site is appropriate	13	0	1
Pictures and graphs in web-site is appropriate	14	0	0
User-interface of the site is appropriate	12	0	2
Use of videos in site is appropriate and beneficial	14	0	0

Last part of C-PE was usability issues of the O-PDM. All of the participants agreed about easiness to write web address, and convenient use of "Share Documents" and "Samples" pages. Thirteen of out of fourteen participants evinced that videos could be opened and watched easily and all links works smoothly. Only two participants see login to site was inconvenient. Table 4.5 shows checklist results related with usability issues.

Table 4. 5

Usability issues of the online material

	Yes	**No**	**Not sure**
Videos can be opened and watched easily	13	1	0
It is convenient to login to site	11	2	1
It is easy to write website address	14	0	0
All links in website works smoothly	13	1	0
It is convenient to use "Share Document" page	14	0	0
It is easy to monitor activities in "Samples" page	14	0	0

4.1.5. Perceptions about possible contributions of O-PDM

According to interviews with twenty-one science and technology teachers, three main categories revealed about possible contributions of O-PDM. These categories were guiding for professional development, guiding for practice, and providing efficiency.

Guiding for Professional Development. Sixteen out of twenty-one teachers expressed opinions about feature of O-PDM to be a guide for professional development of teachers. Fifteen of these teachers marked positive sides of O-PDM that it was a complementary, comprehensive tool. They claimed that it will contribute teachers to reveal misconceptions about alternative assessment and evaluation methods and to learn new techniques. T2 pointed out that "*After reviewing videos, samples, templates and examples, this webpage seemed to me as a guide* [49]". Parallel to that claim, T4 declared that "*If teacher uses this material, I believe*

that his/her applications about assessment will be increased. This will (also) contribute students. It will contribute professional development of teacher [50]". T12 stressed on effectiveness of O-PDM in revealing misconceptions of teachers about structural communication grid technique. He pointed out that,

> For example, I would use structural communication grid in lessons however I would not use technique (mentioned in O-PDM) to grade students. We would grade only right answers. I would neglect their wrong answers. However, this grading technique is very good [51]

Moreover, fourteen teachers declared that they benefited from O-PDM to learn new techniques. New techniques learned from O-PDM can be listed as vee diagram, structural communication grid and CMap Tools program to prepare concept maps with computer. Eleven out of fourteen teachers marked that they would not have existence and information about vee diagram technique. Similarly, six out of fourteen teachers pointed out that they learned about structural communication grid technique after reviewing O-PDM. Two out of fourteen teachers declared that they learned existence of computer programs such as CMap after use of O-PDM.

Only one out of sixteen teachers declared negative opinion about O-PDM. He argued that providing templates, samples and activities can propel teachers into laziness.

Guiding for Practice. Sixteen out of twenty-one teachers declared that they can use samples and templates provided by O-PDM in class activities. T1 declared that he can use samples in O-PDM as "*I can use samples (in O-PDM) easily. These can be conveyed to students. Students can see different presentation, views and activities when we use these samples* [52]*"*. T12 pointed out that he can use these samples in evaluating students and to give homework. He marked that,

> I will use these materials in assessment and evaluation. At the end of lectures, I can use these samples to take feedback from students. Moreover, I can print out these samples and give them to students as homework [53]

Providing Efficiency. Four out of twenty-one teachers stated that O-PDM provide efficiency for teachers. They declared that this material save time and effort, and eliminate difficulty. T14 marked that "*Having templates (provided in O-PDM) makes it easy. No need to grapple with preparation. If you try to prepare on your own on a computer, it takes time too much* [54]". T5 mentioned about easy use of CMap Tools program. He uttered that,

> CMap program is a good thing. I was drawing concept maps to blackboard and it was hard to construct. Concepts, arrows could be in trouble in this wise. But, I can prepare a concept map (without trouble) with students by using CMap program in class with the help of projector [55]

4.1.6. Perceptions about comparison of online professional development training and face-to-face training

Three main categories were constructed about comparison of online training and face-to-face training. These categories were views about online in-service training, views about face-to-face in-service training, and choice for in-service training.

Views about online in-service training. Thirteen out of twenty-one teachers stated opinions about giving in-service training online. They all gave positive feedbacks about online in-service training. They thought that this type of training had advantages about accessibility, efficiency, and being up-to-date. T6 pointed out that,

> It is beneficial to give training online since you can reach much more teachers. There is no problem about time issue. You can use internet whenever you want. Now, internet is accessible in all schools unrestricted and free. Teachers can access internet from schools conveniently [56]

T19 marked efficiency of online in-service trainings that "*Online training can be used by teachers in free times for professional development. So, I think that this type of training is more efficient* [57]". T3 declared another advantageous point of online in-service training as being up-to-date. He mentioned that "*Online training is more*

beneficial (than face-to-face) that you can update training easily. In face-to-face trainings, it is hard to update information [58]".

Views about face-to-face in-service training. Nine out of twenty one teachers declared opinions about face-to-face in-service trainings. Seven out of these nine teachers gave negative feedbacks about these trainings. They mostly complained about incompetent trainers, taking shallow information and lectures without practice. Five out of nine teachers declared that trainers coming to give lectures were incompetent about constructivist curriculum. T5 stated that "*In-service training was given but trainers coming for training are not knowledgeable for lecturing. They just lecture in order to accomplish tasks given to them* [59]". T15 claimed that in-service training given to introduce new curriculum included too shallow information. She pointed out that "*Shallow information was given in in-service training. If they could give detailed information, it would be better* [60]". T16 mentioned another issue about face-to-face in-service training as "*We need in-service trainings having more activities. These activities should be beneficial for practices in class. We do not want text based face-to-face trainings since it would not be effective* [61]".

Two out of nine teachers gave positive feedback about face-to-face in-service trainings. T12 marked that,

> We had an in-service training about new curriculum on one occasion by MoNE. In this training, assessment and evaluation techniques such as vee diagram, concept map, and structural communication grid were explained well [62]

Choise of training delivery. Thirteen out of twenty-one teachers gave opinions about their choice for training. While eleven of these teachers had chosen online method for in-service training, the rest, two teachers, supported face-to-face method. T8 claimed that "In my opinion, i*t is advantageous to give in-service trainings online since every teacher uses internet. And we can reach internet wherever we want. So, it is compulsory to give it online to access training*

immediately [63]". Similarly, T14 pointed out that "*If you give these content in face-to-face, teachers would get bored* [64]". In contrary, T12 stressed that trainings should be face-to-face because of non-participation of teachers. He declared that,

> Teachers do their jobs well if you keep your eyes on them. There should be an officer who comes to teach, regulate and look for outcome. Otherwise, (training) would not be successful if you send just an online material [65]

T11 also stated her choice of face-to-face method for in-service trainings. She pointed out that "*In my opinion, in-service training should be face-to-face not online. After face-to-face lecture is given about the topics, teachers will get more benefit from this online material* [66]". Figure 4.4 shows the number of teachers according to their choice of method of training delivery.

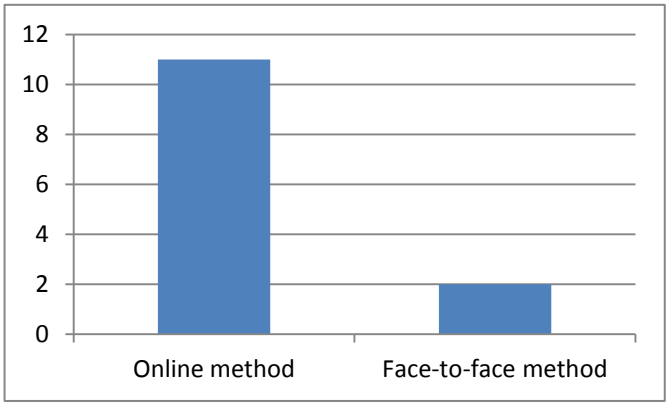

Figure 4. 4 Science and technology teachers' choice of method of training delivery

4.1.7. Internet Tutorial Attitude Questionnaire (ITA-Q) Scores

Participants attended in three prototyping phases completed ITA-Q after they used and evaluated prototypes. They expressed their attitudes towards O-PDM on a five point scale (1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly Agree). There were 14 questions in questionnaires that total score of questionnaires could have minimum 14 and maximum 70 points.

Table 4.6 presents raw data of ITAQ items for first cycle evaluation and mean scores of ITA-Q items for second and third cycle evaluations. The mean value of total scores of fourteen items was 55.25 (n=4) in first prototype evaluation. It rose to 62.18 (n=17) in second prototype evaluation. Lastly, participants attended in third prototype evaluation scored 67.29 (n=14) for total score of fourteen items. Mean value of total scores of fourteen items rose from first administration through last administration.

In first administration, Participants perceived online professional development material at least "Agree" response about seven items: Item 1 and Item 7 related with clarity of content, Item 2 evaluating sufficiency of content, Item 3 measuring whether headings were in logical choice, Item 8 assessing listing of topics, Item 9 and Item 10 related with navigation feature of online material. Three items (Item 4, Item 6, and Item 13) were rated at least "Neutral". These items were about design facilities, speed of page loading, and color-scheme of online material respectively. Study findings revealed three attitude items (Item 5, Item 11, and Item 12) rated at least "Disagree" response. Item 5 was supposed to measure instructiveness of images in online material. Item 11 and Item 12 were about visual attractiveness and well design of the pages. Lastly, Item 14 which was evaluating participants' attitudes about multimedia support of online material. Two out of four participants responded this item as "Strongly Disagree".

In second administration, mean scores of 14 items ranged from 3.65 to 4.82 on a five point scale. Only one item had mean score below 4 point. Mean score of 11^{th} item which gather perceptions of participants about visual attractiveness of pages was 3.65.

The third administration of ITA-Q revealed mean scores of 14 items ranging from 4.36 to 5.00 on a five point scale. There was no item having mean score below 4 point. In this questionnaire only 11^{th} item was below 4.50 point. All other items were scored 4.50 or above.

Table 4. 6

Results of internet tutorial attitude questionnaire in prototyping procedure

	First cycle		Second cycle			Third cycle		
	n	Raw Data	n	M	SD	n	M	SD
1- The purpose of the pages is clearly explained	4	5, 5, 4, 5	17	4.71	.77	14	4.93	.27
2- The topics and content in the pages is sufficient to teach	4	4, 4, 4, 4	17	4.47	.72	14	4.71	.47
3- Subject headings and sub-headings are in a logical choice	4	4, 5, 5, 4	17	4.82	.39	14	5.00	.00
4- Pages are designed to let users access all topics at any moment they want	4	5, 5, 4, 3	17	4.53	.62	14	4.93	.27
5- Images contained in the pages is instructive and enough	4	5, 2, 3, 3	17	4.18	.88	14	4.50	.52
6- Colors used on the pages are well-chosen and do not cause eye strain	4	5, 3, 5, 3	17	4.35	.70	14	4.93	.27
7- Information given is clear and fluent	4	4, 4, 4, 4	17	4.59	.71	14	4.64	.50
8- Topics are listed in a sensible way	4	5, 5, 4, 4	17	4.65	.70	14	4.93	.27
9- Pages allow users to start whatever topics they want and progress according to demand of users	4	5, 5, 4, 4	17	4.65	.86	14	4.93	.27
10- Use of pages is very easy	4	5, 5, 4, 4	17	4.76	.44	14	4.93	.27
11- Pages are visually attractive	4	5, 4, 2, 2	17	3.65	1.27	14	4.36	.74
12- Pages designed well	4	4, 4, 2, 3	17	4.41	.94	14	4.79	.43
13- Page loading is fast enough	4	5, 5, 5, 3	17	4.12	.99	14	4.86	.36
14- Multimedia support in pages is enough	4	4, 1, 1, 2	17	4.29	.69	14	4.86	.36
Total Score	4	55.25	17	62.18	7.45	14	67.29	2.27

4.2. Results of Final Phase

Researcher used a checklist and a self-efficacy questionnaire as pre-test and post-test method in final study. His aim was to provide descriptive data about validity and effectiveness of O-PDM to understand whether it satisfied teachers' needs about alternative assessment and evaluation methods.

4.2.1. Checklist for material validation (C-MV) Results

Researcher aimed to conduct this checklist before and after the implementation of O-PDM for three reasons. First reason was to identify whether teachers' perceived knowledge about alternative assessment and evaluation methods differ before and after use of O-PDM. Second reason was to understand whether their perceptions about these methods' use in class differ before and after implementation of online professional development training. Lastly, he tried to reveal whether their use frequencies of these methods change after use of O-PDM.

Evaluation of teachers' perceived-knowledge about methods. The first dimension in this checklist was to evaluate science and technology teachers' knowledge about alternative assessment and evaluation methods. Researcher conducted same checklist before and after application of the O-PDM. The research results were given in Table 4.7.

Fifteen out of seventeen teachers stated that they had information about peer evaluation before the implementation. The number of the teachers informed about the peer evaluation method rose to sixteen after the implementation. Sixteen out of seventeen teachers were informed about observation, concept map, presentation, and project alternative assessment and evaluation methods before using O-PDM. Number of the informed teachers in these methods increased to seventeen which means that all of the teachers were informed about these methods after using O-PDM. Moreover, number of the teachers informed about self-evaluation and poster methods

increased from fifteen to seventeen after use of O-PDM. Number of the teachers informed about diagnostic tree method was fourteen before use of O-PDM. However, it rose to sixteen after implementation of O-PDM. It can be seen that there has been small increase in the number of teachers informed about peer evaluation, observation, concept map, presentation, project, self-evaluation, poster, and diagnostic tree methods.

Table 4. 7

Number of teachers having perceived-knowledge about alternative assessment and evaluation method

	Before implementation		**After implementation**	
	Yes	**No**	**Yes**	**No**
Peer evaluation	15	2	16	1
Interview	11	6	16	1
Observation	16	1	17	0
Concept map	16	1	17	0
Self evaluation	15	2	17	0
Portfolio	14	3	17	0
Project	16	1	17	0
Rubric	12	5	16	1
Presentation	16	1	17	0
Diagnostic tree	14	3	16	1
Vee diagram	6	11	15	2
Structural communication grid	9	8	16	1
Poster	15	2	17	0

If we look at portfolio results, number of the teachers informed about this method increased from fourteen to seventeen after use of O-PDM. In addition, number of the teachers knowledable about rubric method increased to sixteen, although it was twelve before implementation of O-PDM. There has been medium growth in number of the teachers knowledgeable about portfolio and rubric methods.

High increase in number of the teachers before and after implementation of O-PDM was seen in interview, structural communication grid, and Vee diagram methods. Sixteen out of seventeen teachers stated that they had information about interview method although it was twelve before use of O-PDM. Furthermore, there has been seven point increase in number of the teachers knowledable about structurel communication grid method after use of O-PDM. Lastly, the biggest increase was in number of teachers declaring that they know vee diagram method. It increased from nine to sixteen after implementation of O-PDM. According to results, it was clear that there has been increase in the number of informed teachers in all kind of methods after use of O-PDM. Increase point sizes in number of informed teachers about each method was given in Figure 4.5.

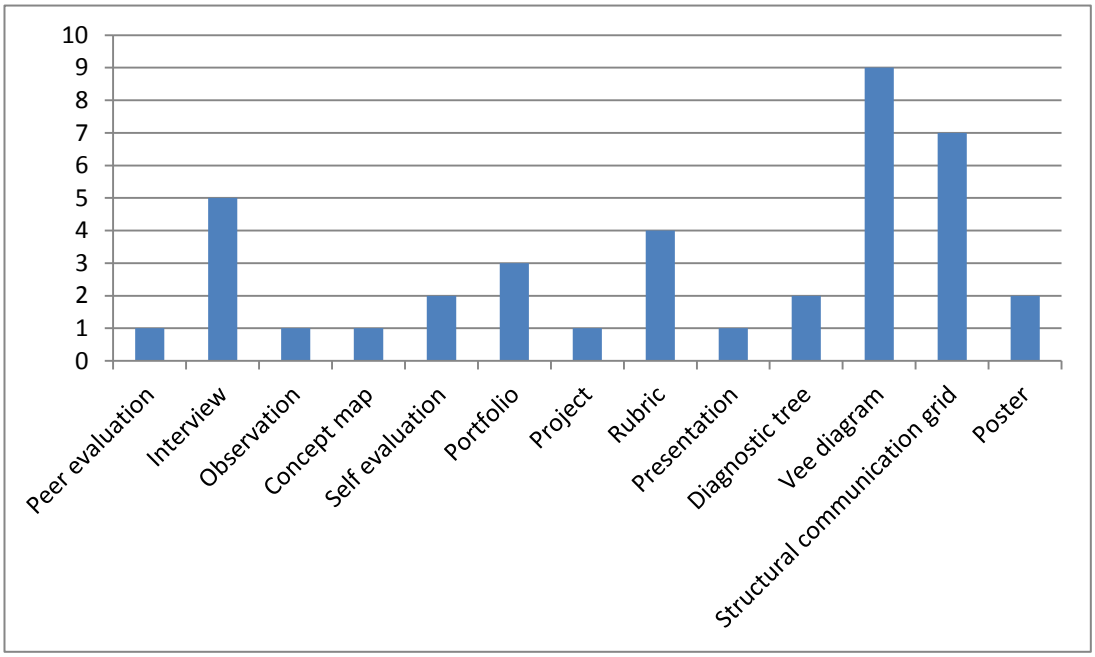

Figure 4. 5 Increase points in number of the informed teachers about each method after use of O-PDM

Evaluation of perceptions about methods' use in assessment. Second dimension was to evaluate teachers' perceptions about use of these alternative assessment methods in class. Teachers declared their perceptions about whether these methods are appropriate in class use before and after the implementation of O-PDM. Results of second dimension of the C-MV were given in Table 4.8.

There was slight increase in number of the teachers finding concept map, project, presentation, interview, self-evaluation, and poster methods' use appropriate in lessons after implementation of O-PDM. Number of teachers who believe use of concept maps as appropriate altered from fifteen to sixteen after online professional development training. While sixteen teachers think that use of projects is appropriate in lessons, after use of O-PDM, all seventeen teachers declared its use as suitable. Same increase in number of teachers observed in presentation method from fourteen to fifteen. Moreover, number of teachers finding interview as appropriate method changed from eleven to thirteen. Two-point increase was seen in number of teachers declaring self-evaluation as proper that it increased from thirteen to fifteen. Again, similar change was seen in number of participants who find use of poster method as appropriate in class setting. Although number of teachers finding this method's use as appropriate was fifteen, it elevated to seventeen after use of O-PDM.

Table 4. 8

Number of teachers finding alternative assessment and evaluation methods' use appropriate in lessons

	Before implementation		**After implementation**	
	Yes	**No**	**Yes**	**No**
Peer evaluation	6	11	9	8
Interview	11	6	13	4
Observation	16	1	16	1
Concept map	15	2	16	1
Self evaluation	13	4	15	2
Portfolio	12	5	16	1
Project	16	1	17	0
Rubric	11	6	15	2
Presentation	14	3	15	2
Diagnostic tree	13	4	16	1
Vee diagram	5	12	14	3
Structural communication grid	8	9	14	3
Poster	15	2	17	0

There has been medium increase in number of the teachers who see use of diagnostic tree, peer evaluation, portfolio and rubric methods as proper. The number of the participants finding diagnostic tree method's use suitable changed from thirteen to sixteen. The same increase was seen in the number of teachers who perceive peer evaluation method's use appropriate as it was changed from six to nine. Sixteen of the teachers stated portfolio method's use as suitable in lessons after use of O-PDM. However, the number of them was twelve before the implementation. Number of participants seeing rubric method's use proper altered from eleven to fifteen after implementation of professional development training.

High growth was grasped in number of teachers who find structural communication grid and vee diagram methods' use as suitable in lessons. Number of the participants declaring appropriateness of structural communication grid method in lessons rose from eight to fourteen. Similarly, number of teachers stating vee diagram as appropriate lifted from five to fourteen. There has been increase in number of the participants finding methods' use suitable in lessons according to all kinds of methods except observation after implementation of O-PDM. Figure 4.6 shows growth points in number of participants seeing each method's use appropriate after professional development training.

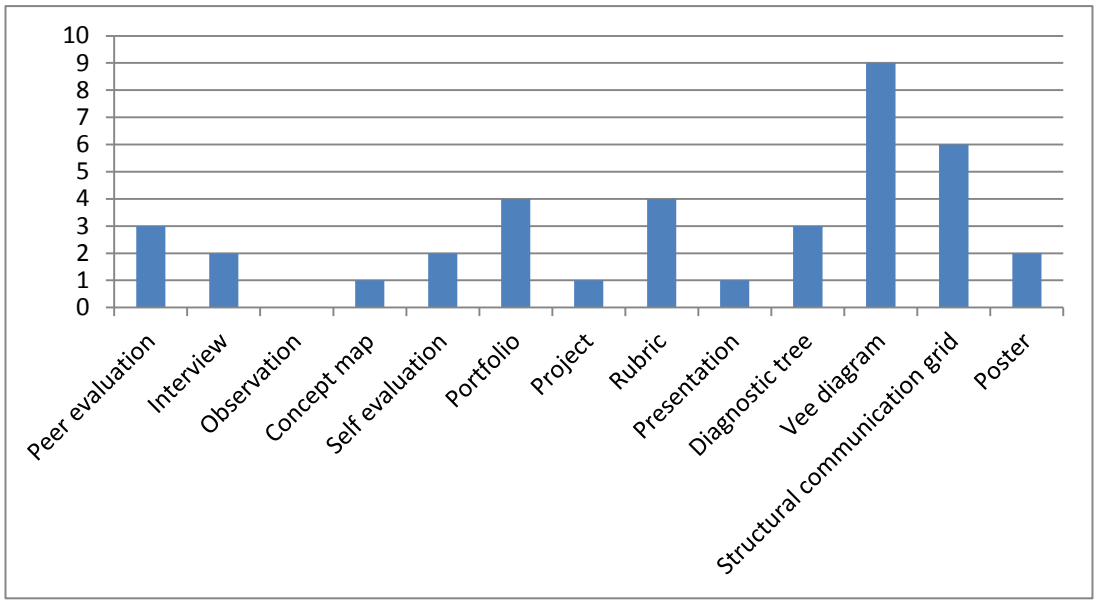

Figure 4. 6 Increase points in number of the teachers seeing each method's use appropriate after use of O-PDM

Evaluation of teachers' in class use frequencies of methods. The third dimension of the checklist was to evaluate teachers' use frequencies of alternative assessment methods. In this part of the checklist, teachers declared how many times they use each method for a period of a semester in a class. Researcher created graphs showing changes in science and technology teachers' frequency of use of each method in a semester after use of O-PDM.

Peer Evaluation Method. 11 participants of this study declared no use of peer-evaluation method before use of O-PDM. Participants who never use this method decreased to seven after implementation. However, four teachers changed their practice; they started to use this method. While three of these four participants applied this method once in a semester, one of them began to practice this method twice in a semester after online training (See Figure 4.7). Three of four participants who use this method once in a semester did not change their application about this method. However, a teacher increased his/her practice about this method as beginning to use it twice in a semester after use of O-PDM.

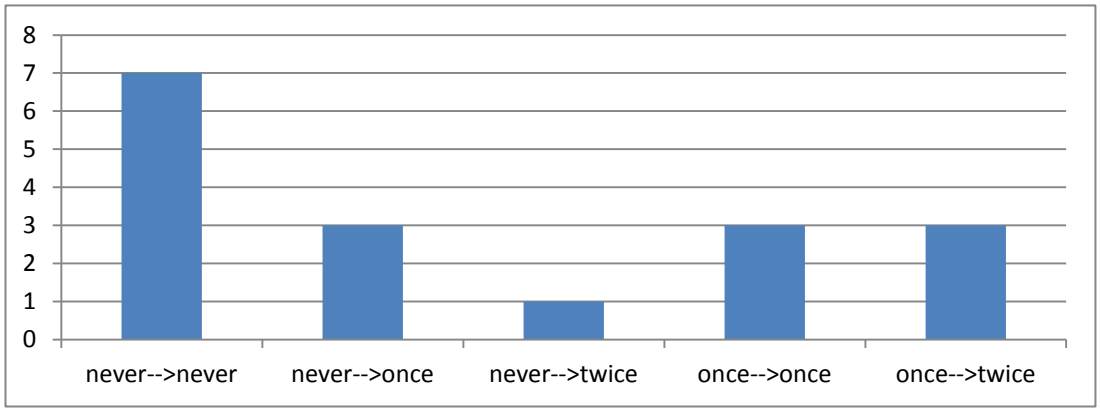

Figure 4. 7 Checklists results showing changes in frequency of use in a semester regarding peer-evaluation method

Interview Method. Figure 4.8 shows the frequency of use statistics of interview method. Number of teachers who never used interview method was eight before implementation of professional development. However, number of teachers never using this method decreased to five after implementation. One of these eight

teachers started to use this method once in a semester after use of O-PDM. Similarly, two of these eight teachers declared use of this method twice in a semester after implementation.

Four participants marked use of interview method once in a semester. One of these teachers still continued to use of this method once in a semester. Nevertheless, three of these four participants reported increase in frequency of use of interview method after use of O-PDM. One of them increased his/her frequency of use from once to twice. And, two of them increased use of this method in a semester from once to four times and more.

Additionally, three participants were using interview method twice in a semester before implementation of online professional development training. Two of these three participants remained same to use this method in a semester after implementation. But, one of them swelled frequency of use of this method to four times and more.

Lastly, two participants reported use of this method four times and more both before and after use of O-PDM.

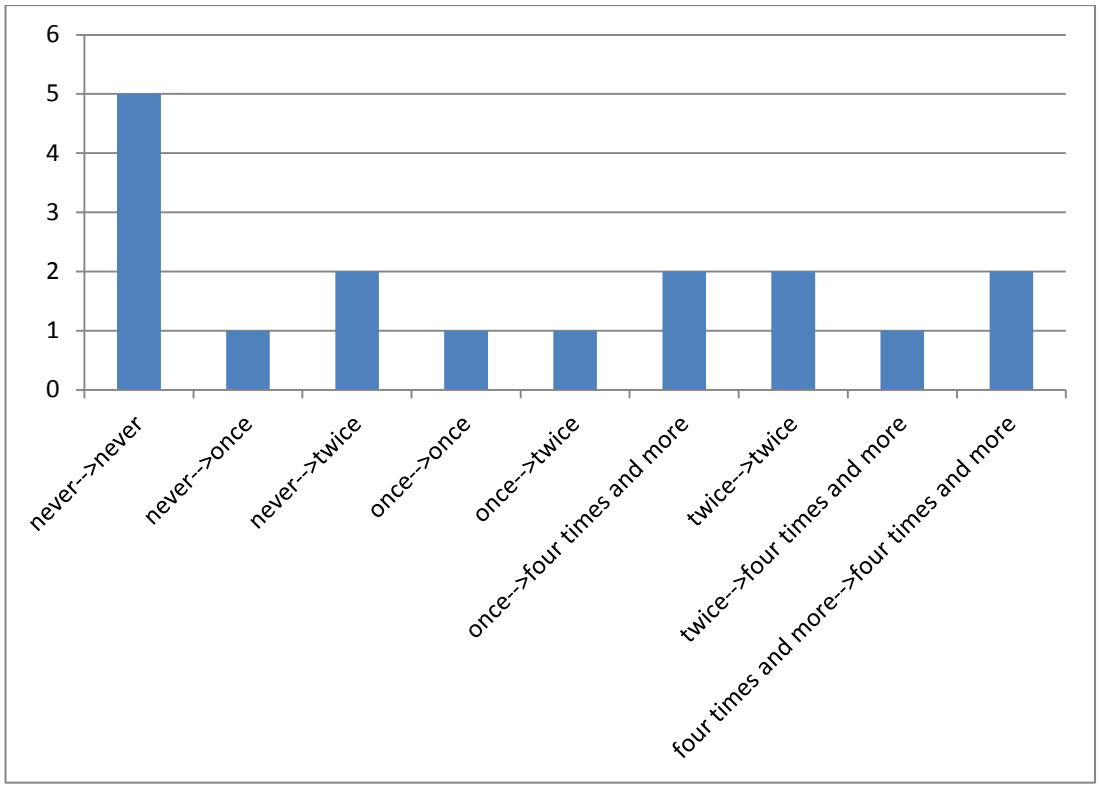

Figure 4. 8 Checklists results showing changes in frequency of use in a semester regarding interview method

Observation Method. Figure 4.9 presents teachers' usage statistics of observation method. The number of teachers affirming no usage of observation technique in a semester was five before implementation. However, number of these teachers decreased to two. Other three teachers enhance their practice about observation method after use of O-PDM. One of them rose his/her use into once in a semester. The other one started to use this method twice. Last participant who never uses this method stated use of this method four times and more in a semester. Moreover six participants declared use of observation method once in a semester. Half of these participants did not change their use of this method after implementation. However, three of these participants have increased their practice about observation method. While one began to use this method three times, two of these participants reported use of four times and more in a semester after online professional development material. There was a change in number of participants who uses observation method three times in a semester after implementation. While two participants remained to use this method three times in a semester, a participant

raised frequency of his/her use of this method to four times and more in a semester after use of O-PDM. Lastly, there was no change in number of participants who uses this method four times and more after use of online training.

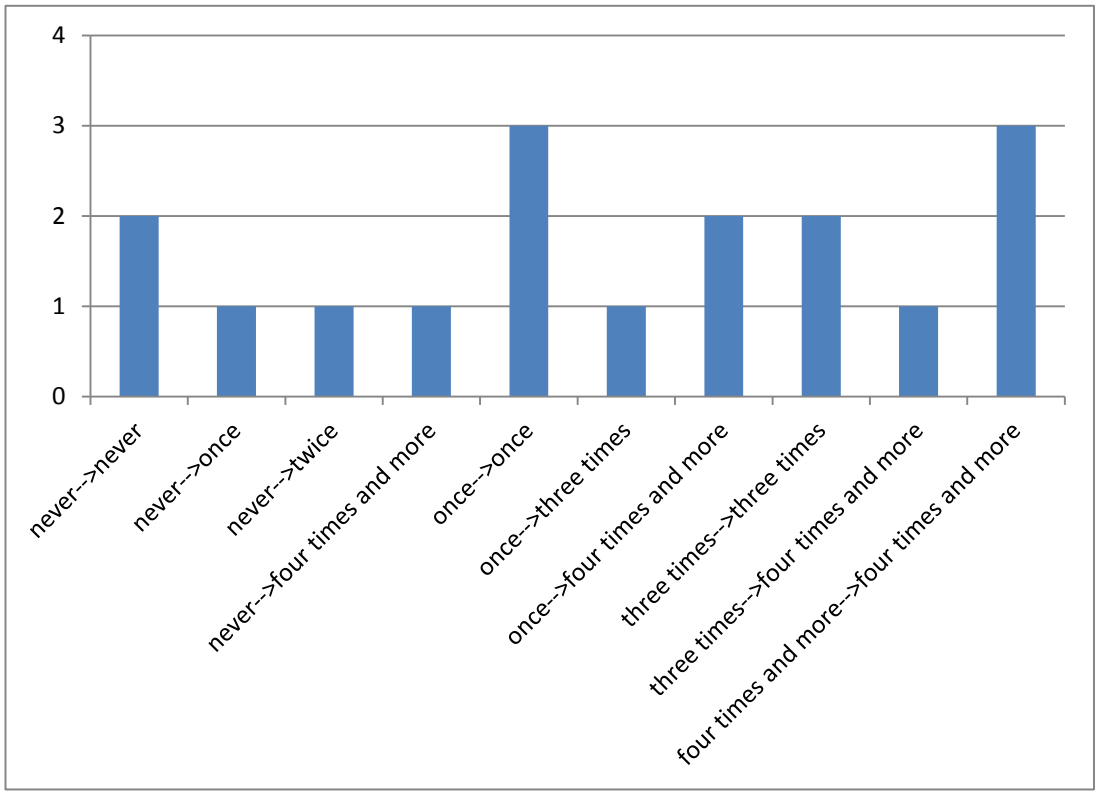

Figure 4. 9 Checklists results showing changes in frequency of use in a semester regarding observation method

Concept Map Method. Figure 4.10 shows number of teachers using concept map method in a period of a semester. After implementation of O-PDM, number of teachers who never used this method reduced from two to one. A participant declared growth in use of this method in a semester from never to once. Then, three participants were using this method in classroom practice once in a semester. One of these three participants declared n change in his/her practice after implementation. However, two of these participants stated increase in practice. One of them started to use this method twice and the other one raised use of this method four times and more in a semester. Number of participants who use concept maps three times in a semester was three before implementation. One of these participants kept using this

method in the same frequency. On the other hand, two enhanced their use from three times to four times and more. Finally, five participants reported use of concept maps four times and more both before and after use of O-PDM.

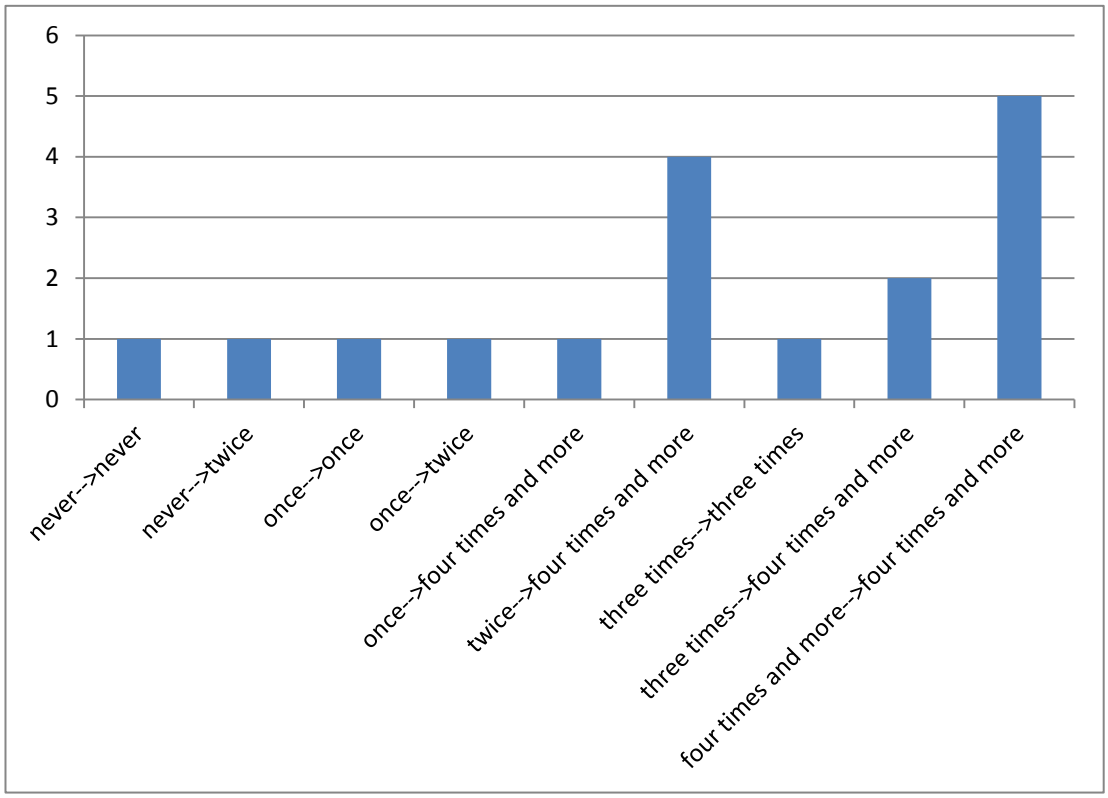

Figure 4. 10 Checklists results showing changes in frequency of use in a semester regarding concept map method

Self-Evaluation Method. Five out of nine teachers who never use self-evaluation method in a semester did not change their classroom practice about this method after implementation of the O-PDM. However, two participants increased their use of this method to once and three times respectively. Rest, two participants who never use self-evaluation method, raised their application of this method to twice in a semester after online training. Furthermore, there were six participants who use self-evaluation method once in a semester. While three of these participants kept using once in a semester, two swelled their practice into twice in a semester after use of O-PDM. And, one raised use of this method from once to three times in a semester after implementation. Additionally, a participant who uses self evaluation

method twice in a semester enhanced his/her application to three times in a semester after online training. Lastly, a participant kept using self evaluation method four times and more both before and after use of O-PDM.

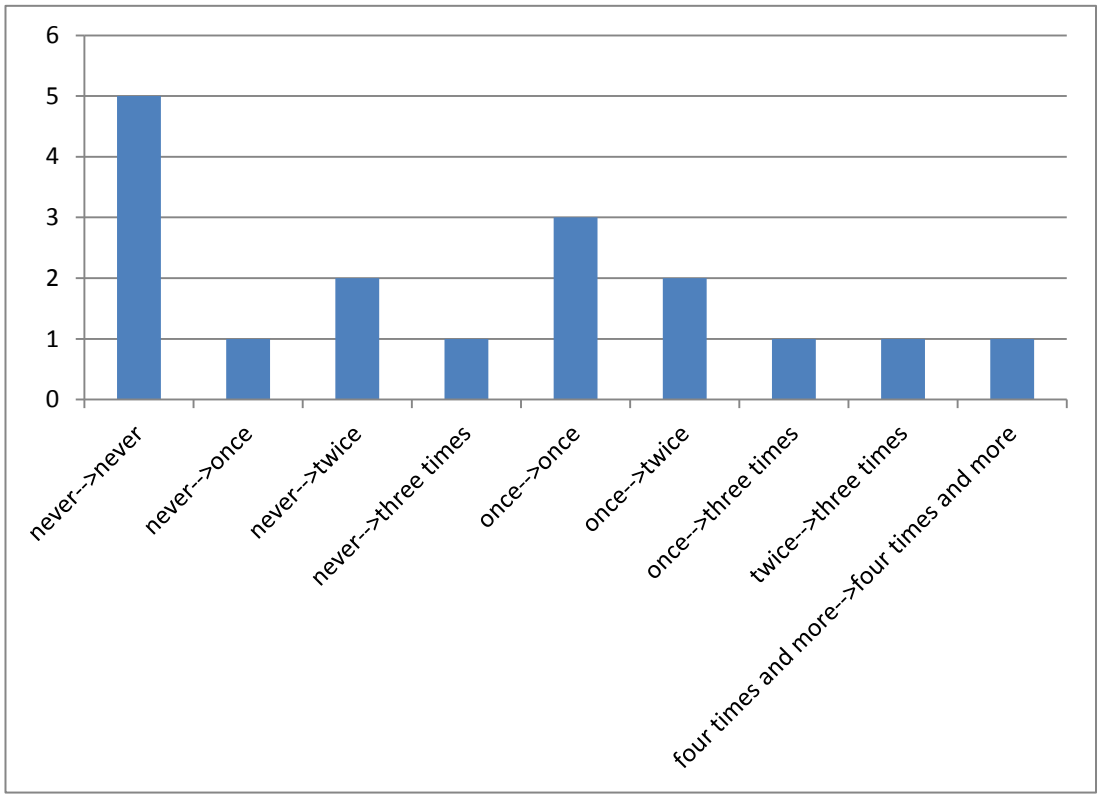

Figure 4. 11 Checklists results showing changes in frequency of use in a semester regarding self-evaluation method

Portfolio Method. Portfolio method usage statistics were given in Figure 4.12. There has been downturn in the number of participants affirming no use of portfolio method in a semester after use of O-PDM. The number of participants reporting no use of portfolio decreased from seven to one. Conversely, four of these seven participants started to use portfolio once in a semester. Furthermore, two participants increased their use of this method to twice and three times respectively after implementation.

About half of nine participants who use portfolio method once in a semester kept using this method in the same rate. However, five of these participants swelled

their classroom practice about this method. Three of them started to use twice in a semester after use of O-PDM. The rest, two participants, raised their use of this method three times and four times and more respectively.

Finally, one participant stated use of this method four times and more both before and after implementation.

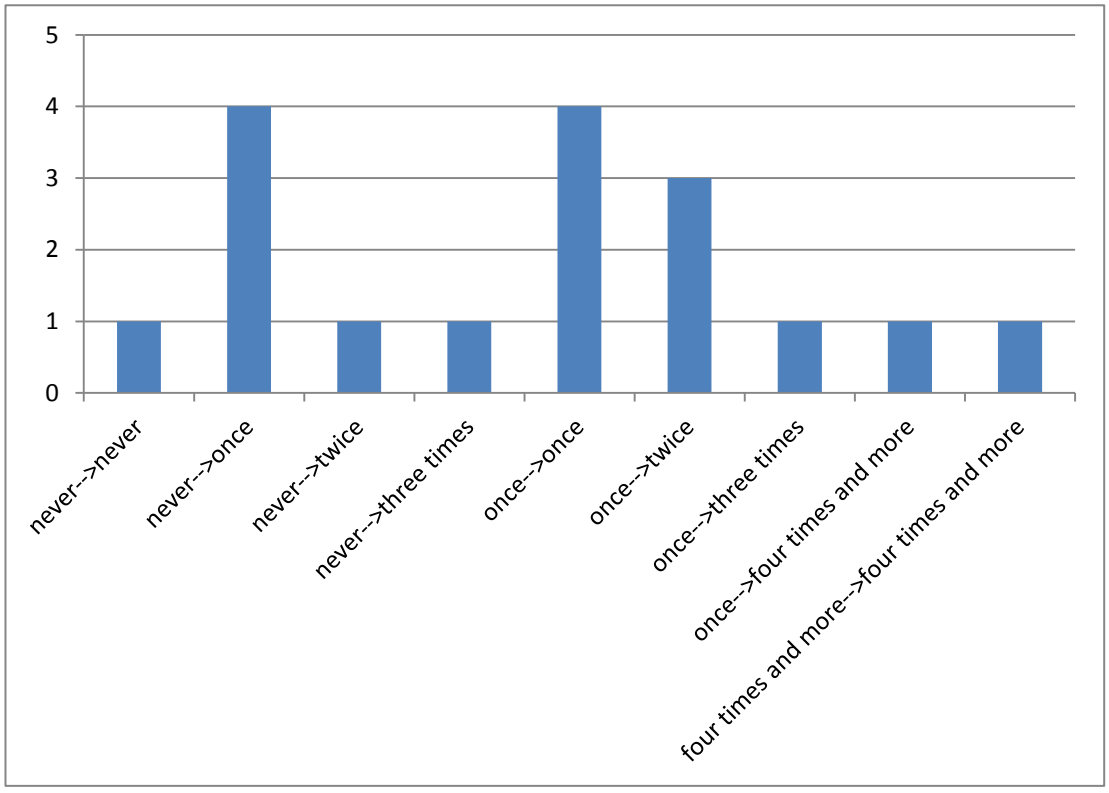

Figure 4. 12 Checklists results showing changes in frequency of use in a semester regarding portfolio method

Project Method. Figure 4.13 presents project usage statistics before and after implementation of professional development training. Results showed that four participants who never use project method in a semester started to use it once in a semester. Moreover, there were nine participants who use project method once in a semester before implementation. Six out of these nine participants did not change their practice about this method. In contrast, three of these nine participants increased their application of this method; they declared use of this method twice in a semester.

No difference revealed in practice of teachers who use project method twice before implementation of O-PDM.

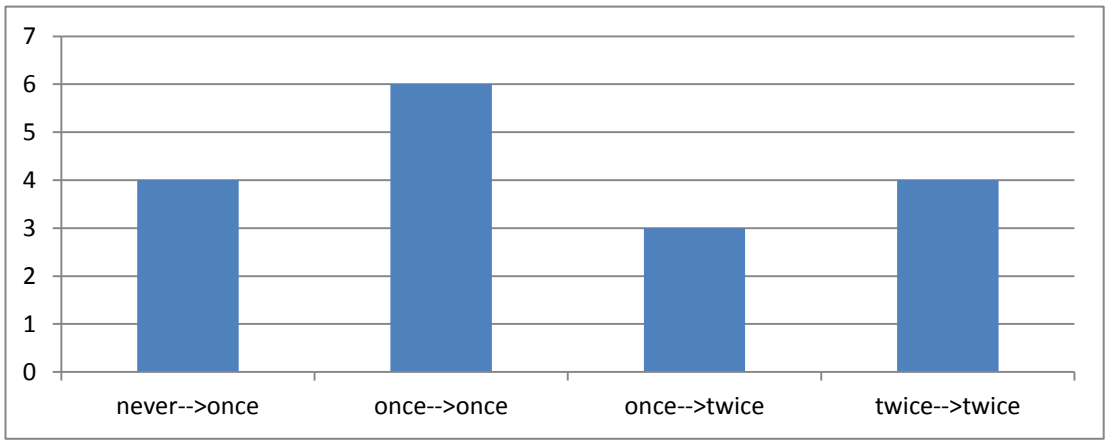

Figure 4. 13 Checklists results showing changes in frequency of use in a semester regarding project method

Rubric Method. Figure 4.14 presents participants use statistics of rubric method. After use of O-PDM, there has been downturn in number of the teachers who never use rubric in a semester. Number of these teachers reduced from eight to two. One of six these participants changing their practice about rubric method started to use this method once. Four of these six teachers changed their use frequency from never use to twice in a semester. Remaining one teacher increased his/her use frequency from never to four times and more in a semester.

Besides, there were eight participants who use rubric method once in a semester before implementation of O-PDM. Two of these eight teachers kept using this method once in a semester after implementation. Nevertheless, remaining six participants increased number of use of this method after use of O-PDM. Three participants raised their application of this method from once to twice in a semester. One of them started to use this method three times in a semester and remaining two raised their use from once to four times and more in a semester.

Lastly, one participant was using this method twice in a semester before implementation. S/he improved his/her practice to four times and more after use of O-PDM.

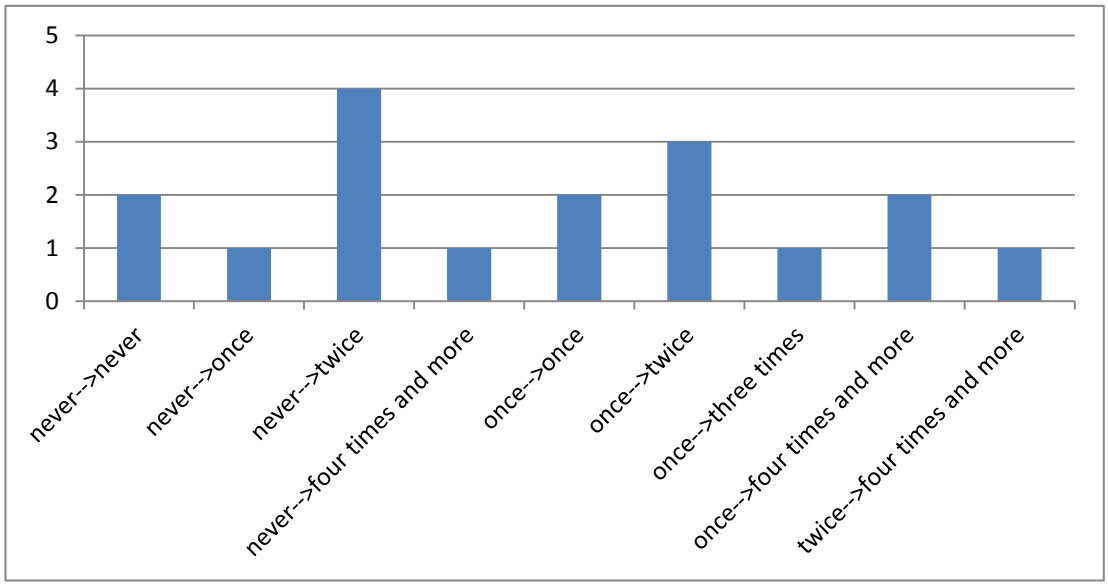

Figure 4. 14 Checklists results showing changes in frequency of use in a semester regarding rubric method

Presentation Method. Figure 4.7 shows the changes in participants' use frequencies of presentation method before and after implementation. Results showed no use of this method by four participants before implementation. This number of participants decreased to two after implementation. Remaining two participants started to use presentation method once, and four times and more in a semester respectively after use of O-PDM.

Results showed that there were four participants using presentation method once in a semester before implementation of O-PDM. Half of these four participants did not change their use frequency of this method. Nonetheless, remaining two participants started to use it twice in a semester.

One out of three participants who reported use of presentation method twice in a semester kept using it twice even after implementation. However, remaining two participants augmented their frequency of use of this method to four times and more.

Findings revealed that only one of five participants using presentation method three times in a semester continue to use it same frequency. Remaining four participants raised their use frequency to four times and more.

Lastly, one participant stated use of presentation method four times and more in a semester both before and after implementation.

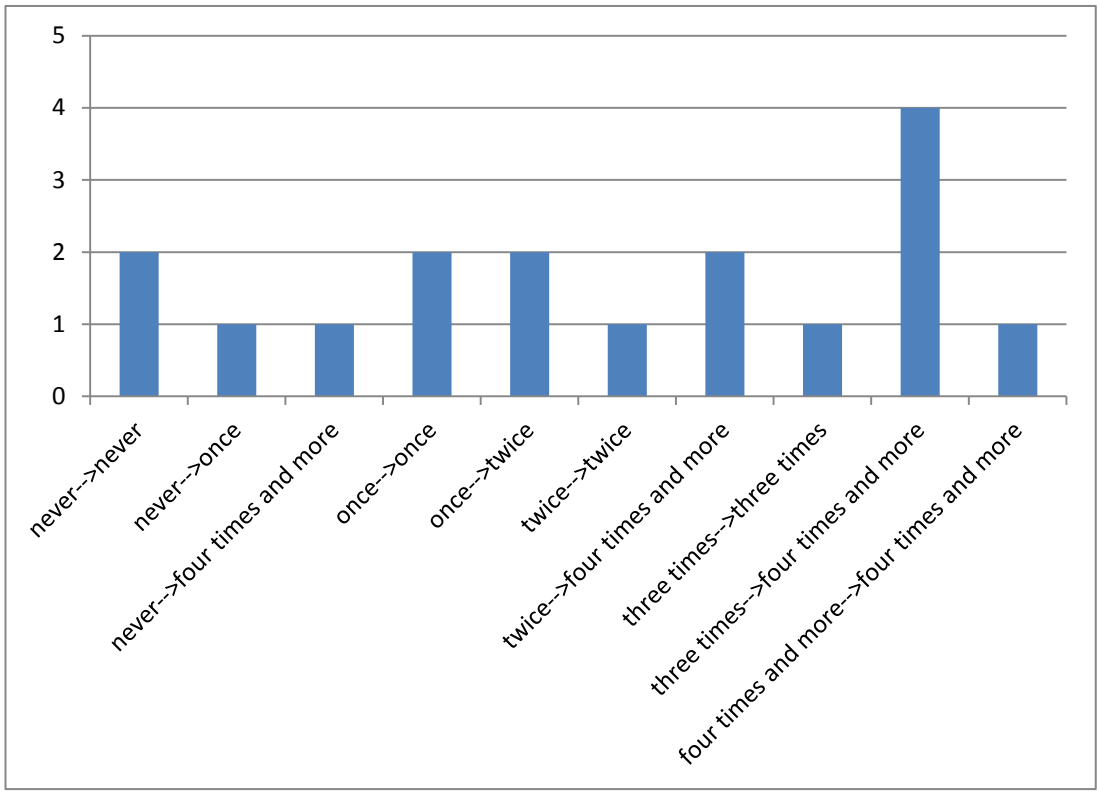

Figure 4. 15 Checklists results showing changes in frequency of use in a semester regarding presentation method

Diagnostic Tree Method. Diagnostic tree method use frequencies of participants were displayed in Figure 4.16 both before and after implementation. Four teachers declared no use of diagnostic tree method before use of O-PDM.

Number of these teachers reduced to one after training. Also, one of these participants started to use this method twice after use of O-PDM. Remaining two participants declared use of this method four times and more after implementation.

Before use of O-PDM, there were four participants using diagnostic tree method once in a semester. Although one of these participants kept using once in a semester after implementation, remaining three started to use this method twice in a semester.

Study findings revealed one of two participants who reported use of diagnostic tree method three times in a semester did not change frequency of use of this method. The other participant increased frequency of use of this method to four times and more.

Finally, the most used frequency of diagnostic tree method was four times and more by seven participants. All these seven participants continued to use this method four times and more after implementation of O-PDM.

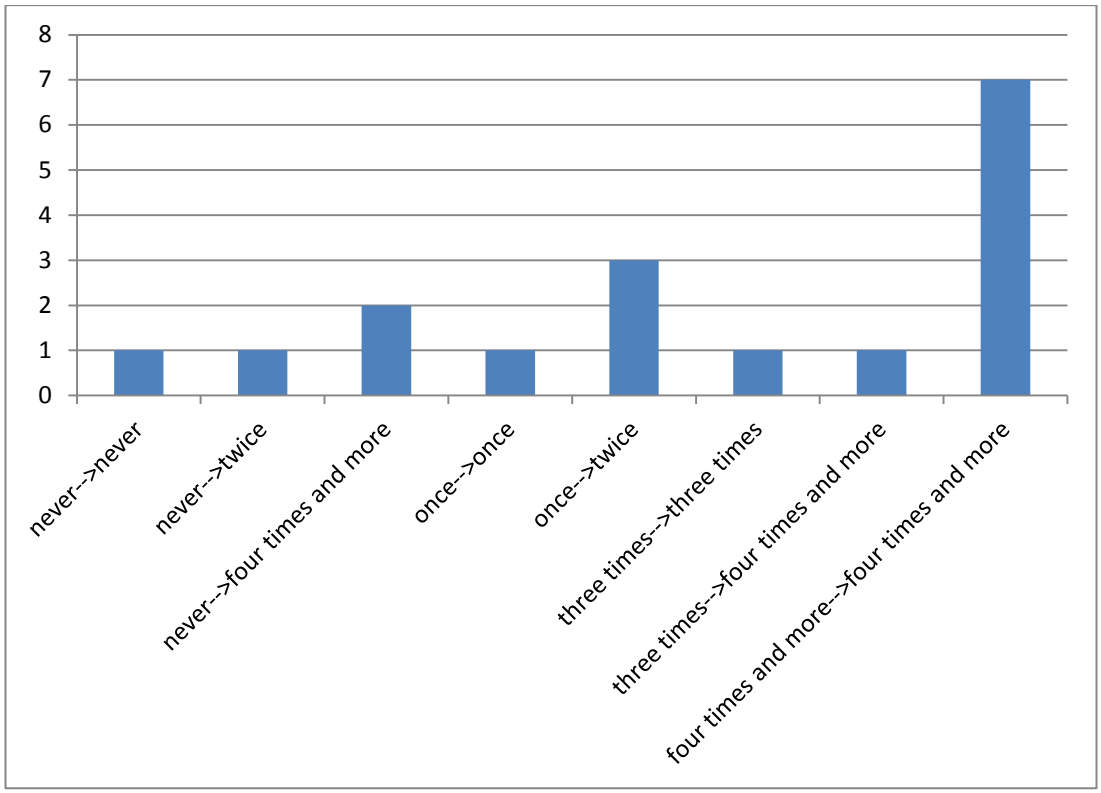

Figure 4. 16 Checklists results showing changes in frequency of use in a semester regarding diagnostic tree method

Vee Diagram Method. Figure 4.17 demonstrates participants' frequencies of vee diagram method use. Number of the teachers stating no use of this method diminished from fifteen to nine after implementation of O-PDM. Four of remaining six participants raised their frequency of use to once in a semester after online training. The rest two participants also changed their frequency of use of this method to twice, and four times and more respectively. Besides, there was a participant stating use of vee diagram method twice in a semester both before and after implementation. The last participant reported use of this method four times and more kept using it four times and more after use of O-PDM.

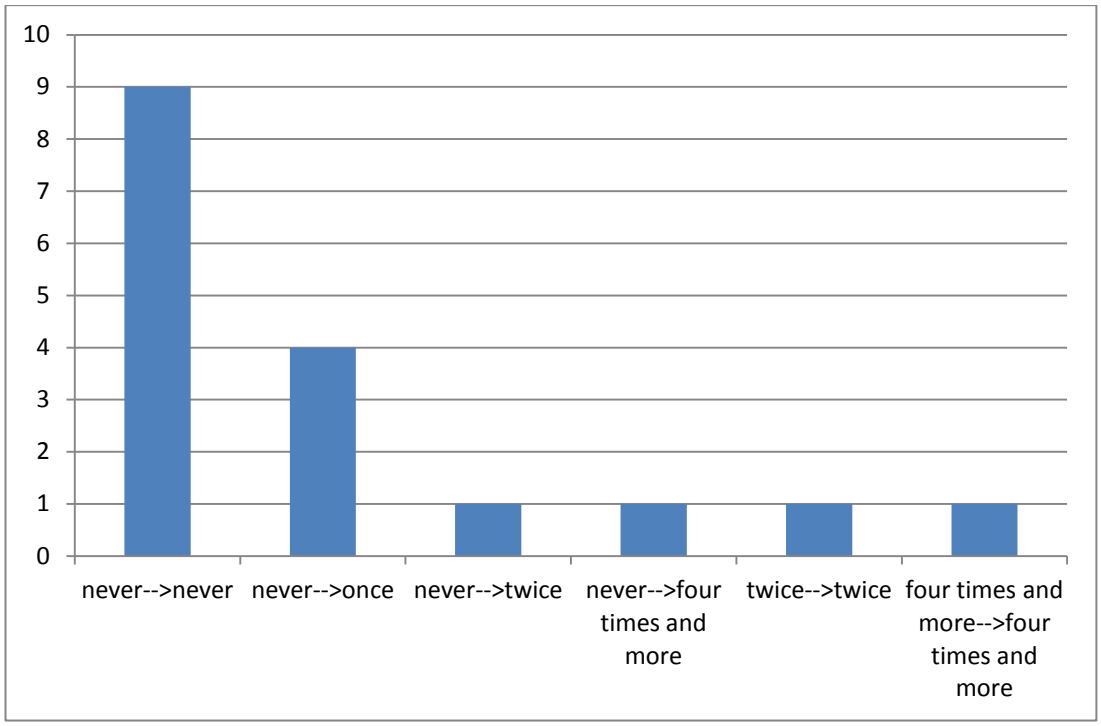

Figure 4. 17 Checklists results showing changes in frequency of use in a semester regarding vee diagram method

Structural Communication Grid Method. Frequencies of use statistics of structural communication grid were presented in Figure 4.18. There was downturn in the number of teachers who never use this method in a semester. Number of teachers not using this method decreased from eleven to four. Four of remaining seven participants started to use it once in a semester. The rest, three participants, increased use of this method to twice, three times, and four times and more respectively.

Findings revealed that two participants reported use of structural communication grid method once in a semester. One out of these two participants kept using this method once in a semester. However, the other participant raised his/her use frequency to four times and more after implementation.

Both two participants who had declared use of structural communication grid method twice in a semester enhanced their frequency of use after implementation. While one of them started to use three times in a semester, the other increased use of this method into four times and more after implementation.

Lastly, two participants who stated use of structural communication grid method three times, and four times and more respectively kept using these methods just the same.

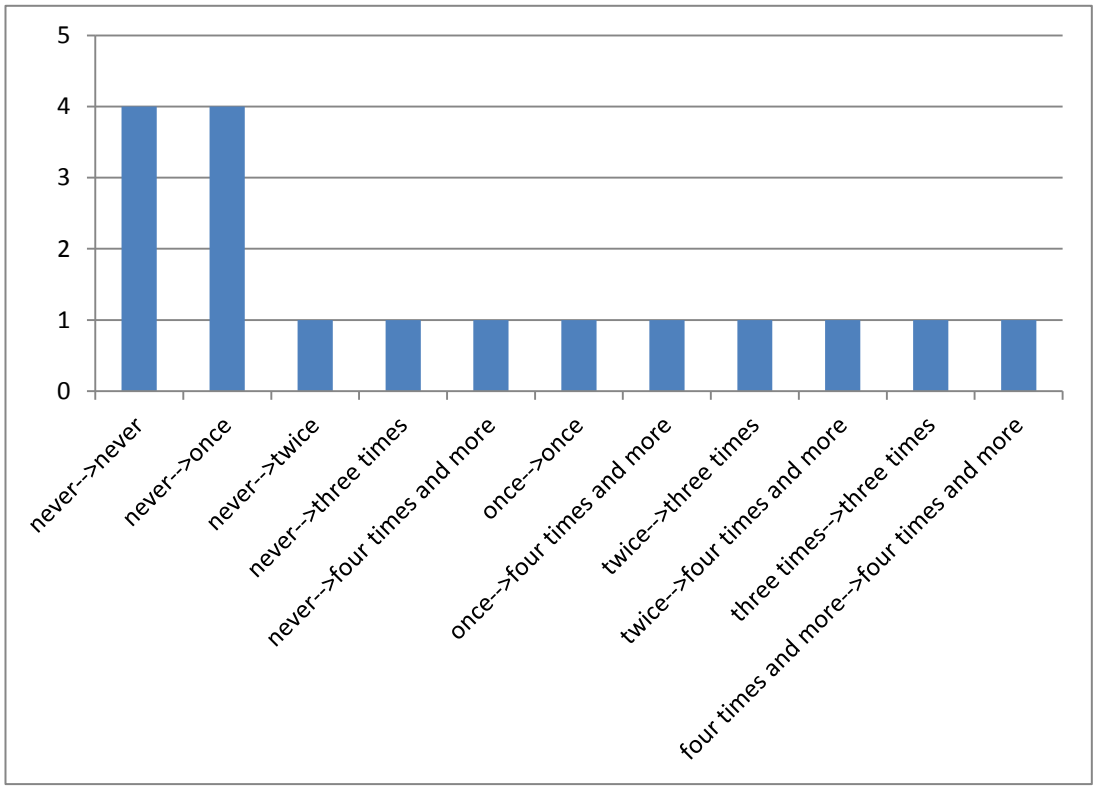

Figure 4. 18 Checklists results showing changes in frequency of use in a semester regarding structural communication grid method

Poster Method. Frequency of poster method use statistics can be observed in Figure 4.19. Although there were two participants declaring that they never use posters before use of O-PDM, these participants started to use this method once in a semester after implementation.

Before implementation of O-PDM, there were seven participants using poster method once in a semester. However, this number decreased to two after online training. Two out of remaining five participants began to use this method twice in a semester after use of O-PDM. Similarly, two participants raised their use of this method from once to three times in a semester. The last participant who used to use

this method once augmented his/her frequency of use to four times and more after implementation.

Study findings presented use of poster method by four participants twice in a semester before use of O-PDM. However, there was only one participant stated use of twice after implementation. One out of remaining three participants started to use poster method three times in a semester. The rest, two participants, increased their use frequency to four times and more after implementation of O-PDM.

Lastly, four participants using poster method four times and more before use of O-PDM continued to use it in the same frequency after implementation.

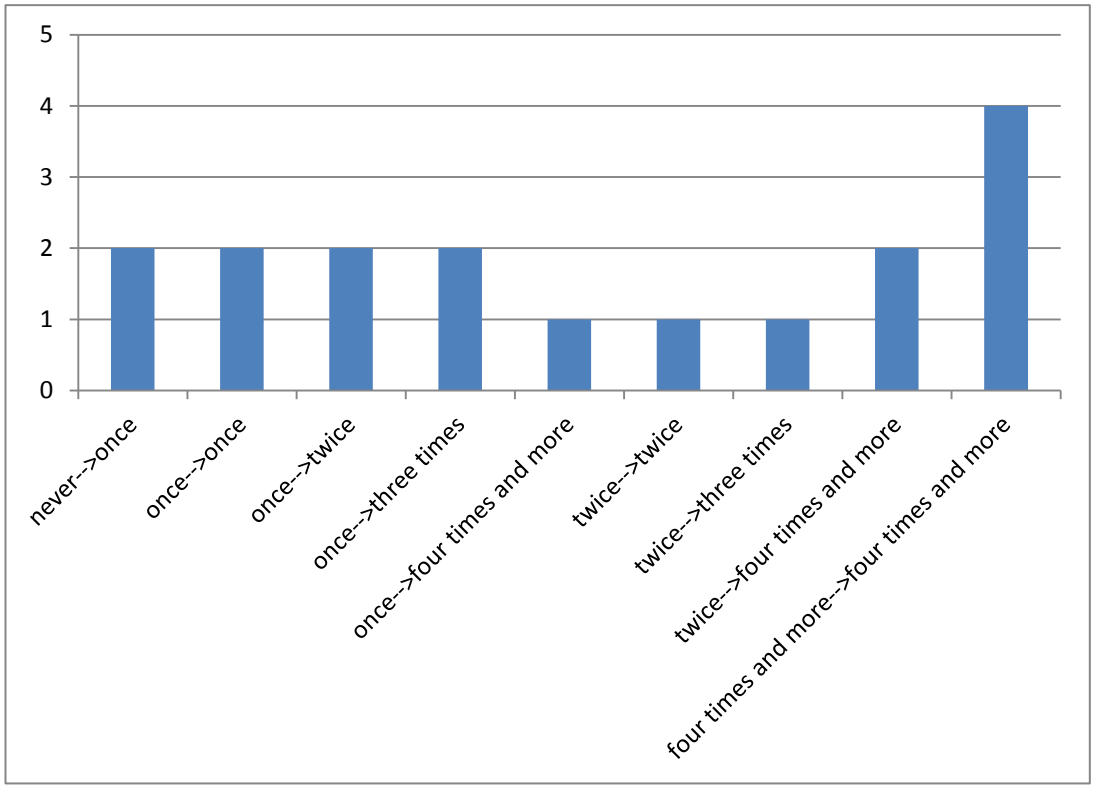

Figure 4. 19 Checklists results showing changes in frequency of use in a semester regarding poster method

4.2.2. Self-Efficacy Questionnaire (SE-Q) Results

SE-Q conducted to evaluate whether teachers self-efficacy scores change with support of professional development training. There were 21 items to evaluate self-efficacy of participants towards alternative assessment and evaluation methods. There were ten negative items (Item 4, 8, 11, 13, 16, 17, 18, 19, 20, and 21) and the rest were positive items. Researcher employed SE-Q before and after the implementation of O-PDM. Table 4.9 presents statistics of frequencies, mean scores, and standard deviations of both pre and post self-efficacy questionnaire items.

To start with positive items, the 1st item was asked to evaluate whether teachers could provide a meaningful way of learning for their students by using alternative assessment and evaluation methods. Although, mean score for this item was 4.18 in pre questionnaire, it rose to 4.71 in post questionnaire.

There has been increase in mean scores of the 2nd item ("I can improve positive attitudes of students by using alternative assessment and evaluation methods") after implementation that it escalated from 4.06 to 4.59.

3rd question assessed whether teachers think that they can add new values to their students by using alternative assessment and evaluation methods. Teachers responded to that question in mean score of 4.00 before use of O-PDM. However, it increased to 4.59 after implementation.

There was very slight incline in mean scores of 5th item ("I can determine students' level of readiness by using alternative assessment and evaluation methods"). There were also growth in self-efficacy scores of teachers about whether they can use opportunities of their school and surroundings. Mean score for this question rise from 3.41 to 3.82 after use of O-PDM.

Table 4. 9

Results of self-efficacy questionnaire of final phase before and after use of O-PDM

	Before			After		
	n	M	SD	n	M	SD
1- I can provide a meaningful way of learning for my students by using alternative assessment and evaluation methods.	17	4.18	1.13	17	4.71	0.47
2- I can improve positive attitudes of students by using alternative assessment and evaluation methods	17	4.06	1.03	17	4.59	0.51
3- I can add new values to my students by using alternative assessment and evaluation methods.	17	4.00	1.17	17	4.59	0.51
4- I will be confronted with problems in timing while using alternative assessment and evaluation methods.	17	4.24	0.83	17	3.94	0.83
5- I can determine students' level of readiness by using alternative assessment and evaluation methods.	17	4.24	0.66	17	4.29	0.69
6- I can use opportunities of my school and my surroundings effectively while using alternative assessment and evaluation methods.	17	3.41	1.00	17	3.82	0.73
7- I can draw the attention of my students to the subject by using alternative assessment and evaluation methods.	17	4.59	0.51	17	4.59	0.51
8- I think that I will have trouble about assessing students' attitudes towards the course by using alternative assessment and evaluation methods.	17	2.29	0.85	17	2.06	0.56
9- I can give feedback to my students where necessary by using alternative assessment and evaluation methods.	17	4.12	0.60	17	4.24	0.44
10- I can improve students' interest to the course by using alternative assessment and evaluation methods.	17	4.53	0.62	17	4.47	0.78

Table 4.9 *Continued*

11- I think that I will have trouble while choosing type of alternative assessment and evaluation methods	17	3.06	0.75	17	2.65	0.86
12- I can consider development level of my student while choosing type of alternative assessment and evaluation methods.	17	3.88	0.86	17	3.88	1.05
13- I think that I will have trouble in class management in application of alternative assessment and evaluation methods.	17	2.71	1.10	17	2.47	0.94
14- I can easily direct my students to let them reach necessary resources while using alternative assessment and evaluation methods.	17	3.94	0.75	17	4.00	0.79
15- I can prepare alternative assessment and evaluation tools effectively by using the technological possibilities of our time.	17	3.82	0.88	17	4.18	0.81
16- I think, I will be faced with difficulties in finding sources while preparing alternative assessment and evaluation tools.	17	2.71	0.85	17	2.47	1.01
17- I think that I will have trouble while preparing alternative assessment and evaluation tools.	17	3.06	1.03	17	2.47	1.07
18- I think I will have trouble in grading students' products which are created as a result of alternative assessment and evaluation methods.	17	2.71	0.99	17	2.35	1.00
19- I think that I will have trouble in determining the criteria for evaluating products which are created as a result of alternative assessment and evaluation methods.	17	2.76	0.83	17	2.65	1.00
20- I think I will have trouble in assessing students' knowledge and skills by using alternative assessment and evaluation methods.	17	2.35	1.06	17	2.18	0.88
21- I think I will have trouble in developing alternative assessment and evaluation tool which is appropriate to course and the content.	17	2.88	0.99	17	2.47	1.07

There was no difference in mean scores (4.59) of 7th item before and after use of O-PDM. This item evaluates teachers' perceptions about whether they can draw attention of students by using alternative assessment and evaluation methods.

9th item was sought to reveal perceptions of teachers about whether they can give feedback by using alternative assessment and evaluation methods. Slight growth of mean score of this item was seen after implementation. It increased from 4.12 to 4.24.

There was only one slight decrease in mean scores of 10th item after use of O-PDM among positive items. Although this item was positive directed, mean score lowered from 4.53 to 4.47 after implementation of online professional development training. Similar to 7th item, there were no changes in mean scores of 12th item. Mean score (*M*=3.88) remained same before and after implementation of professional development training.

14th item was asked to evaluate teachers' perception about their skills to direct students to reach necessary sources while using alternative assessment and evaluation methods. A slight increase was observed in this item. Mean score of this item rose from 3.94 to 4.00.

Last question among positive items was 15th item which evaluates whether teachers perceive themselves capable of preparing alternative assessment tools. Mean score of 15th item in pre-test was 3.82. There has been rise in post questionnaire result of this item (*M*=4.18). Figure 4.20 presents increase levels of mean scores of each positive item in SE-Q after use of O-PDM.

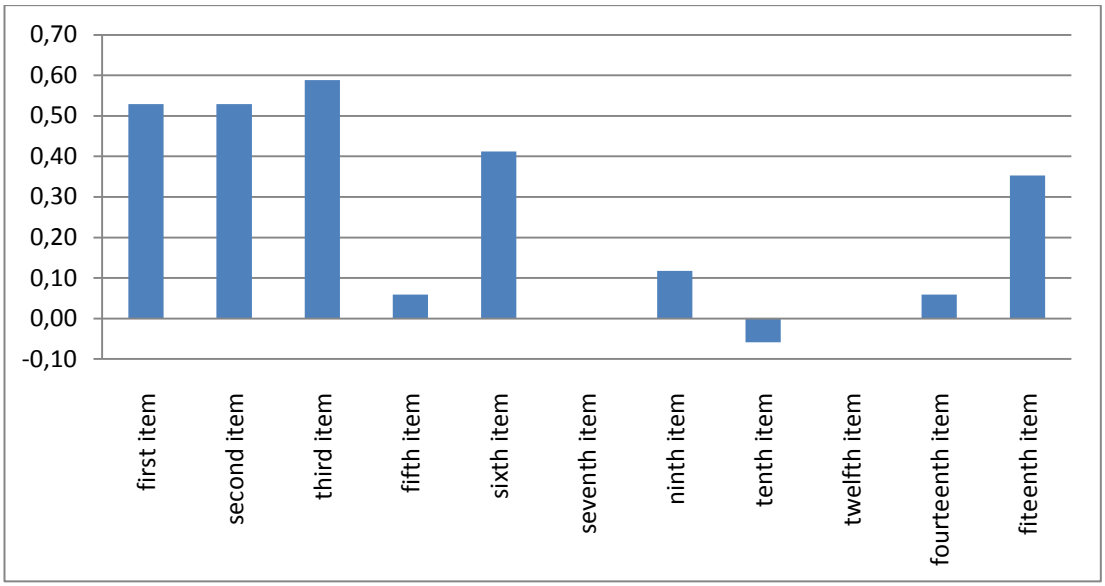

Figure 4. 20 Increase levels of mean scores of each positive item in SE-Q

There were ten negative items in SEQ. 4th item in questionnaire evaluated teachers' perception about timing issue while using alternative assessment and evaluation methods. Mean score of this item was 4.24 before application of O-PDM. After use of O-PDM, mean score reduced to 3.94.

8th item aimed to collect teachers' perceptions about whether they will have problem in assessment of students' attitudes towards course. Mean score of this item was 2.29 before the training. It decreased to 2.06 after implementation.

There was slight decrease in mean scores of 11th item which evaluates whether teachers would have problem while choosing type of alternative assessment and evaluation methods. It diminished from 3.06 to 2.65.

13th item aimed to evaluate teachers' perception about having trouble I classroom management while using alternative assessment and evaluation methods. Mean score of this item dwindled from 2.71 to 2.47.

Same decrease from 2.71 to 2.47 was observed in mean score of 16th item which evaluates whether teachers would face with difficulties in finding sources while preparing alternative assessment and evaluation methods.

17th item asked teachers to find out whether they would have problems in preparing alternative assessment and evaluation methods. Results showed decrease in mean scores of this item after use of O-PDM (M_{before}=3.06, M_{after}=2.47).

Mean scores of 18th item which measures teachers' perception about having trouble in grading students' product shrank from 2.71 to 2.35 after professional development training.

19th item aimed to assess teachers' perception about whether they would have trouble in determining criteria for evaluation of students' products. There was slight decrease in mean scores of this item from 2.76 to 2.65 after implementation of O-PDM.

Teachers' perception about having trouble in assessing students' knowledge and skills by using alternative assessment and evaluation methods reduced from 2.35 to 2.18 after professional development training according to results of 20th item.

Last negative item was 21st item which evaluates teachers' opinions about having trouble in developing alternative assessment and evaluation tools. Mean score of this item also reduced from 2.88 to 2.47 after use of O-PDM. Figure 4.21 shows decrease levels of mean scores of each negative item in SE-Q after implementation of professional development training.

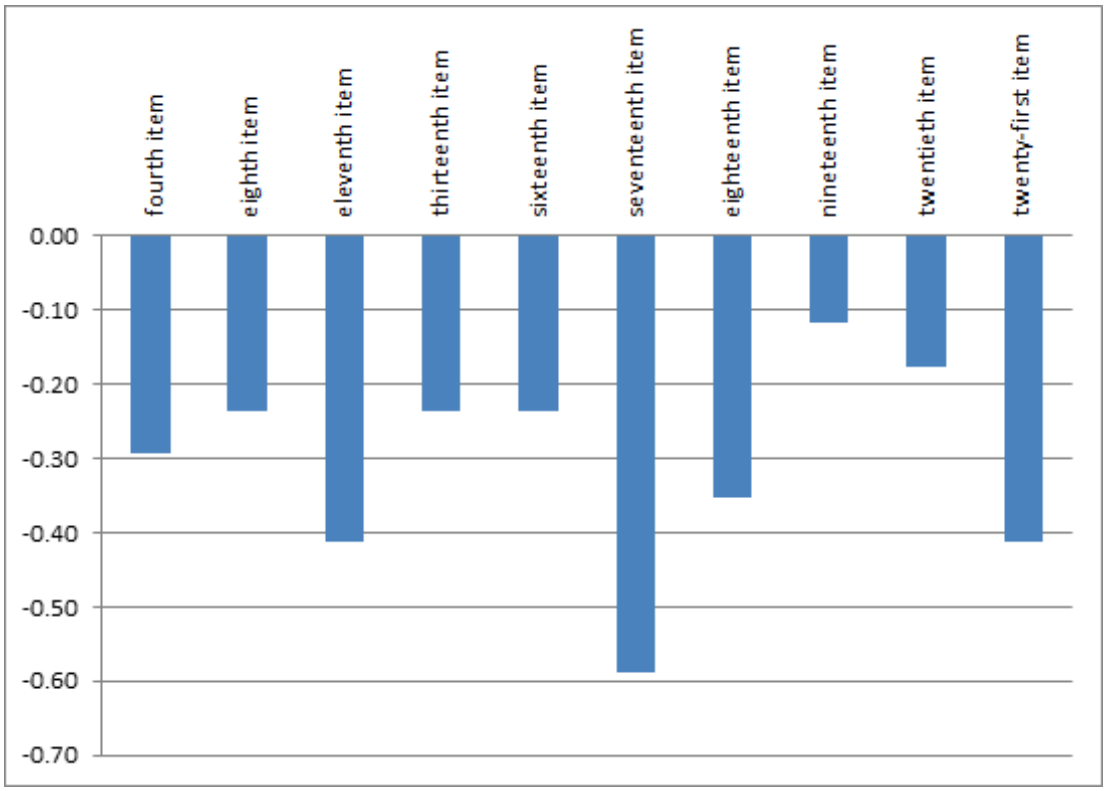

Figure 4. 21 Decrease levels of mean scores of each negative item in SE-Q

4.3. Summary of Results

In this chapter, both quantitative and qualitative data of study participants were analyzed and the results were presented. To recap, the following major findings can be interpreted:

- Most of the participants declared use of computer and internet in such purposes: to prepare or download assessment activities, to follow educational sites, to prepare PowerPoint presentations, animation and video presentations, and doing search.
- Common use of computers was seen among study participants.
- About half of the seventeen teachers participated in prototyping procedures claimed that they had taken in-service training about constructivist learning and teaching principles. But minority of these confirmed discourse of alternative assessment and evaluation methods.

- About half of the seventeen participants declared need for in-service training about alternative assessment techniques.
- Related with content of O-PDM, participants stressed on accuracy, appropriateness to practice, clarity, conciseness, completeness and importance.
- Related with design of O-PDM, participants gave opinions about multimedia, color scheme and visual appeal of O-PDM.
- Related with usability of O-PDM, participants perceived login pages, long site addresses and broken links as barriers to navigation of O-PDM. Besides, usability problems with new modules were criticized by participants in interviews. Lastly, five out of seventeen teachers perceived installation of video plug-in problematic since a plug-in which is not used common was integrated into O-PDM.
- Three main categories revealed about possible contributions of O-PDM: guiding for professional development, guiding for practice, and providing efficiency.
- Teachers mostly gave positive feedbacks about online in-service training. They thought that this type of training had advantages about accessibility, efficiency, and being up-to-date.
- Nine out of seventeen participants gave feedback about face-to-face trainings. Seven of them gave negative feedbacks about face-to-face trainings in interview sessions. They mostly complained about incompetent trainers, taking shallow information and lectures without practice. Remaining two participants gave positive feedback about face-to-face in-service trainings.
- Internet tutorial attitude questionnaire results presented that users give importance to multimedia support of the online professional development training. Integration of videos and images related with text-based content lead positive increase in their attitudes towards the O-PDM. Furthermore, use of unique template instead of pre-prepared template, centering web-site, and adding background image also supported participants' attitudes positively towards visual attractiveness of the O-PDM.

- After use of O-PDM, there were increases in number of knowledgeable participants among all techniques after online training.
- It can be concluded from final study results that use of O-PDM have affected beliefs of participants positively about use of alternative assessment and evaluation methods in lessons.
- There were changes in participants' practices from never use to at least once in a semester in all alternative assessment methods after use of O-PDM. Additionally, there were also growths in use frequencies of participants who was already using these methods at least once in a semester before implementation
- After online professional development training, participants' self efficacy beliefs about alternative assessment and evaluation methods were mostly increased. Only, their beliefs related with alternative assessment methods about drawing attention of students to the subject, considering development level of students, and ability to improve students' interest to the course were not supported by O-PDM.

CHAPTER V

DISCUSSION AND CONCLUSION

In this chapter, researcher is going to evaluate the findings revealed in results chapter. Main purposes of this study were mainly to design and develop an online professional development material (O-PDM), to investigate attitudes and perceptions of the participants about this material in design and development processes, and to validate that material by exploring its effect on teachers' beliefs, knowledge and practices.

5.1. Discussion of Prototyping findings

5.1.1. What are the perceptions of the science and technology teachers towards online professional development material? (RQ 1)

This section encompasses four aspects of science and technology teachers' beliefs towards online professional development material. In first section, science and technology teachers' background about constructivist approach and alternative assessment and evaluation methods is interpreted. In second section, their views about content and design of the online professional development material are discoursed. In third section, participants' perceptions about which contributions that they have gained by experiencing online professional development material were covered. In last section, their opinions about comparison of online professional development training and face-to-face training were discussed.

5.1.1.1. What are teachers' perceptions about their background of technology use, and constructivist approach and alternative assessment and evaluation methods? (RQ 1.1)

This section is divided into two parts. In the first part, participants' background of technology use is discussed. Then, results related with their background of constructivist approach and alternative assessment and evaluation methods are conferred.

Background of technology use. It can be concluded from participants' responses that most of them declared use of computer and internet to prepare or download assessment activities, and to follow educational sites. Most of these teachers declared that they mostly download assessment activities to use them in class. However, very few of these teachers prepare assessment activities on their own. Most of them just download and use these activities in their lessons. This can be resulted since preparation of these activities requires much time and effort (Cepni & Coruhlu, 2010). Teachers mostly have lots of duties besides their teaching activities: membership of the examination commission, office meetings, school trips, competitions, conference, panel, theater work, exhibition, student clubs, ceremonies, training courses for students, lesson plan preparation, exam paper evaluations etc. (MoNE, 1992). These can take their time much and lead them to download and use ready materials and activities. Moreover, they would not know about software programs and sample documents which save times and let teacher to prepare assessment activities easily. Participants claimed that they have learned existence of these types of programs after use of O-PDM although they had used sample documents. Presentation of these technologies to teachers would help them to prepare their own assessment activities. Furthermore, participants mostly follow educational sites. By this way, they try to follow new knowledge and skills related with their profession. In the light of these results, it can be concluded that participants of this study presented familiarity to use internet for their professional growth.

Other activities employed by teachers with computers and internet were to prepare PowerPoint presentations, animation and video presentation and doing search. These also related with their enthusiasm to present content by using different media. Gulbahar and Guven (2008) claim that it is expected from teachers to use technology in education for growth in educational outcomes, increase in technological skills and reduction of anxiety in lesson preparation. Pringle, Dawson and Marshall (2002) state four ways to use technology in education: knowledge source, data organizer, information presenter and facilitator. This literature is also in line with results of this study. Teachers do search and follow educational sites to gain new knowledge and skills related with their subject. Second, they use computers as data organizer by downloading animations, videos, PowerPoint slides and new assessment activities to store. Next, they present animations, videos, and new content as a result of their research to their students by using technology as information presenter. Lastly, assessment activities used for formative evaluation and media presented can facilitate students' higher order skills such as observation, description, critical thinking and construction of examples (Pringle, Dawson & Marshall, 2002).

In the study, findings presented that all teachers attended in prototyping phase had their own computers at home. This shows common use of computers among science participants. This is very encouraging for online trainings developers since teachers' familiarity of computers and internet can diminish some infrastructure problems in application of online learning. Ocak (2011) declared three barriers in diffusion of blended teaching: instructional processes, community concerns, and technical issues. He identifies technical issues in two dimensions as difficulty of adoption to new technologies and lack of electronic means (internet access, hardware software problems). Common use of computers would be encouraging for instructional designers to create online learning environments to have fewer concerns about technology adoption, and hardware-software problems.

Background of constructivist and alternative assessment and evaluation methods. About half of the seventeen teachers participated in prototyping procedures claimed that they had taken in-service training about constructivist learning and

teaching principles. But, only five of these teachers confirmed discourse of alternative assessment and evaluation methods. This is parallel with study of Cepni and Coruhlu (2010). They investigated barriers to the use of alternative assessment and evaluation methods with 40 science and technology teachers. 87.5 % of these participants did not attend any in-service training about these alternative assessment and evaluation methods. Besides, they claimed these in-service training did not meet their needs for achieving knowledge and skills required to apply new curriculum principles.

Study findings revealed that remaining half of the participants of prototyping cycles could not attend in-service trainings since these trainings only applied between years of 2004 and 2007. Teachers occupied after 2007 would not have chance to take these in-service trainings since these trainings were not on-going trainings. They were arranged as one-shot two-day or three-day trainings. These problems showed that face-to-face one-shot trainings are not as efficient as ongoing trainings over different times (Cepni & Coruhlu, 2010). Online trainings give opportunity to train developers to discourse of the professional development content ongoing. Growth and use of online trainings can be solution for deficiencies of face-to-face one-shot trainings.

Yayla (2011) investigated self-efficacy of science and technology teachers towards alternative assessment and evaluation methods. She found that especially experienced teachers could not get to know these alternative methods because of inadequate pre-service and in-service trainings. She advised in-service trainings to acquaint these teachers of alternative assessment methods. Moreover, Kilic, Kaya and Kurt (2012) also marked that teachers does not prefer to use alternative assessment and evaluation instead of standard ones and they should be informed about these methods. Finding of this study also presented similar results with literature discussed above. About half of the seventeen participants declared need for in-service training about alternative assessment techniques. Both experienced and inexperienced teachers expressed that they had troubles in preparation and application of these alternative assessment methods.

5.1.1.2. What are the teachers' perceptions about the content and design of the online professional development material? (RQ 1.2)

Content. In sum of all three phases, participants stressed on accuracy, appropriateness to practice, clarity, conciseness, completeness and importance of content. They declared positive expressions about accuracy of the content in O-PDM. This result was consistent with responses of internet tutorial attitude questionnaire (ITAQ). Researcher and content expert adhered to guide books and reports of MoNE in preparation processes of content. This might lead satisfaction of participants about accuracy of the content.

Second issue was about appropriateness of content for practice. Teachers had negative impressions about content if they see method explained as inappropriate for classroom practice. In these situations, content of assessment methods should be enriched to diminish teachers' negative prejudice about alternative assessment and evaluation method. In this study, participants of second cycle proposed negative opinions about some alternative assessment and evaluation methods since they thought these methods were hard to implement in class settings. According to these considerations, researcher and content expert revised content of these methods. They supported content of these methods with topics about how to make easy to apply these methods and how to deal with problems related to classroom practices. These ensued with success since third evaluation checklist results presented confirmation of participants about appropriateness of all content for classroom practice.

As indicated in findings, clarity of content was another important issue according to participants' evaluation. In sum of all three cycles, participants provided positive feedback about clarity of content in interview sessions and C-PE. It was also consistent with results of ITAQ. Participants agreed that information given in O-PDM was clear according to responses of Item 7 in first cycle evaluation. Moreover, mean scores of this item which is related with clarity of content were 4.59 (*SD*=0.71) and 4.64 (*SD*=0.51) respectively in second and third prototype evaluations.

Furthermore, learners emphasized conciseness of content. They proposed content to be short and clear. They did not want to read useless and boring content. According to cognitive load theory, there are two types of memory that we use in learning or retrieving information: working memory and long-term memory. Although it is supposed that long-term memory is unlimited to store information, working memory has constraints. Sweller (2005) argue that information in working memory can be lost in 20 seconds without rehearsal. This explains limitations of working memory very clearly. In this study, participants also preferred to read only what is supposed to be learned from them to use resources of limited working memory.

According to evaluations of participants, learners cared about completeness of the content. In first cycle, participants gave opinions about exemplar and expository text. In second cycle, they found descriptive, expository, exemplar and video content rather shallow. This means that content should satisfy users of an online professional development material. They want both concise and complete content. This issue also revealed in results of ITAQ. The mean score of Item 2 was related with completeness of content. Participants gave rather low responses to this item in first cycle evaluation compared to second and third evaluation results. After enhancements made by designer and content expert in content, results of checklist for prototype evaluation (C-PE) and ITAQ presented participants' satisfaction about completeness of content in third cycle evaluation. In all cycles, participants complained about completeness of exemplar content. They wanted to see examples of topics and ready-materials in online professional development material. Similar to these results, Gelbal and Kelecioglu (2007) proposed that preparing alternative assessment and evaluation methods and providing for use of teachers would be helpful for teachers having problems in use of these methods. Arslan et al. (2009) also advise to develop and distribute ready instruments for teachers' use. According to considerations of participants and related literature, researcher and content expert increased number of example and sample forms from first to third prototype continuously. There were 7 samples in first prototype. It grew to 19 unique samples in second prototype and almost 100 unique samples in third prototype. These increases in number of samples resulted with positive attitude and perception of participants based on responses of

ITAQ and C-PE. For example, Item 5 was to measure the instructiveness and completeness of example and sample forms in O-PDM. Participants responded relatively low to this item in first cycle evaluation compared to second and third prototype evaluations. Mean score for Item 5 rose from 4.18 to 4.50 in second and third cycle evaluations respectively. Although there were positive perceptions about increase in number of samples, some participants found it inadequate in third prototype evaluations. This can be explained majority of teachers' needs of examples and samples about alternative assessment and evaluation methods. This result is parallel to considerations of EREDED (2006) report. Designers and content experts should be more considerate about completeness of content in needs analysis and content analysis phases while developing online professional development material. Moreover, as the more examples and samples used in these online materials, this increases perception of participants about material in positive direction.

As inferred from comments of O-PDM users, they also evaluated importance of content. They valued the topics or methods more if they see them important. Huizing (2000) also stresses on importance of content of web-sites. He marks that web-sites should provide value to users by increasing the extent to which website is informative.

Design. According to study findings, participants gave opinions about multimedia, color scheme and visual appeal of O-PDM. Firstly, participants did not give feedback about multimedia issues in first cycle because of its unsophisticated design. Multimedia components were rare in this design. These findings were inline with results of ITAQ. In first prototype evaluation, users scored low on Item 14 measuring satisfaction of users about multimedia support. Considering this issue, design & development team decided to support O-PDM with multimedia components. They added pictures of exemplar content, pdf file viewer module, and two videos about install and use of CMap Tools program. These resulted with increase in responses to 14^{th} item about multimedia support. After additions of multimedia components, mean score of this item was 4.29 (*SD*=0.69) in second cycle evaluation. Moreover, additions of multimedia component such as video and graphics also produced

positive change in mean score of Item 14 as it rose to 4.86 (*SD*=0.36) in third prototype evaluation. Third cycle ITAQ results were also consistent with responses to C-PE. There was no problem reported related with multimedia issues in C-PE of third cycle evaluation.

In total, results presented positive impressions about use of videos in O-PDM. They wanted to see how-to-do videos in professional development material related with content. By this point of view, it can be concluded that users have preference for multimedia items in online learning materials. Mackey and Ho (2008) argue that use of multimedia is crucial in comprehension of learners. Likewise, Moreno and Valdez (2005) also support use of multimedia because of its potential of promoting meaningful learning by increasing number of representations and student interactivity.

Design issues of multimedia was seen another important issue by users. In second cycle, some participants had trouble with enlargement of graphics. They reported problems with small resolution screens. Researcher and design & development members solved this issue with presenting graphics and videos by overlaying it into whole screen. Thus, users had chance to view graphics and videos without trouble with all size screen resolutions. These results support importance of user-centered design of multimedia elements. Mackey and Ho (2008) argue that designers should be considerate about screen resolutions to guarantee that all users could see the elements in a web page properly.

Presenting graphics and videos by overlaying it into whole screen solved another problematic issue about presentation of pdf modules. In second cycle, addition of pdf modules in order to show sample and example forms came up with problem: slow page loading. It can be seen from ITAQ results that results of Item 13 (measuring satisfaction of users about page loading) was satisfactory in first cycle evaluation. However, it was relatively low in second cycle evaluation (*M*=4.12, *SD*=0.99). After removing these pdf modules and using different script to show these examples and

sample forms resulted with fast loadings of these forms. This design change lead mean score of Item 13 to rise 4.86 (*SD*=0.36) in third prototype evaluation.

Second, results of interviews, C-PE and ITAQ presented that participants gave attention to color-scheme of O-PDM. They did not want too many different colors in online material. Rather, they prefered few consistent-colors for online material. Parallel to that result, Johnson (2010) expressed that color perception of human beings has limited color vision. For that reason, Chapman (2010) marked that use of five different colors would be sufficient to present websites to users. But, he also advised that designer should be flexible to increase and decrease the number of colors used in design process according to needs of the website.

Furthermore, participants in this study preferred to see bright, attractive colors in online material instead of pale, formal and non-attractive colors. In another study, user preference for educational sites was about use of colorful pages (Baturay, 2007). According to study of Baturay (2007), users respected use of soft or light colors in-harmony for educational sites. In first prototype, researcher used template for visual design of online material. He did not have chance to change color of template. Number of colors used in this template was found too many by participants in first cycle interview results. Design & development members decided to use few numbers of colors in online material in second prototype. Complaints about number of colors diminished in second prototype evaluation. However, there were new complaints about choice of colors. They advised to use more bright and attractive colors in second prototype evaluation. In third prototype, design & development members considered these recommendations in re-development of third prototype. After use of warm colors in visual design of O-PDM, both C-PE and ITAQ results of third prototype evaluation revealed positive user feedbacks about color-scheme.

Third, users emphasized visual design of O-PDM according to interview results. They preferred it unique and created related with content. For example, a first cycle user declared that using a picture not related with content affected his attention negatively. Second cycle users rather advise using colorful icons, clipart, and

pictures related with content to enhance visual design of O-PDM. After fulfilling participants' needs in third prototype, C-PE results presented that most of the users found visual design appropriate. These results were consistent with ITAQ results of users towards O-PDM. In first cycle evaluation, one of the participants gave "Disagree" response and response of another participant was "Neutral" to Item 12 (Pages designed well). Remaining two participants rated this item as "Agree" in first cycle evaluation. After re-design and re-developments, the mean scores of this item was 4.41 (*SD*=0.94) and 4.79 (*SD*=0.43) in second and third cycle respectively. Additionally, users rated visual attractiveness of O-PDM low in first cycle. After revisions, the mean scores of their responses in second and third evaluation results were 3.65 (*SD*=1.27) and 4.36 (*SD*=0.74) respectively. According to these findings, it can be concluded that preparing unique visual designs which are consistent with content affects attitudes and beliefs of users positively towards online material.

Usability. In first cycle, there were no obstacles and issues about usability of O-PDM. This would be resulted because of simplicity of design, few use of multimedia, and no interactivity in O-PDM. The first prototype was HTML based and very easy to use and convenient. Moreover, users were familiar with this design of online material. There were no different and unfamiliar modules in this prototype. However, supporting second prototype with change in infrastructure, adding interactivity, multimedia and modules came up with usability problems. First of all, participants perceived login pages, long site addresses and broken links as barriers to navigation of O-PDM. They preferred to enter short site address and no login page to access O-PDM. Preferring no login pages and short site address presented that participants want to reach content as easy as possible. Broken link was another barrier to access content. Designers should be very careful about that issue since it blocks users to reach some part of the content. Revisions about these issues in third prototype resulted with positive responses to C-PE about navigation of O-PDM. Most of the participants in third cycle found login as easy and convenient, wrote web address without difficulty and accessed to all content directed by links of O-PDM.

Next, usability problems with new modules were criticized by participants in interviews. They argued that any text or expressions in these modules should be in their common language. They expressed negative perception about some English words in modules. After language package installations in third prototype, all of the participants agreed that use of this module become convenient and easy.

Lastly, usability issues with multimedia used in O-PDM were presented in second cycle evaluation. Five out of seventeen teachers perceived installation of video plug-in problematic since a plug-in which is not used common was integrated into O-PDM in second prototype. Although plug-in requires only one installation (if it is not installed on computer), participants had negative views about installation of this plug-in. In third cycle, using alternative common plug-in reduced problems since most of the participants presented no trouble about watching videos.

5.1.1.3. What are the teachers' perceptions about the contributions that they have gained by experiencing in online professional development material?

Study findings revealed that participants of this study perceived O-PDM as a guide for their professional development and for their practice in class. Moreover, science and technology teachers claimed that this O-PDM provided efficiency for them. They marked that if any teacher uses this material, s/he would be supported about alternative assessment and evaluation methods. They also declared that they saw this online material as complementary and comprehensive. Moreover, they perceived that O-PDM would contribute science and technology teachers in two dimensions. First, they would learn new alternative assessment techniques. Then, their misconceptions about alternative assessment and evaluation methods would be revealed. By using online professional development material, teachers would have chance to correct these misconceptions accurately. EREDED (2006) report also points out science and technology teachers' deficiencies about alternative assessment and evaluation methods. In this report, it is declared that teachers have inadequate knowledge about characteristics of these new methods. Moreover, there are many studies about science

and technology teachers' low level of knowledge about alternative assessment and evaluation methods (Dogan, 2007; Arslan, Avci & Iyibil, 2008; Yayla, 2011; Kuran & Kanatli, 2009). Considering these studies, O-PDM can help teachers to gain knowledge about alternative assessment methods and to diminish their misconceptions about alternative assessment methods.

Besides, O-PDM would support teachers on their classroom assessment practices considering participants' perceptions about contributions of O-PDM on knowledge and clearing up misconceptions about alternative assessment methods. Sixteen out of twenty-one teachers declared that they can use samples and templates provided in O-PDM in class assessment activities. By using these ready activities which are categorized according to units in three grade levels, teachers can enrich their assessment practices by using them for taking feedback after completion of each unit. Moreover, they have chance to give these assessment practices as homework. It is very convenient to distribute these assessment activities to students both online and printed since they can be downloaded in portable document format (PDF). One of the participants declared positive use of these assessment materials to provide students with different presentations, views, and activities.

Last contribution of O-PDM was to provide efficiency to science and technology teachers. Preparation and application of alternative assessment and evaluation methods is seen hard and time consuming activity for teachers (EREDED, 2006; Cepni & Coruhlu, 2010). Providing ready assessment materials and templates, and giving chance to all users to share their own materials with peers are essential parts of this O-PDM. Owing to this support of O-PDM, teachers might improve their in class assessment activities without consuming time in preparing these activities. Moreover, participants of this study expressed positive opinions about instructions given about use of CMap Tools software program. They declared that they can use CMap Tools software in preparation of concept maps without trouble.

5.1.1.4. What are the teachers' perceptions about comparison of online professional development training and face-to-face training

More than half of the teachers declared their opinions about positive and negative sides of online professional development training. All of these teachers gave positive opinions about this type of training. They emphasized three main advantages of online training: accessibility, efficiency and being up-to-date. First, participants marked that further number of teachers can access online in-service trainings anytime and anywhere. Parallel to this result, there are lots of studies emphasizing flexibility of online learning environments that users can access content whenever and wherever they have connection (Benson, 2004; Nelson, 2008; Shin & Lee, 2009; Metz, 2010). Second, users of O-PDM expressed efficiency of online in-service trainings that online in-service trainings can be taken in free times. Most of the face-to-face in-service trainings are held after working hours. This may lead teachers to think in-service trainings as an extra workload. In this perspective, teachers see online in-service training effective since they can regulate training hours according to their time schedule (Metz, 2010). In line with these results, time efficiency of asynchronous online education is emphasized in another study as it is convenient for students to determine training time according to their own schedule (Nelson, 2008). Lastly, participants of O-PDM pointed out another advantage of online professional development training that it can be kept up-to-date frequently. However, this is much more difficult issue in face-to-face in-service trainings. Parallel to this finding, literature also supports that online in-service training products supply most up-to-date content for professional development (Nelson, 2008; Baran, 2008; Ersoy, 2009).

Participants giving feedback about face-to-face learning expressed mostly negative opinions: incompetent trainers, shallow content, and lectures without practice. Participants of this study argued that face-to-face trainings are not given by competent trainers. This result can be explained by high number of training required for in-service teachers. After curriculum change, MoNe should have given in-service training to nearly 600,000 teachers. And, MoNE would not provide competent trainers for all of these face-to-face training sessions.

Additionally, participants expressed that shallow information was given in face-to-face in-service trainings. Training hours are also limited in these in-service trainings to distribute these trainings to high number of teachers. Limited training sessions would impede trainers to give content in detail. For example, one of the participants declared that two day in-service training was arranged to inform them about new curriculum change. In this limited time period, there is no way to expect trainers to explain content in detail. As discussed in section 5.1.2.1, these limited one-shot trainings are not sufficient to meet teachers' needs.

Lastly, participants stated that face-to-face in-service trainings were given without practice. They did not want to be trained by direct teaching. Rather, they wanted these training to be held with activities and practices. They argued that text-based PowerPoint presentations held by trainers were not effective to teach in-service training content. They wanted to see how to apply new information into class settings in these in-service trainings. They expected to see presentation of examples related with content in these face-to-face trainings. In online professional development trainings, it is easy to add multimedia components like videos explaining how to apply all information in classroom practices. Moreover, lots of examples related with content can be put into online trainings. Online learning materials may be a solution to teachers' needs about activities and practices in trainings. They can be integrated into face-to-face training programs as supplemental material.

Although most of the participants have negative opinions about face-to-face in-service trainings, some teachers believe that these trainings were held properly. And, they pointed out that content in these trainings were explained well.

Most of the participants giving feedback about their choice of delivery method for in-service training had chosen online learning method to take in-service trainings. They expressed advantages of online learning over face-to-face learning: accessibility and flexibility. Only two teachers were against pure online in-service training. One of them pointed out that teachers cannot take responsibility for their professional development. So, there should be an authority to control and let them to take in-

service trainings. He expressed that effective training can be provided only by face-to-face. Other teacher who did not support pure online training stated blended use of online training materials. She insisted on use of online training materials as supplemental following face-to-face in-service training to gain maximum benefit.

To recap, participants of this study declared advantages of online in-service training over face-to-face training such as accessibility, flexibility, and being up-to-date. There was no expression about disadvantages of online training. Most of the participants giving feedback about face-to-face training marked disadvantages of it as incompetent trainers, shallow content and lectures without practice. Moreover, most of the teachers were eager to choose online in-service training for professional development instead of face-to-face training.

5.1.2. What are attitudes of the science and technology teachers towards online professional development material? (RQ 2)

The attitudes of learners might affect their behaviors. Positive attitudes towards a material would promote adoption and usage of online material. Thus, attitudes of learners towards prototypes of O-PDM were evaluated in three cycles. Attitude results of the learners shed light into re-design and redevelopment of following prototype. They expressed their attitudes towards O-PDM on a five point scale (1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly Agree).

There were fourteen items evaluating participants' attitudes towards O-PDM. All items and responses to these items were considered by researcher and design & development members while creating next prototype. They attached importance to items to be rated "Strongly Disagree" and "Disagree" in first prototype evaluation. These items and actions performed for results of these items will be discussed in this section.

In the first prototype, two over four participants graded Item 14 (Multimedia support in pages is enough) with "Strongly Disagree" response. Considering these low

scores, two videos and example pictures of alternative assessment techniques examples were added into O-PDM in second prototype. These design and development considerations affected attitudes of participants attended in second prototype evaluation positively. They graded better for this item in second prototype evaluation (*M*=4.29, *SD*=0.69). In third prototype, number of videos and pictures were also increased to get better attitudes scores from participants for Item 14 which is related with multimedia support. This also resulted with positive increase on attitudes scores of participants on this item (*M*=4.86, *SD*=0.36). This result presented that design considerations related with multimedia affected participants' attitudes positively.

Attitude scores of three items had at least "Disagree" responses. These items were 5th item (which evaluates whether images contained in the pages are instructive and enough), 11th item (which evaluates whether pages are visually attractive), and 12th item (which evaluates whether pages are designed well).

In the first prototype evaluation, one of the participants gave "Disagree" response to Item 5 (Images contained in the pages is instructive and enough) while evaluating instructiveness and sufficiency of images in O-PDM. Similar results were also revealed in interview data. In interview sessions, participants declared to see more example images related with all alternative assessment and evaluation techniques. These low attitude scores and interview results were taken into consideration. Then, images showing example of each assessment technique were created and put into second and third prototypes of O-PDM. These also resulted with positive increase in mean scores of participants' attitudes towards Item 5 which is related with sufficiency and instructiveness of images in second and third prototype evaluations (*M*=4.18, *SD*=0.88; *M*=4.50, *SD*=0.52 respectively).

Two over four teachers graded Item 11 (Pages are visually attractive) with "Disagree" response in first prototype evaluation. In first prototype, designer and his team used an educational template to create web-pages. However, both interview and internet tutorial attitude questionnaire results presented negative perceptions and low

scores on evaluation of visual appeal of O-PDM. Use of unique template for second prototype was resulted with mean score of 3.65 (*SD*=1.27) for Item 11 in second cycle evaluation. In third prototype, some adjustments were made on visual design of template which was prepared for second prototype. These also increased participants' attitude scores of Item 11 related with visual attractiveness of O-PDM. Mean score for this item was 4.36 (*SD*=0.74) in third cycle evaluation.

Item 12 (Pages designed well) was asked to evaluate participants' attitudes related with design of the pages. One over four participants in first prototype evaluation responded "Disagree" for this item. In interview data of first cycle evaluation, participants reported incompleteness of design of O-PDM. They advised some changes in design of links and "Sample" page. According to these considerations, design adjustments were put into action to complete design of O-PDM. In second prototype evaluation, participants graded Item 12 with mean score of 4.41 (*SD*=0.94). After making enhancements in multimedia objects in third prototype, mean score of this item rise into 4.79 (*SD*=0.43) in third cycle evaluation.

To recap, design and development members investigated participants' attitudes and they made revisions on O-PDM accordingly. Study results presented that users give importance to multimedia support of the online professional development training. Integration of videos and images related with text-based content may increase their attitudes positively towards the O-PDM. Furthermore, use of unique template instead of pre-prepared template, centering web-site, and adding background image also can support participants' attitudes positively towards visual attractiveness of the O-PDM. Lastly, using attention taking buttons for links, overlaying all multimedia content on top of current page, adding modules to increase asynchronous communication facilities might improve attitudes of participants towards page design of online professional development material.

5.2. Discussion of Final Study Findings

5.2.1. Are there any differences in teachers' perceived-knowledge, perceptions, practices, and self-efficacy about alternative assessment and evaluation methods before and after use of the online professional development material? (RQ 3)

In this section, study results revealed during implementation of final product to seventeen science and technology teachers are discussed. There are four dimensions to be discussed in this last implementation. First dimension is whether use of O-PDM has impact on perceived-knowledge of participants about alternative assessment and evaluation techniques. Then, how their perceptions about use of alternative assessment and evaluation methods change after use of O-PDM was conferred. Additionally, effects of use of O-PDM on participants' use frequencies of alternative assessment and evaluation methods were explained. Lastly, changes on self-efficacy beliefs of participants about alternative assessment and evaluation methods were discussed.

5.2.1.1. Are there any differences between teachers' perceived-knowledge about alternative assessment and evaluation methods? (RQ 3.1)

Final study results showed that before implementation of O-PDM, most of the participants of final study had perceived-knowledge about peer evaluation, observation, concept map, self evaluation, portfolio, project, presentation, diagnostic tree and poster methods. More than half of these participants were knowledgeable about interview and rubric methods according to their reports. And, only about half of them had perceived-knowledge about vee diagram and structural communication grid.

After use of O-PDM, all of the participants declared that they are knowledgeable about observation, concept map, self-evaluation, portfolio, project, presentation, and poster methods. Peer evaluation technique, interview, rubric, diagnostic tree and

structural communication grid techniques were stated as knowledgeable by sixteen over seventeen participants. Lastly, only two participants declared that they are not knowledgeable about vee diagram after use of O-PDM. It can be inferred from results that there were increase in number of knowledgeable participants among all techniques after online training. The findings about participants' gain of knowledge are also supported by relevant literature (Hull & Saxon, 2009; Hou & Wu, 2011; Lan, Tsai, Yang & Hung, 2012; Chen & Wu, 2012). Lin, Hou, Wang, Chang (2012) pointed out features of an online continuing education course as development of higher level of cognitive skills for a specific domain and ability to practice adequate knowledge to a specific domain. Another study of Cacciamania, Cesarenib, Martinib, and Ferrinic (2012) also supported online learning environments that high levels of participation, a supportive facilitator style, and sufficient opportunities for metacognitive reflection of students promote knowledge building of learners.

5.2.1.2. Are there any differences between teachers' perceptions about use of alternative assessment and evaluation methods in lessons? (RQ 3.2)

According to final study result, most of the participants agreed on that observation, concept map, project, presentation, and poster alternative assessment and evaluation methods were appropriate to use in lessons before use of O-PDM. Moreover, more than half of the participants declared use of interview, self-evaluation, portfolio, rubric, and diagnostic tree methods as appropriate before implementation of online professional development training. Techniques such as peer evaluation, vee diagram, and structural communication grid methods were seen as appropriate in classroom practice by less than half of the participants before implementation.

After use of O-PDM, most of the participants declared use of all alternative assessment techniques as appropriate in lessons except peer evaluation. Nine out of seventeen participants agreed on use of peer evaluation method as appropriate in lessons after implementation of O-PDM. However, in this method, three participants

changed their beliefs about appropriateness of use of this method in lessons from negative to positive.

Figure 4.6 presented growth in number of participants who perceive appropriate use of each alternative assessment methods except observation method arter online training. These increases varied from one to nine participants. There was no change in the number of participants considering use of observation technique in lessons as appropriate. It was sixteen out of seventeen both before and after implementation of online professional development training. No change in observation technique can be resulted because of high number of teachers agreed on use of this technique in lessons as appropriate before implementation of material. It can be inferred from study findings that use of O-PDM might generally affect beliefs of participants positively about appropriateness of alternative assessment and evaluation methods' use in lessons.

5.2.1.3. Are there any differences between teachers' use frequencies of alternative assessment and evaluation methods before and after use of the online professional development material? (RQ 3.3)

In this section, findings regarding to changes in science and technology teachers' classroom practices after use of O-PDM is discussed. The results of checklist for material validation presented positive changes in teachers' applications and practices about alternative assessment and evaluation methods. Although about more than half of the participants kept using the same use frequencies of alternative assessment methods, there were also improvements about use frequencies of participants. For example, there were changes in participants' practices from never use to at least once in a semester in all alternative assessment methods after use of O-PDM. Additionally, there were also growths in use frequencies of participants who were already using these methods at least once in a semester before implementation. Parallel to these results, there are many studies showing positive effect of online learning materials about participants' behavior change in literature (Thompson, Baranowski, Cullen & Baranowski, 2007; Cheong, 2010; Zhan, Xu, and Ye, 2011;

Lau & Woods, 2009). Zhan, Xu, and Ye (2011) suggest that online learning environments can be used as effective materials to improve learners' performances. In another study, it is pointed out that exposure of training through online multimedia learning system affected inexperienced users' beliefs and intentions to use learning objects positively. This study findings revealed that online multimedia learning material also helped to reduce gaps between experienced and in experienced participants' gaps about belief and intention to use learning objects (Lau & Woods, 2009).

5.2.1.4. Are there any differences between teachers' self-efficacy scores in alternative assessment and evaluation methods before and after use of the online professional development material? (RQ 3.4)

To investigate beliefs of participants about alternative assessment and evaluation methods, self-efficacy questionnaire was used in this study. There were 21 items in total. 11 over 21 items were positive and the rest were negative. With regard to positive items, study results revealed that the mean scores of 8 out of 11 items were increased after use of O-PDM. After online professional development training, participants' self efficacy beliefs were increased about providing a meaningful way of learning, improving attitudes of students, adding new values to students, determining students' level of readiness, using opportunities of school and surroundings, giving feedback to students, and directing students to reach resources by using alternative assessment and evaluation methods. These results were acceptable since the aim of this O-PDM was to increase science and technology teachers' knowledge and competencies about alternative assessment and evaluation methods. However, there were no mean difference in responses of Item 7 and Item 12 before and after implementation. Additionally, there was a slight decrease in mean score of Item 10 after use of O-PDM. 7^{th} and 12^{th} items evaluated participants' self-efficacy beliefs about drawing attention of students to the subject by using alternative assessment methods and considering development level of students while choosing assessment methods. And, 10^{th} item assessed participants' self-efficacy

beliefs about ability to improve students' interest to the course by using alternative assessment methods. Abdullah (2004) argue that one of the techniques that teachers can use to draw attention and interest of students to subject matter and to the course is asking questions to students. To perform that, teacher can use quizzes, competitions, assessment activities etc. In this respect, it is expected from participants to increase their self-efficacy levels to draw attention and take interest of students by using alternative assessment and evaluation methods after use of online professional development training (Thompson, Baranowski, Cullen & Baranowski, 2007). Conversely, there were no change and decrease in mean scores of items related to these competencies in this study. It can be inferred from these results that content given in this O-PDM is not adequate to support participants' knowledge about use of alternative assessment methods as tools to draw attention and to improve interest of students to the course. Moreover, it can be concluded that O-PDM does not include content to inform science and technology teachers about which alternative assessment technique should be used in which development level of students. These can be seen deficiencies of content given in O-PDM. Content of O-PDM should be enriched accordingly.

With respect to negative items, study results revealed decrease in mean scores of all these self efficacy items after implementation of O-PDM. After use of online professional development training, participants' self-efficacy beliefs were decreased about confronting problems with problems in timing, having trouble about assessing students' attitudes towards the course, having trouble while choosing type of method, having trouble in class management in application of methods, having trouble in determining the criteria for evaluating products, and having trouble in assessing students' knowledge and skills while using alternative assessment and evaluation methods. There has been also decrease in self-efficacy beliefs of participants about having trouble and facing with problems in finding resources in creation process of alternative assessment and evaluation methods after use of O-PDM. Lastly, participants self-efficacy beliefs decreased about having toruble in grading students' products created as a result of alternative assessment and evaluation methods.

Both positive and negative items results were typical except three positive items (7th, 10th, and 12th). Bandura (1994) declares most effective way of building sense of efficacy is mastery experience. Mastery experience is satisfaction of person to succeed a task since he/she performed it completely in previous experiences. Additionally, Girasoli and Hannafin (2008) pointed out that asyncronuous scaffolding learning can improve students' mastery experiences. They argued this type of online learning tools should be created to increase self-efficacy of students. In this study, results also revealed that after implementation of O-PDM, teachers mostly increased their perceived-knowledge about alternative assessment and evaluation methods, and they started to practice these assessment techniques more in lessons as discussed in 5.2.1.3. These results were also inline with model of process of teacher change in Figure 3.1 (Guskey, 1986). Guskey marked three changes which can be resulted by professional development in an order: change in teachers' classroom practices, change in students' learning outcomes, and lastly change in teachers' beliefs and attitudes. Effect of online professional development training on teachers' classroom practices and their beliefs and attitudes were investigated in this study. However, students' learning outcomes were not in scope of this study. Study findings depicted that participants' classroom practices were increased after use of O-PDM. And this might lead to growth in self-efficacy beliefs of them towards alternative assessment and evaluation methods. Lastly, Cheong(2010) investigated the effect of online learning environment on the pre-service teachers' teaching efficacy, and the difference of changes between individual teaching practice and collaborative teaching practice in their teaching efficacy. He stated that online learning environments have impact on pre-service teachers' teaching efficacy beliefs. Furthermore, he marked that practices in these online learning environments had more positive effect on their beliefs than their individual practices.

5.3. Implications for Practice

Findings of this study provided some implications related to pedagogy, policy, and design/development about preparation of online professional development programs.

To start with pedagogical implications, diffusion of technology into professional development programs should be concerned since science and technology teachers find this type of delivery method more accessible, efficient and up-to-date. Moreover, computer use of these teachers was very common, and they had reported no technological problems while taking online professional development training. Like many other literature suggestions (Cepni & Coruhlu, 2010; EREDED, 2006), this study also confirmed that teachers should be supported by both ready materials and software programs. These software programs should help teachers to prepare ready materials on their own. In these online programs, introduction and use of these software programs can increase efficiency of in-service training. Multimedia features of online trainings can be used to perform these issues.

Specifically, professional development for alternative assessment and evaluation methods might contain direct information about how to use these methods to increase students' attention and interests to the course and topics. Moreover, participants should be informed about which alternative assessment methods can be used in each grade level.

If we concern policy implications, online professional development programs might contribute MoNE to decrease costs of in-service face-to-face trainings and to reach more teachers who need these trainings. Although MoNE had steps to prepare their own online professional development programs; this effort is in its infancy. MoNe should concern to this issue and employ design and development teams to create and evaluate online in-service training programs. Besides, stake-holders such as universities, non-governmental organizations, foundations for corporate social responsibility can give support to MoNE to prepare these online in-service trainings to reduce cost of creation of these online materials and programs. Also, these online programs can be used to support face-to-face trainings as blended learning model. They can be solution to satisfy in-service teachers' needs even after these face-to-face trainings were ended.

At least little changes in curriculum come up with training of high number of teachers. To reach all of these teachers, online professional development programs can be a solution to give them correct, high quality and practical courses. Moreover, by using online professional development programs MoNE can give continuous in-service trainings rather than one-shot face-to-face trainings. Learners can access online trainings wherever and whenever they need. Thus, these online trainings would support in-service teachers during their teaching profession.

Lastly, implications related to design principles will be discussed. While preparing content of online professional development programs, designers should be considerate about accuracy of the content. Users ought to be informed about source of the content. Moreover, content framework can be prepared in line with the training program of the institution for which online program is prepared. Moreover, content should include not only theoretical information but also practical information. It can involve information about how to apply theoretical information into classroom settings. Videos, interactive modules might be used for comprehension of practical information by users. Both problems related application of theoretical information and solutions to these can be dramatized or simulated.

Cognitive load principles should be also considered while design and development of online professional development programs. Content should contain concise and clear information. Multimedia components should be designed to decrease overload of working memory. Designers should give emphasis on needs analysis and content analysis phases to prepare sufficient content for online professional development material. While creating content for professional development, designers should rather rely on more examples and activities instead of long theoretical information texts in order to increase comprehension level of learners. Lastly, importance of content should be present in online professional development materials to increase motivation and attention of learners.

While design/development phases of online professional development, multimedia support should exist and multimedia components of online material should be

designed not to cause any usability problem. All components should be created according to low or high screen resolutions, and be supported by common plug-ins. Moreover, online material users give emphasis to visual design and choice of colors. Unique web-designs can be used to satisfy preference of users about visual design. These visual designs should not include any components which distract attention of users from the intended content. Additionally, these unique designs should be created associated with content given in online material. If we consider color-scheme, warm colors might be used to appeal learners. Lastly, users emphasize use of multimedia in online professional development trainings. Designers should be considerate about integration of enough multimedia into online professional development trainings.

5.4. Implications for Research (Further Studies)

This study was employed to design and develop an online professional development material for science and technology teachers to inform them about alternative assessment and evaluation methods. Moreover, validation of this material was evaluated to understand whether their knowledge, beliefs, and applications differ after use of it. However, teachers in any other subjects like Mathematics, Turkish, History, and Geography also expressed need for in-service training for their professional development (EREDED, 2006). In further studies, new online professional development materials can be designed and developed for other disciplines. Moreover, teachers' classroom practices, beliefs, and attitudes were evaluated in this study. Another part of Guskey's model of process of teacher change was students' learning outcomes. In future research, this component also might be integrated into design of another study. Teachers' classroom practices, beliefs, and attitudes and students' achievement levels can be evaluated before and after use of online professional development material. These results can be compared to investigate validity of the online material. Moreover, 17 subjects were used and chosen according to purposive sampling methods in this study. Future research should include high number of subjects selected with random sampling strategy. Hence, inferential statistics can be used to make inferences to more general conditions rather than using descriptive statistics.

This study was limited to prepare design & development of online professional development material for computer use. Nowadays, utilization rate of other devices such as tablets, mobile phones is growing. MoNE is planning to distribute tablets to all students in public schools according to Movement to Increase Opportunities and Technology (FATİH) project. It is aimed with this project to gain maximum benefit from technology by integrating it with public education system. Accordingly, this diffusion of technology will increase use of such devices by teachers also. In further researches, new online professional development materials can be designed and developed in order to use them with such devices. In these studies, new design/development implications related with these new devices might be investigated.

Besides alternative assessment and evaluation methods, teachers also have problems with constructivist learning principles and practices. This online professional development material can be enriched by adding other components of constructivist curriculum change. In this study, material was designed and developed according to teachers' needs about alternative assessment and evaluation methods. However, in further studies, an online professional development material can be designed and developed to inform teachers about philosophy, paradigm, and principles of constructivist learning based on learners, instructors, learning processes, and instructional strategies etc.

REFERENCES

Abdous, M. & Yoshimura, M. (2010). Learner outcomes and satisfaction: A comparison of live video-streamed instruction, satellite broadcast instruction, and face-to-face instruction. *Computers and Education*, 55(2), 733-741.

Abdullah, S. H. Z. (2004). *The Role of English Teachers in Drawing Students' Attention in Salfit District Schools and the Factors Affecting Attention as Perceived by Teachers*. Unpublished doctoral dissertation, An-Najah National University, Nablus, Palestine.

AECT (2004) *The Meanings of Educational Technology*, Washington DC: AECT, Definition and Terminology Committee document, June 1, 2004.

Airasian, P. & Walsh, M. (1997). Constructivist Cautions, *Phi Delta Kapan*, *78*(6), 444-449.

Akçadağ, T. (2010). Öğretmenlerin İlköğretim Programındaki Yöntem Teknik Ölçme ve Değerlendirme Konularına İlişkin Eğitim İhtiyaçları. *Bilig*, *53*, 29-50.

Anderson, R. S. (1998). Why Talk About Different Ways to Grade? The Shift from Traditional Assessment to Alternative Assessment, *New Directions for Teaching and Learning*, *74*, 5-16.

Arslan, A. S., Avcı N., İyibil U. (2008). Fizik öğretmen adaylarının alternatif ölçme-değerlendirme yöntemlerini algılama düzeyleri, *D.Ü.Ziya Gökalp Eğitim Fakültesi Dergisi, 11*, 115-128.

Arslan, A. S., Kaymakcı, Y. D., Arslan S. (2009). Alternatif Ölçme-Değerlendirme Etkinliklerinde Karşilaşilan Problemler: Fen ve Teknoloji Öğretmenleri Örneği, *Ondokuz Mayıs Üniversitesi Eğitim Fakültesi Dergisi, 28*, 1-12.

Aydin, H. (2007). Yapılandırmacı yaklaşımda doğruluk, gerçeklik ve bilim eğitimi, *Üniversite ve Toplum. 7*(2).

Bandura, A. (1977). Self-efficacy: Towards a unifying theory of behavioral change. *Psychological Review*, *84*(2), 191-215

Bandura, A. (1994). Self-efficacy. In V. S. Ramachandran (Ed.), *Encyclopedia of human behavior*, Vol. 4. pp. 71-81. New York: Academic Press, Retrieved July 25, 2012, from http://www.des.emoiy.edu/mfp/BanEncy.html

Bandura, A. (1997). *Self-Efficacy: The Exercise of Control*. New York: Freeman

Barbosa, H., Garcia, F. (2005). *Importance of Online Assessment in the E-learning Process*. Paper presented at the ITHET 6th Annual International Conference, Juan Dolio, Dominican Republic.

Baturay, M. (2007). *Effects of web-based multimedia annotated vocabulary learning in context model on foreign language vocabulary retention of intermediate level English language learners*. Unpublished doctoral dissertation, Middle East Technical University, Ankara, Turkey.

Bernard, R. M., Rubalcava, B. R. d., & St-Pierre, D. (2000). Collaborative Online Distance Learing: Issues for Future Practice and Research. *Distance Education*, 21(2), 260-277.

Bhuasiri, W., Xaymoungkhoun, O., Zo, H., Rho, J. J., & Ciganek, A. P. (2012). Critical success factors for e-learning in developing countries: A comparative analysis between ICT experts and faculty. *Computers & Education*, *58*, 843-855.

Bichelmeyer, B.A. (2003). *Instruction theory and Instructional-Design Theory: What's the difference and why should we care? IDT Record*. Retrieved on May 5, 2012 from: http://www.indiana.edu/~idt/articles/documents/ID_theory.Bichelmeyer.html

Bichelmeyer, B.A. (2005). *The ADDIE "Model" - A Metaphor for the Lack of Clarity in the Field of IDT. IDT Record*. Retrieved from the Web May 18, 2012 at http://www.indiana.edu/~idt/shortpapers/documents/aect2004.htm

Black, P. & William, D. (1998). "*Inside the black box: Raising standards through classroom assessment*". Phi Delta Kappan, 80 (2): 139-148.

Bohner, G. & Wanke M. (2002). *Attitudes and attitude change*. Psychology Press, New York: Taylor & Francis.

Branch, R. M. & Merrill, M. D. (2012). Characteristics of Instructional Design Models. In Reiser, R. A., Dempsey, J. V. (Eds.), *Trends and Issues in Instructional Design and Technology (3rd edition)*. (pp. 8-16). New Jersey: Prentice Hall.

Brooks, M.G. & Brooks, J.G. (1999). The courage to be constructivist. *Educational Leadership, 57*(3), 18-24.

Butt, G. (2010). *Making Assessment Matter,* NewYork, USA: Continuum International Publishing Group.

Cacciamani, S., Cesareni, D., Martini, F., Ferrini, T. & Fujita, N. (2012). Influence of participation, facilitator styles, and metacognitive reflection on knowledge building in online university courses. *Computers & Education 58*. 874-884.

Can, N. (2008). Öğretmenlerin geliştirilmesi ve etkili öğretmen davranışları, *Sosyal Bilimler Enstitüsü Dergisi, 16*, 103-119.

Çaycı, B., Demir, M. K., Başaran, M. & Demir, M. (2007). Sosyal bilgiler dersinde işbirliğine dayalı öğrenme ile kavram öğretimi. *Kastamonu Eğitim Dergisi, 15*(2). p. 619- 630.

Çepni, S. & Çoruhlu, T. S. (2010). Alternatif ölçme ve değerlendirme tekniklerine yönelik hazırlanan hizmet içi eğitim kursundan öğretime yansımalar, *Pamukkale Üniversitesi Eğitim Fakültes Dergisi*, *28*, 117-128.

Chang, C. C., Chen, C. C. & Chen, Y. H. (2012). Reflective behaviors under a web-based portfolio assessment environment for high school students in a computer course. *Computers & Education 58*(1). 459-469.

Chapman, C. (2010, February 8). Color Theory for Designer, Part 3: Creating Your Own Color Palettes. SmashingMagazine, Retrieved June 30, 2012, from: http://www.smashingmagazine.com/2010/02/08/color-theory-for-designer-part-3-creating-your-own-color-palettes/

Charmatz K. (2007). A case study of the development of environmental action projects from the framework of participatory action research within two middle school classrooms. *Proquest Dissertations & Theses*, UMI Number: 3297420.

Chen, C. H., Wu, I. C. (2012). The interplay between cognitive and motivational variables in a supportive online learning system for secondary physical education. *Computers & Education*, *58*(1). 542-550.

Chen, I. (2008). Instructional Design Methodologies. In Kidd, T. & Song H. (Eds.), Handbook of Research on Instructional Systems and Technology (pp. 1-14). Hershey, PA.

Cheong, D. (2010). The effects of practice teaching sessions in second life on the change in pre-service teachers' teaching efficacy. *Computers & Education 55*(2). 868-880.

Chua, C.K., Leong, K.F. & Lim C. S. (2003) *Rapid Prototyping: Principles and Applications in Manufacturing 2nd edition*, Danvers, USA: World Scientific Publishing Co. Pte. Ltd.

Cinar, O., Teyfur, E. & Teyfur, M. (2006). İlköğretim Okulu Öğretmen ve Yöneticilerinin Yapılandırmacı Eğitim Yaklaşımı ve Programı Hakkındaki Görüşleri, *Eğitim Fakültesi Dergisi, 7* (11), 47-64.

Clark, R. E. (1983). Reconsidering research on learning from media, *Review of Educational Research, 53*(4), 445-459.

Clarke, D., Hollingsworth, H. (2002). Elaborating a model of teacher professional growth. *Teaching and Teacher Education, 18*(8), 947-967. Retrieved April 5, 2012, from Science Direct: http://www.sciencedirect.com/science/article/pii/S0742051X02000537

Çoruhlu, T. S., Nas, S. E. & Çepni, S. (2008). Fen ve teknoloji öğretmenleri için alternatif ölçme ve değerlendirme tekniklerine yönelik bir hizmet içi eğitim programından yansımalar: Trabzon örneği, *Necatibey Eğitim Fakültesi Dergisi, 2*(2), 1-22.

Creswell, J. W. & Miller, D. L. (2000). Determining validity in qualitative inquiry. *Theory into Practice, 39*(3), 124-131.

Desrosier, J. (2011). Rapid Prototyping Reconsidered, *Journal of Continuing Higher Education, 59*(3), 135-145.

Dey, I. (1993). *Qualitative Data Analysis* : A User Friendly Guide for Social Scientists. London: Routledge.

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

Dindar H. & Yangın S. (2007). İlköğretim fen ve teknoloji dersi öğretim programına geçiş sürecinde öğretmenlerin bakış açılarının değerlendirilmesi, *Kastamonu Eğitim Dergisi, 15*(1).

Doğan, A. B. (2005). *Fen Öğretiminde Değerlendirme Etkinlikleri Üzerine Öğretmen Görüşleri*. (Unpublished doctoral dissertation), Yüzüncü Yıl Üniversitesi, Fen Bilimleri Enstitüsü, Van.

Doğan, Y. (2010) Fen ve Teknoloji dersi programının uygulanması sürecinde karşılaşılan sorunlar, *Yüzüncü Yıl Üniversitesi, Eğitim Fakültesi Dergisi, 7*(1). 86-106.

Driscoll, M.P. (2002). *Trends and issues in instructional design and technology*. Reiser, R.A., & Dempsey, J.A. (Eds.). Upper Saddle River , New Jersey: Merrill/Prentice Hall.

Duffy T. M. & Jonassen D. H. (1992). *Constructivism and the Technology of Instruction: A Conversation*. New Jersey, USA: Lawrence Earlbaum Associates.

Duyff, R. L. (1999). The value of lifelong learning: Key element in professional career development. *Journal of the American Dietetic Association, 99*(5) 538-543.

EREDED (2006). Temel eğitim destek programı öğretim programlarının değerlendirme raporu. Retrieved from: http://earged.meb.gov.tr/earged/subeler/olcme_degerlendirme/dokumanlar/mufredat_degerlendirme/degerlendirme_raporu6/fen_ve_teknoloji.pdf

Ekici G. (2002). Biyoloji Öğretmenlerinin Laboratuvar Dersine Yönelik Tutumlarının Farklı Değişkenler Açısından İncelenmesi, *Ulusal Fen Bilimleri ve Matematik Eğitimi Kongresi*, 2002.

El Mansour, B., & Mupinga, D. M. (2007). Students positive and negative experiences in hybrid and online courses. *College Student Journal*, *41*, 242-248.

Ellington, H., & Aris, B. (2000). *A Practical Guide to Instructional Design*. Johor Bahru: Penerbit UTM Press. Retrieved March 30, 2012, from Google Books: http://books.google.com/books?id=QW6BqjAPLugC&pg=PA12&dq=aDDIE+instructional+design&hl=en&sa=X&ei=lSN2T626O6LW0QHWipTLDQ&ved=0CEUQ6AEwAA#

Erdoğan M. (2007). Yeni geliştirilen dördüncü ve beşinci sınıf fen ve teknoloji dersi öğretim programının analizi; Nitel bir çalışma. *Türk Eğitim Bilimleri Dergisi, 5*(2), 221-254.

Ertmer, P. A., & Newby, T. J. (1993). Behaviorism, Cognitivism, Constructivism: Comparing Critical Features from an Instructional Design Perspective. *Performance Improvement Quarterly, 6* (4), 50-72.

Fraenkel, J. R. & Wallen, N. E. (2005). *How to design and evaluate research in education (6th ed.)*. New York: McGraw-Hill.

Fouts, J. T. (2000). *Research on Computers and Education: Past, Present and Future*: Bill and Melinda Gates Foundation.

Frey, T.J. (2008) Determining the Impact of On-line Practicum Facilitation for In-service Teachers. *Journal of Technology and Teacher Education, 16*(2), 181-210.

Gelbal, S. & Kelecioğlu, H. (2007). Öğretmenlerin ölçme ve değerlendirme yöntemleri hakkındaki yeterlik algıları ve karşılaştıkları sorunlar, *Hacettepe Üniversitesi Eğitim Fakültesi Dergisi, 33*, 135-145.

Gentry L. B., Denton C. A. & Kurz T. (2008). Technologically-Based Mentoring Provided to Teachers: A Synthesis of the Literature . *Technology and Teacher Education, 16*(3), 339-373.

Girasoli, A. J. & Hannafin, R. D. (2008). "Using asynchronous AV communication tools to increase academic self-efficacy". *Computers & Education, 51*(4), 1676- 1682.

Göçebe, H. (2005). *MEB merkezi hizmetiçi eğitim kurslarının etkinliği ve yönetim becerilerine katkıları*. (Unpublished doctoral dissertation), Yeditepe Üniversitesi, Sosyal Bilimler Enstitüsü, Istanbul.

Goh, D. H. L., Chua A., Khoo D. A., Khoo E. B. H., Mak E. B.T. & Ng M. W. N. (2006). A checklist for evaluating open source digital library software. *Online Information Review, 30*(4), 360 – 379.

Gökdere M., Çepni S. (2005). Üstün yeteneklilerin fen bilimleri öğretmenlerine yönelik bir hizmet içi eğitim uygulama ve değerlendirme çalışması. *Türk Eğitim Bilimleri Dergisi, 3*(3) p. 271-296.

Golafshani, N. (2003). Understanding Reliability and Validity in Qualitative Research. *The Qualitative Report*, *8*(4), 597-606. Nova Southeastern University. Retrieved from http://peoplelearn.homestead.com/MEdHOME/QUALITATIVE/Reliab.VALIDITY.pdf

Gömleksiz, M. N. & Koç A. (2011) Bilgisayar Kullanımı Öğretiminde Akran Değerlendirme, Paper presented at *5th International Computer & Instructional Technologies Symposium*, Elazığ, TURKEY.

Gönen S. & Kocakaya S. (2006). Fizik Öğretmenlerinin Hizmet İçi Eğitimler Üzerine Görüşlerinin Değerlendirilmesi, *Pamukkale Üniversitesi Eğitim Fakültesi Dergisi*, 19(1), 37-44.

Gozutok, F. D., Gulbahar, Y., & Kose, F. (2007). Teacher training on human rights e-learning Ankara University. *Journal of Faculty of Educational Sciences, 40*(1), 135–156.

Gray, D. E. (2004). *Doing Research in the Real World*. London: SAGE Publications.

Gray, L., Thomas, N., & Lewis, L. (2010). *Teachers' Use of Educational Technology in U.S. Public Schools: 2009* (NCES 2010-040). National Center for Education Statistics, Institute of Education Sciences, U.S. Department of Education. Washington, DC.

Gronlund N. E. & Waugh C. K. (2006). *Assessment of Student Achievement, 9th edition*. Upper Saddle River, New Jersey: Pearson.

Gulbahar, Y., & Guven, I. (2008). A Survey on ICT Usage and the Perceptions of Social Studies Teachers in Turkey. *Educational Technology & Society, 11*(3), 37-51.

Guskey, T. R. (1986). Staff Development and the Process of Teacher Change. *Educational Researcher , 15*(5), 5-12.

Gustafson, K. L. & Branch, R. M. (2002). *Survey of instructional development models*. Syracuse, New York: Syracuse University.

Hançer A. H. (2007). Fen eğitiminde yapılandırmacı yaklaşıma dayalı bilgisayar destekli öğrenmenin kavram yanılgıları üzerine etkisi, *C.Ü. Sosyal Bilimler Dergisi, 31*(1), 69-81.

Hoadley, C. & Haneghan J. P. V. (2012). The Learning Sciences: Where They Came From and What It Means For Instructional Designers, In Reiser, R. A., Dempsey, J. V. (Eds.), *Trends and Issues in Instructional Design and Technology (3rd edition)*. (pp. 8-16). New Jersey: Prentice Hall.

Hosie, P. & Schibeci, R. (2005). Checklist and context-bound evaluations of online learning in higher education. *British Journal of Educational Technology, 36*(5), 881-895.

Hou, H. T. & Wu, S. Y. (2012). Analyzing the social knowledge construction behavioral patterns of an online synchronous collaborative discussion instructional activity using an instant messaging tool: A case study. *Computers & Education, 57*(2). 1459-1468.

Howey, S. C. (1999). The Relationship between Motivation and Academic Success of Community College Freshmen Orientation Students, *Dissertations & Theses*, Retrieved October 26, 2006 from http://proquest.umi.com/

Howard, S. B. (2009). The Benefits of Face-to-Face Interaction in the Online Freshman Composition Course. *Journal of Online Learning and Teaching 5*(4), 685-697.

Huizingh, E., K.R.E (2000). The content and design of web sites: an empirical study, *Information & Management, 37*(3), 123-134, Retrieved from the Web July 15, 2012 at: http://www.sciencedirect.com/science/article/pii/S0378720699000440.

Hull, D. M., Saxon, T. F. (2009). Negotiation of meaning and co-construction of knowledge: An experimental analysis of asynchronous online instruction. *Computers & Education, 52*, 624–639

Intel (2010). *Intel Öğretmen Programı Temel Kursu: Temmuz 2009 – Ağustos 2010 Değerlendirme Raporu*, Retrieved February 13, 2012, from http://cache-www.intel.com/cd/00/00/47/50/475064_475064.pdf.

Isikoglu, N., Basturk, R., Karaca F. (2008). Assessing in-service teachers' instructional beliefs about student-centered education: A Turkish perspective. *Teaching and Teacher Education, 1*(7).

James, E. A., Milenkiewicz, M. T. & Bucknam, A. (2008). *Participatory Action Research for Educational Leadership: using data-driven decision making to improve schools*. California, USA: Sage Publication.

Jang, S. J. (2008). The effects of integrating technology, observations, and writing into a teacher education method course. *Computers & Education, 50*, 853–865.

Januszewski, A., & Molenda, M. (2008). *Educational Technology: A Definition with Commentary*. New York: Routledge/Taylor & Francis Group.

Johnson, J. (2010) Many Factors Affect Learning. In Kaufmann, M., *Designing with the Mind in Mind*, (pp. 133-150), Boston: Elsevier Inc. Retrieved from the Web May 30, 2012 at http://www.sciencedirect.com/science/article/pii/B9780123750303000119

Johnson, J. (2010) Our Attention is Limited; Our Memory is Imperfect. In Kaufmann, M., *Designing with the Mind in Mind*, (pp. 79-95), Boston: Elsevier Inc., Retrieved from the Web May 30, 2012 at http://www.sciencedirect.com/science/article/pii/B9780123750303000077

Jones, T.S. & Richey, R.C. (2000). Rapid prototyping in action: a developmental study. *Educational Technology Research and Development, 48*(2), 63-80.

Kajornboon, A. B. (2005). Using interviews as research instruments. *E- Journal for Researching Teachers*, *2*(1). Retrieved from the Web July 23, 2012 at: http://www.culi.chula.ac.th/e-Journal/bod/Annabel.pdf

Katie, A. (2012). Quality Concerns Slow E-Learning Groth in China, *Education Week, 31*(19).

Katz, Y. Z. (2002). Attitudes affecting college students' preferences for distance learning, *Journal of Computer Assisted Learning, 18,* 2-9.

Kaya A., Küçük M., Çepni S. (2004). Fizik laboratuarlarına yönelik hazırlanan bir hizmet içi eğitim programının değerlendirilmesi, *Pamukkale Üniversitesi Eğitim Fakültesi Dergisi, 2004*(2).

Kerka, S., & Wonacott, M.E. (2000). *Assessing learners online: Practitioner file*. Washington, D.C.: Office of Educational Research and Improvement.

Kibby, M (1999). *Assessing Students On-line*. The University of Newcastle Retrieved June 3, 2008, from: http://www.newcastle.edu.au/discipline/sociol-anthrop/staff/kibbymarj/online/assess.html

Kilic S., Kaya B. & Kurt H. (2012). Assessment and evaluation techniques being used in classrooms by biology teachers. *International Journal of New Trends in Arts, Sports & Science Education*, *1*(1).

Kozma, R. B. (1994). Will media influence learning? Reframing the debate, *Educational Technology Research & Development*, *42*(2), 7-19.

Kucuksuleymanoglu R. (2006). In-service training of ELT teachers in Turkey between 1998-2005. *Uludağ Üniversitesi Eğitim Fakültesi Dergisi, 14* (2) pg. 359-369.

Kuran, K. & Kanatlı, F. (2009). Alternatif ölçme ve değerlendirme teknikleri konusunda sınıf öğretmenlerinin görüşlerinin değerlendirilmesi, *Mustafa Kemal Üniversitesi Sosyal Bilimler Enstitüsü Dergisi, 6*(12), 209-234.

Lan, Y. F., Tsai, P. W., Yang, S. H. & Hung, C. L. (2012). Comparing the social knowledge construction behavioral patterns of problem-based online asynchronous discussion in e/m-learning environments. *Computers & Education*, *59*(4). 1122-1135.

Lawler, P. A., & King, K. P. (2000). *Planning for effective faculty development: Using adult learning strategies*. Malabar, FL: Krieger.

Lau, S. H. & Woods, P. C. (2009). Understanding the Behavior Changes in Belief and Attitude among Experienced and Inexperienced Learning Object Users. *Computers & Education*, *52*(2), 333-342.

Lin, P. C., Hou, H. T., Wang, S. M. & Chang, K. E. (2012). Analyzing knowledge dimensions and cognitive process of a project-based online discussion instructional activity using facebook in an adult and continuing education course. *Computers & Education (2012), doi: 10.1016/j.compedu.2012.07.017*

Mackey, T. P. & Ho, J. (2008). Exploring the Relationships Between Web Usability and Students' Perceived Learning in Web-Based Multimedia (WBMM) Tutorials. *Computers & Education, 50*(1), 386–409.

Marshall, C. & Rossman, G. B. (1995). *Designing Qualitative Research, Second Edition*. California, USA: Sage Publication.

Means, B., Toyama, Y., Murphy, R., Bakia, M., & Jones, K. (2009). *Evaluation of Evidence-based Practices in Online Learning: A Meta-analysis and Review of Online-learning Studies*. Washington, D.C.: U.S. Department of Education.

Merriam S. B. (1998). *Qualitative research and case study applications in education*. San Francisco: Jossey-Bass.

Metz, K. (2010, September). Benefits of online courses. *Techniques*, 20-23.

Meyers, L., Gamst, G., & Guarino, A. (2006) A*pplied multivariate statistics: Design and interpretation*. Thousand Oaks, CA: Sage Publications.

Miles, MB. & Huberman, AM. (1994). *Qualitative Data Analysis*. Thousand Oaks, CA: Sage Publications.

Mitkovska, S. J., & Hristovska, D. (2011). Contemporary teacher and core competences for lifelong learning, *Procedia - Social and Behavioral Sciences*, *28*, 573-578.

Molenda, M. (2003). In Search of the Elusive ADDIE Model. *Performance Improvement, 42*(5), 34–37.

MoNE (1992). *Millî Eğitim Bakanlığının Teşkilat Ve Görevleri Hakkında Kanun*, Retrieved January 3, 2012, from http://mevzuat.meb.gov.tr/html/73.html

MoNE (1995). *Millî eğitim bakanlığı aday memurlarının yetiştirilmesi*. Retrieved March 7, 2012 from http://ogm.meb.gov.tr/adayegitim.asp

Moll, H., & Tomasello, M. *(*2007*).* Cooperation and human cognition: The Vygotskian intelligence hypothesis. *Philosophical Transactions of the Royal Society B: Biological Sciences, 362, 639–648.*

Moreno, R. & Valdez, A. (2005). Cognitive load and learning effects of having students organize pictures and words in multimedia environments: the role of student interactivity and feedback, *Educational Technology Research & Development, 53*(3), 35–45.

Mouzakis C. (2008). Teachers' Perceptions of the Effectiveness of a Blended Learning Approach for ICT Teacher Training, *Technology and Teacher Education* (2008) 16(4), 459-481

NCME (1990). *Standards for Teacher Competence in Educational Assessment of Students*. Retrieved from http://www.unl.edu/buros/bimm/html/article3.html

Nelson, J. A. (2008). Advantages of Online Education. *Home Health Care Management & Practice, 20,* 501-502.

Ocak, M.A. (2011). Why Are Faculty Members Not Teaching Blended Courses Insights From Faculty Members. *Computers & Education, 56*, 689-699.

Ozer, B. (2004). Inservice training of teachers in Turkey at beginning of the 2000s. *Journal of In-service Education,* 30(1), 89-100.

Özerbaş M. A. (2007). Yapılandırmacı öğrenme ortamının öğrencilerin akademik başarılarına ve kalıcılığına etkisi, *Türk Egitim Bilimleri Dergisi, 5*(4), 609-635.

Pallant, J. (2001). *SPSS survival manual.* Buckingham, UK: Open University.

Patton, M. Q. (1990). *Qualitative evaluation and research methods (2nd ed.)*. Newbury Park, CA: Sage.

Peterson, C. (2003). Bringing ADDIE to life: Instructional design at its best, *Journal of Educational Multimedia and Hypermedia*, *12*(3), 227-214

Pringle, R., Dawson, K., & Marshall, S. (2002). *Technology, science, and preservice teachers: Creating a culture of technology-savvy elementary teachers*. Paper presented at the Society for information Technology and Teacher Education, Nashville, TN.

Rahimi, A. & Ebrahimi, N. A. (2011). Constructivist vs. objectivist learning environments, *Contemporary Online Language Education Journal, 1,* 89-103.

Rasmussen, C. L. (2008). A causal-comparative model for the examination of an online teacher professional development program for an elementary agricultural literacy curriculum. (Utah State University). *ProQuest Dissertations and Theses*,
http://search.proquest.com/docview/304434655?accountid=13360

Reeves, T. C., (2000). Enhancing the worth of instructional technology through "design experiments" and other developmental research strategies. *Proceedings of the 81st Annual Meeting of the American Educational Research Association symposium on International Perspectives on Instructional Technology*, sponsored by the SIG/Instructional Technology, New Orleans.

Reeves, T. C. (2006). Design research from a technology perspective. In J. v. d. Akker, K. Gravemeijer, S. McKenney & N. Nieveen (Eds.), *Educational Design Research* (pp. 52-66). New York: Routledge.

Richey, R. C., & Klein, J. D. (2007). *Design and development research: Methods, strategies and issues*. Mahwah, NJ: Lawrence Erlbaum.

Richey, R.C. & Nelson, W.A. (1996). Development research. In D. Jonassen (Ed)., *Handbook on educational communications and technology*, London:MacMillan.

Rockman, I. F. (2002). The importance of assessment, *Reference Services Review, 30*(3), 181-182.

Rosenthal T. L. (1978), Bandura's self-efficacy theory: Thought is father to the deed, *Advances in Behaviour Research and Therapy*, *1*(4), 203-209.

Ryan, S. (2001). Is online learning right for you? *American Agent & Broker*, *73*(6), 54-58.

Şaşan H. H. (2002). Yapılandırmacı Öğrenme. *Yaşadıkça Eğitim.* 74-75. Retrieved from: http://talimterbiye.mebnet.net/ogrenci%20merkezli%20egitim/yapilandirmaci ogrenme.pdf

Saygin Ö., Atilboz N. G. & Salman S. (2006). Yapılandırmacı öğretim yaklaşımının biyoloji dersi konularını öğrenme başarısı üzerine etkisi: canlılığın temel birimi-hücre, *Gazi Eğitim Fakültesi Dergisi, 26*(1), 51-64.

Saettler, P. (1990). Behaviorism and Educational Technology. *The Evolution of American Educational Technology*, (pp. 286-317). Englewood, CO: Libraries Unlimited.

Schunk, D.H. & Pajares F. (2010) Self-Efficacy Beliefs, In: Editors-in-Chief: Penelope Peterson, Eva Baker and Barry McGaw, Editor(s)-in-Chief, I*nternational Encyclopedia of Education (Third Edition)*, 668-672, Oxford: Elsevier, Retrieved April 2, 2012, from Science Direct: http://www.sciencedirect.com/science/article/pii/B9780080448947006205

Sekuler, R. & Blake, R. (1990). *Perception (2nd ed.)*, New York: McGraw-Hill.

Seels, B., & Glasgow, Z. (1998). *Making Instructional Design Decisions. (2nd ed.)* Upper Saddle River, NJ: Merrill.

Selim, H. M. (2007). Critical success factors for e-learning acceptance: Confirmatory factor models, *Computers & Education, 49*, 396–413.

Sener, J. (2004). Escaping the comparison trap: evaluating online learning on its own terms, *Innovate, 1*(2). Retrieved October 30, 2011 from: http://www.innovateonline.info

Shelton, K., & Saltsman G. (2008). Applying the ADDIE Model to Online Instruction. In L. A. Tomei (Ed.), *Adapting Information and Communication Technologies for Effective Education* (pp. 41-58). New York: Information Science Reference.

Shenton, A. K. (2000). Strategies for ensuring trustworthiness in qualitative research projects. *Education for Information*, *22*, 63-75.

Schwartz R. (2004). *Perception*. Malden, MA: Blackwell Publishing.

Shin, M., & Yoon-Joo Lee. (2009). Changing the landscape of teacher education via online teaching and learning. Techniques: Connecting Education & Careers, 83, 32-33.

Solimeno, A., Mebane, M. E., Tomai, M., & Francescato, D. (2008). The influence of students and teachers characteristics on the efficacy of face-to-face and computer supported collaborative learning. *Computers & Education, 51*(1), 109-128.

Starkey, L., Yates, A., Meyer, L., Hall, C., Taylor, M., Stevens, S. & Toia, R. (2009). Professional development design: embedding educational reform in New Zealand. *Teaching and Teacher Education, 25* (1), 181-189.

Strauss, A. & Corbin, J. (1990). *Basics of qualitative research: Grounded theory procedures and techniques*. London: Sage.

Sweller, J. (2005). Implications of Cognitive Load Theory for Multimedia Learning. In R. Mayer (Ed.), *Cambridge Handbook of Multimedia Learning*, pp. 19-30. New York: Cambridge University Press

Sun, P. C., Tsai, R. C., Finger, G., Chen, Y. Y. & Yeh, D. (2008). What drives a successful e- Learning? An empirical investigation of the critical factors influencing learner satisfaction. *Computers & Education, 4*(50), 1183–1202.

Tabachnick, B. G., & Fidell, L. S. (2007). *Using Multivariate Statistics , 5th ed*. Boston: Allyn and Bacon.

Tam, M. (2000). Constructivism, Instructional Design, and Technology: Implications for Transforming Distance Learning, *Educational Technology & Society, 3*(2), ISSN 1436-4522.

Telch M. J., Bandura A., Vinciguerra P., Agras A. & Stout A. L. (1982) Social demand for consistency and congruence between self-efficacy and performance, *Behavior Therapy, 13*(5), 694-701.

Tekin S., Ayas A., (2002). Kimya öğretmenlerinin profesyonel gelişim süreçleri ve hizmet içi eğitime bakış açıları, *Ulusal Fen Bilimleri ve Matematik Eğitimi Kongresi*, 2002.

Tessmer, M., & Richey, R. C. (1997). The role of context in learning and instructional design. *Educational Technology Research and Development, 45* (2), 85–115.

Teyfur M., Teyfur E., Çınar O. (2006). İlköğretim okulu öğretmen ve yöneticilerinin yapılandırmacı eğitim yaklaşımı ve programı hakkındaki görüşleri, *İnönü Universitesi Eğitim Fakültesi Dergisi. 7*(11), 47-64.

Thiagarajan, S., Semmel, D., & Semmel, M. I. (1974) *Instructional development for training teachers of exceptional children: A sourcebook*. Reston, Virginia: The Council for Exceptional Children.

Tripp, S. D. & Bichelmeyer, B. (1990). Rapid Prototyping: An Alternative Instructional Design Strategy. *Educational Technology Research and Development, 38(1),* 31-44.

Wall, J. & Ahmed, V. (2008). Use of a simulation game in delivering blended lifelong learning in the construction industry – Opportunities and Challenges. *Computers & Education, 50*(4), 1383-1393.

Wallace, F. L., & Wallace, S. R. (2001). Electronic office hours: A component of distance learning. *Computers & Education, 37*, 195-209.

Ward, A., Stoker, H. W. & Murray-Ward, M. (1996) *Educational measurement: Origins, theories, and explications, Vol. 2*, Maryland: University Press of America.

Yagodzinski, E. D. (2012). *Formative research on an instructional design theory for online learning communities: A higher education faculty development case*. (Nova Southeastern University). ProQuest Dissertations and Theses, http://search.proquest.com/docview/922588835?accountid=13360

Yayla, G. R. (2011). Fen ve teknoloji öğretmenlerinin tecrübeleriyle alternatif ölçme ve değerlendirme yaklaşımlarına yönelik yeterlilikleri arasındaki ilişki, *2nd International Conference on New Trends in Education and Their Implications*, 2011.

Yıldırım, A., & Şimşek, H. (2004). *Sosyal bilimlerde nitel araştırma yöntemleri, 2nd ed.* Ankara: Seçkin.

Zembat, I. O. (2007). The Main Tenets of Direct Instruction and Constructivism: the Case of Translations. *Gazi Eğitim Fakültesi Dergisi, 27*(1), 195-213.

Zhan, Z., Xu, F. & Ye, H. (2011). Effects of an online learning community on active and reflective learners' learning performance and attitudes in a face-to-face undergraduate course, *Computers & Education, 56*, 961–968.

APPENDIX A

INTERVIEW QUESTIONS (TURKISH)

Merhaba, bildiğiniz üzere öğretmenlerin web-tabanlı öğrenme materyaline karşı algıları ve kullanım biçimlerini incelemekteyim. Bugün kullandığınız web-tabanlı materyalle ilgili sizinle görüşmek istiyorum. Bu görüşmedeki amacım materyal hakkındaki düşüncelerinizi öğrenmek, bu bilgiler ışığında materyali zenginleştirmek ve gelecekte öğretmenlerin hizmetine sunmaktır. Her türlü olumlu ve olumsuz görüşlerinizi rahatça ifade edebilirsiniz. Burada konuştuğumuz tüm konular gizli kalacaktır ve araştırmam dışında herhangi bir maksatla kesinlikle kullanılmayacaktır. İsimlerinizi ve çalıştığınız kurum bilgilerinizi hiçbir şekilde raporlarıma yansıtmayacağım.

Not alırken söylediklerinizin bir kısmını kaçırma ihtimalime karşılık ses kayıt cihazı kullanmak istiyorum. Bunun sizin için bir sakıncası var mı? Varsa, ses kaydı yapmadan not alarak da devam edebilirim.

Tahmini yarım saat sürecek bir görüşmemiz olacak. Başlamadan önce sormak istediğiniz bir şey veya paylaşmak istediğiniz fikriniz varsa belirtebilirsiniz.

Başlayalım o zaman.

Soru 1. Hocam, öncelikle kaç yıldır görevdesiniz? Mezun olduğunuz okul hangisidir? Kaç yılında mezun oldunuz?

Soru 2. Eğitimde teknoloji kullanımı konusunda ne düşünüyorsunuz?

Soru 3. Ölçme ve değerlendirme hakkındaki düşünceleriniz neler?

Alt Soru1. Ölçme ve değerlendirme adına derslerde neler yapıyorsunuz?

Alt Soru2. Yenilenen sistemle birlikte ölçme ve değerlendirme uygulamalarınızda değişiklikler oldu mu? Oldu ise ne gibi değişiklikler?

Soru 4. Kaç yıldır bilgisayar kullanıyorsunuz?

Alt Soru 1. Kendinize ait bilgisayarınız var mı? Kaç yıldır kullanıyorsunuz?

Alt Soru 2. Bilgisayarı eğitim amaçlı kullanıyor musunuz?

Alt Soru 3. Mesleki olarak internetten nasıl faydalanıyorsunuz?

Soru 5. 2005 yılından beri yapılandırmacı görüş üzerine kurulan müfredat ile derslerinizi işliyorsunuz. Bu yeni eğitim sistemi hakkında herhangi bir hizmet içi seminere katıldınız mı?

Evet ise:

Alt Soru 1. Kaç kere?

Alt Soru 2. Bu seminerlerde ölçme değerlendirme ile ilgili ne gibi bilgiler verildi?

Alt Soru 3. Ölçme değerlendirme konusunda verilen bilgilerin yeterli olduğunu düşünüyor musunuz?

Hayır ise:

Alt Soru 1. Ölçme ve değerlendirme konusunda hizmet içi eğitime ihtiyaç duydunuz mu?

Soru 6. Kullandığınız web tabanlı materyali hakkında genel görüşleriniz neler?

Alt Soru 1. Tasarım olarak sizi rahatsız edici temalar nelerdi?

(Renk, yazı büyüklüğü vb.)

Alt Soru 2. Tasarım olarak güzel, yarayışlı bulduğunuz temalar nelerdi?

Alt Soru 3. Tasarım olarak materyali geliştirmek için neler yapılabilir?

Soru 7. Web tabanlı öğretim materyalinin içeriğinin

Alt Soru1. Yeterliliği hakkında ne düşünüyorsunuz?

Alt Soru2. Kalitesi hakkında ne düşünüyorsunuz?

Alt Soru3. Derslerinizde nasıl kullanabilirsiniz? Örnek verebilir misiniz?

Alt Soru4. İçerik olarak neler eklenebilir? Nasıl daha faydalı hale getirilebilir?

Soru 8. Öğretmenlerin böyle bir materyale ihtiyaç duyduğunu düşünüyor musunuz? Bu materyal geliştirildiğinde ihtiyaçlara cevap verebilir mi?

Soru 9. Materyali ilerde kullanmak ister misiniz? Neden?

Soru 10. İçeriğin yüz yüze olması yerine çevrimiçi(internet üzerinden) verilmesi hakkında ne düşünüyorsunuz?

Alt Soru 1. Çevrimiçi bilgi sunumunun sizce potansiyel pozitif ve negatif yönleri neler olabilir?

APPENDIX B

ATTITUDE QUESTIONNAIRE (TURKISH)

Çevrimiçi Materyal Tutum Ölçeği

Bu ölçek, kullandığınız çevrimiçi materyale yönelik olumlu ya da olumsuz tutumlarınızın belirlenmesi amacıyla oluşturulmuştur. Her bir ifade için (**X**) işareti koyabilirsiniz.

	Kesinlikle Katılıyorum	Kısmen Katılıyorum	Ne katılıyorum Ne katılmıyorum	Kısmen Katılmıyorum	Kesinlikle Katılmıyorum
1. Sayfaların amacı net bir şekilde açıklanmıştır.					
2. Sayfalarda yer alan konular ve içerikleri konuyu öğretmek için yeterli düzeydedir.					
3. Konu başlıkları ve alt başlıklann seçimi mantıklı bir şekilde yapılmıştır.					
4. Sayfalar tüm konulara istenildiği an erişilebilir yapıda tasarlanmıştır.					
5. Sayfalarda yer alan resimler öğretici ve yeterlidir.					
6. Sayfalarda kullanılan renkler iyi seçilmiştir ve gözü yormamaktadır.					
7. Konu anlatımları anlaşılır ve akıcıdır.					
8. Konular mantıklı bir şekilde sıralanmıştır.					
9. Sayfalar kullanıcının istediği konudan başlamasına ve istediği şekilde ilerlemesine olanak tanımaktadır.					

10. Sayfaların kullanımı çok kolaydır.					
11. Sayfalar görselolarak çekicidir.					
12. Sayfalar iyi tasarlanmıştır (dizayn edilmiştir).					
13. Sayfalar yeterince hızlı yüklenmektedir.					
14. Sayfalarda yer alan çokluortam (multimedya) desteği yeterlidir.					

APPENDIX C

CHECKLIST FOR PROTOTYPE EVALUATION (TURKISH)

İÇERİK

Aşağıdaki alternatif ölçme araçlarının derslerde kullanımı uygundur.				
	Evet	**Hayır**	**Kararsızım**	**Görüşlerim**
Akran Değerlendirme				
Görüşme				
Gözlem				
Kavram Haritası				
Öz Değerlendirme				
Tanılayıcı Dallanmış Ağaç				
Vee Diyagramı				
Portfolyo				
Poster				
Proje				
Rubrik				
Sözlü Sunum				
Yapılandırılmış Grid				
Sitedeki bilgiler				
	Evet	**Hayır**	**Kararsızım**	**Görüşlerim**
Açık ve net				
Kısa ve öz				
Önem arzetmektedir				
Konu anlatımları eksiksizdir				
Açıklayıcı bilgileri eksiksizdir				
Örneklerin içerikleri eksiksizdir				
Video içerikleri eksiksizdir				

TASARIM VE KULLANILABİLİRLİK

	Evet	**Hayır**	**Kararsızım**	**Görüşlerim**
Sitede kullanılan renklerin seçimi uygundur				
Sitedeki resimlerin ve grafiklerin seçimi uygundur				
Sitenin kullanıcı arayüzü uygundur.				
Sitede videoların kullanımı uygundur, yararlıdır.				
	Evet	**Hayır**	**Kararsızım**	**Görüşlerim**
Sitede kullanılan videolar rahatlıkla açılıp izlenebiliyor.				
Siteye rahatlıkla giriş yapılabiliyor.				
Sitenin adresi rahatlıkla yazılabiliyor.				
Sitedeki bağlantıların (linklerin) hepsi sorunsuz çalışıyor.				
Dosya Paylaş sayfasının kullanımı uygundur.				
Örnek sayfasındaki etkinlikleri rahatlıkla izleyebildim.				

APPENDIX D

SELF EFFICACY SCALE USED FOR STUDY (TURKISH)

ALTERNATİF ÖLÇME DEĞERLENDİRME YÖNTEM TEKNİKLERİNE YÖNELİK ÖZ-YETERLİLİKLERİ BELİRLEME ANKETİ

	Kesinlikle Katılıyorum	**Katılıyorum**	**Ne katılıyorum Ne katılmıyorum**	**Katılmıyorum**	**Kesinlikle Katılmıyorum**
Alternatif ölçme ve değerlendirme tekniklerini					
kullanarak öğrencilerimin anlamlı bir şekilde öğrenmelerini sağlayabilirim.					
kullanarak öğrencilerimde olumlu tutumlar geliştirebilirim.					
kullanarak öğrencilerime yeni değerler kazandırabilirim.					
kullanırken zaman problemi yaşayacağımı düşünüyorum.					
kullanarak öğrencilerimin hazır bulunuşluk düzeyini belirleyebilirim.					
kullanırken okulumun ve çevrenin imkanlarını etkili şekilde kullanabilirim.					
kullanarak öğrencilerimin dikkatini konuya çekebilirim.					
kullanarak öğrencilerin derse yönelik tutumlarını değerlendirmede zorlanacağımı düşünüyorum.					
kullanırken öğrencilerime gerekli yerlerde dönüt verebilirim.					
kullanarak öğrencilerimin derse ilgisini artırabilirim.					
seçerken zorlanacağımı düşünüyorum.					
seçerken öğrenci gelişim düzeylerini dikkate alabilirim.					
uygularken sınıf yönetiminde zorlanacağımı düşünüyorum.					
kullanırken öğrencilerimi gerekli kaynaklara ulaşmaları konusunda rahatlıkla yönlendirebilirim.					

	Tamamen katılıyorum	Katılıyorum	Kısmen Katılıyorum	Katılmıyorum	Kesinlikle Katılmıyorum
Çağımızın teknolojik imkanlarını etkili bir şekilde kullanarak alternatif ölçme ve değerlendirme araçları hazırlayabilirim.					
Alternatif ölçme ve değerlendirme araçlarını hazırlarken kaynak bulmada sıkıntı yaşayacağımı düşünüyorum.					
Alternatif ölçme ve değerlendirme araçlarını hazırlarken zorlanacağımı düşünüyorum.					
Alternatif ölçme ve değerlendirme yaklaşımları sonucunda oluşan öğrenci ürünlerini nota dönüştürmekte zorlanacağımı düşünüyorum.					
Alternatif ölçme ve değerlendirme sonucu oluşan öğrenci ürünlerini değerlendirmek için kriter belirlemede zorlanacağımı düşünüyorum.					
Alternatif ölçme ve değerlendirme araçlarını kullanarak öğrencilerimin bilgi ve becerilerini değerlendirmekte zorlanacağımı düşünüyorum.					
Konu içeriğine ve derse uygun olan alternatif ölçme ve değerlendirme aracı geliştirmede zorlanacağımı düşünüyorum.					

APPENDIX E

CHECKLIST FOR MATERIAL VALIDATION (TURKISH)

YÖNTEM	**Bu yöntem hakkında bilgim vardır**		**Bu yöntemin derslerde kullanımı uygundur**		**Bu yöntemi sınıf içi ölçme- değerlendirmelerimde kullanırım**	
	Evet ise (✓)	Hayır ise (x)	Evet ise (✓)	Hayır ise (x)	Dönem içinde bir sınıfta	Hayır ise (x)
Akran Değerlendirme					..... kere kullanırım	
Kısa Cevaplı Yazılı Sınav					..... kere kullanırım	
Kavram Eşleştirme					..... kere kullanırım	
Görüşme					..... kere kullanırım	
Boşluk Doldurma					..... kere kullanırım	
Gözlem					..... kere kullanırım	
Çoktan seçmeli test					..... kere kullanırım	
Kavram Haritası					..... kere kullanırım	
Öz Değerlendirme					..... kere kullanırım	
Soru-Cevap					..... kere kullanırım	
Portfolyo					..... kere kullanırım	
Projeler					..... kere kullanırım	
Uzun Cevaplı Yazılı Sınav					..... kere kullanırım	
Rubrik					..... kere kullanırım	
Sözlü Sunum					..... kere kullanırım	
Tanılayıcı Dallanmış Ağaç					..... kere kullanırım	
Vee Diyagramı					..... kere kullanırım	
Yapılandırılmış Grid					..... kere kullanırım	
Poster					..... kere kullanırım	

APPENDIX F

SITE USER GUIDE FOR SECOND PROTOTYPE (TURKISH)

Site Kullanım Klavuzu

Siteye giriş yapabilmek için;

Adım 1: http://tss-home.tss.ceit.metu.edu.tr/odp adresini internet tarayıcısına yazalım.

Adım 2: Yeni açılan penceredeki boş kısımlara aşağıdaki bilgileri giriniz.

Kullanıcı Adı (User name): ogrt1

Şifre (Password): 1182.odp

Aşağıdaki penceredeki gibi bir site açılması gerekmektedir. Yukarıdaki ve soldaki linklere tıklayarak sitede gezintinizi sürdürebilirsiniz.

Figure F. 1 Screenshot of home page in second prototype

APPENDIX G

SITE USER GUIDE FOR THIRD PROTOTYPE (TURKISH)

Site Kullanım Klavuzu

Siteye giriş yapabilmek için;

Adım 1: www.olcme.org adresini internet tarayıcısına yazalım.

Adım 2: Yeni açılan penceredeki boş kısımlara aşağıdaki bilgileri giriniz(Bütün harfler küçük yazılmalıdır)

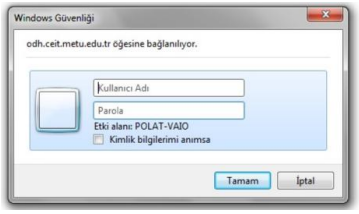

Figure G. 1 Screenshot of login pop-up in third prototype

Kullanıcı Adı (User name): ogrt2 (eğer açılmazsa : odh\ogrt2 şeklinde giriniz)
Şifre (Password: odp.112

Aşağıdaki penceredeki gibi bir site açılması gerekmektedir(açılış bazen 5-10 sn sürebilir). Yukarıdaki ve soldaki linklere tıklayarak sitede gezintinizi sürdürebilirsiniz.

Figure G. 2 Screenshot of home page in third prototype

APPENDIX H

CONSENT FORM (TURKISH)

Gönüllü Katılım Formu

Değerli Öğretmenim;

ODTÜ Bilgisayar ve Öğretim Teknolojileri Eğitimi anabilim dalında araştırma görevlisi olarak çalışmaktayım. Doktora tez çalışmamın bir parçası olarak siz değerli öğretmenlerimizin kullanımına sunulacak bir web portalı(web site) hazırlamaktayım. Bu web portalında yapılandırmacı ölçme ve değerlendirme teknikleri hakkında bilgiler bulunmaktadır. Web portalında kullanabileceğiniz ölçme değerlendirme araçları şablonları, ünitelere göre yapılandırılmış ölçme değerlendirme örnekleri ve videolar bulunmaktadır.

Bu materyalin geliştirilmesinde siz değerli öğretmenlerimizin pratik bilgileri ve gözlemleri büyük önem arzetmektedir. Bunun için sizlerin web portalı ile ilgili görüş, öneri ve isteklerinizi öğrenmek istiyorum. Hazırladığım portala istediğiniz zaman bağlanabilir ve inceleyebilirsiniz. Katkıda bulunmak istediğiniz takdirde yaklaşık 30 dk. süren bir görüşmede size sitenin tasarımı, içeriği ve eklenmesini istediğiniz bölümlerle ilgili sorular soracağım. Ayrıca materyalle ilgili 5 dk. süren bir anket doldurmanızı isteyeceğim.

Görüşme ve anket sonuçları tamamen gizli kalacaktır ve araştırmam dışında herhangi bir maksatla kesinlikle kullanılmayacaktır. İsimleriniz ve çalıştığınız kurum bilgileriniz hiçbir şekilde raporlarıma yansıtılmayacaktır. Anket doldururken veya görüşme esnasında sorulardan rahatsızlık duyduğunuzu hissettiğiniz anda cevaplama işini yarıda bırakabilirsiniz. Anketi veya görüşmeyi yapan araştırmacıya anketi veya görüşmeyi bitirmek istediğinizi belirtmeniz yeterli olacaktır. Bu projeye katılımınız ve değerli katkılarınızdan dolayı şimdiden teşekkür etmeyi bir borç bilirim. Araştırmanın sonuçları hakkında bilgi almak veya kafanıza takılan herhangi bir soru için aşağıda belirtilen e-posta veya telefon numarasından istediğiniz zaman bana ulaşabilirsiniz.

Neşet MUTLU

Bu çalışmaya tamamen gönüllü olarak katılıyorum ve istediğim zaman yarıda kesip çıkabileceğimi biliyorum. Verdiğim bilgilerin bilimsel amaçlı yayımlarda kullanılmasını kabul ediyorum. (Formu doldurup imzaladıktan sonra uygulayıcıya geri veriniz).

İsim Soyisim Tarih İmza

APPENDIX I

QUOTATIONS FROM THE PARTICIPANTS' INTERVIEWS

[1] SBS sınavı yüzünden bu alternatif ölçme metodlarını kullanamıyoruz. Fakat her durumda öğrenci performanslarını testle ölçme imkanı da olmuyor. İşte bu tip öğrenci performanslarının ölçümünün nasıl yapılacağıyla ilgili hizmet içi eğitim ihtiyacı hissediyoruz.

[2] Milli eğitimden hizmet içi eğitim gelmedi. Ama ihtiyaç duyduk tabii. Etkinliklerin hazırlanmasında, sayısının artırılmasında. Ne gibi değişik yöntemlerin olduğu konusunda. Ölçme değerlendirme konusunda da sıkıntıya düştüğüm zamanlar oldu.

[3] Ölçme değerlendirmede bazı kısımların eksik kaldığını düşünüyorum. Hem yeni bir öğretmen olmam açısından. Birde bizim kullandığımız hep belirli değerlendirme yöntemleri var. Onların dışında ekstra yöntemlerle ilgili bir seminer olabilir

[4] Ben özellikle fenokulu.net i takip ediyorum. Bu sitede bir grup var. Bu gruba üyeyim ve sürekli olarak buradaki diğer grup üyeleriyle paylaşım içerisindeyim.

[5] Genelde bu fenokulu.net ten gelen videoları veya tartışma konularını takip ediyorum. Sürekli güncellenen bilgilere göre kendimi yenilemek adına buraları takip ediyorum.

[6] Bilgiler literatüre uygun.

[7] Alternatif ölçme ve değerlendirme teknikleri gayet açık bir şekilde sunulmuş

[8] Projenin önemi bu sayfada biraz daha açıklanması gerekirdi. Bu sayfa biraz yalın kalmış

[9] Proje sayfasına daha fazla bilgi eklenebilir.

[10] Proje sayfası daha detaylandırmak adına gözden geçirilebilir.

[11] Ölçme değerlendirmeyi anlatırken daha çok örneklendirmeler olabilirdi.

[12] (Ölçme)tekniğinin ne olduğu yazılmış evet çok güzel ama onunla ilgili örnek yoktu.

[13] Renklendirme konusunda fazla renk var bence yani bunun içerisinde. Renkler biraz daha azaltılabilir.

[14] Sitede biraz daha değişik renkler kullanabilirsiniz

[15] Örnek sayfasını 6-7-8. Sınıf olarak ayırmanız gerekir. Milli eğitimin ders kitaplarında her ünite sonlarında bu türden örnekleri var. Bunun gibi sizin de hangi örneğin hangi sınıf ve üniteyle ilgili olduğunu göstermeniz gerekir.

[16] Kavramm haritası hazırlama konusu gerçekten sıkıntı yaratan bir konu. Bunun Powerpoint sunumuyla açıklanması etkili olmuş.

[17] Sitenin üst tarafındaki resim, alt tarafındaki yazıları okurken yani insanın dikkatini dağıtıyor daha doğrusu.

[18] Okuduğum kadarıyla bilgi yanlışlığı yok gibiydi

[19] Yeni müfredata uygun örnekler verilmiş

[20] Zaten bunların hepsi Milli Eğitimin kitabında bulunan şeyler, bunları destekliyor

[21] Ama tek tek görüşme imkanı maalesef yok çünkü ben 200 e yakın öğrenciye ders anlatıyorum

[22] Öğrencilerin sübjektif değerlendirme yapmamaları gerekiyor. Birde bütün öğrencilerin birbirleriyle çalışıp, birbirlerini gözlemeleri lazım. O zaman, o öğrencilerde yok zaten

[23] Özdeğerlendirme işini pek fazla biz yapmıyoruz. Yani biz ilköğretim öğretmeniyiz. İlköğretim öğrencisi kendini değerlendirebilir mi? Pek değerlendiremeyebilir.

[24] Teorik bilgiler anlaşılır biçimde yazılmış

[25] Videolardan Cmap kurulumunu izleyip bilgisayarıma kurabilirim. Zaten anlatım direkt yönlendiriyor

[26] Birde kısaca örneklerle belirtmenizde anlaşılırlığını artırmış

[27] Bence içerik gayet iyiydi. Öyle çok fazla bilgi verip sıkıcı olmamış

[28] İçerik olarak güzel hazırlanmış, öğretmenin işine yaramayan bir şey yok

[29] Birincisi, Kavram haritası oluşturduğumuz gibi diğer teknikler içinde böyle programlar anlatılması gerekir. İkincisi, bu siteyi nasıl kullanabileceğimize dair herhangi bir bilgi yok.

[30] Özellikle şimdi proje tabanlı eğitimde olduğumuz için projeyle ilgili daha fazla bilgi verilebilirdi

[31] Mesela yazılılarda hangi tarz sorulara yer verilmesi gerektiği, hangi tarz soruların kullanılması gerektiği eksik.

[32] Örnekler kısmındaki etkinlikler güzel hazırlanmış, bunlar artırılabilir, diğer ünitelerde eklenebilir.

[33] Siz araştırmacı olarak aktivite sayısını artırabilir, "Örnek" sayfasında verdiğiniz gibi dökümanları siteye ekleyebilirsiniz

[34] Hani bu tanılayıcı dallanmış ağaçta ve yapılandırılmış gridde onlarda da böyle rahat hazırlama programları videosu konulabilir

[35] Diğer formların hazırlanmasıyla ilgili videolar eklenirse en azından bizde hazırlayıp katılımcı olarak siteye ekleyebiliriz

[36] Videoları izleyerek bu programı(CMap) kullanabileceğimizden şüpheliyim

[37] Hani biz şu an fen olarak konuşuyoruz ama fenle ilgili örneklemeler yapmışsınız bunlar işte sosyalde de matematikte de vb uygulanacak yöntemler

[38] Şu anda internete erişim konusunda sınır yok, çok hızlı ve her türlü video tarzı şeyler konulabilir. Tabi hızlı açılması şartıyla tabii ki.

[39] Videolarda yararlı oluyor, izlerken kalıcı oluyor

[40] Üzerinde büyüdüğünde ne oldu karmaştı. Resim var alttaki bilgiler var, boş bir alan var. Ne yapılabilir, buna bastığımızda açılsın, üzerinde bir çarpı işareti olsun kapansın. Şu yani komple sayfayı kaplasın. Bence.

[41] Birde küçük resimlerin büyümesi büyük ekranlar için iyi ama küçük ekranlarda yarım sayfa olarak çıkıyor. Okumakta zorlanıyorum

[42] Biraz daha renklendirebilirsiniz. Öylece daha göz alıcı olacağını düşünüyorum renklendirilirse

[43] Daha ilgi çekici, parlak renkler olmalı ama parlak derkende yazı karakter ve puntolarıyla da uyumlu olması gerekir. Renklerinde çakışmaması uyumlu olması gerekir

[44] Üst tarafa bakıyor insan genellikle üstteki linkler ön plana çıktığı için sol menüdekilerde aynı şekilde yapılabilir.

[45] Bir de şu clipart dediğimiz şeyler varya onların çokça bulunması gerekir. Daha janjanlı yapacaksın. Görselliği artırır.

[46] Şifreyle girilmesi siteye ulaşımda bir sıkıntı yaratıyor

[47] Sitenin ismi daha kısa olabilirdi. Çünkü ismini yazarken zorlandım

[48] Etkinlik eklemeyi fazla kullanmadım. İngilizce terimler olduğu için çoğu kişi kullanamayabilir. Türkçeleştirilmesi lazım. Türkçeleştirilse doküman çok rahat paylaşılır.

[49] Sonra sitenin içindeki videolara, örneklere, şablonlara ve etkinliklere baktıktan sonra dedimki ha bu bize kılavuz olacak bir siteymiş gibi geldi

[50] Öğretmen böyle bir şeyi kullandığı zaman, ben inanıyorum ki, öğretmenin uygulama süreci artacak. Öğrenciye bir katkısı olacak, öğretmenin kendini geliştirmesine katkısı olacak

[51] Mesela yapılandırılmış gridi derslerde kullanıyordum ama puanlamanın bu şekilde olduğunu bilmiyordum. Çocuğun verdiği doğru cevap sayısına göre puan veriyorduk, yanlışlarını göz ardı ediyorduk. Güzel bir sistem bu.

[52] Buradaki örnekleri rahatça kullanabilirim. Öğrenciye aktarılabilirler. Bu örnekleri kullandığımızda öğrenciler farklı sunuş, farklı görüş, farklı etkinlik örnekleri görebilirler.

[53] Ölçme değerlendirme de direkt işime yarayacak zaten. Dediğim gibi ders sonunda öğrencilerden geri dönüt alırken geri bildirim alırken işime yarayacaktır. Mesela ev ödevi verebilirim buradan çıktı alarak.

[54] Şablonlar işi kolaylaştırıyor. Uğraşmıyorsunuz uzun uzun. Kendi kendine bilgisayarda yapmaya kalktığın vakit çok zaman alıyor.

[55] Cmap programı güzel bir şey. Mesela kavram haritasını tahtaya çiziyordum çok zor oluyordu. Kavramlar oklar tam denk gelmiyor yerlerine. Kavram haritaları Cmap programını kullanarak projeksiyonda yardımıyla hep birlikte çocuklarla sınıfta yapılabilinir.

[56] İyi oluyor hocam internet üzerinden. Daha çok kişiye ulaşılabilir. Zaman sorun olmuyor. Şimdi, internet bütün okullarda serbest ve ücretsiz. Öğretmen arkadaşlar okuldan rahatlıkla girebilirler.

[57] Boş vakitlerinde kendilerini geliştirmesi amaçlı kullanılması nedeniyle çok daha verimli olacağını düşünüyorum

[58] Kolay güncellenebilmesinden dolayı eğitimin internet üzerinden verilmesi daha faydalı bence. Yüz yüze eğitimde bilginin güncelleştirilmesi hiçte kolay olmuyor.

[59] Hizmet içi eğitim verildi ama bu hizmet içi eğitimi veren kişilerde pek yeterli bir şekilde gelmiyorlar. Hani vermiş olsun diye veriliyor.

[60] Hizmet içi eğitimde basit yüzeysel bilgiler verildi. Ama ayrıntılı daha kapsamlı bilgiler verilseydi daha iyi olurdu

[61] İhtiyacımız olan şey, daha böyle etkinlikler şeklinde geçen, biz hizmet içi eğitimi böyle istiyoruz. Bu aktiviteler sınıf içindeki uygulamalarımıza katkı sağlayacak şekilde olmalı. Yani normal verilen eğitim metinsel olunca o kadar etkin olmuyor.

[62] Okullarda bir defa seminer verdiler, milli eğitim yaptı bunu da. Seminerde v-diyagramı, kavram haritası ve yapılandırılmış grid gibi ölçme değerlendirme teknikleriyle ilgili bilgi verildi.

[63] Bence internet üzerinden verilmesi daha avantajlı. Çünkü her öğretmen interneti artık kullanıyor. Her yerden de internete girme imkanı var. Daha hızlı erişebilmek adına eğitimin internet üzerinden verilmesi şart.

[64] Siz bu içeriği yüz yüze verdiğiniz zaman öğretmenler sıkılacaktır.

[65] Takip olduğu zaman öğretmen iyi iş yapar. Yani birisi gelip uygulattıracak, denetleyecek, çıktısına bakacak. Onun haricinde eğitimi internet üzerinden göndermeyle, bu sistem yürümez

[66] Bence bunun eğitimi verilecekse yüz yüze olmalı, internet üzerinden verilmemeli. Hizmet içi ile ilk başta yüz yüze bilgi verildikten sonra internet üzerindeki materyalden daha çok faydalanacaklarını düşünüyorum.

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SELECTED PUBLICATIONS

Articles

Baser, V. G., Mutlu, N., Sendurur, P., Sendurur, E.(2012). Perceptions of students about technology integration. *e-Journal of New World Sciences Academy, 7*(2), pp 591-598.

Baser, V. G., Mutlu, N. (2012). Analyzing Pre-service Elementary Teachers' Pedagogical Beliefs. *International Journal on New Trends in Education and Their Implications, 3*(1), pp 95-101.

Sendurur, E., Sendurur, P., Mutlu, N., Baser, V. G. (2012). Metacognitive Awareness of Pre-service Teachers. *International Journal on New Trends in Education and Their Implications, 3*(1), pp 102-107.

Congress (International or National)

Sendurur, P., Baser, V. G., Sendurur, E., Mutlu, N. (2011). Pre-Service Teachers' Information Literacy Self Efficacy Levels: Factors in Interaction. *2nd International Conference on New Trends in Education and Their Implications*, pp 839-843.

Baser, V. G., Mutlu, N., Sendurur, P., Sendurur, E. (2011). Investigation of Factors Affecting Technology Perceptions of Elementary and Junior High School Students. *2nd International Conference on New Trends in Education and Their Implications, 3*(1), pp 871-878.

Baser, V. G., Mutlu, N. (2011). An Investigation of Relationship between Pre-service Elementary Teachers' Pedagogical Beliefs and Their Technology Integration Perception. *2nd International Conference on New Trends in Education and Their Implications*, pp 963-967.

Chapters in a Book

Şimşek, H. (2007). Toplam Kalite Yönetimi: Kuram, İlkeler, Uygulamalar (Chapter 10), Ankara