A NON-FORMAL LEARNING PROGRAM FOR THE CONTRIBUTION OF CREATIVE PROBLEM SOLVING SKILLS: A CASE STUDY

A MASTER'S THESIS

BY

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May 2012

I certify that I have read this thesis and have found that it is fully adequate, in scope and in quality, as a thesis for the degree of Master of Arts in Curriculum and Instruction.

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ABSTRACT

A NON-FORMAL LEARNING PROGRAM FOR THE CONTRIBUTION OF CREATIVE PROBLEM SOLVING SKILLS: A CASE STUDY

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May 2012

The purpose of this study is to examine the contribution of a non-formal learning program to the creative problem solving skills of elementary and middle school students, using a mixed method case study. This research was conducted over 14 weeks during the first semester of the 2011 – 2012 school year at a private school in Ankara, Turkey. The participants of the study consisted of 25 elementary and middle school students who had chosen the creative problem solving activity as their extracurricular activity and 50 team managers, who were also schoolteachers. A focus group consisting of six of the middle school students as observed over a period of 14 weeks to determine if the program contributed to the creative problem solving skills of the students. They were also interviewed during two of the activity sessions to get their perceptions of the program to their skills and to determine to what extent they were aware of their progress. The 50 team managers completed questionnaires on their views on the contribution of the program on the students' skills. As quantitative support to the observations and perceptions from students and team

managers, 11 tasks requiring problem solving and creative problem solving skills were given to all the elementary and middle school participants of the program, in a pre- and post-application. The results show that both students and team managers feel that the students participate in the program because it is fun, improves their problem solving skills and they are aware of their increase in skill. Team managers generally feel that students need to participate in the program for two years to observe an increase in these skills. Quantitative data supported these impressions and showed a small increase in creative problem solving skills over the 14 weeks. This increase is greater for problem solving than for creative problem solving. In conclusion, it can thus be said that the non-formal learning program does contribute to students' problem solving skills.

Key words: Creative problem solving, non-formal learning

ÖZET

BİR YAYGIN ÖĞRENME PROGRAMININ İLKÖĞRETİM ÖĞRENCİLERİNİN YARATICI PROBLEM ÇÖZME BECERİLERİNE KATKISI ÜZERİNE BİR ÖRNEK OLAY ÇALIŞMASI

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Bu tez çalışmasının amacı bir yaygın öğrenme programının ilköğretim okulu öğrencilerinin yaratıcı problem çözme becerilerine katkısını değerlendirmektir. Bu çalışma 2011- 2012 eğitim öğretim yılı ilk döneminde 14 hafta boyunca, Ankara'daki özel bir okulda yürütülmüştür. Bu çalışmanın katılımcıları, okul sonrası aktivite olarak bir yaratıcı problem çözme programını seçen altı ilköğretim öğrencisi, okul öğretmeni olan 50 takım çalıştırıcısı ve programa katılan 25 ilköğretim öğrencisidir. Altı ilköğretim öğrencisinden oluşan odak grup, katıldıkları programın yaratıcı problem çözme becerilerine katkısı olup olmadığını belirlemek için 14 hafta boyunca gözlenmiş ve ayrıca programın yeteneklerine olan katkısı ve farkındalıkları açısından iki aktivite oturumunda mülakata alınmıştır. 50 takım çalıştırıcısına, program hakkındaki görüşleri ve programın öğrencilerin yaratıcı problem çözme becerilerine olan katkısını belirlemek için anket uygulanmıştır. Nitel verilere destek olması için, problem çözme ve yaratıcı problem çözme becerisi gerektiren 11 soru,

ön ve son uygulama olarak programa katılan 25 öğrenciye uygulanmıştır. Sonuçlar, hem öğrencilerin hem de takım çalıştırıcılarının programa eğlenceli olduğu ve problem çözme becerilerini geliştirdiği için katıldıklarını göstermiştir. Öğrenciler yeteneklerinin geliştiğinin farkındadırlar. Takım çalıştırıcıları genellikle öğrencilerin yeteneklerinde bir artış gözleyebilmek için öğrencilerin iki yıl süresince programa katılmalarına gerek olduğunu belirtmişlerdir. Nicel veriler bu izlenimleri desteklemektedir ve 14 hafta boyunca öğrencilerin yaratıcı problem çözme yeteneklerinde küçük bir artış göstermiştir. Bu artış, problem çözme becerilerinin yaratıcı problem çözme becerilerinden daha fazla olduğu yönündedir. Sonuç olarak, yaygın öğrenme programının öğrencilerin problem çözme becerilerine katkısı olduğu söylenebilir.

Anahtar Kelimeler: Yaratıcı problem çözme, yaygın öğrenme

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CHAPTER 1: INTRODUCTION

For the European Union (EU) harmonization process Turkey has been increasing its quality in education, as in other areas. Youth programs supported by the government and the Ministry of National Education (MEB) are contributing to this harmonization process by providing important opportunities for students to experience non-formal learning with cultural diversity. These are crucial in terms of nurturing whole children.

Non-formal learning is an independent learning process that is characterized as having a planned nature (Bjornavold, 2000). European Centre for the Development of Vocational Training- [CEDEFOP] (2008) supports this definition in stating that non-formal learning is embedded in planned activities that are not explicitly designated as learning (in terms of learning objectives, learning time or learning support). Thus, students are generally not aware of the intention of the activity, which stands for helping students gain important skills such as critical thinking, problem solving, creativity or working in a team. These activities encourage students and, in this way, the intention of the program is realized.

There is a variety of youth programs (lifelong learning and non-formal learning) outside the MEB curriculum, such as Odyssey of the Mind, Destination ImagiNation, SALTO-Youth (2005), and EU Youth in Action Programs. Sponsors, commissions, schools or the government support these organizations financially. Students participate in these programs voluntarily and without interference in their formal

learning. They learn how to solve problems, work in teams and manage their time. A youth organization, SALTO-Youth (2005) states that "the environments and situations may be intermittent or transitory, and the activities or courses that take place may be staffed by professional learning facilitators (such as youth trainers) or by volunteers (such as youth leaders)". The biggest advantage of the programs is that students are not aware of learning skills while they find enjoyment doing the tasks given. One of the most important skills is creative problem solving as this skill is expected by current and future employers (Staw, 2006). In order to observe the contribution of non-formal learning to the creative problem solving skills of students, the Destination ImagiNation program in Turkey is examined in this study.

Destination ImagiNation (DI) is an educational program in which teams solve open-ended tasks (challenges) and present their solutions at tournaments (Rules of the Road program brochure, 2010-11 seasons). DI began in the summer of 1999 and, at that time, nearly 200 international volunteers united to create a global creative problem solving program (Organization of Destination ImagiNation, n.d). The aim of this program was to provide students with an exciting, joyful, and supportive learning experience.

In Turkey, DI was first established in 2004 as a social club at Robert College in Istanbul, and after a good experience at the Global Finals, the organization of DITURK was established with the aim of spreading the program throughout Turkey (DITURK, 2012). In 2011, there were 25 schools with 600 students registered for the national District Affiliation Tournament (DAT) and many of the schools also had additional students participating in DI but not competing in DAT (Welsh, 2011QW).

Cadle and Selby (2010) stated that "DI has taught K-12 students the process of using imagination and thinking to solve open-ended challenges" (p. 1). Isaksen and Treffinger (2004) claimed that DI is based upon recognized research in learning theory and more than 50 years of research on creative problem solving (CPS) by individuals, teams and organizations around the world. A program evaluation report on DI conducted by Callahan, Hertberg, and Missett (2011) showed that creative problem solving task scores of DI students are higher than the task scores of non-DI students. This shows that the process of CPS can positively affect the way that the participants approach problems and find solutions.

In addition, in the 21st century, employers are looking for more educated workers with the ability to respond to complex problems with flexibility, to communicate effectively, and to work in teams (Staw, 2006). Also, many public and private institutions believe that there is a growing need for employees who are able to think creatively and solve a wide range of problems (Grabinger, 1996 as cited in Lavonen, Autio, and Meisalo, 2004). However, several researchers have maintained that many of the skills and competencies needed in working life are obtained at school rarely (Lavonen et al., 2004). Therefore, new approaches in education have been developed in order to give students a broader perspective. In particular, it has been argued that problem solving is an integral part of education (Oğuzkan, 1985; PISA, 2003; Öztürk, 2007) and, especially, creative problem solving should be taken into account by considering future educational needs. It is stated in the European Commission (EC, 2011) Youth in Action Program Guide that "non-formal and informal learning enable young people to acquire essential competences and contribute to their

personal development, social inclusion and active citizenship, thereby improving their employment prospects" (p. 4).

Due to the spread of globalization and explosion of knowledge, the world is becoming more competitive (Regmi, 2009). Considering the necessities of this competition, educational needs to keep up with the times and supply the requirements needed by employers. Thus, new ways of learning should be taken into account by educators.

According to Regmi (2009), formal learning becomes incomplete without informal and non-formal learning. Ideally, formal learning should be supported by non-formal learning to expand the problem solving skills of students. Non-formal and informal learning activities within the youth in action programs are complementary to the formal education and training system (Regmi, 2009). These types of activities have a participative and learner-centred approach, are carried out on a voluntary basis and are closely linked to young people's needs, aspirations and interests (Regmi, 2009). By providing an additional source of learning and a route into formal education and training, such activities are particularly relevant to young people (The Programme for International Student Assessment- [PISA], 2003).

Background

Learning is the process of acquiring knowledge or developing skills to carry out new behaviours (Mazur, 2006 as cited in Regmi, 2009). Generally, learning is associated with school, but the International Standard Classification of Education (ISCE) differentiated between three types of learning: formal, non-formal and informal

(Torres, 2001 as cited in Regmi, 2009). According to Regmi (2009) formal learning comes from regular school education, non-formal learning occurs in out of school activities and continuous education such as extracurricular activities, clubs and organized sports and finally informal learning is located within the family, society or at any place and is a socially directed learning process.

Today, human development and prosperity rely on problem solving, which is an outstanding skill (Sonmaz, 2002), making one of the aims of many schools around the world the improvement of students' creative problem solving abilities. Due to rapid change within the world, education has become incomplete when it only consists of formal learning. The general belief that school is the unique place that delivers true knowledge is becoming outmoded. According to Torres (2001 as cited in Regmi, 2009), school systems are thus unable to cope with current political, economic, and social realities, and are unable to meet the basic learning needs of children, youth and adults. However, extra activities that support formal learning could be added to the curriculum and/or education to expand learning. One example of extracurricular activities and a non-formal learning program, the Destination ImagiNation program, is encountered in Turkey.

Destination ImagiNation (DI) program overview

Destination ImagiNation (DI) is a program that aims to help learners of all ages discover their creative potential through teamwork (Mission of Destination ImagiNation Program, 2012).

The main DI program is a five-month problem solving session that begins with the fall school semester each year. Elementary (kindergarten-5th grade), middle (6th grade-8th grade) and high school (9th grade-12th grade) students form teams of up to seven members. Each team participates in sessions where they are busy with challenges based on problem solving while they are also preparing their team challenge (Organization of Destination ImagiNation, n.d.).

Destination ImagiNation is a voluntary activity based on the mission of "enriching the global community by providing opportunities for learners of all ages to explore and discover unlimited creative potential through teamwork, co-operation and mutual respect" (Mission of Destination ImagiNation Program, 2012). With the guidance of a teacher or a parent as the team manager, each team creates an action plan and works together for weeks or months to develop and create a solution to each challenge.

According to the vision of DI, the organization (DI) aims to be the world's leading non-profit organization attributed to improving "three lifelong values: Creativity, Teamwork and Problem Solving" (Organization of Destination ImagiNation, n.d.). These lifelong values focus on lifelong learning, which is a process in which all learning activities undertaken throughout life are aimed at improving knowledge, skills, and competencies within personal, civic, social and employment related perspectives (Abukari, 2005). Lifelong learning places emphasis on learning from pre-school to post-retirement, so it should encompass the whole spectrum of formal, non-formal and informal learning (European Commission, 2003). This corresponds with the aim of non-formal learning in that it is a process where learners decide to

acquire skills by studying voluntarily with a teacher (Livingstone, 2001). According to Regmi (2009), the heart of lifelong learning lies in non-formal and informal learning settings.

Table 1
The goals of the DI program (Rules of the Road Brochure, 2010-11)

Have fun
Learn critical and creative thinking skills
Learn and apply creative problem solving method and tools
Develop teamwork, collaboration and leadership skills, working together to achieve goals
Nurture research and inquiry skills, involving both creative exploration and attention to detail
Encourage competence in, enthusiasm for, and commitment to real life problem solving

The goals of the DI program, as listed in Table 1, illustrate the intention of preparing students for real life by giving opportunities, or challenges, which are prepared as tasks with open-ended solutions, thus mimicking real world problems for students to work in a team with a guide referred to the team manager (McDonald, 2011).

The DI program and problem solving

During the DI program activities, students are asked to deal with two different kinds of challenges. These are called Team Challenge and Instant Challenges (see Appendix E). Each of the challenges has its own educational goal. Teams exhibit their solutions to both challenges at an organized tournament, where appraisers with experience in DI assess them. According to a rubric, students' performances or solutions are evaluated considering their creativity, originality, fluency, and flexibility skills (Start a Team Brochure, 2010-2011).

The Team Challenge is a challenge that teams work on over a period of time, usually several months. Each year, there are some alternatives for choosing team challenges, each specializing in a number of skills such as design, construction, science, research, playwriting, theatrical presentation, understanding of cultures, improvisational acting, structural engineering (Start a Team Brochure, 2010-2011).

Team challenges consist of two parts: the Central Challenge and the Side Trips (Start a Team Brochure, 2010-2011). The purpose of the Central Challenge is to encourage the development of creative problem solving techniques, teamwork and the creative process over a sustained period of time. This encourages students to work through a typical learning cycle (e.g. Kolb's [1984] learning cycle) a number of times.

The purpose of the DI Side Trips is to encourage participants to discover and showcase their collective interests and talents as a team and as individuals over several months. It is based on the educational theory of multiple intelligences, which in part emphasizes allowing participants to find their own best ways to present what they have learned (Start a Team Brochure, 2010-2011).

The Instant Challenge is an unknown task that teams are asked to solve in a very short period of time at the organized tournament. The purpose of this is to put teams' creative problem solving abilities, creativity and teamwork to the test in a short, time-driven challenge. This develops the ability to quickly assess the properties of provided materials, and creatively manipulate the materials for a solution (Rules of the Road Brochure, 2010-11). These abilities are qualities required in life or business

where they would encounter similar circumstances and the need to find quick solutions or make quick decisions (Staw, 2006).

The DI program as a non-formal learning program

The rules of DI make the program a non-formal learning program because the first rule of the program is non-interference by a teacher or anyone except the team members. The program suggests that team managers may supply scaffolding to some extent. The situations in which scaffolding is used are called The Interference Triangle (Figure 1). The base of this triangle consists of three edges: skills, challenges and rules (Start a Team Brochure, 2010-2011). The triangle shows that the team manager should need to ease the team members' obtainment of skills. On the other hand, it is the job of the team to apply already learned acquired skills to a particular purpose or to use them in creating a viable solution (Start a Team Brochure, 2010-2011).

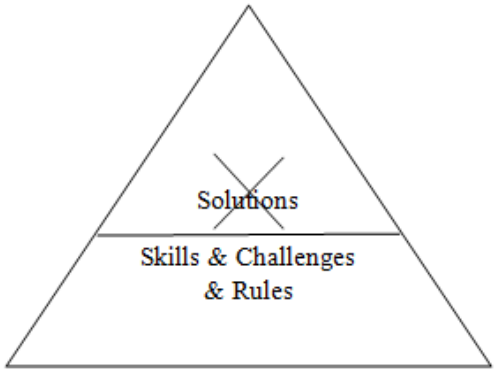


Figure 1. The interference triangle (Start a Team Brochure, 2010-2011)

Indeed, challenges and rules are the printed challenges that are prepared by the program administrators but the role of the team, team manager and officials is to understand and internalize them. However, the organization emphasizes that the

team's solution must be the team's alone, without interference from team managers, and thus it serves the purpose of a non-formal learning program (Start a Team Brochure, 2010-2011).

In the light of the claims of the program to emphasize learning without interference or structured activities for a purpose, the DI program stands not only as an example of non-formal learning but also as giving students a chance to acquire a crucial skill for living in the future: creative problem solving.

DI and creative problem solving

Creativity is a skill producing new ways, solutions, methods or ideas for a problem, which does not have a single correct answer, similar to most problems experienced in real life (Thornton, 1998; Torrance, 1962 and Buzan, 2001).

The non-formal learning program DI enables people to learn and apply creative problem solving methods by supplying Instant Challenges. When the goals of DI (Table 1) and the versions of the creative problem solving (CPS) steps (Wallas, 1926; Osborn, 1952; Fisher, 1995; Treffinger & Isaksen, 2005) are compared, it can be seen that the method that the students apply during solving the challenges is similar to the CPS steps in which they follow the Kolb's (1984) learning cycle.

In this study, the non-formal learning program DI was chosen to investigate the claim by the National Youth Agency (2008), The Office for Standards in Education, Children's Services and Skills- Ofsted (2007), Merton et al. (2004) and the EC & EOC (2004) that non-formal learning programs, which combine enjoyment, challenge and learning, can contribute to skills such as responsibility, identifying

strengths and weaknesses, problem solving, communication skills and motivation. This study examines the role of DI in creative problem solving skills for students.

Problem

Although various aspects of non-formal learning have been well documented in literature (Livingstone, 2001; Colley, Hodkinson & Malcolm, 2002; Bjornavold & Colardyn, 2005; NCVER, 2008; Smith & Clayton, 2009; Regmi, 2009; Stasiunaitiene & Kaminskiene, 2009; OECD, 2010; Ainsworth & Eaton, 2010) there is little emphasis on the contribution of non-formal learning to creative problem solving skills. The contribution of non-formal learning must be taken into account by observing and evaluating programs that give children a chance to experience non-formal learning at a young age.

Purpose

The purpose of this study was to examine the contribution of a non-formal learning program called Destination ImagiNation on the creative problem solving skills of the elementary and middle school students who participate in the Destination ImagiNation program at a private school in Ankara, Turkey. The perceptions of students and team managers were also investigated to determine their views on the contribution of DI to students' creative problem solving skills by using a mixed method case study.

Research questions

The following research questions will be investigated by this study;

- ✓ How do DI students perceive the program?
    - Are they aware of their progress?
- ✓ What are the views of team managers about the contribution of DI to students' creative problem solving skills?
- ✓ Does DI contribute to students' creative problem solving skills?
    - Is there a difference in the performance of students who participated in the DI program at the beginning and at the end of first semester in terms of creative problem solving skills?

Significance

All stakeholders, such as parents, students, and those who run education systems, as well as the general public need to understand how educational systems prepare students for life. As education is the process of actively constructing the cognitive schemes of the individual by his own experiences (Brooks & Brooks, 1999), a much wider range of competencies other than those presented in formal learning environment is needed for students to be well prepared for the future.

The examples of this wider range of competencies are creative problem solving skills, defined as the capacity of students to understand problems situated in cross-curricular settings, the ability to identify relevant information or constraints associated with the problem to represent possible alternatives or solution paths, and the ability to develop solution strategies, to solve problems and communicate the solutions (Buzan, 2001).

Examination of non-formal learning programs can fill the gap on how they can contribute to students' creative problem solving skills in Turkey. Teachers may benefit from the outcomes of this research by adding extra activities to their lessons in order to improve creative problem solving skills of their students.

The next chapter deals with the review of the related literature in the study area to establish a theoretical background for this study.

Definition of key terms

Key terms used in this study, given in alphabetical order, are defined below to clarify various concepts:

Constructivism: An approach that defines the learning as an active, contextualized process of constructing knowledge rather than acquiring it (Brooks & Brooks, 1999).

Creative problem solving: Construction of new ideas by using imagination to solve problems (Buzan, 2001).

Formal learning: An intentional, organized and structured learning in organisations such as schools, which has learning objectives and expected outcomes and is guided by a curriculum (OECD, 2010).

Informal learning: Never organized and often thought of as an experiential learning activity (OECD, 2010).

Lifelong learning: The process of acquiring knowledge or skills throughout life by means of education, training, work and general life experiences (EC, 2003).

Logical thinking: Solving a problem by processing various cognitive operations or achieving principles and regulations by abstraction and generalization (Yaman, 2005).

Non-formal learning: Voluntary learning in structured programs for the development of skills and knowledge required by workplaces, communities and individuals (NCVER, 2008).

Problem solving: The mental process that improves the ability of intellectual functions and includes a range of efforts oriented to eliminate the encountered difficulties in order to reach the aim (Korkmaz, 2002).

CHAPTER 2: REVIEW OF RELATED LITERATURE

Introduction

This literature review was shaped according to the research questions set out in Chapter 1. These research questions focused on the contribution of non-formal learning programs to creative problem solving skills of students. There are three review sections that are divided into subtitles according to their content. In the first section, learning is discussed referencing the philosophers' approaches from Dewey (1910) to Kolb (1984) considering the constructivist paradigm as this directly impacts on creative problem solving. As non-formal learning is the centre of this study, it is taken into account in terms of its relationship with other learning types. In the second section, problem solving and its steps were emphasized. Finally, in the third section, the dependent variable, creative problem solving, was reviewed.

Learning

Over the past one hundred years, psychologists have tried to answer the questions related to learning. The understanding of development of learning has thus slowly evolved.

Dewey (1910) and Piaget (1967) focused on the importance of experience in learning while Vygotsky (1978) pointed out the role of social interaction in cognitive development. More recently, Gardner's (2009) book, Five Minds for the Future debates how people learn. He focused on the relationships between how human beings understood scientific concepts such as multiple intelligence theory and how

they should be nurtured by educational societies. According to Gardner (2009), intelligence is a skill of solving a problem in a frame of one or more cultural environments or of creating a product. He stated that evaluating intelligence by using paper and pencil tests or through interviews was outdated and invalid. He refused to use terms such as intelligence, logic, and knowledge as having the same meaning. He suggested that these terms should be put together under the term cognitive in order to differentiate skills and talents (Gardner, 2009). He stated that each individual has different types of intelligence styles including from interpersonal, intrapersonal, logical, naturalist, musical, kinaesthetic, verbal and visual. Dewey (1910), Piaget (1967), Vygotsky (1978) and Gardner (2009) focused on active individuals, those who interact with others and environment while learning or give effort while learning.

Kolb (1984) also defined learning as a process whereby knowledge is created by experience. He described the learning process shown in Figure 2 as falling into 4 sections;

- Concrete Experience (CE): Doing an activity actively
- Reflective Observation (RO): Thinking about what was done
- Abstract Conceptualisation (AC): Generalizing from specific experiences
- Active Experimentation (AE): Practicing new/alternative behaviours (as cited by Healey and Jenkins, 2000)

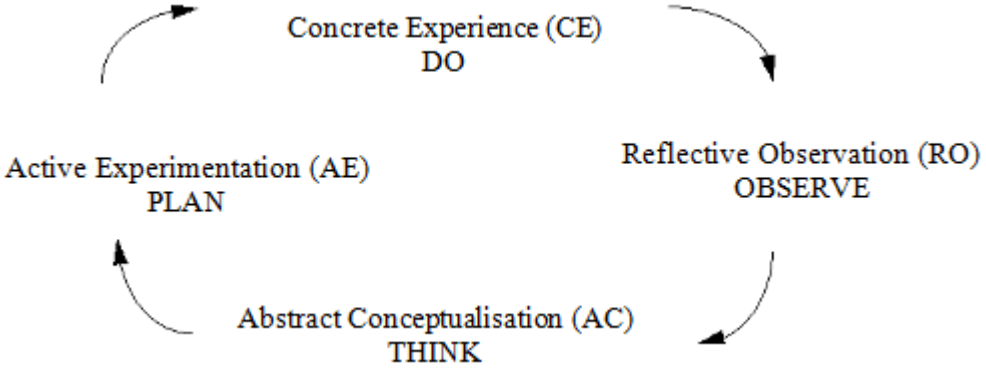


Figure 2. Kolb's experiential learning cycle (Healey & Jenkins, 2000)

The first step described by Kolb (1984) is Reflective Observation, which corresponds to thinking about what was done, followed by Abstract Conceptualisation (Figure 2), which corresponds to generalizing from specific experiences. The next step is called Active Experimentation, which corresponds to practicing new or alternative behaviours. The final step, which helps the learner explore, is called Concrete Experience, which corresponds to actively doing the tasks. As this is a cycle, each step nurtures the next to keep the process flowing. Thus, we observe the active participation in learning, also referred to as experiential learning.

In terms of problem solving, Kolb's learning cycle (Figure 2) translated into observing the details of the problem in the reflective observation stage. Following that, in the Abstract Conceptualization stage, the problem solver thinks of a solution by using past experiences and involving brainstorming and questioning. In the next stage, the solution is tested through active participation and as a reflection; they observe and evaluate the success of their solution which completes the cycle.

There are many different definitions for learning types in terms of the way that learning is applied. There is often overlap and sometimes disagreement regarding these definitions (Colley et al. 2002). The Organisation of Economic Co-operation and Development- OECD (2010) broadly defined the contexts in which learning occurs throughout life in the following terms:

> Formal learning, this type of learning is intentional, organized and structured. Institutions usually arrange formal learning opportunities. These include credit courses and programs through community colleges and universities. Generally, there are learning objectives and expected outcomes. Often a curriculum or other type of formal program guides this type of learning.
>
> Non-formal learning, this type of learning may or may not be intentional or arranged by an institution, but is usually organized in some way, even if it is loosely organized. There are no formal credits granted in non-formal learning situations.
>
> Informal learning, this type of learning is never organized. Rather than being guided by a rigid curriculum, it is often thought of as experiential learning. Critics of this type of learning argue that from the learner's viewpoint, this type of learning lacks intention and objectives. Of the three types of learning it may be the most spontaneous (OECD, 2010, p. 21).

In summary, according to OECD (2010), formal learning takes into account properties such as being intentional, structured, and guided by a curriculum. However, non-formal learning falls between formal and informal learning with properties such as being intentional or arranged by an institution, yet loosely organized. Finally, informal learning is defined as not organized, but spontaneous learning.

As discussed by Bjornavold and Colardyn (2005), formal learning is learning from courses or programs leading to nationally and internationally recognised certification. They defined non-formal learning as learning which is embedded in planned activities but not explicitly designated as learning (in terms of learning objectives, learning time or learning support). They stated that non-formal learning is

intentional from the learner's point of view as opposed to informal learning, which is unintentional learning from the learner's point of view. Informal learning thus results from daily activities related to work, family, or leisure and not typically organised or structured in terms of objectives, time or learning support.

The European Commission and Council of Europe (EC and EOC, 2004) defined learning types in a slightly different way:

> Formal learning: The learning process is structured in terms of learning objectives, learning time, learning support and it is intentional; the participants get certificates and/or diplomas.
>
> Non-formal learning: learning outside institutional contexts (out-of school) is the key activity, but also key competence of the youth field. Non-formal learning in youth activities is structured, based on learning objectives, learning time and specific learning support and it is intentional. For that reason one could also speak of *non-formal education*. It typically does not lead to certification, but in an increasing number of cases, certificates are delivered.
>
> Informal learning: learning in daily life activities, in work, family, leisure is mainly learning by doing; it is typically not structured and not intentional and does not lead to certification. In the youth sector informal learning takes place in youth and leisure initiatives, in peer group and voluntary activities etc. (EC and EOC, 2004, p. 4-5)

In the EC and EOC (2004) definition, there is an emphasis on the use of the terminology non-formal learning or non-formal education. Thus, these terms can be interchanged in this context. However, this is not the case in the contexts in which they are used in Turkey.

Non-formal learning and education

As non-formal learning bridges the gap between formal and informal learning, definitions of non-formal learning need further clarification. In the light of these needs, research for the validation of non-formal learning has been done and is still continuing.

Colley et al. (2002) stated that there was an overlapping of writing a non-formal and informal education by some researchers. However, all refer to the same type of loosely organized programs outside the normal school curriculum. As the programs are applied outside the curriculum, they offer a chance for students to experience non-formal learning. So, the term non-formal learning is preferred in this study instead of non-formal education.

Other than the definition given by the OECD (2010), Bjornavold & Colardyn (2005) and EC & EOC (2004), further definitions of non-formal learning have been developed. Livingstone's (2001) model of adult learning explained that non-formal learning occurs when learners opt to voluntarily study to acquire further knowledge or skill. Livingstone (2001) considered non-formal learning to be intentional, like the OECD (2010), but unlike the EC & EOC (2004) definition, all learning is assumed to be individual rather than social. Also, Livingstone (2001) emphasized the curriculum requirement for non-formal learning. He suggested that the places where non-formal learning takes place, such as courses and workshops, require a curriculum but it is different from a formal school curriculum.

National Centre for Vocational Education Research (NCVER) (2008) agreed defining non-formal learning as "learning in structured programs for the development of skills and knowledge required in workplaces by communities and individuals" (p. 10).

According to the EC & EOC (2004), the skills developed in non-formal learning settings are extremely valuable for the personal development of the individual for active participation in society, as well as in the world of work. They thus complemented the 'hard knowledge' acquired through formal education. The EC & EOC (2004) definition claimed that young people feel less intimidated in non-formal learning environments and, due to the fact that participation is voluntary, they often find learning more enjoyable. Thus, EC & EOC (2004) stated that non-formal education can provide an alternative learning pathway to those whose 'needs and wants' are not met in the classroom.

According to Bjornavold (2000), non-formal learning is an independent learning process that is characterized by its planned nature. The term, planned nature, is open for interpretation. It could represent the goal or the environment of the program. This definition is supported by CEDEFOP (2008) in stating that non-formal learning is embedded in planned activities that are not explicitly designated as learning. Thus, students are not aware of the intention of the activity, which aims to help students gain important skills such as critical thinking, problem solving or teamwork. In this regard, DI can be placed under this category to serve as a non-formal learning activity, considering its intention which sets the goals of the program as promoting the learning of critical thinking, problem solving, and team work skills.

Non-formal learning is defined as organized educational activities that are based on learning objectives and learning time but not explicitly designated as learning (Green, Oketch & Preston, 2004; Golding, Brown & Foley, 2009; EC & EOC, 2004). Also, non-formal learning is considered to be voluntary learning that can occur in different types of spaces (SALTO, 2005). Unlike in formal learning, where the environment, school, is an essential element, in non-formal learning the environment isn't essential to reach the aim of the learning. Instead, the activity can take place in a community centre, after school, at home, in a group, or as an individual.

UNESCO (2006) stated, "Non-formal learning does not necessarily follow the ladder system and may have differing durations, and may or may not confer certification of the learning achieved" (p.82). After completing formal learning, students are often awarded with a diploma or certificate but non-formal learning generally doesn't lead to certification (Stasiunaitiene & Kaminskiene, 2009). However, in Turkey, most of the non-formal education leads to certification to give the individual a chance at having a profession (Tepe, 2007).

In the frame of the definitions, it could be said that there is no limitation in terms of age, ethnicity, culture or religion in order to participate in non-formal learning. The time for non-formal learning is not defined clearly as in formal learning. Thus, it is worthy of mention that time and standards of the programs depend on an individual's effort or the expectations of the organisations. The relationship between teachers and students are different from formal settings, as teachers do not interfere in the learning. In this regard, it could be said that the aim of non-formal learning is to support formal learning in the frame of developing skills and gaining knowledge

through voluntary participation for future needs of society and the workforce (Staw, 2006; Lavonen et al., 2004).

The Destination ImagiNation (DI) program is described as an educational program in which teams solve open-ended challenges as a student group and present their solutions at tournaments (Rules of the Road program brochure, 2010-11 seasons), therefore this activity could be categorized as non-formal learning. However, there are some points, which need emphasis in order to categorize the DI program as a non-formal learning program. First of all, non-formal learning is not limited to a designated place so in this regard DI fits this point as an after school activity. According to the DI program, it can take place in a parent group, university team, college team, business group, home school program, or community group (Rules of the Road program brochure, 2010-11 seasons).

However, as youth in action programs are under this category in Turkey, comparing the definitions for the identification of the DI program, it seems that DI is a good example of observing non-formal learning in progress, especially in problem solving skills, as fostering critical and creative thinking, developing teamwork, collaboration and leadership skills, applying creative problem solving methods, nurturing research and inquiry skills, enhancing verbal and written communication, encouraging commitment to real life problem solving (Table 1). When all of those are integrated with the definition of EC & EOC (2004) about non-formal learning, as empowering young people to set up their own projects, step by step, where they are at the centre of the educational activity, feel concerned, have personal interest, find strong

motivation, get self-confidence and as result, develop capacities and skills, Destination Imagination seems to be a good representative for non-formal learning.

Non-formal education in Turkey

According to Vural (2008), education is seen as an individual right or the duty of the government. It is a tool for change and management in accordance with political, cultural and civil issues. She claims that there are some difficulties in shifting from globalization and industrialization to enlightenment. The globalization process which features a workforce that is open for rapid improvement and dynamic changes can be effective not only economically but also socially and culturally all around the world. For the requirement of transition to enlightenment, the largest contribution to the future of countries is recruitment of human resources (Bozdemir, 2009). As indicated by Lavonen et al. (2004), Staw (2006), Vural (2008), Tepe (2007), and Bozdemir (2009) one requirement of establishing a qualified workforce is to supply lifelong learning through both formal and non-formal education methods.

In Turkey, non-formal education is taken into consideration and regulated by the Ministry of Education (MEB, 2010). Non-formal education is perceived as lifelong learning in Turkey and is based on voluntary learning. The term that is used by Tepe (2007), Vural (2008), and Bozdemir (2009) is non-formal education, which aims at lifelong learning. From the aspect of the government, a lifelong learning approach is based on supplying an education in which individuals can adapt to universal competition, reflect on their creativity and explore properties (MEB, 2010). The National Turkish Education aims;

> To raise the citizens as constructive, creative and productive persons who are physically, mentally, morally, spiritually, and emotionally balanced, have a sound personality and character, with the ability to think freely and scientifically and have a broad worldview, that are respectful for human rights, value personality and enterprise, and feel responsibility towards society. Additionally, it aims to prepare the citizens for life by developing their interests, talents and capabilities and providing them with the necessary knowledge, skills and attitudes and the habit of working with others and to ensure that they acquire a profession which shall make them happy and contribute to the happiness of society (MEB, 1973, 2842/1).

The aims and duties in the regulation related to non-formal education of Ministry of National Education (Ministry of National Education, Regulation of non-formal education, 2010) state that;

> **Item 4- (1)** Non-formal education activities, in line with the aims and principles of National Education, the constitution and the principles of Atatürk, consonant with universal law, democracy and human rights are to be discharged in accordance with the needs and cultures of the society;
>
> g) to provide opportunities to improve skills, to get individuals to adopt a habit of improvement, technologically, scientifically, culturally and making good use of the free time with the help of a lifelong learning approach.

The principles in the regulation relating to non-formal education of Ministry of National Education (MEB, 2010) state that;

> **Item 5- (1)** Non-formal education principles are:
> a) Openness to everybody
> b) Appropriateness for all
> c) Variability
> ç) Validity
> d) Planning
> e) Openness to innovation and improvement
> f) Voluntary
> g) Education everywhere
> ğ) Lifelong learning
> h) Scientific
> ı) Cooperation and coordination (Translated from Ministry of National Education, 2010, Regulation of Non-formal Education, 2010)

Although all organisations relating to education in Turkey fall under the control of the Ministry of Education, voluntary clubs, private organisations or municipalities could conduct non-formal learning. When we look through the non-formal applications in Turkey, activities are conducted both within the formal system and outside of the formal system.

Bozdemir (2009) stated that literacy courses for adults, social activities for youth, educational support called *dersane* for the youth or professional courses for adults serve society as non-formal education in Turkey. As stated before, all responsibilities of these educational activities are under the control of the Ministry of Education in terms of coordination and cooperation (MEB, 1973; The basic law of National Education, 1739, Items 42; 17-56). The aim of non-formal education in Turkey is also to provide opportunities for individuals who did not have a chance to be educated or for individuals who are at a level within the education system but need support to develop skills and knowledge in addition to formal education (Tepe, 2007).

Thus the Destination ImagiNation program in Turkey is categorized under the youth in action programs, which is integrated into the school curriculum as an extracurricular activity. Although, it is a universal organisation and supported by sponsors from overseas countries, there is an annual cost to participate in the program, which makes it different from most other extracurricular activities. Thus, as a non-formal learning program in Turkey, Destination ImagiNation is placed both within the formal education system and out of the formal education system.

Problem solving

Definition of problem solving

According to Sonmaz (2002), the recent development and prosperity of human beings rely on problem solving skills. This gives of the aims of education to improve students' problem solving abilities, particularly as a current expectation of employers is for employees to be competitive in the world. As there is a great deal of research in the area of problem solving, there are a lot of theories and approaches.

Problem solving was identified as one of the highest cognitive processes (Bloom, Englehart, Furst, Hill, & Krathwohl, 1956). Sonmaz (2002) defined problem solving as a sophisticated action since it is one way in which an individual can express his needs, attitudes, beliefs, and customs. Problem solving also links creativity with intelligence, sensation, and desire in itself.

Problem solving is defined in most of the research as an essential element (Sonmaz, 2002; Yaman, 2005; Özsoy, 2005) in education or as being a pivotal part of education (PISA, 2003), which requires time, labour, and practice (Oğuzkan, 1985).

According to Yaman, learners solve problems using logical thinking skills. He claimed that while learners solve problems, they use diverse intellectual implementation or formulate principals or theories by making some inferences and generalizations. In Kolb's (1984) learning cycle, we see the link of logical thinking skills in making generalizations to reach the solution of the problem. In addition, Yaman stated that problem solving improves the skills of analytical thinking.

Treffinger, Selby and Isaksen (2008) defined problem solving as a thinking behaviour that we engage in to obtain the desired outcome we seek. Their view was supported by Özsoy (2005) when he defined problem solving as the aim of an individual when he begins thinking. Thus, these definitions imply that there is a supportive relationship between thinking and problem solving.

The steps of problem solving

If we accept that problem solving is a process of thinking and making inferences, it requires strategies and methodologies to implement. A number of problem solving steps have thus been formulated. According to Gök and Sılay (2010), the most notable strategies are those of Polya (1957) and Dewey (1910).

Dewey (1910) listed five steps in problem solving. These are:

> 1) A difficulty about the problem is felt.
> 2) The feeling about the problem is defined.
> 3) Alternative solutions for the problem are produced.
> 4) The results of the alternative solutions are discussed.
> 5) One of the alternative solutions is accepted (as cited in Gök & Sılay, 2010, p. 8)

Gök and Sılay revised Dewey's problem solving steps as consisting of the problem's location and definition, suggestion of possible solutions, development by reasoning the effects of the solution, and further observation and experimentation leading to its acceptance or rejection. Also, Polya (1957 as cited in Gök & Sılay, 2010) set out his steps as description, planning, and implementation and checking, which align well with those suggested by Dewey.

In addition, PISA (2003) produced a report to summarize the results of problem solving skills in students. In this report, the steps needed by individuals during the process of problem solving are used to establish the following framework:

- Identify problems in cross-curricular settings;
- Identify relevant information or constraints;
- Represent possible alternatives or solution paths;
- Select solution strategies;
- Solve problems;
- Check or reflect on the solutions; and
- Communicate the results (PISA, 2003, p.15).

The steps of Dewey (1910), Polya (1957) and PISA (2003), all require the problem to be identified, followed by alternative solutions and finally select a strategy to solve the problem. Also, when we take Kolb's (1984) experiential learning cycle into consideration in terms of learning, we see that his steps of learning are similar with these problem solving steps. Thus, active participation supports problem solving (Yaman, 2005). Both of these actions, problem solving and learning need observation, identification, trial, experimentation, and reflection.

Creative problem solving

> [While visiting] a major pharmaceutical company to discuss their graduate recruitment for marketing. … one of the key attributes they looked for was **Helicopter Ability**: the ability to soar above a problem and to see all aspects of it, to stand back and see the bigger picture, the wood rather than the trees. Creativity involves being able to think outside the box to find solutions to unpredictable problems. This needs logic and analysis, but also the ability to see the big-picture and this involves a creative mind.
>
> The Director of the Careers and Employability Service, University of Kent

Thornton (1998) stated that creativity is an action producing a new product to solve the problem. According to Buzan (2001) creativity is defined as being superior to others in terms of creating new ideas, solving problems in an original way, and in terms of imagination, behaviours, and productivity.

Torrance (1962) described creativity as being sensitive to identifying problems, trying to come up with various solutions, and improving methods. He created four parameters to assess creativity skills of individuals. These are;

- **Originality:** an ability of creative thinking related to authenticity in both thinking and action
- **Flexibility:** the diversity of solutions or answers for the same stimuli
- **Smoothness:** an ability of creative thinking related to the generation of many ideas in verbal for an open-ended question
- **Detailedness:** the reactions related to considering various details for the same stimuli (as cited in Çavuşoğlu, 2007).

However, not all problems require creativity. Deciding which type of readily available solution is suitable for the problem, or planning in which order it needs to be done, can solve some problems. However, if the question is new, it requires

creativity as an individual, and then needs to explore a new idea or method (Thornton, 1998).

According to Thornton (1998), Torrance (1962) and Buzan (2001), who align creativity with the process of problem solving, creativity is a skill producing new ways, solutions, methods or ideas for a problem, which does not have a single correct answer, similar to most problems experienced in real life. The most important thing in creativity is to find new ways to solve new and old problems.
Ülgen (1997) stated that creative people could view problems from different perspectives and create alternative solutions. Harris (1998) focused on another property of creative people who think that problem solving is fun, instructional, rewarding, self-esteem building, and helpful to society. Also, Harris (1998) claimed that creative people have curiosity. Harris (1998) supported Ülgen's (1997) point by stating that curious people like to identify and challenge the assumptions behind ideas, proposals, problems, beliefs, and statements, implying that they like problem solving. However, it must be kept in mind that creative people have different perspectives or views when looking at new situations.

With the help of programs which are prepared to improve creativity potentials and are applied into almost every area (Atkıncı, 2001), individuals can demonstrate their skills. Although it is a general belief that creativity is a natural born skill, it can be nurtured and developed (Ülgen, 1997). Thus, this improvement should be encouraged by formal, non-formal or informal education (Öztürk, 2007). In order to develop creativity skills, non-formal learning as support for formal learning, is a way of giving individuals this chance (Regmi, 2009).

In order to trigger creativity, an individual needs an environment that develops his/her skill (Atkıncı, 2001). When imagination, emotions and ideas come together and are linked with motivation, individuals can easily formulate their ideas (Atkıncı, 2001). Non-formal learning programs with their flexibility and voluntary nature seem to be suitable for supplying an environment for individuals to demonstrate their skills.

The primary years of education is the ideal time to improve student creativity and problem solving skills (Öztürk, 2007). These are critical years for human development considering developmental psychology. If an individual passes the critical age level without gaining the desired outcome, it is hard to gain that skill in the following years (Yeşilyaprak, 2009). Thus, in Turkey, the primary years educational program aims to improve creativity and critical thinking skills of students by integrating a constructivist approach into programs (MEB, 2005). There has thus been a change in terms of the primary years program development in Turkey since 2004. Students are expected to conduct project-based learning to meet the requirements of a constructivist approach.

Steps of the creative problem solving process

Wallas (1926), who did a study on the writings of creative individuals, examined creative problem solving (CPS) in terms of four stages:

> **Preparation stage:** In this stage, the creative individual collects information about the problem and creates new ideas. The individual focuses on the hypothesis and theories to correlate a relationship with the problem. In this way, the problem is revealed and defined in detail.
>
> **Incubation stage:** In this stage, the individual searches using cognitional processes. The individual thinks of all possibilities, which may take minutes or weeks. In this stage, the subconscious is in action. During incubation, the right and left lobes of the brainwork and thinking procedures, visualization, and sensorial perception are in action.
>
> **Enlightenment (Perception) Stage:** All ideas, sensations, feelings come up in this stage and solutions are seen clearly. In other words, an "Aha moment" emerges to solve the problem. Because of this, it is called enlightenment or perception. Until this stage, the brain is busy with the problem and suddenly an idea emerges. This stage needs to be preceded by an incubation and preparation stage although solutions then come up suddenly.
>
> **Confirmation Stage:** In this stage, solution of the problem is checked in terms of suitability, practicality, and validity. The stage in which logical thinking starts and clarifies all aspects of the problem is known as confirmation. The weakness of the idea is stated and some changes are made for practicing the solution (as cited in Starko, 2001, p. 25).

In Wallas's CPS steps, the individual is active while solving the problem creatively. The steps followed are consistent with Kolb's (1984) experiential learning. If we state that an individual learns from his experiences, the steps of Wallas match up with Kolb's experiential learning steps. For instance, the preparation step in which the individual collects information matches up with the reflective observation stage of Kolb's learning cycle. In addition, both the incubation and enlightenment steps in which the individual thinks and plans what to do to solve the problem match up with

the abstract conceptualisation and active experimentation stages of Kolb's learning cycle. Finally, the confirmation step in which the individual checks the plan matches up with the active experimentation stage of Kolb's learning cycle.

However, the steps of creative problem solving stated by Fisher (1995) are only slightly different to those of Wallas. The former examined CPS steps in terms of 5 stages;

> **Stimuli:** Creativity does not occur without a stimulus. This stimulus could be either a problem, which needs a solution, or a question, which is asked suddenly.
>
> **Exploration:** This includes research on the solution of the problem and production of multiple choices. For that, lateral thinking, delaying the judgement as far as possible, perpetuating the effort maximum and managing the time are needed..
>
> **Planning:** In this stage, problem is stated. Gathering the knowledge related to problem and visualization of the thinking are done**.**
>
> **Efficiency:** In this stage, the produced ideas are put in action. In this way, whether the idea is valid or not is checked.
>
> **Revision:** It is the stage of evaluating the process. The questions such as "What did I do? How much of my idea is successful? How can I improve it? Did I achieve my goal?" are asked (as cited in Doğanay, 2000, 180).

The CPS steps of Fisher seem to be a revision of Wallas's CPS steps. Fisher identifies the problem as a stimulus and following steps do not differ from Wallas's CPS steps and are also congruent with Kolb' learning cycle.

In addition to Wallas and Fisher's CPS steps, Osborn (1952 as cited by Treffinger & Isaksen, 2005) presented a comprehensive description of a seven-stage creative

problem solving process. This process consists of steps called orientation, preparation, analysis, hypothesis, incubation, synthesis and verification. He carried out research to improve his version of the CPS process, to create a five-stage CPS model, which was expanded by Treffinger & Isaksen (2005) who then established a new model called CPS Version 6.1 ^{TM} framework in 2000. Finally, Treffinger and Isaksen developed a systematic approach, which enables individuals and groups to recognize and act on opportunities, respond to challenges, balance creative and critical thinking, build collaboration and teamwork, overcome concerns, and thus manage change. They claim that the elements of CPS Version 6.1^{TM} (Figure 3) enable individuals or groups to use information about tasks, important needs and goals, and several important inputs to make and carry out effective process decisions.

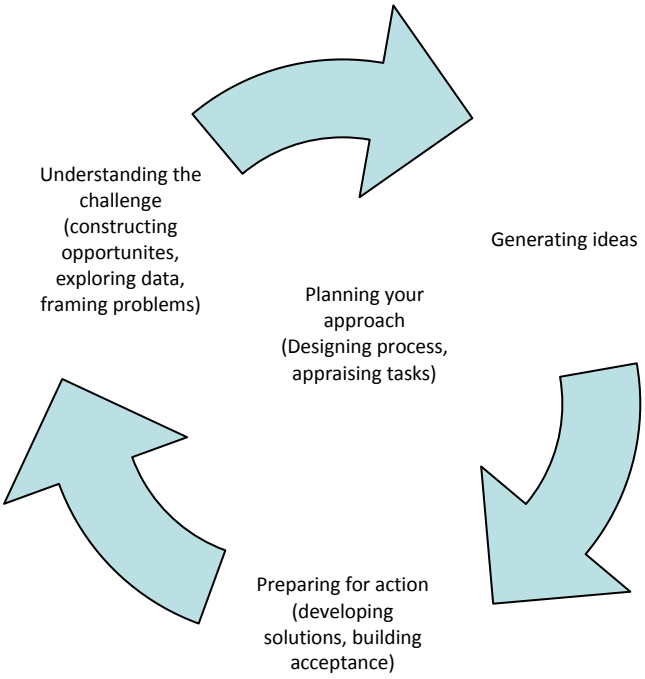


Figure 3. CPS Version 6.1 ^{TM} (Treffinger & Isaksen, 2005)

Different from Osborn, Wallas's and Fisher's CPS steps, in version 6.1, Treffinger and Isaksen (2005) mention individuals and groups. Researchers before did not

emphasize this. Also, instead of referring to the stimulus as a problem, deficiency or difficulty, they prefer using terms such as challenges or opportunities. Table 2 covers the different versions of creative problem solving steps used in this study.

Table 2
Comparison of steps of the creative problem solving

Wallas (1926)	Osborn (1952)	Kolb (1984)	Fisher (1995)	Treffinger & Isaksen (2000)
			Stimuli	
Preparation	Orientation & Preparation	Observe		Understanding the challenge
Incubation	Analysis & Hypothesis & Incubation	Think	Exploration	Generate ideas
		Plan	Planning	Prepare for action
Enlightenment	Synthesis	Do	Efficiency	
Confirmation	Verification	Observe	Revision	Understanding the challenge

When we compare Table 2 to the expectations of DI, there is an overlap between the creative problem solving steps mentioned and DI goals. Generally, teams are expected to first understand the task, then generate ideas and share them with each other, following that, they demonstrate the solution or build a framework solving the task. This is followed by evaluation of the solution, finding weaknesses, thinking of ways to fix it, rebuilding the solution and experimenting with it again. All these steps are also consistent with Kolb's (1984) learning cycle in which the Reflective Observation allows them to think about what was done. Following that, Abstract Conceptualisation is done to generalize experiences, then the Active Experimentation to practice new ways and finally the Concrete Experimentation to trial the activity.

Constructivism and creative problem solving

The constructivist approach is based on the idea that learning is a process of interpreting the facts according to previous experiences or constructing the facts related to specific materials, events, cases or notions in the brain (Jonassen, 1994 as cited from Vural, 2008). When we look through the goals of DI (Rules of the Road Brochure, 2010-2011), it basically emphasizes the necessity of learning how to think, be responsible for self-learning and learn to control behaviours. There is thus an overlap between the constructivist approach and the goals of DI.

Each new learning experience leads to a review of the students' intellectual structure, changing something when necessary or adding something to improve the existing structure (Yeşilyaprak, 2009).

Supporting the approach of constructivism, according to Piaget (as cited by Yeşilyaprak, 2009), individuals should interact with objects to understand and know them. They should change the place of the objects, regenerate, divide them into parts or brought them together. This applies to DI in that the main action of students in DI is interaction with concrete material while solving the problems. Thus, the constructivist approach suits the goals of DI with regard to active participation, being responsible for learning, and interaction with objects. The students are forced to think and reach the conclusion by themselves.

Isaksen and Parnes (1985) stated that "Learning which promotes the development of creative thinking and problem solving skills is important for a society with an emphasis on democracy and innovation" (p. 2). A great deal of research supports the

view that creative learning can be enhanced. In Öztürk's (2007) study, she assessed problem solving skills of students by using "Logical Thinking Group Test (LTGT)", and assessed the level of creative thinking of students by using "Torrance Creative Thinking Test". These two tests were applied to experiment and control groups as pre-test (before the experimental study) and post-test (after the experimental study). She concluded that, creative thinking instruction affected the ability of solving problem and the level of creative thinking of students positively.

Most studies of creativity training programs seem to support the view that creativity can be acquired (Isaksen & Parnes, 1985). In a fifth grade class of social knowledge education, Vural (2008) found that activities, which were used to reinforce student's creative thinking, helped the students improve.

In the light of the few studies on creativity and problem solving discussed above, a theoretical framework on which this study is based on is presented in Figure 4. The non-formal learning approach which is embedded in planned activities (CEDEFOP, 2008) and enables students to have fun by voluntary participation (EC & EOC, 2004), forms the basis of this framework. This study claims that learning, which supports the development of creative thinking and problem solving skills (Isaksen & Parnes, 1985), emerges under the circumstance of voluntary participation with planned activities by building own knowledge, skills and experiences in line with the constructivist theory (Brooks & Brooks, 1999).

According to the similarities of the Kolb's learning cycle with the creative problem solving steps (Wallas, 1926; Osborn, 1952; Fisher, 1995; Treffinger & Isaksen,

2000), it could be said that non-formal learning programs contribute to creative problems solving skills by following the learning cycle of Kolb. Figure 4 represents the theoretical framework of this study.

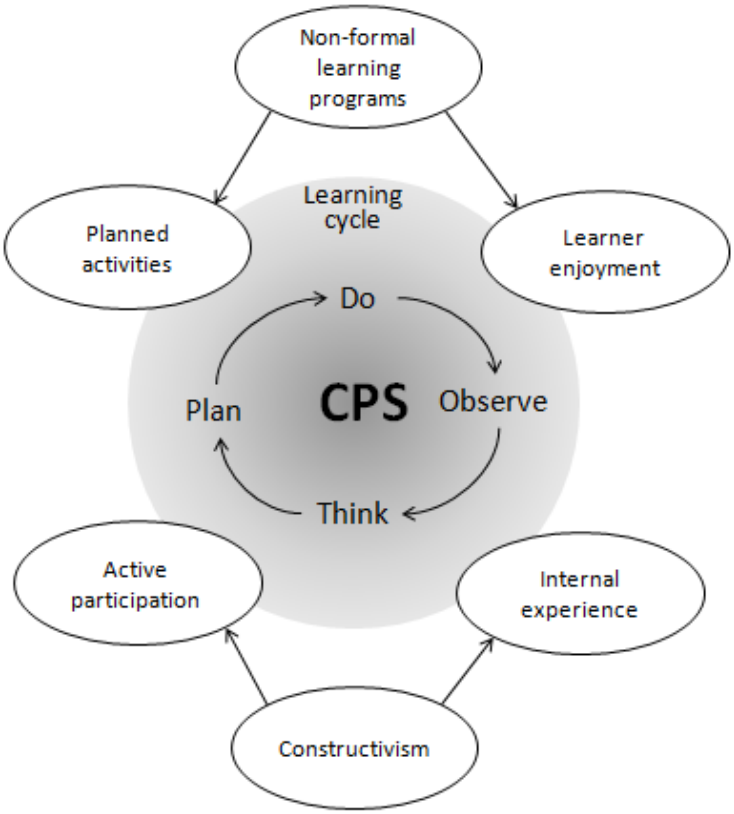


Figure 4. The theoretical framework of this study

Summary

In the 21st century, advanced skills and knowledge will be required of employees by employers (Staw, 2006; Cadle &Selby, 2010). Due to the spread of globalization and the explosion of knowledge, the world is getting more competitive (Regmi, 2009). Cadle and Selby (2010) indicated, "…children need thinking, verbal and written communication, teamwork, creativity, educational research and problem solving process skills to compete and thrive in the future" (p. 1). Students should be nurtured as a future workforce to compete on a global scale and thus be successful in the future.

According to Regmi (2009), formal learning becomes incomplete without informal and non-formal learning. For this purpose, a non-formal learning program, DI could provide opportunities for participants to learn and experience creative problem solving skills, tools and methods to fill the gaps of formal education. Therefore, this study will focus to the realization of non-formal learning on improving the creative problem solving skills of students for the current and future needs in Turkey, by investigating the student and teacher perceptions of DI in this regard.

CHAPTER 3: METHOD

Introduction

The aim of this study is to examine the contribution of a non-formal learning program called Destination ImagiNation (DI) regarding creative problem solving skills of elementary and middle school students at a private school in Ankara, Turkey. This study was done using a mixed method design consisting of four data collection types: observation and interviews with a focus group (one team of six DI students), a questionnaire for team managers participating in the program, and responses to a number of tasks for DI students participating in the program in the fall semester of 2011-2012.

Research design

A mixed method case study was preferred to expand the scope of the findings and to reduce any methodological or personal bias. This study is thus a mixed method case study using a concurrent embedded design model. Research evidence was gathered to make the results accessible to subsequent critical assessment, for internal and external validation.

The embedded design is a mixed method design in which one data set provides a supportive role in the study, yet based primarily on the other data type (Creswell & Plano, 2003). Hanson et al. (2005) describes the embedded design as including the collection of both quantitative and qualitative data, in which one of the data types plays a supplemental role within the overall design. In this embedded design model,

quantitative data was embedded within a qualitative methodology in order to answer the research questions.

For the qualitative phase of the study, observations and interviews with a focus group were completed. Concurrently analysis of the questionnaire for teachers and the set of tasks for students constituted the quantitative data sets. All the information related to how this study was conducted was summarized in Table 5.

Participants

This study was completed with the participation of a group of six DI middle school students who were 13 years old girls and in 8th grade, 50 DI team managers who are also schoolteachers, and 25 DI students at a private school in Ankara, Turkey. This school was selected because the DI program was conducted as an extracurricular activity in Ankara. The students in this school come primarily from higher socio-economic backgrounds. The nationality of the students is mixed. Most of them are Turkish but there are international students from other nationalities in the school. The profession of the parents vary but most are well educated. All of the students who participated in this study are Turkish and have well educated parents. Most of the team managers were international teachers and a few of them were Turkish. Table 3 outlines the data collection methods and participants preferred for this study.

Table 3
Research methods and participants for each data collection

Focus group	DI team managers	DI students	
n= 6	n=50	n=25 (begin)	n=25 (end)
Observations Interviews	Questionnaire	Task Analysis	

Instrumentation

For the qualitative phase of the study, observations and interviews were preferred to get the perception of students and team managers about the program and their progress in creative problem solving. The focus group was observed and interviewed during the first fall semester of 2011-2012 while they participated in the activity, doing Instant Challenges (Appendix E) and preparing for their team challenge.

Observations

In order to define the behaviour of the students while doing the tasks, this group was observed in a classroom which was the venue where they met for the activity. During the observations, besides the researcher, their team manager was in the classroom. Each observation, of which there were 14 in total, lasted 45 minutes.

In order to see the content and extent of the observations, observational approaches needed to be analysed. The first approach emphasizes structured or non-structured observation (Flander, 1970) with regard to the aim of the observation. In structured observations, a set of behaviours of students is observed and noted. In order to note these behaviours, an observation form is completed, which is categorized under the

intended titles. On the other hand, non-structured observation is conducted in a natural area without any predetermined plan.

An observation can be based on participant observation and non-participant observation (Flander, 1970). In participant observation, the researcher participates in the program. In the non-participant observation the researcher stands back and observes the participants from the outside.

For this study, structured and participant observations were preferred because these types of observations could give the researcher a chance to observe the situations, behaviours and events in detail. As stated by Patton (2002), the participant observer employs multiple and overlapping data collection strategies such as being fully engaged in experiencing the close contact, interpreting body language and comment better or observing and talking with other participants about whatever is happening. The extent to which it is possible for the researcher to become a participant in a program depends on the nature of the program (Patton, 2002). As a participant observer, the researcher passively participated in the tasks, taking a team manager type of role, to monitor student behaviour.

Information about the researcher and the study were introduced to the students at the beginning of the semester to establish a working relationship with them. During each session, notes about their reactions, behaviours and events that occurred were taken according to a structured guide (Table 7), especially with regard to creative problem solving. These observations helped to record the progress of the students in

the program and compared their creative problem solving skills from the beginning of the semester to the end of the first semester.

In order to expand the scope of the findings, the same focus group, consisting of six students, was interviewed in order to get their perceptions on their own progress during the first semester.

Interviews

Interviewing is a process of interaction in which two or more people come together for a purpose using oral or written techniques (Özgüven, 2007, p. 84). As it depends on having a conversation between two or more people, it is a natural interaction and a good way of collecting data and also differentiates between aim, content, properties and attitude of the participants (Yıldırım & Şimşek, 2005).

The reason behind choosing an interview guide approach was to explore their perceptions more deeply (Yıldırım & Şimşek, 2005). The interview guide approach lists the questions or issues that are to be explored in the course of an interview in writing. It aims to ensure that the same basic lines of inquiry are followed with each person interviewed (Patton, 2002). The advantage of the interview guide is that it helps to make interviewing a number of people more systematic by delimiting, in advance, the issues to be discovered. Another advantage of an interview guide is to provide a framework within which the interviewer can develop questions, sequence those questions, and make decisions about which information to pursue in greater depth (Patton, 2002).

As the qualitative researcher's philosophy determines what is important, what is ethical, and the completeness and accuracy of the results (Rubin & Rubin, 1995, p.2), good interview skills require practice and reflection. To achieve this, a pilot trial interview was done with four students at the school. After gathering these interview results, questions were revised, some changes were made and final version of the interview guide (Table 4) was prepared.

The questions used aimed to gather information about six topics. First, the reason behind choosing DI was asked of the participants. Second and third, their ideas on the current and future benefits of the program were asked. Fourth and fifth, they were asked to think about the contribution of the program to their problem solving skills. Finally, they were asked to describe their own progress during the two years they had participated in the program.

To ensure that these were not perceived as leading questions, merely eliciting a yes or no response, additional clarification questions were asked. These included "What do you mean by…?, Can you say a little more about…?, In what way...?, Can you give me some examples?, How does that relate to…?, Have you anything more to say about that?" and ensured that more in-depth answers, reflecting true opinions, were obtained.

The interviewees decided on a suitable time for the interviews. Since the interviews were held during the extracurricular activity time, they were conducted in Turkish as this is the mother tongue of the focus group students when the students felt relaxed.

This allowed the students to be more at ease and to give detailed information more easily.

In an attempt to minimize bias from the interview, each question was asked in a similar voice and manner for all participants, and clarification was minimal and given only if requested by the participant. If it was obvious that a question would not apply in a situation of the participant, it was skipped and the next applicable question was asked. The participants were encouraged to describe situations in detail, and were asked follow-up questions to draw forth-emerging meaning. After obtaining their permission to do so, their answers were recorded using a voice recorder.

Table 4
The interview guide for the focus group (translated from the Turkish original)

Categorizing	**Sub-questions**
1. Reason for participating in DI as an after school activity	✓ There are many after school activities that you could choose from. What made you choose DI?
2. Perception of the current benefits of the program	✓ What opportunities have you had while doing DI for 2 years? ✓ How is DI a benefit in your life? -outside of school - in school - on your grades - your future
3. Perception of the future benefits of the program	
4. Perception of the impact of this program on student' problem solving skills	✓ What is your role in the team? ✓ How do you deal with the challenges given to you? ✓ When you are given a task, what is the most important thing that you need to consider? ✓ Which of your skills emerged in that situation? ✓ What skills are needed to do DI? ✓ What skills have you improved while doing DI? Are those new skills or ones you have developed further? ✓ How much of those skills do you put into practice while doing tasks? ✓ What do you think the reason behind this is? ✓ Is DI a good way to demonstrate your skills or improve your skills? ✓ What habits have you developed from doing DI?
5. Perception of the impact of this program on student' creativity skills	
6. Evaluation of progress	✓ How do you evaluate your progress considering participation in the program at the beginning and now? ✓ Are there any changes that you have noticed in the way you do things from the beginning till now? ✓ What about the competition you participated in? ✓ Do you have an aim for the future that involves DI?

Questionnaire

For the quantitative phase of the study, a questionnaire (Appendix B) for team managers was prepared, and administered via e-mail. The questionnaire as a data collection instrument allows the collection of information from people about the problem (Özgüven, 2007). In this study, the questionnaire was mainly used to collect information about the teachers' perception of the creative problem solving skills of their DI students.

Preparation of the questions of a questionnaire needs research and discussion with experts in the area (Erden, 1998). While preparing the questions, a review of the literature was done and some sample questionnaires were analysed. Questions were then written using the Google Docs program on the Internet mail system. The questionnaire consisted of four parts. In the first part, private information such as confirmation of being a team manager, number of years' experience as a team manager, their school subject area, the reason behind being a team manager and their opinions on students' choice of DI as an extracurricular activity were requested. In the second part, views on students' skills such as problem solving, creativity and time management were requested. The third part looked at teachers' approaches to the DI program and finally, the fourth part collected details on their knowledge of the DI program. Teachers were asked to complete the questionnaire using a Likert scale, thus making it easy and quick to complete.

For validity requirements, after preparation of the first version of the questionnaire, academicians in Bilkent University checked it and a copy of the first version was sent to 20 teachers at the school via e-mail. After taking suggestions and advice, the

wording to some questions were made to ensure validity requirements were met. As it was written in English, it was further checked for correct language and grammar. Then, the final version of the questionnaire was sent out to 50 DI team managers.

Tasks

A set of eleven tasks (Appendix C) were applied to DI primary school students (n=25) in the school two weeks after the beginning of the first semester, and 14 weeks later, the same tasks were given to the same group of students (n=25) at the end of the first fall semester. These eleven tasks were given to DI students in order to focus on two major areas: logical thinking skills and creativity skills. After research on logical thinking and creativity, 11 tasks consisting of logical thinking questions, creativity questions, and questions which included both logical thinking and creativity, were selected from a series of resources to analyse students' creative problem solving skills. These tasks were selected and put together considering their relevancy with DI tasks, and the research questions of this study.

These 11 tasks were as follows: five tasks related to following the problem solving steps (Dewey, 1910; Polya, 1957; PISA, 2003) ; three tasks related to interpreting shapes and completing a story; three tasks including both logical thinking and creativity skills were added and analysed in terms of creativity and logical thinking skills, separately.

For the reliability requirement, early in 2011, the selected 20 tasks were tested with 61 DI students as a pre and post application. As a result, the number of the tasks was reduced to shorten the time required to solve the problems. In addition, the tasks

were placed in random order to spread the different task types. The remaining 11 tasks were used in this study. For the validity requirement, expert judgment was conferred by Oliver Wright (was a member of Psychology Department at Bilkent University, personal communication, 2011).

Data collection

In all phases of the study, as a researcher, active participation was conducted and all ethical requirements were followed closely. Personal and participant bias was reduced as much as possible but could not be entirely prevented, especially where participants were concerned, as they had chosen DI as an extracurricular activity.

The required applications were sent to the Ministry of National Education, the Provincial Directorate for National Education in order to do research at the private school in Ankara. In October 2011, all data collection instruments were revised and pilot trials were conducted. As a requirement of the Ministry of National Education, the study was only started two weeks after the first day of school. Observations, interviews, questionnaires and tasks were applied through voluntary participation during the entire study.

For the focus group observations, a team was selected after discussion with team managers. The observations were made each week, for 14 weeks, during the activity period and notes regarding observations were taken in writing. Focus group interviews, which took almost 10 minutes for each interview, were conducted during two activity periods. The final version of the team manager questionnaire was sent out via e-mail. To determine whether DI affected creative problem solving skills, the

11 tasks were applied to all grade 6 to 8 DI students (n=25) in the school two weeks after the beginning of the first semester and again at the end of the semester. Students were told that they had a maximum of 15 minutes to complete these 11 tasks (Appendix C). This time was allotted based on previous trials, according to the number of the tasks that needed to be completed and the age of the students. However, students were allowed as much time as they needed.

The tasks were written and conducted in Turkish as this was the native language of the majority of the students, ensuring that problem solving skills were being determined and not English language skills. At the beginning of the task sheet, information on age and gender were asked to allow for more detailed analysis.

Data analysis

For the observation, interesting and related events and notes were selected considering the program objectives and research questions. The notes were summarized, categorized and converted into table form (Table 7), so that trends and pattern recognition were facilitated.

For interviews, data was first transcribed and then analysed. Analysis involved categorizing the data related to answers according to research questions and then comparing the responses. After transcribing the data, pattern analysis was done to find trends. Related answers were selected from the transcribed data as quotes. This data was also converted into a table (Table 8), which summarizes the answers of the students.

For the team manager questionnaire, all of the questions in the questionnaire were coded and analysed using the Windows program, Microsoft Excel. The Likert scale response options were converted into percentages, to determine to what extent the team managers agreed or disagreed with each statement.

For tasks, after collecting the data from 25 DI students at the beginning and end of the semester, the data were analysed in terms of creative problem solving skills. In order to assess creative problem solving skills of the primary school students in science lessons, a three point performance criterion (Appendix D) was prepared referring to Saiz and Rivas (2008)'s Pentrasal assessment system in order to analyse student responses. Students gained points of any, partial and full according to the quality of their answers. Logical thinking skills of students were analysed in terms of the steps followed while solving the problems. The creativity skills of students were analysed in terms of the answers' originality, which is one of the creativity parameters of Torrance (1962). Average scores of students were reported directly or converted to percentages. In summary, Table 5 presents information about types of samples, the number of the participants, instruments used, and applications done for validity and reliability requirements and types of analysis followed in this study.

Table 5
The instruments, number of participants, types of samples, validity and reliability and analysis types used in the study.

Participants	**Instrument**	**Number of participants**	**Validity and reliability**	**Type of analysis**
Focus group	Observation Interview (Appendix A)	6	A pilot trial interview was done with four students.	**Pattern analysis** **1.** Reading and transcribing **2.** Relating anecdotes to previously selected categories **3.** Comparing answers and determining the similarities and differences **4.** Identifying trends **5.** Converting patterns into tables
DI team managers	Questionnaire (Appendix B)	50	Literature was reviewed and relevant samples were selected. 20 teachers were used for the pilot trial. According to feedback, questions were revised and some changes were made.	A five point Likert scale is preferred to get the views of the team managers. Each question was analysed separately using percentages.
DI students	Tasks (Appendix C)	25	For the validity requirements, expert judgment was preferred. For the reliability requirements, pilot trial was done with 61 students.	Each task was analysed separately following the performance criteria (Appendix D) considering creative problem solving skills and reported as logical thinking and creativity.

CHAPTER 4: RESULTS

Introduction

In line with the methodology, this chapter consists of four parts; focus group observations, focus group interviews, team manager questionnaires and creative problem solving tasks. These data collected will then be used to answer the research questions about the contribution of the Destination ImagiNation (DI) program to the creative problem solving skills of students.

Results of the observations of the focus group

A DI team was selected and participant observations were conducted by the researcher during the activity period time set aside for extracurricular activities in the first semester in 2011. Before analysing the categorization of the observations, the classrooms, the materials used in tasks and how sessions were conducted are discussed. The observations were then categorized in line with the research questions. The findings related to this categorization are summarized in Table 7.

Materials used in tasks (Instant Challenges) were diverse and ranged from stationery, such as paper, paper clips, elastic bands to everyday items such as shoes, pans, hoola hoops or wooden blocks. Other items used could include wooden spatulas, marbles, ping-pong balls or pipe cleaners. These materials can be used in any form and thus are meant to enhance the creativity use of the materials. For example, a pencil should not be viewed as pencil but can be broken into two parts and used as forceps.

To illustrate how the DI activity sessions were conducted, the key points from a typical observation are listed below;

- The team manager set up the Instant Challenges before each meeting began. She sorted the materials neatly and placed copies of the challenge for the team.
- The team manager read the entire Instant Challenge (An example is provided in Appendix E) as they read along with the copies. When she finished reading, she read the challenge section again to let them focus on the key factors of the task.
- The team manager tried to begin timing the activity in time. In the first weeks, the team manager tended to allow a lot more time than stated in the challenge but in later weeks, the team manager strictly followed the time stated for each task.
- The team manager didn't remind the team of any rules unless they specifically asked. When they asked, the team manager directed them to read the challenge again.
- When the challenge said that they must have something completed in order to proceed to the next part of the challenge, and the team didn't have it done, she didn't allow them to proceed. However, if the team failed, she let them repeat the challenge at a later stage. When they didn't solve the challenge, the team manager ended the challenge without trying to cajole them. When asked the reason for this, the team manager explained that it was to let them learn failure and to encourage them to learn from their mistakes.
- After presenting their solution for a task or performing their presentation, the team manager asked them some questions to assess their solution. DI has a list of questions to discuss during this debriefing (feedback) session in line with those stated in the Rules of the Road document (2010-11);

- ✓ What did you and your team do well?
- ✓ What could you improve on?
- ✓ How well did your team communicate and work together?
- ✓ How creative was your solution to the problem?

The team manager then preferred to go through the scoring section, letting the team assess themselves on each of the listed categories. She would ask why they gave themselves that score. She asked if they could think of anything that would improve their score.

- Although the team manager didn't use a checklist during the debriefings, she had distributed a checklist at the beginning of the semester. The checklist included reminders to students to read the challenge, determine what is necessary, discuss what they think as a team, keep the time management issue in mind, work as a team, and use the materials effectively. Read the instructions well, is the first item on the list and is considered the most important factor in the problem solving steps, as suggested by Wallas (1926), Fisher (1995), and PISA (2003).

The team manager never used the checklist during the semester but asked similar questions as much as possible to force them to focus on these issues and improve their scores. In this way, they started to focus on the questions well and read the instructions carefully. She mostly focused on time management issues that students had difficulty with and also encouraged teamwork using guiding questions.

- When time allowed and the team had discussed better ways of solving the challenge, she gave another challenge to solve. This chance gave the team an opportunity to develop their skills.

An example of a DI session is given in Table 6 to illustrate how students dealt with a problem and the time issues.

Table 6
An observation from an activity session (Appendix E)

Observation no: 3
Task: Breaking Point
Materials: 6 Straws, 4 Craft Sticks, 10 Pieces of Spaghetti, 10 Toothpicks, 1 Paper Plate, 1 Paper Cup, 12 in (30 cm) of String, 2 Mailing Labels, 2 Rubber Bands, 1 Piece of Foil, 1 Sheet of Paper
Challenge: Their challenge (problem) was to build a freestanding structure that is as tall as possible and that, when turned on its side and balanced on a brick, would support weights added to both ends. There are two parts in this task. At the end of first part, they should place their structure in the taped area, in the middle of the floor. In part 2, they move their structure onto the brick in the taped area. They then have a chance to test the strength of their structure on the brick by adding weights to each end.
Observation notes: The team manager taped the stated area on the floor of the class, distributed team copies of the task and read the task aloud. She emphasized the time requirements which were; 4 minutes to use their imagination to design and build the structure and to place it in the taped area, then up to 1 minute to balance the structure on a brick and finally up to 2 minutes to add weights to both ends. Then she moved away and monitored the team. The students first read the instructions of the task individually and Öykü said "I think we should put the paper cup at the bottom to balance the tower well". Then Burcuhan said, "if we do that, it won't be high enough. We will get a point for each 2, 5 cm". They ignored Öykü's idea and focused on the issue of height. They tried to arrange all the items in such a way that it would be as tall as possible. Everybody participated in shaping the structure. The requirement of "1 point for each inch (2.5 cm) of height of the structure (30 points maximum)", that is maximum 12 cm, mentioned in the scoring part of the task was ignored and nobody reread the task or the scoring part of the task. During the time given, they were excited, willing, enthusiastic and on task. Everybody in the team put in effort. There was not much noise as they tried to be careful while shaping the structure. Thus, they sometimes whispered. They sat down on the floor and carefully used the items given. A hidden leader emerged from the team. This was Burcuhan, who directed her friends with good body language and phrases such as "I think it would be better if you put that there" And, her friends followed her directions.

Table 6 (Cont'd.)
An observation from an activity session (Appendix E)

When time was called, the structure was 30 cm high but they couldn't balance it on the brick, although they tried for 10 minutes. After allowing 10 minutes, the team manager asked them what they did well, what was good for this task, how they could improve it, and finally she asked them to score themselves according to the scoring criteria in the task. They were hard on themselves. They got angry with themselves as they didn't read the instructions well and lost points because of that. They gave themselves low points for missing details but awarded themselves 10 points (out of 10) for teamwork. At the end of this debrief, they decided to read the instructions in detail. Then, the team manager evaluated their performance.
Scoring section: A. 10 points if you have a freestanding structure within the taped square at the end of Part One. (They gained 10 points) B. 1 point for each inch (2.5 cm) of height of your structure (30 points maximum) (they gained 30 points) C. 20 points for the creativity of your structure. (They gained 15 points according to the originality of the structure) D. 1 point for each inch (2.5 cm) that your structure extends out over each side of the brick (20points maximum) (they lost 20 points as they could not balance the structure on the brick) E. 1 point for each set of weights that your structure supports (10 points maximum) (They lost 10 points because of the same reason as above) F. Up to 10 points for how well your team works together. (They gained 10 points because of sharing their ideas, putting effort to the task cooperatively, and good communication)

Sessions similar to the one described in Table 6 were observed for 14 weeks. Observations were recorded and categorized according to changes in behaviour (Table 7). Their practice with Instant Challenges, every week, in a class session set aside for extracurricular activities contributed to their teamwork skills, time management skills, problem solving skills, and creativity even though improvement differed for each skill.

Although there was an improvement in their problem solving skills compared with the first weeks' achievement, they often didn't reach the desired outcomes with regard to the goals of the task. Although it is hard to define the differences in terms

of students' creativity skills, the students generally tended to ignore the creativity expectations of tasks. However, it depended on the task. When it was a performance based task, creativity was visible; when it was a task based task, they mostly focused on solving the problem, ignoring the creativity requirements.

Although time management skills were the main focus set by the team manager during the semester, not much improvement was observed. Towards the end of the first semester, they were still struggling with time management issues.

With the aid of debriefings, students started to focus on what they did well. This improved their self-confidence and awareness of teamwork. Without verbalizing it, they determined their roles according to tasks. While some of them were dominant in the performance-based challenges, others took the lead in task-based challenges.

It was obvious that the team manager was merely an observer in the activity. The team manager stood on the side-line as a mentor and controlled the noise level, which decreased towards the end of the semester but depended on the task, warned them not to hurt themselves with the materials provided for the task, and reminded them of the time without interfering in their ideas or beliefs.

Table 7
The categories of 14 weeks of the observations and the changes in the behaviour of students.

Categorizes	Week 1-5	Week 6-10	Week 11-14
Success at achieving a good solution	They were struggling with missing key factors written in the tasks so they were not successful.	They started to learn from their mistakes. They succeeded in tasks but missed points because of lack of attention to detail.	They were better compared to previous weeks. They succeeded in more tasks than in previous weeks.
Problem solving	They struggled with reading the task properly or sharing ideas about solving the problem. They attempted, but did not reach a solution or even get close to reaching a solution.	They started to learn what they should do to solve the problems. They barely reached a solution but did get closer to achieving a viable solution.	They could reach a solution but it was not satisfactory in terms of the scoring rubric. However, considerable improvement was observed compared to previous weeks.
Creativity	As the main focus was completing the task in the given time, they ignored the expectations of tasks on creativity.	As they realized that they missed points because of ignoring creativity, they put some emphasis on creativity.	More creativity was observed in performance based challenges than task based challenges, but with poor evidence.
Type/amount of guidance given	In the first five weeks, the team manager explained and reminded the rules of the program. She expanded the time range to let them complete the tasks.	The team manager kept giving feedback after the task but didn't interfere in during the task. The team manager continued expanding the time range for tasks.	The team manager focused on time management kept giving feedback and followed what written in tasks.

Table 7 (Cont'd.)
The categories of 14 weeks of the observations and the changes in the behaviour of students.

Learning from previous feedback	After two weeks they started to learn what to do due to feedbacks and from their mistakes.	As they missed points because of not reading the task well or not working as a team, they started to work cooperatively. They started to explore who does what well.	Students mostly learned how to make a plan when they were given a task.
Self-assessment	As the team manager let them assess themselves after each task, they gave themselves too low scores.	Self-assessment started to be more realistic. They started to focus on the positive aspects-those they did well.	They assessed themselves objectively comparing good points and bad points in the task.
Noise level	Although it changed according to tasks, they were eager to shout at each other because of their excitement.	They started to learn the importance of listening to peers but the noise stayed high.	As they learned cooperation, and listened to each other, the noise level decreased considerably.
Time allowed/needed to complete the task	The team manager let students expand the time given in the task so completing a task took a full session, that is, 40 minutes.	The team manager was not strict but tried to restrict their time as written in the task, that is, 10 minutes or 15 minutes. They could thus do more than one task.	The team manager was strict about time management. Completing a task took 5 or 8 minutes as written in the tasks. The rest of the time, they were busy with preparing their team challenge.
Number of challenges completed per session and time spent on team challenge	They could complete 1 task per session	They started to complete 2 tasks per session	They completed a task but could spend time for team challenge

Results of the interviews with the focus group

Observing the students in the focus group during the first semester of 2011, the students were interviewed using an interview guide during two of the activity periods. The interview guide (Appendix A) included a series of six open-ended questions which focus on six central issues: reason for choosing DI, current benefits of DI, future benefits of DI, contribution of DI to problem solving skills, contribution of DI to creativity skills, and self-evaluation of their progress in the DI program. This took almost ten minutes per student. Interviews were taped and then transcribed for analysis. Table 8 summarizes the responses of the focus group.

In the pages that follow, student responses to the interview guide are presented and analysed. The major purpose of the analysis was to organize student responses in such a way that overall patterns would become clear.

The interviews elicited that the main reason for choosing DI as an after school activity was fun. In addition, some students stated that DI gave them a chance to be with their friends, thus the emphasis on extrinsic rewards was seen. They preferred DI as it gave them a chance to go to İstanbul and possibly to the USA for the Global Finals, if they won in İstanbul. Only one student mentioned the intrinsic reward of choosing DI to learn from the challenges, although she did not elaborate on how this was done or what skills she had learned.

Table 8
Individual student responses to interview questions (translated from Turkish)

Central issues	Patterns
The reason for choosing DI as an after school activity	Having fun Having a chance to be with friends Having a chance to go to İstanbul and the USA Learning much from challenges (*e.g. physics principles used in the science lesson*)
Current benefits of the program	Sharing time with close friends Reflecting what was learned in DI to real life situations (*the door of the cupboard was broken and I replaced it using a sheet of paper*) Focusing on tasks well Learning the importance of listening to people well Learning the importance of reading tasks well (*e.g. in a challenge, it was written that 50 cm is enough but as we didn't read it well, we lost points*) Improvement of manual skills Improvement of thinking quickly Improvement of creativity Improvement of planning and organizing Improvement of time management skills

Table 8 (Cont'd.)
Individual student responses to interview questions (translated from Turkish)

Future benefits of the program	Advancing social skills for CVs (when applying to universities abroad) Application to future career (*e.g. I want to be a diplomat in the future so I want to struggle with the world problems*)
Contribution of the program to problem solving skills	Learning is to read the instructions in detail Focusing on the problem Focusing on tasks and points Not missing any detail. Responding to a problem quickly Using experiences while solving the tasks Brainstorming while solving the tasks
Contribution of the program to creativity skills	Reflecting the creativity on performance based challenges Although having this talent before, improvement by doing Instant Challenges During the 2 years, becoming an actress, a space woman, an engineer, a driver, a hairdresser in challenges Improvement of imagination
Evaluation the progress	Being aware of the program expectations much more By having more experience every year, becoming more successful Perfect improvement considering creativity Concentrating on what was done well Improvement of confidence as a team Realization of representing BLIS at competition Being more serious and ambitious

According to the students, the current benefits of the program were sharing time with friends, learning to listen to people well, read instructions carefully, improving manual skills, focusing on task, thinking quickly, planning and organizing and improving creativity. From these responses, it can be realized that they were aware that they could learn by doing the challenges. When they addressed the issues of losing points, they readily stated these as the reasons. One of them explained the issue about "listening to each other" as follows;

> "...When we started to do DI, we had many arguments. Everybody wanted to say something when we were given the task but none of us were listening to the others so it created a bad atmosphere. As we didn't listen to each other, some good ideas were lost. We lost points in the challenges. Then we learned to listen to each other carefully" (Öykü, 13)

Another student emphasized the benefit of the program by mentioning the importance of reading tasks carefully, pointing out that they had lost points due to building a structure higher than the required 50 cm (Table 8).

Finally, time management was seen as a benefit of DI. One of them shared her memory:

> "...When we were given a task last year, we panicked about the time but this year, even if we had 2 minutes for completing the preparation part of the task, we could finish it in a minute as we focused on what we needed to do". (Aslı, 13)

Considering the future benefits of DI, one student perceived the program as being an advantage when applying to universities. Some emphasized skills that could be used in the future. These were manual skills, thinking fast, creativity and managing time effectively. Only one of them linked DI with her future goal.

> "...I want to be a diplomat in the future so I want to struggle with the problems of society. DI helps me in that way" (Burcuhan, 13)

Also, students agreed on the development of skills such as creativity and time management. Although they believed that they had already had these skills before, all of them mentioned positive changes in their abilities.

However, they didn't mention development of problem solving skills directly. They emphasized the importance of reading tasks well to solve the tasks and not to miss any detail and thus, any points but did not link this to directly to solving the task. While solving a challenge, the first thing they did was to read the challenge well and then brainstorm with their teammates. They agreed on the changes in their behaviour regarding this issue. One of the examples from a student interview is given below:

> "...Last year when we were given a task, we got excited. But this year it changed. Now the first thing that we do is to read the task well and then we share our thoughts by brainstorming. Some silly ideas come to our minds. But while thinking and sharing, we decide to choose the best idea and apply it quickly". (Dilara, 13)

Also, they stated that they could use what they learned from other areas in their lives such as the news or interesting events to solve the tasks. One of them mentioned this by saying that:

> "...I try to find new and interesting examples and ideas from real life. For instance, once we had to build a building. The building in Dubai that has a narrow base and goes wider towards the top came to my mind and we created our building based on that one". (Zeynep, 13)

Or they reflected what they had learned from DI to real life situations. One of the students shared her memory:

> "...We can use what we learned in DI in our life, as well. For example, the door of the cupboard was broken and I repaired it using a sheet of paper". (Burcuhan, 13)

Some students mentioned using what they learned in Instant Challenges in their school lessons. One of them gave an example which showed using the lessons learned in DI in a subject exam:

> "...Once we were given a task which required us to build a freestanding structure using some materials. This task was based on physics principles. To do this task, we were given paper clips, paper cups, paper, and some other things which I can't remember. We first focused on making it as tall as possible, ignoring the importance of standing freely so our structure fell down. Then in the following days, we had an exam in the science lesson. In that exam, I tried to read the instructions well and thought about these kinds of issues. I got 92 out of 100 in that exam. I believe that DI changed my thinking style because of the Instant Challenges we experienced." (İrem, 13)

Two other students stated that their creativity skills were reflected in their drama lessons. They mentioned proudly that their drama teacher commented positively on their creative ideas. One of them mentioned the various characters such as being an actress, an engineer, a driver, and a spacewoman that she had a taken on in DI challenges, which then helped her in her drama lessons.

The awareness of students on their own progress was also observed in the interviews. Students were aware of the importance of experience in terms of achievement. They stated that they had progressed year by year. One of them believed that her theatrical

skill improved during this process. Another stated that she could concentrate more on what she did well, compared to the beginning. This also showed that their self-confidence had improved. As they still do DI, they have some future aims such as improving teamwork skills or focusing on time management more.

Results of the team manager questionnaire

To collect information on how team managers viewed the program and their teams' skills, fifty team managers were asked to complete a questionnaire, using a five point Likert scale for each question. The questionnaire (Appendix B) consisted of four parts. In the first part, some personal information, in the second part, team managers' views on students' skills, in the third part, team managers' approach to the DI program and finally in the fourth part team managers' knowledge on DI was requested. Whereas part one was used to correlate some of the later questions, the results of parts two, three and four are presented below. It must be noted here that all results are biased as all respondents had chosen to be team managers, thus already seeing value in students participating in the program. However, the degree to which team managers felt that the program contributed to the different skills varied.

Team managers' perception of the problem solving and creativity skills of DI students

The first and second questions were prepared in order to learn what team managers thought about the changes in their students' problem solving and creativity skills during the first semester.

As seen in Table 9, in both problem solving and creativity, the trend is an increase in skill, as perceived by the team managers, generally from students having average skills (a three on the Likert scale) to above average (a four on the Likert scale). In this regard, 84 % (n=42) of team managers who participated in the questionnaire believed that their students' problem solving skills were average or below the average at the beginning of the program, while 76 % (n=38) of team manager

believed that their students' problem solving skills were above average by the end of the semester.

Table 9
The frequency of the views of the team managers on students' problem solving and creativity skills

	Problem solving(*f*) (n=50)		Creativity (*f*) (n=50)	
Scale	Beginning	14 weeks later	Beginning	14 weeks later
1- poorly	3	1	1	1
2- little	17	5	4	1
3- average	22	6	26	9
4- satisfactory	7	20	6	15
5- well	1	18	3	24

Similarly, 62 % (n=31) of team managers who participated in the questionnaire believed that their students' creativity skills were average or below average at the beginning of the program, whereas 78 % (n=39) believed that their students' creativity skills were above the average 14 weeks later. Thus, most team managers felt that their students had increased their problem solving and creativity skills comparing to beginning of the semester.

Perception of team managers on contribution of DI to students' skills

The third question related to the perception of the team managers on the extent that DI contributes to students' skills generally, thus including such as communication, creativity, problem solving, and teamwork.

Table 10
The frequency of the views of the team managers on the contribution of DI to students' skills

Views on contribution of DI to students' skills	*f (n=50)*	*% (n=100)*
1-not at all	0	0
2- very little	0	0
3- average	5	10
4-much	9	18
5-very much	36	72

Ninety percentage of the team managers thought that the DI program contributed more than average to students' skills as seen in Table 10. As stated by National Youth Agency (2008), in general terms, participation in educational leisure activities is widely associated with a range of benefits for the young person involved. These primary changes include the acquisition of a range of skills and attributes. Following the view of the National Youth Agency, the views of team managers were interpreted. However, this is expected, as team managers would be biased towards DI as they had chosen to become team managers, thus seeing value in the program. This question assists in valuing the other data as it shows the extent of the bias to some extent.

The fourth question related to the team managers' views on the number of years needed to observe the contribution of DI to students' creative problem solving skills.

Table 11
The frequency of the views of the team managers on number of years needed to observe the contribution of DI to students' skills

Views on years to needed to observe contribution of DI to students' skills	*f* *(n=50)*	*%* *(n=100)*
less than a year	2	4
1 year	12	24
2 years	33	66
more than 2 years	3	6

As seen in Table 11, the majority (66 %) of team managers who participated in the questionnaire believed that two years were needed to observe the contribution of DI to students' skills. Twenty-four percents thought that one-year was sufficient to observe an improvement in skills. This shows that the views of the team managers are parallel to those of the focus group. The students in the focus group stated that there was a difference in terms of achievement in tasks compared to previous year (Table 8). However, they stated that they could go to National Finals, to İstanbul in a year. The focus group students felt that they had improved their skill considerably in one year (enough to do well at the National tournament) (Table 8), thus agreeing with the team managers that feel one year is sufficient.

The fifth question referred to the perception of team managers' on what extent DI students are aware of the program objectives.

Table 12
The frequency of the views of the team managers on the awareness of DI students of the program objectives

Views on awareness of DI students of the program objectives	*f (n=50)*	*% (n=100)*
1-not at all	0	0
2- very little	1	2
3- average	5	10
4-much	14	28
5-very much	30	60

All team managers involved in the study felt that the students were aware of the program objectives, even if only 'very little'. Eighty-eight percents even thought that students were 'much' or 'very much' aware of the objectives. This means that the students go into the program expecting to improve various skills and not merely "to have fun" or "to be with friends" (Table 8), even though that is their main reason for joining the activity. The team managers believe that the DI students are aware of the intention of the program goals (Table 1).

The sixth question referred to the perception of team managers' on what extent DI students are inclined to use their skills in tasks assigned during team managers' subject lessons. Those team managers, who did not have DI students in their lessons, left this question blank, leaving 33 team managers who responded to the question.

Table 13
The frequency of the views of the team managers on the inclination of using skills in school subject lessons

Views on the inclination of using skills in school subject lessons	*f* *(n=33)*	*%* *(n=100)*
1-not at all	0	0
2 very little	1	3
3- average	12	36.4
4-much	18	54.5
5-very much	2	6.1

Of these 33 team managers, the majority (90. 9 %) felt that students did use the skills learned in DI in other lessons, at a level of average or more. As the question did not specify the skills, this could be interpreted as manual skills, creative problem solving skills, teamwork skills, communication skills or others. The results of this question show that the team managers observe transference of the skills learned in DI to their lessons or *vice versa*. The focus group also stated that they used the skills that they learned in DI, in their lessons (Table 8). However, as stated in the interview results, it is hard to distinguish whether the skills learned in lessons are used in DI or *vice versa*.

Perception of the team managers of the DI program objectives

In order to get an idea about team managers' perception on one of the goals of the program (Table 1), the team managers were asked what they thought about encouraging commitment of DI to real life problem solving.

Table 14
The frequency of the views of the team managers on encouraging commitment to real life problem solving

Views of team managers on encouraging commitment of DI to real life problem solving	*f (n=50)*	*% (n=100)*
1-I strongly disagree	0	0
2- I disagree	1	2
3- Neutral	0	0
4- I agree	12	24
5-I strongly agree	37	74

As shown in Table 14, although only one team manager disagreed that DI challenges would encourage students to solve real life problem, 98 % of team managers agreed that DI encouraged commitment to real life problem solving. These results are also consistent with the focus group answers about real life examples in which one of the students replaced the broken door of the cupboard using a sheet of paper and the other reflected what she learned in DI to her physics lessons (Table 8).

The reason for choosing DI as an extracurricular activity by students

The two questions related to the reasons for choosing DI, as an extracurricular activity by students and choosing to be team manager were open-ended, eliciting a number of different responses from 35 of the 50 respondents. Answers were thus categorized before giving the frequency with which each category was given as an answer. The frequency of the responses is given in Table 15.

Table 15

The frequency of the team managers' views for students choosing DI as an extracurricular activity

Categories	*f* *(n=35)*	*%* *(n=100)*
Enjoyment, excitement and fun	17	48.6
Improve skills	6	17.1
Show skills & produce something	6	17.1
Travel (Global Finals in USA and Nationals in İstanbul)	4	11.4
Different from other extracurricular activities	1	2.9
Love to work with their friends	1	2.9

With the help of the results shown in Table 15, when the views of the team managers were compared to the answers of the focus group, we see some similarities. For instance, the focus group stated the reason for choosing DI as its enjoyment value just like the team managers with 48.6 percents. However, the focus group stated the second most important reason for joining DI as to work with closest friends. Only one team manager emphasized this.

Team managers perceived fun and enjoyment to be the reason why students joined DI, in line with the reasons given by the focus group students (Table 8). However, the focus group put more emphasis on travelling as a factor than the team managers (11.4 %) as they were extrinsically motivated by the possibility of trips to İstanbul and the US for tournaments. Although most of the team managers (34.2 %) believed that the DI students preferred DI to improve or show their skills, the students in the

focus group did not put much emphasis on this, except one student who stated the reason for doing DI was to learn from challenges (Table 8). Although one of the team managers stated the reason for choosing DI by the students as loving to work with their friends, the focus group students stated it as the second important reason.

The reasons for choosing to be DI a team manager

The team managers were also asked their reason for choosing to be a team manager in DI and following responses were collected.

The results in Table 16 show that approximately half (51 %) of the team managers chose to be a team manager to be a guide for students, as they are teachers after all, or because of its enjoyment value. This is also consistent with the "The Interference Triangle" (Figure 1) in which it is shown that the roles of the team managers emerge to ease the team members' obtainment of skills (Start a Team Brochure, 2011).

Table 16
The frequency of the reason for choosing to be a team manager in DI

Categories	*f* *(n=35)*	*%* *(n=100)*
To be a guide for students while they improve skills	10	28.7
Enjoyment and fun	8	22.8
To observe an improvement in students' skills	6	17.1
To observe improvement of creativity and problem solving skills of students	4	11.4
A great experience and pride for my career	3	8.6
To be with students outside school	2	5.7
Different from other extracurricular activities	2	5.7

Less than 29 % of the team managers stated the reason to be the observation of the improvements in creativity skills or problem solving skills. The team managers stated their role as observers, which include scaffolding. Other responses (20 %), which included being with students outside of the school, and different from other extracurricular activities or that were a career enhancer, probably reflect the team managers' personalities. The ones who prefer DI in order to be with students probably love students. However the ones who gave career enhancement as the reason are possibly more ambitious teachers.

Results and analysis of the 11 tasks

As quantitative support for the perceptions of students and team managers about the contribution of the program to students' creative problem solving skills, eleven tasks (Appendix C) were given to DI students to solve.

To determine if there was any change in the creative problem solving skills of students, these tasks were given to students who participated in the program at the beginning (pre application, n=25) of the first semester and then 14 weeks later (post application, n=25) the same tasks were given to the same group of students.

The tasks were divided into 3 categories: logical thinking skills, creativity skills and a combination of the two, while had been presented to the students in mixed order. Then, according to criteria (Appendix D) the tasks (pre and post applications) were analysed. The results are illustrated in Tables 18, 20 and 22.

For evaluating logical thinking skills, five tasks were included in the tasks and evaluated following the study of Saiz and Rivas (2008) in which they used Pentrasal assessment system. In order to evaluate students' creativity skills, three tasks which were related to interpreting shapes and completing a story were included in the tasks and assessed in terms of originality of the answers by using one of the creativity parameters of Torrance (1962). The remaining three tasks included both logical thinking and creativity skills.

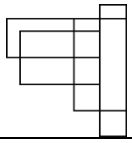
Students were given a 15 minutes to complete these 11 tasks. This time was determined according to the number of tasks that needed to be completed and the age of the students, after doing a small pilot study. All tasks were written and done in

Turkish, as this was the native language of the majority of the students. Thus students were assessed in terms of their creative problem solving skills and not in terms of English skills.

Logical thinking tasks results (LTTs)

In Table 17, five of the tasks were categorized as logical thinking tasks (LTTs) and are given.

Table 17
Logical thinking tasks (LTTs)

	LLTs
2	Once a dog named Pitsi lived on a farm. There were three other dogs on the farm. Their names were Ciksi, Diksi and Fiksi. What do you think the fourth dog's name was?
3	Some months have 30 days and some have 31. How many have 28 days?
4	Once, I was going to Büyükada. I saw a man with his wife and his three children at port side. Each of them had a basket. In each of the baskets there was a cat. Next to each cat, there were 8 kittens. How many living beings were going to Büyükada?
5	How many rectangles appear in the diagram below? 
7	Five athletes were returning from a cross-country race. Athlete C placed third, and athlete E placed second. How did athletes A, B, and D place in the race if athlete A was not last, athlete A came in after E, and athlete D was not first.

The LTTs were analysed using a scaling system called Pentrasal assessment system as described by Saiz and Rivas (2008):

No points: when the answer is incorrect or left blank
Partial points: when the solution is correct, but the reasoning is insufficient, showing that the subject only identifies and demonstrates an understanding of the basic concepts but is missing the detail
Full points: when, as well as giving the correct answer, the subject suitably justifies as to why and what

Table 18
The pre and post results of the LTTs

	Task 2		Task 3		Task 4		Task 5		Task 7	
	Pre	**Post**	**Pre**	**Post**	**Pre**	**Post**	**Pre**	**Post**	**Pre**	**Post**
Correct	36	60	8	12	0	4	8	4	68	72
Partial	0	4	92	76	48	72	56	88	4	20
Incorrect	64	36	0	12	52	24	36	8	24	8

The general trend for tasks 2, 3, 4 and 7 shows that there was an increase in the number of the students giving the correct answer from pre to post application (full point) and Tasks 2, 4, 5 and 7 also show a decrease in the number of the students giving an incorrect answer or leaving the question blank (any point), even though the increase is relatively small in some cases (Tasks 3 and 4) it shows that a positive trend, and supports both the students' and team managers' perception of the program.

Task 5, in which students needed to count the rectangles, shows a decrease in the correct answers in the post application. Counting all the rectangles requires students to persist with the task long enough to identify all of these. In the post application, students appeared to spend insufficient time on this problem in order to find and count all the rectangles, as compared to the pre application. The decrease in the number of the students giving the correct answer could be as a result of students' exposure to Instant Challenge. Instant Challenges (ICs) require students to think and work quickly. Although ICs train students to improve their quick thinking, time management and practical skills, the results for Task 5 could imply that ICs decrease the students' willingness to persevere with a problem.

Creativity tasks (CTs)

Three of the tasks done by the students were shown in Table 19.

Table 19
Creativity tasks (CTs)

CTs	
1- 9	List all the things this figure could represent 
11	In the puzzle, some clues to a scenario are given, but the clues don't tell the full story. Your job is to fill in the details and complete the story. "*A man is lying dead in a room. There is a large pile of gold and jewels on the floor, a chandelier is attached to the ceiling, and a large window is open.*"

The creativity tasks (Table 19) were analysed using Torrance's (1962) creativity

parameter called originality:

No point: when the answer is ordinary or left blank
Partial point: when the answer is creative with poor evidence
Full point: when as well as giving an original, authentic answer the subject clearly shows the ability of creative thinking

Table 20
The pre and post results of the CTs

	Task 1		**Task 9**		**Task 11**	
	Pre	**Post**	**Pre**	**Post**	**Pre**	**Post**
Correct	24	20	8	16	44	60
Partial	76	76	92	4	20	24
Incorrect	0	4	0	80	36	16

Similar to the LTTs, the general trend for Task 9 and 11 is that there was an increase in the number of the students giving an original answer from pre to post applications. Task 1, in which students needed to list the things that the figure could represent showed a decrease in the post application. At first glance, the figure given was perceived as if it was a piece of hair or string by 76 % of the students. On the other hand, some students (24 %) interpreted this figure as if it was a tsunami or the path a giddy fly followed. Comparing Task 1 to 9, the percentage (20 %) of the students with a creative answer for Task 1 is higher than that (16 %) for Task 9 in the post application. This may be merely because Task 1 was the first task on the sheet while Task 9 was one of the last problems done. Factors such as fatigue may have contributed to the decrease in original answers.

Also, although there was 12 % decrease in terms originality for Task 1, there were 8 and 16 % increases in the post application for Task 9 and 11. The disadvantage of the time limitation was encountered once more in this case. This interpretation is supported with the results of the Task 9, which is similar to Task 1. Although the students gave less original answers for Task 9, there is an 8 % increase in terms of originality in the post application.

Task 11 also shows a decrease in the number of the students in terms of not giving an original answer or leaving the question blank (any point). It is worthy of mention that the students were willing to attempt an answer for Task 11 in the post application, although they had to spend time writing a story in order to show their creativity skills. This could imply that the students were thinking more quickly and using their imaginations more readily while problem solving.

The tasks which include both logical thinking and creativity

Three of the tasks required both logical thinking and creativity skills were included as Tasks 6, 8 and 10 and are shown in Table 21.

Table 21
The tasks, which include both logical thinking and creativity

Task numbers	Tasks
6	How much of our lifetime do we spend with our eye closed, just by blinking? How would you calculate this?
8	How can two fathers and two sons divide three automobiles among themselves with each receiving one?
10	Deep in the forest the body of a man, wearing only swimming trunks, snorkel and facemask was found. The nearest lake was 8 miles away and the sea was 100 miles away. How did he die?

The tasks above (Table 21) were analysed using the type of the answer based on either logical or creative. Thus, the percentages of the students who gave logical thinking or creativity answers were reported separately. Both answers were accepted as correct, and the rest of the percentages were accepted as incorrect and left blank answers. The pre and post results of logical thinking and creativity after analysing the answers of the students are stated in Table 22.

Table 22
The pre and post results of the logical thinking and creativity answers

	Task 6		**Task 8**		**Task 10**	
	Pre	**Post**	**Pre**	**Post**	**Pre**	**Post**
Logical	16	20	16	28	44	52
Creative	16	16	8	8	28	24
Incorrect	68	64	76	64	28	24

Related to giving a logical or a creative answer, the general trend for tasks 6, 8 and 10 is that there is an increase in the number of the students who gave a logical answer in the post applications compared to the pre application. However, there is no increase in the number of the students who gave a creative answer in the post application. For the tasks 6, 8 and 10, increase in logical answers is more dominant compared to creative answers. This may be because the students practiced to find logical solutions to Instant Challenges during 14 weeks since and neglected the more creative aspects, as observed in the focus group (Table 6 and 7).

In summary, in the tasks related to logical thinking (Task 2, 3, 4, 5 and 7) and creativity (1, 9 and 11), there was an increase in the percentage of the students' creative skills from pre to post applications. However, Task 6, 8, and 10 show that there is almost any change in giving creative answers. Although the students were told at the beginning of the applications that there was no correct answer for the tasks, and encouraged to write whatever they thought, they preferred logical answers more. The reasons for this could be many, such as their formal education, desire of giving the correct answer, fear of giving a silly answer.

The results of the tasks showed that the students developed their problem solving skills more than their creative problem solving skills, over the 14 weeks.

CHAPTER 5: DISCUSSION

Introduction

In order to present a clear integration of the findings, the literature and the research questions, this chapter will address each question separately. Initially, the questions will be answered directly, according to the findings only. Thereafter, each will be discussed in more detail, using the literature to support or refute the findings.

- DI students' perception of the program and awareness of their progress
  - ✓ It is fun and allows them to be with their friends.
  - ✓ It will allow them to travel to Istanbul or even the US if they succeed at tournaments.
  - ✓ They learn from the program and thus benefit from it in terms of problem solving, improving skills, increasing self-confidence, working as a team, helping school work and solving real world problems (weak).
  - ✓ As they compare their skills to those of the previous year they claim to see improvement.

The views of team managers on the contribution of DI to students' creative problem solving skills

- ✓ The program increases the problem solving and creativity skills of the students.
- ✓ It also improves other skills. This was taken to mean skills such as social, communication, teamwork or time management skills.
- ✓ Two years are necessary to show an increase in the improvement of the skills.

- The extent to which DI contributes to students' creative problem solving skills and the difference in the performance of students who participated in the DI program at the beginning and at the end of the first semester in terms of creative problem solving skills
  - ✓ It contributes to their problem solving skills as they repeatedly go through a learning cycle.
  - ✓ It contributes less to their creative problem solving skills than to their problem solving skills.

Discussion of the findings

DI students' perception of the program and the awareness about their progress

The results of the focus group observations and interviews related to how the DI students perceived the program showed that the DI program was a way of having fun and being with friends. The focus group students clearly enjoyed working with each other and also gave this as their main reason for joining DI. This is also supported by the team managers' perception of why most students do DI.

The European Commission and Council of Europe (2004) definition claims that young people feel less intimidated in non-formal learning environments and. due to the fact that participation is voluntary, they often find learning more enjoyable. European Centre for the Development of Vocational Training- CEDEFOP (2008) also supports this claim in stating that non-formal learning is embedded in planned activities that are not explicitly designated as learning. Thus, students are not aware of the intention of the activity, which aims to help students gain important skills such as critical thinking, problem solving or teamwork. In this regard, while indicating the reason for participating in the activity, as it was fun, the focus group students in this study show the most important value of a non-formal learning program as occurred in the program.

Considering the age level, which is 13 years; students tend to spend more time with their friends who allow them to socialize, get feedback for skills and talents, and have forums for discussing their moral values and attitudes with their peers.

Activities such as scouting or sports in particular help students to have democratic relationships, besides improving their physical skills (Gander and Gardiner, 2001).

As supported by Merton, Payne, and Smith (2004) participation in educational activities addressing non-formal learning activities provides students with a range of benefits such as increased self-confidence and an enhanced relationship with peers. Parallel to Merton's view, the participants of this study stated that they concentrated on what they did well and not on what they did not do well during their two years of DI, that is they also felt an improvement in self-confidence as a team. During the debriefing (feedback) sessions, in the light of the questions which focused on what the team members did well, how their team work was and how creative their solution to the problem was, the students were nurtured to learn teamwork which is one of the expected skills of employers (Staw, 2006; Lavonen et al., 2004).

The focus group students also stated that they had a chance to go to İstanbul with the program if they did well at the regional tournament. There is thus an extrinsic reward factor, which motivates the students (Hayenga & Corpus, 2010). There is also intrinsic motivation, as pointed out by one of the focus group students when she scored high on a physics test due to the skills learned in DI. Another was pleased that she had used her problem solving skills to repair a broken cupboard door. All those statements on learning in DI, even if they are weak, show that some of them had a benefit from DI in terms of problem solving, schoolwork and real world problems.

Although the first reflection of their thoughts about the program seemed to indicate that they preferred the program for its fun value or travel opportunities, when asked

about the benefits of the program they stated that they felt they had improved their creativity, problem solving and time management skills compared to the previous year. Also, some of the team managers believed that the students preferred DI to improve or demonstrate their skills (Table 15). As Merton et al. (2004) pointed out that participation in such activities contributes to individuals' personal, social and emotional development, as perceived by the focus group students and the team managers. However, the perceived improvement in creativity was not observed over the 14 weeks. This conclusion is also supported by the results of tasks in which the increase in the percentages of logical thinking skills (Table 18) were higher than creativity skills (Table 20).

According to Davalos, Chavez, and Guardiola (1999), the non-formal extracurricular activities enable the student not only to explore new interests and develop new peer relations but also to test and develop a broad range of physical, interpersonal, leadership, and intellectual skills. As stated by Davalos et al. (1999), Merton et al. (2004) and EC (2011) that non-formal learning enhances the social and personal developmental process of students on a voluntary basis. Participants in the focus group stated that they had learned the importance of listening to each other, planning and organizing, and reading instructions well as current benefits of the DI program which combine enjoyment, challenge and learning as done in non-formal learning programs (Merton et al., 2004).

Despite the student awareness of some improved skills, the focus group students in this study put more emphasis on success at achieving a good solution rather than improving creativity. Their perception of success was thus determined by the points

gained in the challenges, rather than their improvement in communication, creativity or problem solving skills (Table 7), which are expected from employers.

The students need thinking, teamwork, creativity, and problem solving process skills to compete in the future (Cadle and Selby, 2010). Also, many public and private institutions believe that there is a growing need for employees who are able to think creatively and solve a wide range of problems (Grabinger, 1996 as cited by Lavonen et al., 2004, p. 107). Therefore, considering future benefits of DI, some of the students preferred university programs where the extracurricular activities students have done were taken into account. Some emphasized the skills that could be used in the future such as manual skills, quick thinking, creativity and effective time management which are consistent with the employer's needs. One even linked DI to her professional goals (Table 8). This shows that they do not just prefer participating in the DI program for fun, although that may have been a reason why they joined DI in the first place.

They also seemed to be aware of their improvement in these skills, making it more likely that they would use them. This can be seen in their comments on using what they had learned in DI in their lessons (Table 8). The majority of the team managers (88 %) involved in the study felt that the students were aware of the program objectives. This may mean that students are learning valuable skills in DI that they knowingly transfer to other spheres of their lives, adding to the intrinsic motivation factor which keeps the students involved in the activity (Walker & Green, 2009). This is supported in Callahan, Hertberg and Missett (2011) evaluation report on DI,

where students directly or indirectly mentioned raised self-confidence, courage, teamwork and intrinsic motivation.

The views of the team managers about the contribution of the DI program to students' creative problem solving skills

The majority of team managers who participated in the questionnaire believed that their students' creativity and problem solving skills had increased due to their participation in DI (Table 9). This is supported by the focus group students' perception but is, of course, expected as all had chosen DI as an extracurricular, non-formal learning activity and are thus biased in favour of the program. In addition, some of the team managers stated the reason for being a team manager was to observe improvements in creativity and problem solving skills in students, thus increasing the bias. The fact that both students and team managers are aware of a perceived improvement means that there is a positive attitude in terms of the contribution of the DI program to students' skills. This would lead to self-confidence which in turn leads to increased skill. These perceived improvements are supported by the National Youth Agency (2008). As stated, in general terms, participation in educational leisure activities is widely associated with a range of benefits for the young person involved. These primary changes include the acquisition of a range of skills and attributes.

Most team managers felt that their students had increased their problem solving skills. This view was supported by the focus group interviews (Table 8) and observations (Table 6 and 7) over the 14 weeks. Although the focus group students had difficulty in struggling with problems and succeeding in the tasks, towards the

end of 14 weeks they were better at problem solving compared to previous weeks. However, although most team managers (Table 9) believed that their students had increased their creativity skills compared to the beginning, this was not confirmed by the observations. Over the 14 weeks, the main emphasis of the focus group was to complete the tasks correctly in the given time (Table 6 and 7), but they had a tendency to ignore the creativity aspect of the task.

Team managers generally believed that one to two years were needed to observe the contribution of DI to students' creative problem solving skills (Table 11). This shows that the views of the team managers are parallel to the focus group answers in which the difference in terms of achievement in tasks comparing to the previous year was addressed. However, the focus group students stated that they could go to National Finals, in İstanbul in a year, thus implying that their skills would have improved sufficiently in one year to compete on a national level (Table 7).

Also, of the 33-team managers, the majority (90.9 %) felt students did use the skills learned in DI in other lessons, at a level of average or more. This implies that the team managers observe a reflection of the skills learned in DI or *vice versa* although it is hard to distinguish the impact on which.

The views of the team managers were compared to the program statements on the team managers' expected role (Table 16). The results show that many team managers chose to be a guide for students, as they are teachers who facilitate and guide (Harden and Crosby, 2000). This is also consistent with "The Interference Triangle"

(Figure 1), which shows one role of the team managers to assist the team members' obtainment of skills (Start a Team Brochure, 2011).

The majority (98 %) of team managers agreed that DI had an impact in terms of encouraging commitment to real life problem solving. This is one of the important aspects of the affective domain as described by Krathwohl, Bloom and Masia (1964) such as commitment. These results are also consistent with the focus group answers about commitment to real life examples in which one of the students expressed her pride in fixing a broken door using a sheet of paper (Table 8). This shows that one of the goals of the program (Table 1) has also been achieved.

One of the team managers emphasized the importance of the supporting atmosphere in which students could create, think critically, analyse and learn. This view confirmed the importance of the atmosphere factor in the program and also in non-formal learning programs (EC & EOC, 2004). In establishing a supportive and inclusive environment, non-formal education is able to foster and support student perceptions of belonging and thereby increase student engagement and achievement (Davalos et al, 1999).

The contribution of DI to students' creative problem solving skills

From results obtained through observations (Tables 6 and 7) and interviews (Table 8) of the focus group, team manager questionnaire (Tables 10 and 11) and analysis of the tasks (Tables 18, 20 and 22), it would appear that DI contributed to the creative problem skills of students over 14 weeks, although only in minor ways. However, 14

week is a relatively short time in which to expect major improvements in one of Bloom's higher-level skills (Bloom, Englehart, Furst, Hill, & Krathwohl, 1956).

The students in this study did not directly mention the development of problem solving skills. They emphasized the importance of reading tasks well in order to solve the tasks properly and not to miss any detail. The importance of reading tasks well was interpreted with problem solving skill as it was stated in the checklist of the DI program (Rules of the Road program brochure, 2010-11 seasons) as the most important factor considering the problem solving steps. Also defined by Wallas (1926), Fisher (1995), PISA (2003), Sonmaz (2002), Yaman (2005), and Özsoy (2005) as the first step in solving a problem is to describe the problem.

Towards the end of the 14 weeks, the first thing they did while solving a challenge was to read the challenge well. They no longer just worked from their first impression of the problem. Following that, students addressed the importance of listening to each other to share ideas to solve the problem. In doing this, they followed the first two phases of Kolb's learning cycle (1984) as they observed and started planning (Figure 2). They also stated that they used what they learned from the news or interesting events in solving the tasks. Again, there is evidence that Kolb's (1984) learning cycle is followed. In the reflective observation stage, the individuals think about what was done and relate this either to their own experiences, or someone else's which they have observed, read or heard about.

They stated that they could transfer what they learned from DI to real life situations or what they learned from real life situation to DI. One of the students mentioned that she had replaced a broken door of the cupboard with a piece of paper. Another

mentioned the image of a building in Dubai, which she saw from the news and used in one of the Instant Challenges. Here, we see two-sided reflection. The constructivist approach is based on the idea that learning is a process of interpreting the facts according to previous experiences or constructing the facts related to specific materials, events, cases or notions in the brain (Jonassen, 1994 as cited in Vural, 2008). When we look through the goals of DI (Rules of the Road Brochure, 2010-2011), it basically emphasizes the necessity of learning how to think, be responsible for self-learning and learn to control behaviour. Each new learning experience leads to a review of the students' intellectual structure, changing something when necessary or adding something to improve the existing structure (Yeşilyaprak, 2009). Supporting the approach of constructivism, the focus group students constructed their own experience learning confirmed this aspect.

The issues mentioned above showed reflective thinking in line with constructivism while solving a problem. Considering problem solving skills, it could be said that these students became good at reflecting on what they learned and used in new situations. They thus applied knowledge to the new problems, a higher order skill in Bloom's taxonomy (Bloom, Englehart, Furst, Hill, & Krathwohl, 1956).

Callahan et al. (2011) used a task called "Monkey in Motion" (MIM) to evaluate students' problem solving and creativity skills. The MIM task was given to 105 students (59 DI participants and 46 non-DI participants) aged 12 to 16 in teams of two to seven. Callahan et al. (2011) claimed that this task was selected for evaluation as it mimicked the process of Instant Challenges. Different from the application of this study, the participants in the study of Callahan et al. (2011) could work together

in their teams to create a solution. Results for the MIM showed statistically significant ($p < .05$) higher mean scores on creativity and problem solving scores for DI participants (*N=59, M Cr= 3.64, M PS= 3.8*) than for non-DI participants (*N= 46, M Cr = 3.04, M PS= 2.74*). It is worthy of mention that Callahan et al. (2011) analysed the difference between DI and non-DI students, thus showing that DI students have better problem solving skills than non-DI students. However, that could merely be because students who were better at problem solving skills selected to do DI, as they enjoyed creative problem solving activities. This study was conducted using pre/post application comparison groups to determine whether DI students showed improvements in process, over time.

In order to evaluate creativity skills, researchers (Treffinger & Isaksen, 2004; Cadle & Selby, 2010; Callahan et al., 2011) used the Torrance Creativity Test (1962) to assess the quantity and quality of creative ideas produced by test takers. They took three components including fluency, flexibility and originality into account. Because of time limitations to keep students interested, three creativity tasks referring to one of the creativity components of Torrance (1962) was used to assess students' creativity skills in this study. The results of the creativity tasks showed that students gained higher marks in the post application compared to pre application (Table 22). This supports the fact that most team managers (Table 9) believed that their students had increased their creativity skills from beginning to end. However, it was seen that the main focus of the focus group was to complete the tasks correctly in the given time (Table 8), while ignoring creativity. Similarly, the results of the creative problem solving tasks showed that the students developed their problem solving skills more than their creative problem solving skills, over the 14 weeks.

Conclusion

This study indicates that non-formal learning programs, such as Destination ImagiNation, may provide important opportunities to encourage students to learn and apply creative problem solving skills to realistic problems of the present and future. This is supported by other studies such as that by Treffinger and Isaksen (2005). As stated by Gladwell (2009), the ones who are nurtured in doing activities earlier become more successful at those activities than the ones who start to do the activities later or only do them sporadically. Thus, the earlier students start attending non-formal learning activities as a support to formal learning, the more successful they could be in creative problem solving skills, which will be valuable for future university and employment success.. The aim of Turkish National Education is to nurture the whole child to have all the skills required by the future workforce (MEB, 1973). As stated (Staw, 2006; Cadle and Selby, 2010; Lavonen et al., 2004; Vural, 2008; Tepe, 2007, Regmi, 2009 and Bozdemir, 2009), formal learning with its achievement pressure and test applications becomes incomplete in nurturing the whole child. Many of the skills and competencies needed in working life are thus obtained at school rarely. Educators and all stakeholders need to be aware of this problem and consider including non-formal learning aspect in formal learning, which allows students to gain valuable skills such as creative problem solving, teamwork, time management, critical thinking and innovation (National Youth Agency, 2008; Staw, 2006; Cadle and Selby, 2010). The overall conclusion drawn from this study is that DI as a non-formal learning program contributes in developing creative problem solving skills in students.

Implications for practice

Based on the findings of this study, some suggestions for application were stated.

- As there was a slight trend showing improvement in problem solving skills, and so many team managers felt that it contributed considerably to students' skills, the program should be more widespread, so that more students can develop their problem solving skills.

- As supported by the team managers' views, teachers could be encouraged to use non-formal learning methods in the formal curriculum such as giving open-ended tasks to improve their students' problem solving skills.

- As it takes time for students to develop their creative problem solving skills, students should be encouraged to spend more than one year doing the program.

Implications for research

Based on the findings of this study, some suggestions for further research were stated.

- An experimental study should be conducted to compare DI and non-DI students in terms of creative problem solving skills, also looking at more variables within the study.
- This study was conducted at a private school in Ankara. In order to generalize the findings to Turkey, more participants should be included in a study, from a wider range of schools in Turkey.

- This study could be conducted with all levels of students in school, including high school (or even university) students.

- More objective study is needed, with an attempt to eliminate bias. This study should thus be seen as only the beginning of investigations into the contribution of the DI program to the creative problem solving skills of students.

- For further research, Turkish and foreign team managers' attitudes in this study and their opinions about the program's contribution to students' creative problem solving skill can be expanded.

- The DI program can be used as a model for non-formal learning program in terms of measuring its contribution to students' creative problem solving skills for different grade levels.

Limitations

The conditions beyond the control of this study are described within the following limitations:

- The study was conducted in only one school, an elite private school and only with the primary and middle school students.

- The number of the participants was limited to the students who participated in the activity.

- Only one focus group, consisting of six students was used in this study. Observations based on more teams may have allowed more detailed observations.

- Because of time limitations, data collection was conducted in a short time (in 14 weeks). More time would be needed to observe clearer changes in problem solving skills, especially as students and team managers felt that at least one year was necessary for this.

- For qualitative data collection, interviews were done. The weakness of this type of data collection method was that it asked participants' perceptions, thus relying on "at the moment" opinions rather than actual facts.

- The greatest limitation is that all participants in the study had chosen DI as an extracurricular activity, thus making all perceptions biased towards the program.

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APPENDICES

Appendix A: Interview questions for the focus group

- Why did you prefer participating in this program as an after school activity?
- What are the current benefits of the program?
- What are the future benefits of the program?
- What do you think about the impact of this program on your problem solving skills?
- What do you think about the impact of this program on your creativity skills?
- How have you been evaluating your progress?

Appendix B: The team manager questionnaire

https://spreadsheets.google.com/spreadsheet/viewform?formkey=dGZNRGhqdXl5cWdKTmJ2NE54WnJDZVE6MQ

Teachers' Approach on Destination ImagiNation Program (Revised)

I am doing some research on the program Destination Imagination (DI) for my Masters Degree.The purpose of this study is to determine how DI activities contribute to skills in Turkish students.
I would greatly appreciate it if you could take 5 minutes to answer some questions on your observations regarding students and DI. The individual answers to the questionnaires will be anonymous and will be kept confidential.
Many thanks for your help.
Elif Olgun

Have you ever been a team manager for DI?
Yes

If yes, how long have you been a team manager during your career?
0

Please, state your subject area that you teach
Grade 1

Why do you prefer being a team manager in DI?

Why do students prefer DI as an extracurricular activity according to you?

Please rate each one of the following statements on a scale of 1-5, where 1 is

"do poorly" and 5 is "do well".

You'll consider your team (students) from beginning till now.

1. Please rate your students in their problem solving skills

	1	2	3	4	5
Beginning	○	○	○	○	○
Now	○	○	○	○	○

2. Please rate your students in their creativity skills

	1	2	3	4	5
Beginning	○	○	○	○	○
Now	○	○	○	○	○

Please rate each one of the following statements on a scale of 1-5, where 1 is "not at all" and 5 is "very much".

3. To what extent do you believe that DI contributes to students' skills

	1	2	3	4	5	
not at all	○	○	○	○	○	very much

4. How many years are needed to observe the contribution of DI to students' skills?

- ○ less than a year
- ○ 1
- ○ 2
- ○ more than 2 years

5. To what extent do you think that DI students are aware of the program objectives

	1	2	3	4	5	
not at all	○	○	○	○	○	very much

6. To what extent do you observe that DI students are inclined to use their skills in tasks assigned during your lessons

	1	2	3	4	5	
not at all	○	○	○	○	○	very much

Please rate each one of the following statements on a scale of 1-5, where 1 is "I strongly disagree" and 5 is "I strongly agree"

7. I have considerable knowledge about the DI program

	1	2	3	4	5	
I strongly disagree	○	○	○	○	○	I strongly agree

8. DI has some objectives in order to contribute to students' skills

	1	2	3	4	5	
I strongly disagree	○	○	○	○	○	I strongly agree

9. DI encourages commitment to real life problem solving

	1	2	3	4	5	
I strongly disagree	○	○	○	○	○	I strongly agree

Submit

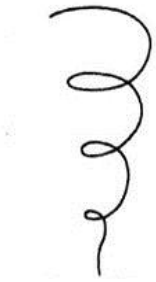
Appendix C: Sheet of tasks

School: Gender:

How long have you been doing DI?: Age:

The tasks that are going to answer are just for FUN! No matter your answers are correct or not. You may write whatever you want to.

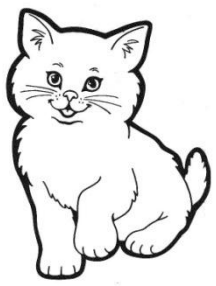
1. List all the things this figure could represent



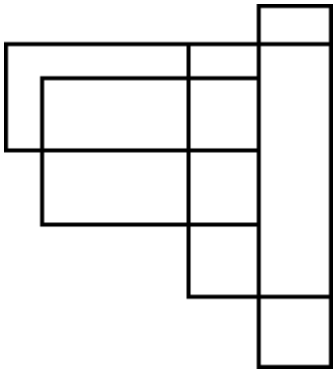
2. Once a dog named Pitsi lived on a farm. There were three other dogs on the farm. Their names were Ciksi, Diksi, and Fiksi. What do you think the fourth dog's name was?

3. Some months have 30 days, some have 31. How many have 28 days?

4. Once, I was going to Büyükada. I saw a man with his wife and his three children at port side. Each of them had a basket. In each of the baskets there was a cat. Next to each cat, there were 8 kittens. How many living beings were going to Büyükada?



5. How many rectangles appear in the diagram below?

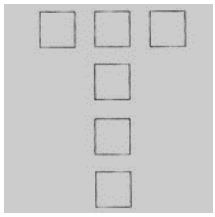


6. How much of our lifetime do we spend with our eye closed, just by blinking? How would you calculate this?

7. Five athletes were returning from a cross-country race. Athlete C was placed third, and athlete E was placed second. How were athletes A, B, and D placed in the race if athlete A was not last, athlete A came in after E, and athlete D was not first.

8. How can two fathers and two sons divide three automobiles among themselves with each receiving one?

9. List all the things this figure could represent

. 

10. Deep in the forest the body of a man, wearing only swimming trunks, snorkel and facemask was found. The nearest lake was 8 miles away and the sea was 100 miles away. How did he die?

11. In the puzzle, some clues to a scenario are given, but the clues don't tell the full story. Your job is to fill in the details and complete the story.

a) A man is lying dead in a room. There is a large pile of gold and jewels on the floor, a chandelier is attached to the ceiling, and a large window is open.

Appendix D: Performance criteria for tasks

	Full points	Partial points	No points
Task 1 (Creativity)	The path that a giddy fly follows; Tsunami	String Hair Spring	Left blank
Task 2 (Logical thinking)	Pitsi	Ciksi, Diksi or Fiksi	Another name
Task 3 (Logical thinking)	All months	February	None or left blank
Task 4 (Logical thinking)	One living being (only the man who tells the story)	51 living beings (assuming that the man is at port side, too)	Another number of living beings, with incorrect calculations or left blank
Task 5 (Logical thinking)	24	Between 24 and 10	Below than 10
Task 6 (Full points: Logical thinking; Partial points: Creativity)	We count how much time we spend blinking in a minute and we multiply it by 24 *60 to find the time that we spend in a day. Then we subtract the time that we spend in sleeping. Then we multiply this number with our average lifetime.	We create a machine to count how much time we spend for blinking in a minute. Then we multiply this number with our average lifetime.	
Task 7 (Logical thinking)	B,E,C,A,D	B&A,E,C,?,D&B	?,E,C,?,?
Task 8 (Full points: Logical thinking; Partial points: Creativity)	Each one could be divided into the three cars because there are 3 people (grandfather, father, son)	Each one could be divided into three cars but the rest one could get into the car's trunk.	
Task 9 (Creativity)	Crossroad; Symbol of Tetris; Blowing stones in a non-gravity area	T shape	Left blank
Task 10 (Full points:	Tsunami, over flooding;	He came there by walking but he	

Logical thinking; Partial points: Creativity)	A fire extinction helicopter took the man who was diving from sea by mistake and carried him to the forest where there is a fire; Once, there was a lake in that area but it dried up. The man had died already there. They found his fossils.	died because of fatigue; Before going to sea, he wanted to try the snorkel but he died because of not breathing.	
Task 11 (Creativity)	Follows an original way of writing supporting with valid evidence	Follows an original way of writing but poor in terms of evidence.	

Appendix E: A sample of an Instant Challenge

APPRAISER COPY

Destination ImagiNation
Instant Challenge

BREAKING POINT

Challenge: Your **TASK** is to build a free-standing structure that is as tall as possible and that when turned on its side and balanced on a brick, will support weights added to both ends.

Time: You will have up to 4 minutes to use your IMAGINATION to design and build your structure and to place it in a taped area, then up to 1 minute to balance the structure on a brick and finally up to 2 minutes to add weights to both ends.

Set-up: In the middle of the floor is a taped area in which to place your structure by the end of Part One. Next to the taped area is a brick that you must balance your structure on in Part Two. There is also a table with materials you may use to build your structure and 10 sets of weights.

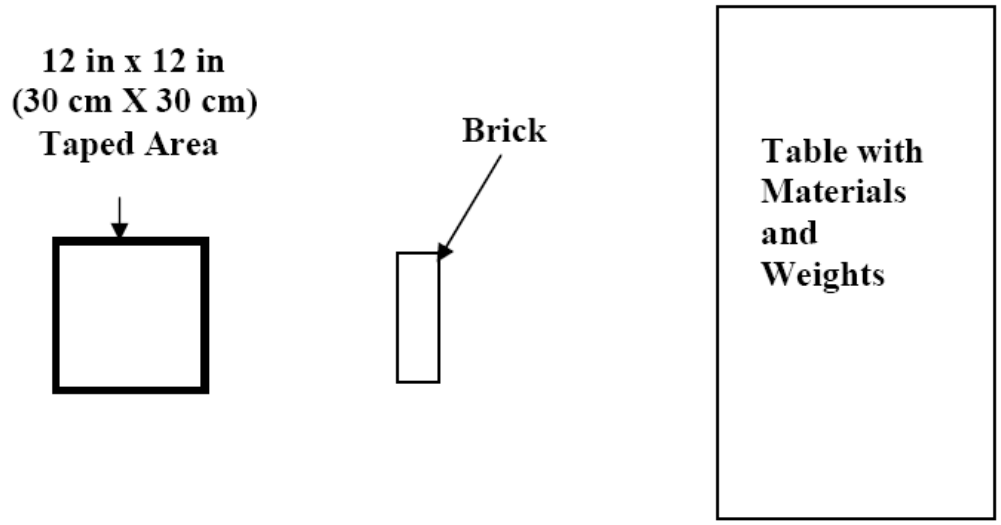
Procedure:
Part One (4 minutes): Using the materials on the table, build a free-standing structure that is as high as possible and place it in the taped area. **IN ORDER TO ADVANCE TO PART TWO, THE TEAM MUST HAVE A FREE-STANDING STRUCTURE WITHIN THE TAPED AREA BY THE END OF PART ONE.** You may test your structure on the brick in Part One if you wish. Your team will be warned when you have 1 minute remaining and when you have 30 seconds remaining. At the end of Part One, the Appraisers will measure the height of your structure.
Part Two (1 minute): Move the structure to the brick and balance the structure on the brick so that part of the structure extends out over both sides of the brick. The structure may only touch the brick. Pieces of the structure may fall off during this move without penalty but you may not change the structure in any other way. At the end of Part Two, the Appraisers will measure how far your structure extends out over each side of the brick.
Part Three (2 minutes): Add sets of weights to each end of the structure at the same time until a) the structure breaks, b) the weights or the structure touches the floor or one of the sides of the brick, c) 10 sets of weights have been added (5 on each end), d) a team member touches the structure or the weights on the structure or e) time ends.

Materials:
6 Straws 4 Craft Sticks 10 Pieces of Spaghetti 10 Toothpicks 1 Paper Plate 1 Paper Cup 12 in (30 cm) of String 2 Mailing Labels 2 Rubber Bands 1 Piece of Foil 1 Sheet of Paper

Scoring: You will receive
A. 10 points if you have a free-standing structure within the taped square at the end of Part One.
B. 1 point for each inch (2.5 cm) of height of your structure (30 points maximum)
C. 20 points for the creativity of your structure.
D. 1 point for each inch (2.5 cm) that your structure extends out over each side of the brick (20 points maximum)
E. 1 point for each set of weights that your structure supports (10 points maximum)
F. Up to 20 points for how well your team works together.

For Appraisers Only:

1. The Set-up consists of table with materials. In the middle of the floor is a 12 in X 12 in (30 cm X 30 cm) taped area. Next to the taped area is a tall brick.



2. At the end of Part One, the height of the tower to the nearest full inch should be measured. At the end of Part Two, how far the structure extends out over each side of the brick should be measured.
3. Each set of weights consists of 2 6 in (15 cm) nails connected by a rubber band.
4. The brick needs to needs to at least 12 in (30 cm) in height.

Destination ImagiNation

BREAKING POINT

Challenge: Your **TASK** is to build a free-standing structure that is as tall as possible and that when turned on its side and balanced on a brick, will support weights added to both ends.

Time: You will have up to 4 minutes to use your IMAGINATION to design and build your structure and to place it in a taped area, then up to 1 minute to balance the structure on a brick and finally up to 2 minutes to add weights to both ends.

Set-up: In the middle of the floor is a taped area in which to place your structure by the end of Part One. Next to the taped area is a brick that you must balance your structure on in Part Two. There is also a table with materials you may use to build your structure and 10 sets of weights.

Procedure:
Part One (4 minutes):
• Using the materials on the table, build a free-standing structure that is as high as possible and place it in the taped area. **IN ORDER TO ADVANCE TO PART TWO, THE TEAM MUST HAVE A FREE-STANDING STRUCTURE WITHIN THE TAPED AREA BY THE END OF PART ONE.**
• You may test your structure on the brick in Part One if you wish.
• Your team will be warned when you have 1 minute remaining and when you have 30 seconds remaining.
• At the end of Part One, the Appraisers will measure the height of your structure.
Part Two (1 minute):
• Move the structure to the brick and balance the structure on the brick so that part of the structure extends out over both sides of the brick. The structure may touch brick.
• Pieces of the structure may fall off during this move without penalty but you may not change the structure in any other way.
• At the end of Part Two, the Appraisers will measure how far your structure extends out over each side of the brick.
Part Three (2 minutes):
• Add sets of weights to each end of the structure at the same time until
a) the structure breaks,
b) the weights or the structure touches the floor or one of the sides of the brick,
c) 10 sets of weights have been added (5 on each end),
d) a team member touches the structure or the weights on the structure or
e) time ends.

Scoring: You will receive
A. 10 points if you've a free-standing structure within the square at the end of Part1
B. 1 point for each inch (2.5 cm) of height of your structure (30 points maximum)
C. 20 points for the creativity of your structure.
D. 1 point for each inch (2.5 cm) that your structure extends out over each side of the brick (20 points maximum).
E. 1 point for each set of weights that your structure supports (10 points maximum).
F. Up to 20 points for how well your team works together.