

Creativity as a interdisciplinary skill

Criatividade como habilidade interdisciplinar

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ABSTRACT

There are many theoretical and experimental studies on the concept of skill. In education, creativity is regarded as one of the most important skills with its complex dynamic nature. It is a high level skill that occurs interdisciplinarily whereby individuals produce new and useful product as a result of the interaction between skill, process and environment. Based on this notion, the first aim of this study is to provide a review of the development of theoretical and experimental studies, which describes different classifications and definitions of skills and its dynamic nature. The second aim of the study is to present a in-class practice to extent creativity of gifted students through teacher (researcher) observations and project products. The author performed a review of the recent literature (HU; ADEY, 2002; KARADEMIR, 2016, 2017) on primary-middle school / gifted students' creativity. The result of the in-class practice study revealed that creativity skill can be developed by design and project based activities.

Keywords: Skill. Creativity. Gifted Students. Interdisciplinarity.

RESUMO

Existem muitos estudos teóricos e experimentais sobre o conceito de habilidade. Na educação, a criatividade é considerada uma das habilidades mais importantes com sua natureza dinâmica e complexa. É uma habilidade de alto nível que ocorre interdisciplinarmente, na qual os indivíduos produzem produtos novos e úteis como resultado da interação entre habilidade, processo e ambiente. Com base nessa noção, o primeiro objetivo deste estudo é fornecer uma revisão do desenvolvimento de estudos teóricos e experimentais, que descrevam diferentes classificações e definições de habilidades e sua natureza dinâmica. O segundo objetivo do estudo é apresentar uma prática em sala de aula para ampliar a criatividade de alunos

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talentosos por meio de observações de professores (pesquisadores) e produtos do projeto. O autor realizou uma revisão da literatura recente (HU; ADEY, 2002; KARADEMIR, 2016, 2017) sobre a criatividade dos alunos do ensino fundamental/médio. O resultado do estudo prático em sala de aula revelou que a habilidade criativa pode ser desenvolvida por meio de atividades de design e projeto.

Palavras-chave: Habilidade. Criatividade. Alunos talentosos. Interdisciplinaridade.

The concept of skills

Learners' character traits determine the individual's way of interacting with his or her environment and behaviour as well as their ability to apply knowledge, solves problems to complete tasks. Learners' acquisition of skills are cognitive (logical, intuitive and creative thinking) and/or practical (dexterity and ability to use methods, materials, tools). A holistic approach should be followed within when designing the curriculum in depth by taking into account of four dimensions of education, knowledge skill, character and metacognition. Achieving a balance between current and traditional subjects in light of interdisciplinary relations is important. When the information is used, it becomes a skill and combined with the information, it finds itself only in the feedback loop. Furthermore, metacognition contributes to the process of expressing itself as it is and learning to learn itself and the creation of three other dimensions (DE CORTE, 2003; BIALIK; FADEL; TRILLING, 2015).

Skills are classified as disciplinary/interdisciplinary or basic/upper level. They are built on the abilities existing ones individuals acquired and also or can be discovered, developed or hindered during education. The provision of quality education service can determine the successful development or loss of an individual's abilities and skills. Individuals differ in their learning abilities, styles and strategies. It is important to focus on identifying each individual' strength and weaknesses before attempting to improve one's skills. It is equally important to deal with multiple disciplines while dealing with multiple skills during configuration of the curricula by taking into an account of the concept of interdisciplinary skills and pay attention to the holistic skills that the individual needs, instead of singular skills (KARADEMIR, 2017).

Features of skills

Skill is a concept with several features. Some of these features are as follows (OECD, 2005; GUNES, 2012; KARADEMIR, 2017):

The skill has a complex content and includes intertwined knowledge, practice, attitudes, methods, etc. required to integrate during the implementation. The complex structure of the skill requires careful planning when preparing and teaching. The quality of education has a direct impact on the development of skills.

The acquisition of skills is an ever-evolving process and is not restricted beyond formal education. It is developed throughout life and varies on the age and level of education. Skill development activities need to be based on the student's prior knowledge as well as on performing new learning with various forms of interactions in mind to identify and foster individual' skills.

Skill is a structure that stems from individuals' past lives and emerges in the future. It also arises from the need to create possible situations for future events and can indicate future behaviour: For this reason, the student/individual should be encouraged become autonomous and learn to learn on his own

The skill should be handled holistically. The main factor in skill training is to deal with an event/job/situation in its entirety. A situation called half or missing skill cannot be considered. This occurs both in life itself and while performing a profession (BISSONNETTE; RICHARD, 2001).

Skills in education: 21st century skills

As seen in Table 1, it is possible to divide the skills into two parts in general context.

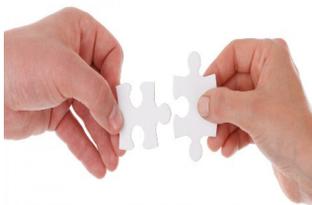
The skills can be divided into two parts. See Table 1. The skills, knowledge and expertise students must master to succeed in work and life; is a blend of content knowledge, specific skills, expertise and literacies. Each 21st-century skills implementation requires the development of key academic subject knowledge and understanding among all students. Those who can think critically and communicate effectively must build on a base of key academic subject knowledge

TABLE 1 – SKILLS IN EDUCATION

Basic Knowledge /Disciplinary Skills	Applied / Advanced Skills
Native Language	Critical Thinking
Reading	Problem Solving
Writing	Communications (Oral / Written)
Mathematics	Teamwork / Collaboration
Science	Diversity
Economics	Information / Technology
Arts and humanities	Leadership
Foreign Languages	Creativity
History / Geography	Innovation
Measurement	Lifelong Learning
Observation	Ethics
	Self Learning

SOURCE: Karademir (2020, p. 87-126).

4C at 21st century skills: Collaboration, Communication, Critical Thinking and Creativity



Collaboration



Communication



Critical thinking



Creativity

SOURCE: Photos taken from royalty-free site Pixabay.com.

Creativity, critical thinking, collaboration and communication skills must be considered in a holistic and interrelated way, not individually and separately within education systems. To develop them as a whole interdisciplinary method must be used. There are many interdisciplinary methods and techniques. Context The four C's of 21st Century skills provide students with a broad perspective. The success of students in both their lessons and their lives depends on developing these skills. It is important for students to use these skills together as a whole in order to gain experience in daily life. Critical thinking teaches students to question claims and seeks the truth, creativity teaches students to think in a way that's unique to them, collaborating provide students with the opportunity work together and accomplish larger tasks and communicating teaches students how to convey ideas. Based approaches are also one of these methods and techniques, creating a model intertwined with real-world problems in skills education. It is inevitable to use creativity, critical thinking, collaboration and communication skills in the solutions of these real problems in education systems. In these cases, both teachers and students play an important part in developing and mastering these skills.

TABLE 2 – 21ST CENTURY SKILLS AND DEFINITIONS

Skills	Sub-skills	Definitions
Learning & Innovation Skills	Critical Thinking & Problem Solving	Rational reasoning and difficult choices; understanding relationships between systems Ability to identify, examine and solve problems
	Creativity & Innovation	Developing, implementing and sharing new ideas with others; willing to be open to new and different perspectives. Elaborate, refine, analyze and evaluate their own ideas in order to improve and maximize creative efforts
	Communication & Collaboration	Understanding, using and preparing effective verbal, written and multimedia communication tools in different forms and environments. Team work and leadership; adapting to different roles and responsibilities; efficient work with others; putting yourself in the shoes of others; respecting different differences
Information, Media & Technology Skills	Information Literacy	
	Media Literacy	
	ICT (Information, Communications & Technology) Literacy	Analyze, access, use, adapt, evaluate and create information in different shapes and environments

(Continue)

TABLE 2 (conclusion)

Life & Career Skills	Flexibility & Adaptability	Fulfilling individual responsibility and flexibility in personal, business and public; setting and achieving high standards and goals for one's self and others
	Initiative & Self-Direction	Understanding her/himself and following own learning needs; identifying appropriate resources; transfer learning from one field to another
	Social & Cross-Cultural Skills	
	Productivity & Accountability Leadership & Responsibility	Acting responsibly, keeping in mind the interests and rights of others; displaying ethical behavior in personal, business and public

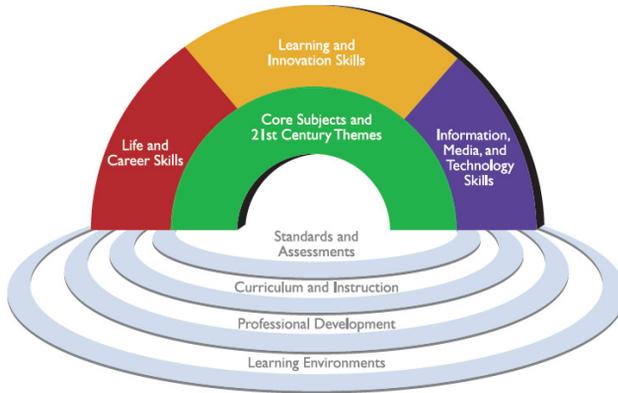
SOURCE: Partnership for 21st Century Skills (2003).

As seen Table 2:

People in the 21st century live with technology and media-driven environment, marked by various characteristics. They have access to an abundance of information, rapid changes in technology tools, and the ability to collaborate and make individual contributions on an unprecedented scale. Increasingly, the governments and the businesses require citizens and workers of the 21st century to exhibit a range of functional and critical thinking skills related to information, media and technology.

Learning and innovation skills are increasingly recognized as those that separate students who are prepared for more and more complex situations and work environments in the 21st century and those who are not. Creativity, critical thinking, communication and collaboration skills as essentials in preparing students for the future (PARTNERSHIP FOR 21ST CENTURY SKILLS, 2013).

FIGURE 1 – 21ST CENTURY STUDENT OUTCOMES



SOURCE: Partnership for 21st Century Skills (2013).

Figure 1 represents each element distinctly for descriptive purposes. The components are fully interconnected in the process of 21st-century teaching and learning. The elements describe the critical systems necessary to ensure 21st-century readiness for every student. 21st century standards, assessments, curriculum, instruction, continuous professional development and learning environments must be aligned to produce 21st-century outcomes for today's students.

Creativity as a skill

The definition of creativity has changed over the years. Researchers describe the phenomenon of creativity, that varies according to many different ideas and approaches, including different expressions such as a reflection of intelligence, an unconscious process, problem-solving capacity, and an act of thinking based on a connotation. (MACKINNON, 1962; GUILFORD; HENDRICKS; HOEPFNER, 1968; KOBERG; BAGNALL, 2003; MALAGA, 2000; ADAMS, 2001) Creativity also is seen as an individual way of thinking and quantitatively examine creative personality, the ability of the individual to grasp, through psychometric approaches. (TORRANCE, 1972). Weis (1993), defined creativity as using the mind to create new ideas, giving the mind a new shape, using the mind to create something new, doing something new, producing new

ideas using imagination, designing something new, something new is inventing. Some researchers examine creativity, on the basis of organizational or social factors and examine how these factors affect creativity (ARGYRIS; SCHÖN, 1996). In 2004 a new definition was proposed by Plucker, Beghetto, and Dow (2004), defining creativity as the interaction among aptitude, process, and the environment by which an individual or group produces a perceptible product that is both novel and useful as defined within a social context.” A generally agreed definition of creativity was proposed by Chung (2012) and Hennessey and Amabile (2010), defining creativity which involves the development of a novel product, idea, or problem-solution that is of value to the individual and/or the larger social group.” Others, who base their research, on tests and measurements, used to measure and improve their creative performance on individual creativity and the information process in the mind (TORRANCE, 1972; WEISER, 1993; KARADEMIR, 2016; ONUR; ZORLU, 2017).

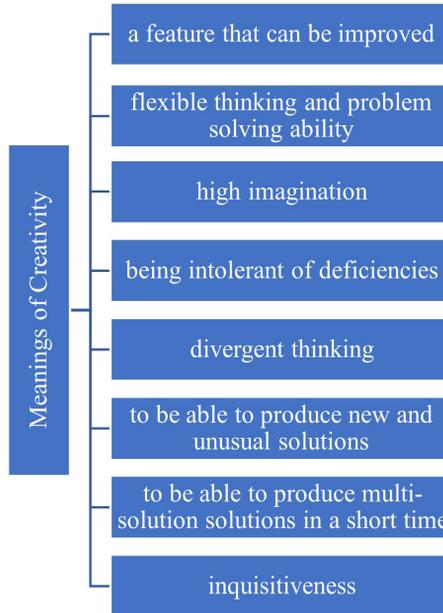
The creative person gradually discovers unknown places through the ways everyone knows. In other words, creates different / unknown / unexplored events or products by using the common way / methods / techniques. The creative process begins with wondering and dreaming. One cannot produce solutions to a problem without dreaming. For this reason, it is necessary to plan educational activities in a way that increases students’ skills in order to transform their creativity skills into a higher skill. In doing so, it is important not to allow educational activities to prevent and reduce creativity.

Arenofsky (2000), identified reasons that prevent creativity and its development. These are listed as follows:

- Criticism: Continuous criticism of ideas or products produced on both individual and group basis by others affects creativity negatively. Because this situation constantly prevents the development of the idea or product produced.
- Stress: The pressures applied on individuals cause individuals to increase their stress levels and lose their creative features.
- Doubt: Doubts over the ideas or products produced cause the originality of that idea or product to be lost.
- Routine: Creativity loses its value over time as every idea or product produced is made in the same way and different alternatives are not offered.
- Troubles in Time Adjustment: The desire to keep a creative thinking between certain time periods will negatively affect creativity.
- Environment: Feeling uncomfortable in the environment in which the individual is located and the environmental conditions in which he / she is located are not affecting creativity negatively.

When dealing with factors that negatively affect creativity, it is necessary to consider the characteristics of the creative person.

FIGURE 2 – RELATION BETWEEN CREATIVITY AND CREATIVE PERSON



SOURCE: Onur and Zorlu (2017).

According to Figure 2, the characteristics of the creative person has a feature that can be improved. A creative person is someone, who has the ability to synthesis by being curious and patient and make discoveries by being adventurous with experiments and research. (USTUNDAG, 2002).

Wechsler (1991), Piske *et al.* (2014), Bahia and Trindade (2013) indicate ways to work with creative potential, focusing on freedom of expression during the teaching and on mutual respect, which can generate opportunities to recognize the different opportunities during the process of teaching and learning. These include:

- Providing students with the freedom to choose between different ways to solve a problem by diversifying the possibilities of carrying out a proposed activity.

- Helping students to express different ideas of yours; provide environments exploration opportunities, leaving whenever possible the limited physical space of the classroom.
- Encouraging students to do their personal projects as a means to recognize their skills and talents; encourage them to be questioners.
- Allowing students to make questions and test their hypotheses, even if they seem inadequate or absurd at first.
- Encouraging curiosity for learning and discourage the focus on memorization.
- Giving options to students to make researches about different areas of knowledge, among other possibilities to work with creativity (PISKE *et al.*, 2016)

Teachers work with many types of students in the process of revealing their creative skills in the classroom. While some of these students are at normal level, some of them are gifted students.

FIGURE 3 – THE TALENT POOL RESULTING FROM THE INTERACTION OF THE COMPONENTS LEADING TO BEING GIFTED



SOURCE: Renzulli (1999).

According to the model in Figure 1, individuals having these three circles are considered as gifted and expected to have special training (AKKANAT, 2012). As seen in the model, creativity is an important component of gifted behaviour features. “Creativity is a mental and socio-cultural environment-related skill found in all individuals at any age rather than being seen as a

supernatural ability, a mystical and a random God's gift power under the monopoly of a limited- number gifted people in society. Creativity is composed of at least four basic components. These are; creative process, creative product, creative individual and creative case. Creativity is often an important aspect of scientific talent. Problem-solving, generating hypotheses, designing experiments and technical innovations require a special form of the unique creativity of science. If gifted students are to be helped in finding their creative intersection, significant and fundamental changes must be made to the way that educators think about teaching and learning (HENNESSEY, 2004; KARADEMIR, 2016).

It is vital that the teaching staff is prepared to create a stimulating environment of creativity that awakens the interest of gifted students and increase motivation to learn. For this, teachers need to know the interests and specificities of their students, for example, if the student likes drawing, it is important that the activities focus on drawing, if the student likes doing researches, then the activities involving researches are essential for this student to learn. In general, working with art can be a good option to develop creativity (PISKE *et al.*, 2016b).

Creativity at gifted students

Scientific creativity comprises of product, trait and process. "Product" depends on the technical product, science knowledge, science phenomena and science problem and trait is evaluated by three structures named fluency, flexibility and originality. In scientific creativity; the process depends on imagination and thinking (HU; ADEY, 2002).

Gifted student, learning faster than their peers; is an individual who is the leader in creativity, art and leadership capacity, has special academic skills, can understand abstract ideas, likes to act independently in his interests and performs at a high level (MNE, 2016). In addition, it expresses the ability to create something special and a combination of all these features, different from their peers in terms of giftedness, creativity, motivation and mental superiority (KOCAK; ICMENOGLU, 2012). For this reason, gifted students are expected to gain creative thinking, discovery, invention, success in social relations, innovation, leadership, communication and artistic skills (MNE, 2016).

Gifted children are those individuals who have a high level of performance in areas related to mental, creative or leadership capacity, or in specific academic fields and who need special training to develop their abilities (DAVASLIGIL, 2004). Furthermore, giftedness includes "high-level talent", "creativity" and "motivation" (RENZULLI, 1999).

Although the definition of giftedness has been expanded and narrowed over time, we must take into account the different kinds of skills in the education of gifted when using the concepts of “difference” and “creativity” in every definition. A skill can be acquired, developed, or extinguished unless training is carried out. The more skills are identified, the easier it is to reach the basic goals of education by students and teachers. The concept of creativity is often confused with the concept of intelligence. Creative people are those who have multi-faceted thinking skills rather than those with high intelligence. However, these two concepts are different from each other. Intelligence is essential for creativity but not sufficient (LIN *et al.*, 2003). Even if creative people are generally intelligent, intelligent individuals may not always be creative in everything.

Gifted students require different teaching methods and techniques than their peers. Since these students learn faster and in different ways, the curriculum needs to be differentiated to meet the needs of the gifted. Curriculum differentiation is created to foster the development of the creative skills of gifted students in curriculum design, enrichment, extension, acceleration (TORTOP, 2015).

Curriculum Differentiation

Curriculum differentiation means providing different learning activities for children of the same age with different learning needs and preferences (KULIK, J.; KULIK, C., 1997). When dealing with gifted students, it is especially important to consider the differences that can be achieved above what other students in the class work.

Enrichment

Enrichment refers to horizontal flexibility, and expansion refers to vertical flexibility. Enrichment is any learning or activity that is outside of normal education for most students. It is carried out in addition to the curriculum created and does not replace the usual program, it is complementary. It can broaden students' horizons, help them look at different aspects of their work and develop creativity. Enrichment means working in a different way than usual, involving groups of students working together.

Extension

Extension allows the student to move faster than the normal curriculum. This means skipping intentional chapters / topics before proceeding. In other

words, it may be necessary to compress the curriculum to make it more intense and complex. Studies in this context allow the student to work individually.

Extension and enrichment can take place in a classroom where more or more challenging activities are taught to tackle gifted students, or alternatively, in addition to the normal classroom environment. When extension and enrichment activities are carried out in the classroom, these should be sufficiently different from the program run by other students in the classroom.

Acceleration

Accelerating children to classes above age groups or, in other words, passing students to class (upgrading) is an important issue for both educators and parents. Currently, leading academics in gifted education in the U.S. and Australia support the use of acceleration / upgrading in favorable conditions, where child's needs can be adequately met.

In-class practice: The determination of creativity skills in gifted students

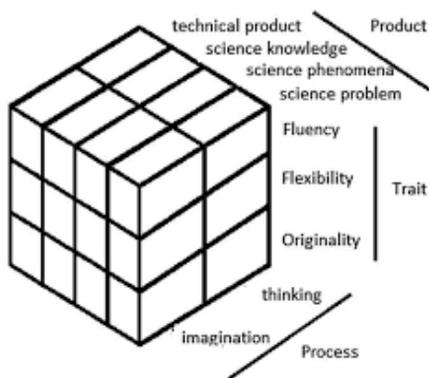
The main purpose of this study is to identify the creativity extent of gifted students through the in class practice. For this purpose, students were asked to design products that would make their lives easier. In accordance with this purpose; students have been asked to design projects and their adequacy to the extent of creativity has been determined. Adequacy of students' project designs have been tried to be explained according to fluency subscale, originality subscale and flexibility subscale, which was defined by Hu and Adey (2002), through teacher (researcher) observations and project products.

In this in-class practice, it was observed that creativity skills changed in the context of different dimensions within the scope of the project studies carried out by gifted primary school students. The change and development of gifted students' creativity in the context of the creativity dimensions specified by Hu and Adey (2002) have been observed. In long-term studies of students in this context; The formation of skills may require a certain process. while this process takes a few lessons in some skills, some may take a long time. therefore, skills should be followed and evaluated in the process. A study is carried out in a wide perspective on the formation of skills (KARADEMIR, 2016), This article covers the part about creativity skills.

The theory of in-class practice

As seen Figure 4, according to Hu and Adey (2002); scientific creativity has three parts named product, trait and process. “Product” depends on technical product, science knowledge, science phenomena and science problem. Trait is evaluated by three structure named fluency, flexibility and originality. In a scientific creativity; process depends on imagination and thinking.

FIGURE 4 - THE SCIENTIFIC STRUCTURE CREATIVITY MODEL



SOURCE: Hu and Adey (2002) and Karademir (2016).

Fluency: It is to be able to generate many ideas that may be the answer to a problem. For example, finding different uses of a brick or finding suitable titles for a short story. Creative people can put forward a number of ideas as a solution to the problem (HU; ADEY, 2002). For example; a student producing 10 different solutions to a problem situation in 5 minutes has more fluency and greater creativity skill than a student producing 5 solutions at the same time (RAHMAN, 1999).

Flexibility: It is to be able to bring different perspectives on an issue, to reveal different dimensions, to generate ideas in different categories, to approach a situation from different perspectives. The more generated ideas deal the problem with different angles, the higher is the flexibility. Creative people offer solutions to problems from different perspectives (HU; ADEY, 2002). The flexibility of a student to move from one approach to another is related to the condition of using different intellectual strategies. A child with a very low level of flexibility shows a strict pattern

of thinking. However, a child who has excessive flexibility can pass from one approach to another (SUNGUR, 1997).

Originality: It is the case of being unique in thought and action. It is considered that the fewer people think of the generated idea, the more original it is. Creative people generate original ideas (HU; ADEY, 2002).

Determining the expected / targeted skills and sub-skills

In the determination of skills section, practice related to skills containing different disciplines have been realized. The suitability of the multi-skill students with the feedback obtained from the gifted students after the study has been demonstrated. As seen Table 3; expected / targeted life skills. It is seen how the target skills are revealed after the activity before the event. This table may differ depending on the skills targeted at the activity. For example, this table can be used for scientific process skills and its sub-skills.

TABLE 3 – SKILL TABLE CROSS SECTION

Skill	Sub-skill	Before the activity [Prediction]		After the activity [Researcher Observation Results]		
		Expectation		Results		
		Occur	Not occur	Yes	Partially	No
Life Skills	Analytical thinking	X		X		
	Skill of decision	X			X	
	Creativity	X		X		
	Entrepreneurship		X			X
	Communication	X			X	
	Cooperation	X			X	

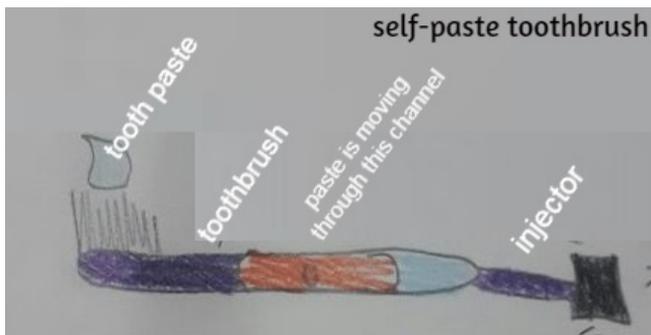
SOURCE: This table is a section of the study researched by Karademir (2017).

Process of the Activity and Evaluation Stages

In this study conducted with gifted students, an environment was provided to enable students to think design-oriented. In this context, a discussion was made to reveal the problems they encountered in their own lives. After this discussion, they were provided to create draft drawings of original products that

they will primarily reveal. An example of student drawings is shown in figure 4. Afterwards, they were provided to introduce their drawings. They focused on additions and subtractions, and they did research. At the last stage, they finished their designs and turned them into products. Observations were made to identify their skills at all stages from beginning to end. In their presentations about their products, they explained their originality, fluency and flexibility.

FIGURE 5 – A PRODUCT SAMPLE OF GIFTED ELEMENTARY STUDENTS: SELF-PASTE TOOTHBRUSH



SOURCE: This image was taken and edited by the author as part of the research.

As seen in Table 4; Some behaviors of students and some features and skills of their products are matched. These behaviors and features are specified through observations and evaluations made in the process.

TABLE 4 - DETERMINING THE EXPECTED / TARGETED SUB-SKILLS [LIFE SKILLS]

Type of skill	Feature or behavior performed by the student in the formation of the skill
Analytical thinking	Removing unnecessary materials from the list of materials
Skill of decision	Deciding which materials to use and how
Creativity	Flexibility: Adding different features to the product that is aimed to be revealed. Originality: Creating a original product Fluency: Producing solutions for different perspectives
Entrepreneurship	Carrying out sales that need to be designed
Communication	Sharing opinions with group friends
Cooperation	Compatible / coordinated work with other group mates

SOURCE: Karademir (2017).

Results of Practice

In this study; It is seen that students' creativity has changed positively in creating products and using these products in daily life. As a dimensions of creativity; in the *Fluency* dimension of creativity, students show positive development; in the *Flexibility* dimension of creativity, students show positive development and in the *Originality* dimension of creativity, students show positive development. The creativity of gifted students has been found to increase with the training provided on product creation processes.

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