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Teaching Techniques and Activities for the Education of the Gifted Young Scientist

Computer Tree

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ABSTRACT: It is crucial that gifted and talented students should be supported by different educational methods for their interests and skills. The science and arts centres (gifted centres) provide the Supportive Education Program for these students with an interdisciplinary perspective. In line with the program, an ICT lesson entitled "Computer Tree" serves for identifying learner readiness levels, and defining the basic conceptual framework. A language teacher also contributes to the process, since it caters for the creative function of the basic linguistic skills. The teaching technique is applied for 9-11 aged student level. The lesson introduces an evaluation process including basic information, skills, and interests of the target group. Furthermore, it includes an observation process by way of peer assessment. The lesson is considered to be a good sample of planning for any subject, for the unpredicted convergence of visual and technical abilities with linguistic abilities.

Key words: Gifted/talented students, high level of intelligence, information technology, mind map

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INTRODUCTION

The intelligence potentials of students, who are in the very centre of our education system, include the concepts of gifted and talented students. The concept of superior intelligence was first used for children who present unusually rapid development of intelligence. According to relevant studies gifted students have high level functions of motivation (Phillips and Lindsay, 2006), learning (Chan, 2001) and social and emotional needs (Chan, 2000; Terman & Oden, 1976; Yakmacı - Güzel, 2002, 2004). According to Clark (1997) high level of intelligence is an embedded biological concept as a result of rapidly developing high level cognitive, affective, physical and intuitional functions. These rapidly developing high level functions appear as properties that are based upon creativity, academic talent, leadership or as visual or performance arts (Clark, 1997). High level of intelligence is a social label used for differences between individuals. Therefore, different definitions exist among individuals, disciplines and societies. In addition, it is observed that some definitions are extensive and some are narrow-scoped. Narrow-scoped definitions define intelligence only through numbers whereas extensive concepts consider intelligence qualitatively; they include factors like creativity in addition to numbers (Sak, 2010).

By definition, gifted/talented (GT) students, have higher performance than normally developed students. Thus, the education for these students should be different. In each school and each grade, it is possible to see mixed classes where GT students can be seen. In line with the students' individual interests and needs, one or more of these techniques together and a proper education program should be presented to GT students. Students, who want to contribute to themselves and the society that they live in, need a distinguished education which goes beyond to regular education and emphasizes individual needs more (Duman, 2013). In this point, applications such as acceleration of student education, grouping, enriching and differentiation are different from regular education (Van Tassel-Baska, 2000).

Differentiation of curriculum is the adaptation of its components in accordance with the need for content, process or product by teachers. They do it at will during classes or exercises by taking students' readiness, interests or education profiles (Clark, 2008). The main objectives of differentiation for GT students' education are to get to know students' properties and to support and provide opportunities in in order to order to develop these properties. The main structure of differentiation consists of adaptations of content, process and product that are made to meet GT students' needs, interests and abilities.

In this context, it is safe to claim that differentiation in comparison to the individualized education is more structured and although it addresses individual properties, it mostly features group education. Perhaps curriculum and education cannot be individualized through differentiation; however the scope of content, process, products and curriculum standards can be modified till each student learns it. Teachers combine the most common and widespread properties of GT students into four main categories that are important concerning these student's education. Education program can be differentiated according to these. The four categories are:

- The speed of learning
- The complexity of forging ideas and knowledge
- The depth in understanding and learning
- Novelty and originality in learning and individual interests

With the help of such education, the brain is able to perform more effective, combined and developed functions (Clark, 2008).

In differentiated education, teachers begin not with the first subjects of the education program, but with students' levels. They acknowledge that students are different from each other and they proceed on subject based upon this assumption. Thus teachers present different learning models to student and they are ready to include students in education. In order to achieve that, they address to students' different fields of interest and differentiate speed of lecturing and difficulty levels (Tomlinson, 2001). According to Kaplan (1986), secondary components that help to differentiate education

program are content, processes and products. Changes of these bring differentiation. The experience of differentiated education program is the result of the interaction of these basic components.

In differentiated education prepared for GT children, the dimension of creativity has a significant place. Creativity is an interaction of talent, process and environment triggered by an individual or a group who provided socially new and useful and perceivable product (Plucker & Barab, 2002). Creativity is not limited with "historical" and "magnificent" individuals such as Darwin, Picasso or Hemingway. On the contrary, it can be used by everyone and it is a developable phenomenon (Sternberg, 2005). One of the main components of creativity is the originality. The second component of creativity is benefit or effectuality. The second component is eventually the product. It is useful to think that these three components form creativity. With students, who are the main focus of education, the process of creativity begins, a student handles a problem and when the process is completed or in other words, when the problem is solved, a product emerges. Thanks to the student, process and product components, a creativity-oriented differentiated education take place (Andreasen, 2005).

The Use of the Mind Map Technique

Among differentiated applications of learning, the "Mind Map" techniques is an application which enables students to show their abilities and knowledge concerning creativity, lingual development and the study field in the highest level possible.

This technique, which had been translated to Turkish as the concepts of mind map, mapping mind or brain map, was developed by English psychologist, mathematician and brain researcher Tony Buzan in the 1960s. This noting technique has received world-wide recognition and has been used in several fields, from education to business world. Mind map, although it is a noting technique, is widely used in areas like strategic planning, designing presentations, academic studies and creative problem solving (Gelb, 2002, pp. 87). According to Novak (2010), the mind mapping technique is a graphical type of presentation which is used to construct the backbone of meaningful learning for students. Mind map is particularly an integrative, visual and graphical tool of thinking; it fits well to memory, creativity, learning and all sorts of brain functions. It is known as "the Swiss knife of brain" (Buzan & Buzan, 2007, 31).

It is not wrong to say that mind mapping is a mental activity operating all brain functions. Michalko (2001) emphasizes this feature of the mind map application and as an alternative to linear thinking, he indicates that it functions the brain as a whole. In the traditional sense, education system generally address to the left hemisphere of the brain. This situation causes less use and rustiness of the right hemisphere. However mind maps stress the importance of using both hemispheres together. Therefore, mind maps by nature prompt and activate both right and left brain. In learning media, mind maps can occasionally be used to give clues to students. They may also be used for getting attention to the lecture and in transition parts; with regard to this feature, mind maps are useful tools in learning processes (Kan, 2012, pp.47). Brinkmann (2003, pp.96) also urges that mind map is an effective tool particularly for teachers' achievement. He emphasizes that mind map functions as a magical tool for introducing the course and making it interesting. In addition, mind map can be easily used in order to visualize cognitive structure; through the implementation of the first and final mind maps, individuals' level of knowledge or false connections in their minds concerning the subject can be revealed (Kan, 2012, pp.77). In doing so, it is not wrong to think that mind maps reflect an individual's knowledge, his or her learning or mislearning and insufficient and false acquisitions.

The mind mapping technique is clearly different from traditional notes. In mind mapping, the structure spreads from the centre to the periphery. In addition, notes on each branch were formed from a key word; not from idioms or sentences. Use of a single word summarizes the thoughts. Important ideas or words that are off the topic do not go unnoticed. Another difference is the use of figures. In the centre of mind map, there must always be a figure because a figure is equal to thousand words (Ede, 2012, pp.59).

In schools, mind mapping has benefits during both learning and teaching. A mind map activity implemented in cooperation may turn learning process to a more open and participative one for students. Through mind mapping, courses automatically become an entertaining process of experience for both teachers and students. Another important benefit of mind mapping stems from the

flexibility of the technique. In other words, mind mapping enables teachers to easily adapt and regulate implementations according to students' age groups and the program's properties. In comparison to linear texts, mind maps not only list information, at the same time reveal relations between these sources; in doing so they facilitate to learn and remember (Buzan, 2009, pp.77).

This study explores an activity based on "mind maps" through examples of differentiated education programs and discusses the effects on such maps on students.

Implementation of the Activity

In Turkey, several condensed and differentiated activities made in Science and Art Centres towards GT students in extracurricular times (MONE, 2007). In this chapter, the implementation of "Computer Tree" activity, which is one of the activities made in the field of Information Technologies, is explored. This activity was made for 5th grade students.

The purpose of this activity is to determine vocabulary of students concerning the field of Information Technologies and their knowledge about the components of computers. The study gives clues about the students' readiness about the field. In addition, the study was adapted to a "contest" format. In doing so it aims to observe behaviours in a competitive environment. In the end of activity, students are expected to answer the following questions:

- What do you remember about computer terms?
- Which words come to your mind about computer?
- Please form meaningful sentences by using words in each branch of the "Computer Tree".

As it is an interdisciplinary implementation, the activity enables to evaluate students' basic knowledge, talents, interests and concerns in different fields. In addition peer evaluation is made in order to observe attitudes and behaviours of students in the dimensions of analysis, synthesis and assessment. The study was done with a linguistics teacher; therefore it aims to improve students' creativity concerning their basic language skills. As it is indicated in instruction of Science and Art Centre (2007) and in line with the Supportive Education Program, an Information Technologies teacher and an English teacher actively participated in implementation of "Computer and Equivocations". The implementation was carried out by the Information Technologies teacher whereas the English teacher makes observations. Besides, the implementation can be done by teachers in any branch.

In the light of the implementation, the following results were aimed to reach:

- To gather information about readiness levels of GT kids concerning the field of Information Technologies
- To teach basic concepts of the field of Information Technologies in an entertaining way to students who have no information about them.
- As it is an interdisciplinary activity, to observe basic knowledge and skills of students in both the fields of Information Technologies and language.

The implementation was made by both students and teachers in an interactive manner. In the beginning of the activity based on the "Mind Map" techniques, only the word "Computer" is written to the black board. "Branches" (equal to number of students) are stretched out and the following question is asked to the students: "Which words come to your mind about computer?" New "branches" are stretched out concerning the answer and the activity proceeds with the following question: (let the answer be "A"), which words come to your mind about A". After five "sub-branches" are formed, then the "Computer Tree" of the students is ready (Figure 1).

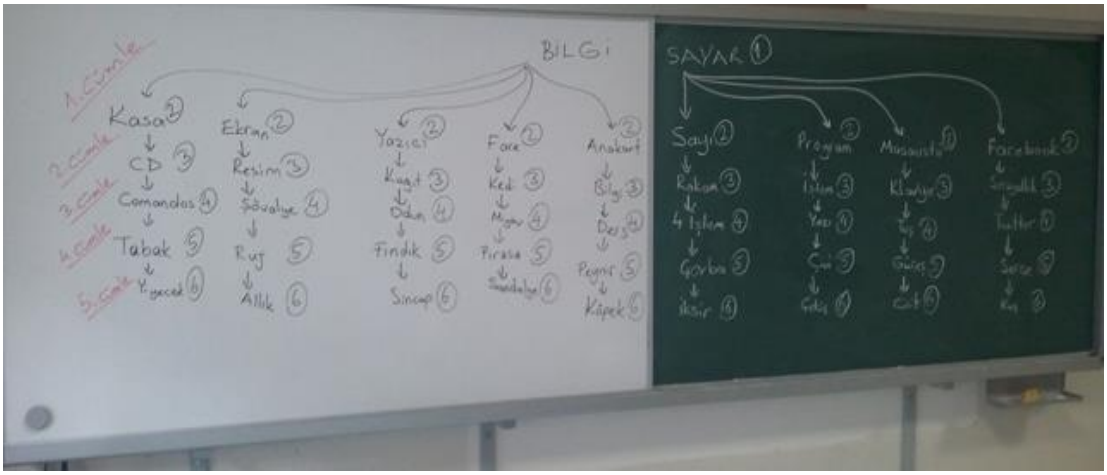

Figure 1. An Example of a Computer Tree

While student are forming the branches of the "Computer Tree", at the same time they unconsciously prepare words that they will use for sentences during the second phase of the implementation. The second part is to reveal both creativity and language skills of students. As students have to use their own words in sentences, they are particularly asked to do a linguistic study in the dimensions of analysis, synthesis and assessment.

During the activity some students, in order to make the activity more entertaining, they speak of totally irrelevant words and on "the final branches" they reach words which are not associated with "Computer". In this point, students are shown (from "Computer" to the word on "final branches" how they reach this word (in this study from "Computer" to the word on "final branches", the following words are found in the final branches: "food", "blusher", "squirrel", "chair", "dog", potion", "hammer", "javelin" and "bird")

After this phase, students are asked to make a meaningful sentence by using the words on each "branch" of the "Computer Tree". The important point here is each sentence includes the word "computer". In the last phase of the activity, students read out their sentences. In this phase, all students assess sentences of their friends which are written by the words on the same "branch" (Figure 2).

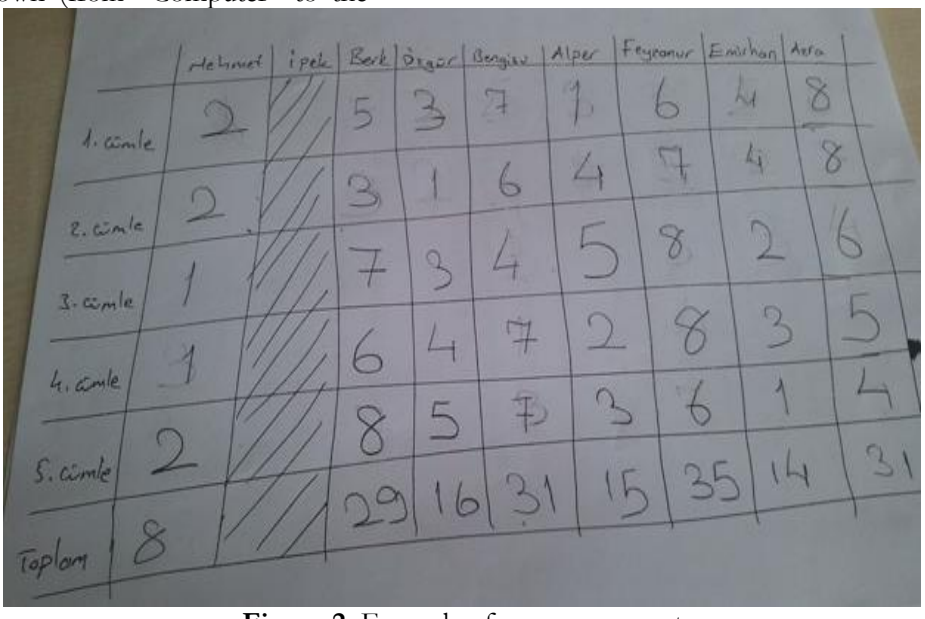

Figure 2. Example of peer assessment

After all sentences are read and given points as seen on Figure 2, the teacher calculates general points on the blackboard and the most successful student of the activity is identified.

DISCUSSION AND CONCLUSION

The technique of "Mind Map" is one of the differentiated education techniques for education of GT students. In this context, in Ankara Science and Art Centre, in line with the Supportive Education Program and the theme

"Computer and Equivocations", a "mind map" based activity called the "Computer Tree" was implemented. The aims of the activity were to determine students' levels of readiness concerning the field of Information Technologies, to reveal their creativity and understand their language skills, to help them in gaining problem solving abilities and do to peer assessment.

In the end of the activity, the pre-set students' acquisitions were reached. Students' levels of readiness were identified. At the same time, the teacher made observations on their language skills.

With the help of the "Mind Map" techniques, students were asked to make complicated sentences with the words they encountered and their problem solving skills were examined. According to the observations of the language teacher, the student having the highest language skills in the final group was also selected by other students with the highest points; this indicate that students were objective in peer assessment.

In general, students show interest in field activities of Information Technologies; however it is observed that some students lack this interest. With the help of "Computer Tree" activity, it was found out that even uninterested students showed interest and participated in the activity keenly. The most important reason for this is that students as a group and in cooperation can direct the activity at will.

Children with high level of intelligence have different cognitive properties than normal children. This is mentioned almost all studies in the literature. According to Leana (2005, pp. 58) Children with high level of intelligence are different in terms of cognitive levels rather than properties. Therefore, According to Robinson and Clinkenbeard, such children show their ability to solve problems in a better and quicker way at early ages. .

Ataman (2004) focuses on properties of creativity of gifted and talented students and underlines that they provide multiple solutions to problems.

As all these studies in the literature show, problem solving and creative abilities of GT students remain at the forefront. In studies done with these students, doing activities in order to improve their problem solving and creative abilities is important in terms of using their current potentials. In this regard, the "Computer Tree" activity contributed to the development of students.

The main purpose of this activity, which addressed GT students, is to observe basic knowledge, interest and skills of students in different disciplines. The activity is an easy study which aims to identify conceptual knowledge in all branches. Implementation of interdisciplinary activities, particularly on GT students' education, provides opportunities for students to pay attention to studies, to enjoy activities more and to be observed in different disciplines. Such interdisciplinary activities in all institutions of country that educate GT students, especially in Science and Art Centres, will be beneficial for both teachers and students.

In addition, such studies are not only for GT students, but they can also be done for students of all levels; however the only problem here is that it is hard to do the activity in crowded classes in 40 minutes. In this case, the class should be divided into four or five groups that each group is supposed to form a "branch" of the "Computer Tree". In GT groups, students are individually observed whereas in activities done at normal education institutions; students can be evaluated through group-based observations. Thus, the study can be easily implemented for student observation on all education levels.

These activities are off the traditional education approach. They are not teacher-oriented. They both educate and entertain. Integration of similar differentiated activities in education systems will help to observe students, to introduce and teach the particular field in a more interesting way and therefore to make students more efficient.

REFERENCES

Andreasen, N. C., (2005). *Yaratıcı Beyin: Dehanın Nörobilimi (Çev. K Güney) [The Creating Brain: The Neuroscience of Genius]*, Arkadaş Yayınevi, Ankara, 2009.

Ataman, A., (2004). Üstün Zekalı ve Üstün Özel Yetenekli Çocuklar. [*Gifted and Talented Children] 1. Türkiye Üstün Zekalı ve Yetenekli Çocuklar Kongresi Seçilmiş Makaleler Kitabı.* ss: 158-159, İstanbul: Çocuk Vakfı Yayınları.

Brinkmann, A., (2003). Graphical Knowledge Display – Mind Mapping and Concept Mapping As Efficient Tools In Mathematics Education, *Mathematics Education Review*, No 16, April, (2003), 35–48 Çeviren: Suphi Önder Bütüner İlköğretim Online, 6(1), Çeviri: 1-11, 2007.

Buzan, T., (2009). *Akıl Haritaları: Yaratıcılığınızı Harekete Geçirin ve Dönüştürün. [Mind Mapping :*

*Kickstart Your Creativity And Transform Your Life]*Hakan Öneş (Ed.), İstanbul: Boyut Yayıncılık

Buzan, T. & Buzan, B., (2007). *The Mind Map Book. Edinburg*, England: BBC Active.

Chan, D. W., (2001). Characteristics and Competencies of Teachers of Gifted Learners: The Hong Kong Teacher Perspective, *Roeper Review*, 23 (4), 197-202.

Clark, B., (1997). *Growing up Gifted (5th Ed.)*. Upper Saddle River, New Jersey, Columbus, Ohio: Merrill, an Imprint of Prentice Hall.

Clark, B., (2008). *Growing Up Gifted.* (7th Ed.) Upper Saddle River, NJ: Prentice Hall.

Duman, M., (2013). *Üstün Zekalı ve Yetenekli Bireylere Yönelik Eğitim Modelleri ve Öğretimsel Uygulamaları*, [*Education Models and Instructional Practices Intended for Gifted and Talented People]*. Yüksek Lisans Tezi, Okan Üniversitesi, Sosyal Bilimler Enstitüsü, İstanbul.

Ede, Ç., (2012). *Zihin Haritalama Tekniğinin Öğrencilerin Türkçe Okuma Metinlerini Anlama, Başarı Ve Öğrenmelerinin Kalıcılığına Etkisi, [The Impact of Mind Mapping Methods on the Comprehension, Success, Compass, and Permanence of Turkish Reading Texts]*. Yüksek Lisans Tezi, Fırat Üniversitesi, Eğitim Bilimleri Enstitüsü, İlköğretim Anabilim Dalı, Sınıf Öğretmenliği Bilim Dalı, Elazığ.

Gelb, M. J., (2002). *Düşünmenin Tam Zamanı.* [Thinking For a Change](Çeviren: Taylan Bilgiç). İstanbul: Arion Yayınevi.

Hızlı, E., (2013). *Üstün Zekalı ve Yetenekli Çocukların Matematik Tutumlarının Çeşitli Değişkenler Açısından İncelenmesi*, *[Investigation to Gifted and Talented Students' Attitudes Towards Mathematics in terms of Different Variables]* Yüksek Lisans Tezi, İstanbul Üniversitesi, Sosyal Bilimler Enstitüsü, Özel Eğitim Anabilim Dalı, İstanbul.

Kan, A. Ü., (2012). *Sosyal Bilgiler Dersinde Bireysel ve Grupla Zihin Haritası Oluşturmanın Öğrenci Başarısına, Kalıcılığa ve Öğrenmedeki Duyuşsal Özelliklere Etkisi, [The Effects of Using Individual and Group Mind Mapping on Students' Academic Achievement, Retention and Affective Characteristics in Social Studies Course]*. Doktora Tezi, Fırat Üniversitesi, Eğitim Bilimleri Enstitüsü, Eğitim Programları ve Öğretim Anabilim Dalı, Elazığ.

Kaplan, S., (1986). *The Grid: A Model To Construct Differentiated Curriculum For Gifted. Systems and Models for Developing Programs for the Gifted and Talented*, Mansfield Center; CT: Creative Learning Press.

Leana, M. Z., (2005). *Üstün Zekalı ve Normal Çocuklarda Yönetsel Fonksiyonlar: Londra Kulesi Testi, [Executive Functions in Gifted and Average Students: Tower of London Test]*. Yüksek Lisans Tezi, İstanbul Üniversitesi, Sosyal Bilimler Enstitüsü, Psikoloji Anabilim Dalı, İstanbul.

MONE, (2007). Ministry of National Education of Turkish Republic. *Bilim ve Sanat Merkezi Yönergesi*, [Directive of Science and Arts Centers] T.C. Milli Eğitim Bakanlığı.

Michalko, M., (2001). *Cracking Creativity: The Secrets of Creative Genius,* Ten Speed Press, Berkeley, California.

Novak, J. D., (2010). Learning, Creating And Using Knowledge: Concept Maps as Facilitative Tools in Schools and Cooperation, *Journal of E-Learning and Knowledge Society,* 6(3), 21-30.

Phillips, N., & Lindsay, G., (2006). Motivation in Gifted Students, *High Ability Studies,* 17 (1), 57-73.

Plucker, S. A., & Barab, J., (2002). *Smart People or Smart Contexts? Talent Development in an Age of Situated Approaches to Learning and Thinking*, Educational Psychologist, 37, 165-182.

Robinson, A., & Clinkenbeard, P. R., (1998). Giftedness: An Exeptionality Examines, [On-line serial] *Annual Review of Psychology*, 49, 211-230.

Sak, U., (2010). *Üstün Zekalılar Özellikleri, Tanılanmaları, Eğitimleri.* [Gifted Children: Characteristics, Identifications, Education] Maya Akademi Yayınevi. Ankara.

Sternberg, R. J., (2005). *The WICS Model of Giftedness*, In R. J. Sternberg & J. E. Davidson (Eds.), Conceptions of Giftedness, (2nd ed., 327-243), New York: Cambridge University Press.

Tomlinson, C. A., (2001). *"How to Differentiate Instruction in Mixed Ability Classrooms"*, (2nd Ed). ABD: Association for Supervision and Curriculum Development.

Van Tassel-Baska, J., (2000). *Theory and Research on Curriculum Development for the Gifted*, (Ed: Heller, K., Mönks, F., Sternberg, R., Subotnik, R.) International Handbook of Giftedness and Talent. P. 345-365. Pergama Publications.

Yakmacı-Güzel, B., (2004): Üstün Yeteneklilerin Belirlenmesinde Yardımcı Yeni Bir Yaklaşım: Dabrowski'nin Aşırı Duyarlılık Alanları, [A New Supplemantary Approach in The Identification of Gifted People: Dabrowski`S Overexcitabilities] *I.Türkiye Üstün Yetenekli Çocuklar Kongresi Makaleler Kitabı* (155-168). Çocuk Vakfı Yayınları, Yayın No:64, İstanbul.