



RELIEVE. Revista electrónica de investigación y evaluación educativa

Universidad de Valencia

relieve@uv.es

ISSN (Versión en línea): 1134-4032

ESPAÑA

2005

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SCIENCE AND ART CENTERS

RELIEVE. Revista electrónica de investigación y evaluación educativa, año/vol. 11,
número 001

Universidad de Valencia

Valencia, España

pp. 83- 98

Red de Revistas Científicas de América Latina y el Caribe, España y Portugal

Universidad Autónoma del Estado de México

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DIFFICULTIES OF TURKISH SCIENCE GIFTED TEACHERS: INSTITUTIONS OF SCIENCE AND ART CENTERS

(Dificultades de los profesores de ciencias turcos de niños bien dotados: los Centros de Ciencia y Arte)

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Abstract

The purpose of this study is to determine the fundamental problems of science gifted teachers (SG/Ts) who teach Turkish gifted children (G/C) and compare it with the international *milieu*. Turkish G/C are taught in different educational contexts named "Science and Art Centers" (SACs) in which better opportunities are presented for them. In this project, field observations were done at three of the SACs in Turkey - in Bayburt, Sinop and Trabzon - and, semi-structured interviews were conducted with each of ten SG/Ts who work in these centers by one of the researchers. Data analysis showed that SG/Ts do not perceive their duties holistically and feel the need help with measurement and assessment techniques, modern learning theories, plan and implementation of a research project, questioning techniques and using laboratory-based methods for G/C. Moving from the research data, it is suggested that in service education courses, which include the above issues should be organized for the SG/Ts and they should be encouraged to use an action research approach in teaching G/C in SACs.

Keywords

Science and Art Centers, Science Teachers of Gifted student, Turkish Educational Context.

Resumen

El propósito de este estudio es determinar los problemas fundamentales de los maestros de ciencia de niños bien dotados (SG/Ts) que son los encargados de enseñar a los niños dotados turcos (G/C) y los compara con el entorno internacional. Se enseña a los G/C turcos en contextos educativos específicos denominados "Centros de Ciencia y Arte" (SACs) en los que se favorecen las mejores oportunidades para ellos. Se realizaron observaciones del campo en tres de las SACs de Turquía - en Bayburt, Sinop y Trabzon - y se llevaron a cabo entrevistas semi-estructuradas con cada uno de los diez SG/Ts que trabajan en estos centros. El análisis de los datos mostró que esos SG/Ts no perciben sus obligaciones holísticamente y sienten la necesidad de ayudar con técnicas medición y de evaluación, teorías de aprendizaje modernas, planificación y aplicación de proyectos de investigación, cuestionando técnicas y usando métodos basados en las investigación de laboratorio para los G/C. A partir de los datos de la investigación se sugiere que deberían organizarse cursos de formación en los centros que incluyan los problemas anteriores para los SG/Ts y que hay que animarles a que adopten un acercamiento de investigación acción para la enseñanza de los G/C en los SACs.

Descriptores

Centros de Ciencia y Arte, Maestros de ciencia de niños bien dotados, Contexto educativo turco.

Introduction

Education of individuals from all intellectual levels in a developed society is quite important. Thus, the society should provide financial support to find solutions for educational issues affecting its community. It is thought that a large amount of money is being used for individuals at low intellectual levels and modern societies do not consider this as a waste of money or time (Gökdere & Küçük, 2003). Likewise, some kind of special education opportunities are provided for G/C's education. These endeavors are aimed to be used in order to widen the potentials of G/C in such an effective form. In this way, G/C can be adapted into the society more easily (Renzulli, 1985). It is found out from the literature that approximately 2 to 3% of individuals in all societies in the world are gifted (Witty, 1958; Marland, 1971). Unfortunately, these gifted individuals are not truly identified and trained accordingly. For that reason, the majority of them might have psychological problems and become dangerous for a community (Witty, 1958; Marland, 1971).

Feldhusen (1986) explained giftedness as a complex of intelligence, aptitudes, talents, expertise, motivation and creativity which can lead an individual to a productive performance in some areas or disciplines such as intellectual and scientific leadership, creativity, artistry, dramatic, musical, mechanical and physical activities. G/C need to be educated with different teaching programs and strategies. A different kind of education for those children is destined to be a support for their own psychological developments and using their own potentials for the benefit of a society in which they live (Feldhusen, 1986; Renzulli, 1999). It is thought that if an effective education is given by a community to G/C, they would be able to give impetus to developments of the society in both art and science areas. Thus, projects about the G/C have a rooted past in some western countries (Witty, 1958; Marland, 1971; Jordan, 1962;

Renzulli, 1985). There are some kinds of gifted education (G/E) models which have been developed and implemented in those countries, for example Autonomous Learning Models (Betts, 1986), Three Phases of Enrichment Model (Feldhusen & Kolloff, 1986) and LES (Learning Enrichment Service) model (Clifford, Runions & Smyth, 1986).

Teacher roles in the G/C's education should be in such a form that a gifted child works as a scientist; inquires, observes, solves, tests and finds answers to his/her own problems at last (Sherwood, 1996). In addition, SG/Ts should have some extra roles as a model and value instructor, interest maker and functional evaluator throughout different parts of teaching practices. G/Ts' ideal characteristics are sequenced as efficiency on subject areas, wide spread concern areas, flexible thinking, tolerance and neutrality. It is also expected from them to be aware of being good examples for children's characteristics and life styles, encourage them to high levels of learning, concern areas and independent studies (Jordan, 1962; Sisk, 1987).

1.1. G/E in the Turkish Context

Turkey is quite late for studies about the G/C's education. However, some kinds of insignificant studies have made progress. For example, high-special level classrooms were opened in the 1960's. Nevertheless, inequitable applications have been encountered in the G/C's identification system and it had to be gotten rid of. In the 1980's, these kinds of attempts were started again and some projects have been developed with the help of the past projects. However, the most important development about the G/C's education is talent development centers which have been established under the name of "Science and Art Centers" (SACs) in five cities since 1993. Now, there are ten SACs which have function and accept G/C in Turkey under the control of the Ministry of National Education (MNE). There are also seven ones which do

not accept children yet. However, most of these centers are either new or still in the establishment phase. Thus, it has been found out that there are many problems with children and/or teacher selection and in program implementation processes in these centers (Çepni, Gökdere & Küçük, 2002; Gökdere & Küçük, 2003). Within those problems, it is believed that the G/T selection method is the most important issue because teachers have essential roles in all parts of learning process and they are the most influential. Nevertheless, SACs have been newly opened and some of them are still in the establishment phases, it is not an unexpected result for these centers to have some problems in the teaching area. Here, there is a point that needs to be thoroughly examined; how should we more appropriately select the G/Ts for the task? Furthermore, how can we cultivate within them ideal characteristics and develop them in the profession? Doubtlessly, it would be helpful to find out those problems and solve them in a way which can provide some critical implications for the G/E literature.

1.1.1. SACs Serve To What?

SACs are a different from normal education institutions in both program and education time. Children go to both normal schools and SACs in a day and sessions at these centers are adjusted to work around the children's normal school programs. Children go to their normal schools during all weekdays, and a few evenings during the week they go to SACs.

Children who are selected and enrolled at SACs take five education programs in sequence as orientation, support education, noticing individual characteristics, developing special abilities, and project construction. Time of each education process is arranged by the centers. Through the process of each education part and at the end of each process, guide and leader teachers make the assessments of the education program toward gifted children and prepare assessment re-

ports. All of these sessions have different importance on education of gifted children. However, the most important of these is project construction sessions that is also a basic aim of this education model. Leader teachers at these institutions provide the required pre-learning for the aim of knowledge and skills to be gained by the gifted children in project preparation and developing subjects. Leader teachers also prepare projects and present sample projects. On the preparation of the projects, gifted children's suggestions are certainly assessed. Children do their project work in groups and each group consists of three to five individuals. If needed, individual projects are done. Projects which are developed at the SACs are basically related to solving a problem or compensating a need in the real world. Selections of subjects of the projects are not limited. Every kind of constructions, services, scientific works and art activities can be given as project characteristics. Those project works aim gifted children to have some qualifications such as working among disciplines and developing synthesis of different skills.

In these projects as a method, gifted children's selections of their own project subjects, adapting their own solutions to them, and learning much more in these phases are taken as a basic point. Thus, gifted children under the guidance of expert teachers can grow as people that have the skills for constructing and learning as living, solving problems, thinking creatively, making scientific research and inventing individuals by making a plan, implementing and assessment phases (Journal of Reports; n.2530).

1.1.2. Problems of The G/E in The Turkish Context

Many studies related to the G/C have been started in many countries since 1920 (Jordan, 1962), but it is rather new in our country. This partly achieved in the art area, however, in the science area little has been done on this issue up until now. In the past, G/C at only art areas were supported in Turkey.

However, currently 46.5% of the children of SACs are gifted in intellectual areas, and 51.5 of them are gifted in art areas (Gökdere & Küçük, 2003). The present identification system determines talented children mostly in cities. Thus, the others who especially live in suburban areas are ignored. G/C mostly belong to parents of high social-economic levels. In contrast, the system should be used to determine all the G/C regardless of their socio-economic levels. Unfortunately, many teachers and families have not comprehensively dealt with the issues or problems of G/C in Turkey (Akarsu, 1993). They do not realize or know how to handle them.

The other problem is that children in these centers are expected to be successful at high stake tests. Because of the nature of the assessment system of Turkish students, achievement is directly related to these tests (Çepni, Kaya & Küçük, 2002). Thus, students' professional life in the future is also related to these examinations. However, in this assessment system gifted/talented children are not given a privilege. Thus, parents are giving importance to getting ready for those national examinations rather than developing abilities available to their children. This expectation leads to a continuing problem at both primary and high school levels. It is important to see that there is lack of G/Ts who are capable of teaching G/C. It is also important to note that G/Ts' education is not valued nor are they educated enough to work with those gifted students, however a large amount of financial source is separated for those centers.

Since the G/C's education is practiced in our country in SACs in parallel to normal education, some problems are encountered in this process. One problem that stands out is that children use up all their time and come to SACs from their normal schools. Thus, they cannot compensate their fundamental needs such as food and resting. Most of the teachers who work at SACs have been selected from normal school teachers. Thus,

teachers at normal schools have a sorrow so as not to be selected for these centers, and look at these centers and G/Ts with prejudgment and antipathy. Because of this, these teachers reflect their negative attitudes upon G/C in their classrooms. It seems that the most important problem of the G/E in Turkey is G/Ts' development. Here I will explain this issue in some details.

1.1.3. The Turkish G/Ts' selection process

The complete selection process of the Turkish G/Ts includes a sequence summarized and presented below (Gökdere & Küçük, 2003):

1. Local education administrations (LEA) where SACs are situated, announce that teachers with some characteristics are required for SACs. Therefore, they send an official letter to all school administrations.
2. Teachers who are willing to work at these centers apply to LEA.
3. Those whose applications have been accepted are taken into a seminar work organized by Ministry of National Education (MNE). Then, sample teachers are separated according to their subject areas and each group is expected to finish a project work. When these project works are finished, teachers that are considered successful are then hired for the job.
4. The required correspondences are done about these teachers with related institutions and those in charge of SACs.
5. These centers are such an independent school status that there is not a mechanism to inspect these schools and teachers at work.

It is accepted that G/E includes quite a student-centered approach, however teachers' roles in this education are too much that we cannot neglect it. Especially, selection of the most appropriate ones among a lot of candidates is difficult and a detailed method is required to examine whether a candidate is suitable for the job. In the Turkish context, as mentioned above announcement for candidacy is limited to ones who work mostly in

the city centers. However, selection announcement of the G/T candidates should be done in a manner that all teachers who want to have a job in the schools hear and thus they should not be limited as stressed by Renzulli (1985) and Wood (1996). In a study Wood and Feldhusen (1996) conducted a research and their purpose was to examine teachers who wanted to work at the "Super Saturday Program." I would like to compare it with the Turkish context as follows:

The first task is to place an ad in a local and university newspaper to select teachers who wish to work at Super Saturday Program. Some kinds of hand notices are also distributed. The aim is to reach as many people as possible in the content of a business announcement is quite important because characteristics of desired individuals are situated in a clear form. Prospective candidates are given enough time, like a few weeks, for submitting the application forms. Then, these are assessed. The most important part of the assessment phase is interviews (Renzulli, 1985). Individuals are interviewed in depth. The aim of interviews is to notice individual characteristics as much as possible. These interviews sometimes can take more than two hours and results are announced within a short time. Each class is required at least a teacher and a course assistant, and a plan is done to meet all these needs (Wood, 1996). Here, it is quite important to make this task attractive for many people because if more candidates apply for this job, the most appropriate and also the best ones could be selected. In the selection process, it is required to be careful with individual characteristics and skills of the candidates. It does not mean that those with some individual characteristics and skills should reach a definite age (Sisk, 1987). Thus, examining the relationship level between ideal characteristics and individuals' characteristics is important to reach a decision on them.

In Turkey on the other hand, business announcements are limited to teachers working

at the normal schools connected to MNE, and this seems to decrease number of candidates and also limit the possibility of finding more qualified candidates. There is not a phase such as the interviews, which can measure the candidates' qualities. These facts can be considered as proofs of not giving the required importance to the G/T selection processes (Gökdere & Küçük, 2003). Most of the people who apply for this task announcement are old teachers, and they do not put their characteristics in front. Thus, a written document that can identify candidates' own characteristics is demanded. In later phases when business applications are assessed for Super Saturday Program, whether a candidate has ideal characteristics is continually tested (Renzulli, 1985). However, in the context of Turkey, there is not a control system like this, and characteristics of teachers who are working at these centers are not tested in an effective way.

Feldhusen (1997) clarified that characteristics that science and mathematics teachers of gifted have are quite different from those who are to work at music, picture and other art areas. Thus, selection process of these teachers should be different from others. However, current practices in Turkish system are contrasted to this idea. It is correct to explain that in the Turkish context, selection process of the G/Ts at the SACs are similar to each other and the same measurement means are used, so G/Ts are not selected by a process based on the real and objective criteria (Gökdere & Küçük, 2003).

Feldhusen and Kollof (1986) explained that G/Ts face some problems in education process and seek for help from academics in some areas such as, perceiving G/C's signals, differentiating the program, determining target attitudes, using measurement and assessment techniques and individual and program assessments. Results of a project done by Archambault and his colleagues (1993) supported this idea. In two new studies, it has been found out that G/Ts mostly

face problems in determining G/C's needs, using alternative assessment techniques and teaching activities (Feldhusen, 1997; Schultz, 2000). It was also determined that G/Ts in Australia have faced a lot of problems in G/C's teaching process and demanded extra help from academics. This context requires some kinds of in service seminars on problematical areas (Schwizer, 1994). G/Ts face some problems about measurement and assessment subjects and related to this topic Gallagher (1998) conducted a large-scale project to help them, named "accountability for gifted students."

It is seen that there are many studies about the G/Ts' problems faced during own teaching practices, however, these are not specified on SG/Ts' problems. Thus, a research question can be formed as whether SG/Ts' problems are similar to the others or not. For this aim, the Turkish context is examined in depth in this article, and it is believed that this project's results would force G/E toward a more developed and improved form. The study's conclusions would also be a sample case for some countries that are new at G/E area. Based on the explained reasons up to now in this article, a case study has been planned to determine the SG/Ts' problems encountered during the G/E and suggested some future implications for the G/E.

Before all, here, I will discuss G/T development in Turkey under four categories as license level, certificate program, pre service education and in service education and also compare it with some western countries.

a) License Level

There is not a program that gives training about the G/T education on license level in Turkey. Just a few universities have such programs to develop special education teachers; however, special education is understood as similar to physically disabled children's education. Because this these programs mostly focus on developing teachers for

those kinds of children, not developing teachers for the G/C.

Literature review shows that there is not a program that can educate teachers according to different branches for the G/C on license level on the world (Abram, 1982; Renzulli, 1985; Schultz, 2001). On the other hand, a course named "*giftedness and gifted children's education*" is taught at the teacher education programs of the universities of America sometimes as obligatory and sometimes as an elective course. Its content includes subjects such as the nature of giftedness, necessities, psychology, and ability kinds, guidance methods to the G/C and, material and strategies for the education of G/C.

b) Certificate Program

It is seen that some kinds of certificate programs for teachers take four or eight months for computer and classroom teachers and also Faculties of Science – Art graduates in Turkey. However, a certificate program has not been planned to develop G/Ts. If the education and development systems of the G/Ts in the world is examined, a teacher graduates from a teacher program and takes a certificate program or a summer course and develops him/herself, is a model which is mostly faced (Abram, 1982; Renzulli, 1985; Karnes, 1995, 2000). The contents of the programs implemented in other countries have some variations due to the structures of implemented programs. For example some kinds of G/E programs are used named as Super Saturday (Wood, 1996), Learning Enrichment Service (LES) (Clifford, Runions & Smyth, 1986) and Enrichment Program (Renzulli, 1986).

Karnes and his colleagues (1977, 1981, 1983, 1991, and 2000) conducted a series of projects in order to determine the needs and kinds of certificate programs in USA between 1977 and 2000's. These studies all aimed to determine in which areas student teachers and teachers require certificate or

development programs, examination times of these certificate and development programs depends on each state. It is thought that a need for G/T education certificate programs is low in the 1970s however it is much more increased in the 2000s. This increased demand explains the request for a certificate program for master degrees. From these studies, it is seen some remarkable variations between G/T development via certificate programs and summer courses and, other teachers who did not take education from both attitude and behavior points (Witlock, 1989; Hansen, 1994). The first condition referred that a G/T is one who is to graduate from a related certificate program on the area of G/E (Renzulli, 1985; Karnes, 1991; Wood, 1996).

c) Pre service Training

In the current selection system of the Turkish G/Ts, they are directly started to work at the SACs without taking a comprised training program. Though there is some local efforts to prepare G/Ts, an in depth course program is not in the works at present (Çepni, Gökdere & Bacanak, 2003).

However, in other countries, a series of training is given to the teachers who are selected for the G/E. Wood and Feldhusen (1996) explained that there should have been some kinds of seminars and activities in this training process. They also explained that with the seminars, it should have been referenced to experienced teachers at the G/C's education areas and subject area experts' ideas and, also both should work in these evaluation phases. Here, there is an important point on which I need to focus. When a selection period starts, a seminar is given to all candidates in Turkey but seminars and training activities abroad are just given to the selected ones (Abram, 1982; Wood, 1986; Wood & Feldhusen, 1996). I suppose that this lets teachers utilize much more from it and the organization of a seminar at the start of G/Ts' selection period is waste of both finance and time. These seminars are not

used as a selection instrument, even if used valid results cannot be taken. It is also discussed that for these seminars to reach their own aims and contribute to the Turkish G/Ts' selections, they did not give as good result as expected. Thus, it is required to move the seminar from the selection period (as it is in the current system) to the education period, and implement them in a more effective form.

d) In service Training

In the Journal of Reports (Issue number: 2530) in which SACs' instruction is revised, it is included that In service courses are to be organized for the G/Ts in the SACs each year. However, there is not additional information about the quality of the contents, teaching methods nor approaches of these In service education courses. Because of the fact that these seminars are organized without taking into consideration teachers' branch differentiation and In service course needs, these are not as a continual In service education form and mostly seen as identification seminars. In an article which examines the present context of the SG/E, data showed that none of the GS/Ts took a course on special education in pre service education period and some of them took an In service course just one time. These can be accepted as proof of the system facing some important problems in both pre service and In service periods (Gökdere & Küçük, 2003). In service seminars should be organized based on a sequenced model, as determination of teachers' needs, preparation of a program, implementation of it, and take feedback from teachers' real practices. In the related literature, there are some approaches used in the G/Ts' education such as unlimited abilities approach (Schlicter, 1986), needs assessment approach (Wood, 1986), and Renzulli's In service approach (Renzulli, 1986).

In the Turkish context, In service education seminars are organized not in a definite period by the NME and teachers' branch differentiation. Thus, In service course needs

are not taken into consideration. In service courses that will be organized are announced in the related instruction each year (Journal of Reports: n.2530); however, just a few seminars are organized for the G/Ts at these centers (Çepni, Gökdere & Bacanak, 2003). Research findings are incorporated in a point that the most important part of In service course development is to determine the needs of the participants (Wood, 1986; Schlieter, 1986; Kaplan, 1986). But, contents of these seminars organized by NME are not effective due to the fact that these are prepared without taking into consideration the G/Ts' real needs and especially branch differentiation (Gökdere & Küçük, 2003). Literature shows that project managers of In service education seminars in the G/E area consist of academics and working groups (Feldhusen, 1986; Wood, 1986). But seminars organized in an irregular form in the Turkish context are directed by some people who are not academics (Çepni, Gökdere & Bacanak, 2003). Thus, contents of these seminars are usually the same and they result to either being non-effective or waste of money and time. In addition to all these problems, another important point neglected in the system is the lack of a system in which G/Ts' performance inspection can be done. G/C feel the need to research and learn; thus, G/Ts who will work at these centers should always renew themselves and be very active (Feldhusen, 1997). This means that G/Ts' sufficiency and performances should be measured periodically; however there is not a mechanism in the current Turkish system.

2. Method

In this project a case study method was used. This method provided an opportunity to investigate one aspect of the research problem; SG/Ts' difficulties with the G/E at SACs in some depth and within a limited time (Bell, 1989; Cohen & Manion, 1989). The problematical situation has been explained in detail in the first part of the article and the Turkish context has been examined.

The sample consists of ten SG/Ts who work at three SACs - Bayburt, Sinop and Trabzon - and was introduced with code names such as A, B, C...K. The sample includes 1/3 of all the SG/Ts who work at the SACs of Turkey, thus, it can be said that data taken from the sample reflects the Turkish context about G/C's education. Data was gathered with the help of semi-structured interviews conducted with the SG/Ts. In these interviews, firstly, a series of questions consisted of five items such as; teachers' graduate programs, graduate levels, professional experiences, G/C's levels taught and concern to academic studies. Data obtained here was presented in Table 3.1. Then, sample teachers were also asked about four critical questions based on the research purpose in order to determine their ideas on the G/E; teaching methods used in teaching process, problems faced and expectations of the related individuals. Interviews took about twenty-five or thirty minutes and data were recorded at the same time with a tape-recorder. Interview data showed that the sample agreed on some ideas and these are combined with some examination categories as effective learning-teaching methods, teachers' roles in the G/E, contradiction about teaching G/C, teaching materials for the G/E and evaluation in the G/E. Interview findings were analyzed and presented under these five sub-headings in which SG/Ts stressed throughout interviews and some small scale comparisons also have been done with the international literature.

3. Findings

The data is presented in two parts; findings obtained from profile questions and examination criteria found out from four critical questions.

3.1. Profiles of SG/Ts

Profiles of the SG/Ts who work at the SACs are shown in Table 3.1. Each SG/T's profiles such as; graduate program, graduate degree, professional experiences, teaching level and concern with academic research

were found out. Here especially, I wanted to examine if SG/Ts are concerned with academic research because if they were to develop G/C towards research projects, then they would like doing research or at least concerned with research. Graduate levels from universities are thought to be important

in teaching G/C, and then this was also examined. Student teachers are graduates from different note systems in universities of Turkey. However, in order to make some comparisons among them, all was changed to a fourth system in which graduated degree can change between 1 and 4.

Professional Profiles					
Code Name	Graduate Program	Graduate Degree	Professional Experience	Teaching Level	Concern With Academic Research
A	Physics teacher education	2.80	3	Orientation and between 4-10 classes	Physics engineering.
B	Chemistry teacher education	3.20	3	Orientation and between 4-10 classes	Chemistry education
C	Biology teacher education	2.80	2	Orientation and between 4-10 classes	No
D	Chemistry teacher education	3.21	2	Orientation and between 4-10 classes	Chemistry education
E	Physics teacher education	2.45	3	Orientation and between 4-10 classes	No
F	Physics	2.50	10	Orientation	No
G	Biology teacher education	2.60	10	Orientation	No
H	Chemistry	2.55	8	Orientation	No
J	Biology teacher education	2.40	7	Orientation	No
K	Chemistry teacher education	2.70	3	Orientation	No
		Mean= 2.72	Mean= 5.1		

Table 3.1 presentation of the gifted science teachers' professional profiles is here.

It is seen from the table 3.1 that the sample has different characteristics; for example, most of the professional experiences change between two and ten years, and graduate degree from universities is 2.72, all work in orientation program and teach between four and ten classes and also 80 % of them have graduated from faculties of education. Three of them are concerned with academic research but just two ones are concerned with educational research.

3.2. Findings obtained from examination criteria

Findings that were obtained from the interviews conducted with SG/Ts are interesting from the point of effective learning and teaching methods for G/C, science teachers' roles in the G/E, contradiction about teaching G/C, teaching materials for the G/E and evaluation in the G/E. Thus, all the interview data were analyzed to determine SG/Ts' reflections on these subjects.

3.2.1. Effective Learning-Teaching Method For G/C

SG/Ts have different ideas about effective learning and teaching methods for the G/C. Just one SG/T in the sample has thought that he had used modern learning theories beforehand when he was teaching in a normal school and is still using them during his teaching practices at SACs. However, five SG/Ts have said that they have known nothing about which are the best learning and teaching methods for G/C. Nevertheless, four others explained that they have just a little knowledge on this subject, but they do not use it in their practices. Learning methods that are known or used are stressed by SG/Ts as; working in a group, individual learning, interactive learning, learning with making/living experiments, computer-based learning and explanative learning. However, responses about the best learning methods for G/E have been seen to focus on usually group working and learning with making/living experiments. These are followed according to their explanation rations as computer-based learning and interactive learning. In addition, SG/Ts have said that they have used different teaching methods for science courses in schools where they had worked before coming to SACs, such as question-response interaction, discussion-making, experiment-making, observation, drama, brain-storming, induction-deduction, explanation, showings, problem solving and project works. From the frequency analyzed results, it is seen that all SG/Ts are agreed on experiment and observation techniques and most of them also stressed the importance of question and discussion in the G/C's education in the SACs.

I can shortly say that SG/Ts have quite different ideas about the best learning types based on the interview findings about the best learning and teaching methods of SACs. However, all of them thought that group working and experiments have a common usefulness and would help G/C to be successful and achieve SACs' real aims. On the

other hand, although project-based learning has been explained as a real aim of SACs in the document of SACs, it has not been stressed by the SG/Ts in an effective manner. I think that this is a result of SG/Ts' not knowing about project based learning, so, they still use other teaching methods like they have used before. Thus, it is required they to learn this method with the help of sample activities that are also situated at the aims of SACs.

3.2.2. SG/Ts' Role In The G/E

The sample SG/Ts all have thought that SG/Ts for the G/E should have some roles as a guide, supporter and researcher. Just one G/T, F, explained his role as presenting knowledge to G/C to expand and increase their viewpoints. This is an old thought about learning area because in the current era, learning is mostly identified in the content of constructivist learning theory, in that learning is explained based on a learner's prior experience and ideas and it is independent from an individual. Literature shows that SG/Ts should have some extra roles as a model and value instructor, interest maker and functional evaluator throughout different parts of teaching practices (Sisk, 1987). Thus, G/Ts should be aware of their roles as also model, evaluator, and a value educator for the G/C's education.

3.2.3. Contradictions About Teaching G/C

Half of the GS/T sample has had some fears about teaching G/C and working in SACs. Those fears are usually on the subjects of, children coming to SACs would have more clarity and a teacher would face large problems while teaching them. On the other hand, the others have stressed their own and positive expectations to start with this mission in these centers. There are some issues SG/Ts face while teaching in the SACs. These are sequenced as; not exactly recognizing children they teach, lack of knowledge about modern learning models, lack of obvious knowledge of the G/E pro-

grams and question asking techniques, lack of clarity of the measurements and evaluation in these institutions, determining the subject of the project, planning and conducting a project, supporting at the academic levels, lack of knowledge about a foreign language thus, not utilizing them. SG/Ts expect educational researchers to help them in some areas such as determining a project subject, taking courses about planning and conducting projects, interacting with the universities, giving courses about the content of science education for the G/C, learning about materials and sources in which they are not sufficient, getting guidance service from the experts, taking courses with the contents of identifications of laboratory approaches and development of laboratory skills, getting support for the academic studies, and also taking courses which include activities along with the contents of modern teaching theories. They show that SACs do not have enough materials for both teachers and children to use, and teachers have not been educated for these institutions as expected to achieve this mission based on its real purposes. For example, SG/Ts are weak at measurement and assessment of G/C, planning and conducting projects and also see themselves as just the current program's applicants, not as researchers. However, for teachers to also act as researchers, it is important to conduct the profession based on its aims.

3.2.4. Teaching Materials for The G/E

SG/Ts have explained that some helpful materials for teaching in the SACs are books and notebooks which they have used in pre service education, also computer programs, laboratory books and especially science-technology journals including all technological developments in the world and published in Turkey. Research reports on subject areas are not considered, as something needs to be used. It is believed that if G/C are to plan and conduct projects and become keen on research, SG/Ts also need to be keen on academic research on concerning subject areas.

3.2.5. Evaluation In The G/E

Sample SG/Ts have some important ideas about assessment of the G/C. They have expressed that they would want a G/C to give different examples related to a studied subject area and write their understandings with their own sentences. They also thought to look at children's experiment reports, encourage them to think, talk and ask some questions in why and how types and, make written or oral examinations. Teaching and learning methods all used by G/Ts are seen to occur as a result of the individual's professional experiences and not based on any objective criteria, whereas especially related to the measurement and evaluation techniques based on determined criteria is an important factor to increase and develop the effectiveness of the assessment practices and learning processes aimed to reach. However, from the teachers' own sentences and explanations I understood that SG/Ts think of assessment as measurement of G/C's knowledge or skill. But, it is required to measure G/C's product rather than knowledge or skills he/she has, and assessment in the modern meaning is already this. Thus, science teachers in the SACs need more knowledge about this area.

4. Results and Discussion

It is understood that the selection process of teachers for the SACs is not identified obviously in the instruction published by the NME. Thus, many different applications in those areas are seen (Gökdere & Küçük, 2003). SG/Ts in the SACs had mostly graduated from educational faculties and their professional experiences range between two and ten years. This shows that all of them are at the beginning or at the middle-point of their teaching profession. Related to this subject, there are some research findings which show that new teachers at the beginning of their teaching profession are more successful, creative, initiative and keen on research (Renzulli, 1985). The important thing to be taken into consideration is that SG/Ts in

these centers, due to lack of branch teachers at all learning levels, teach not only the children of a determined age-group but all the children between fourth and tenth classes. I believe that G/C's needs can change due to their learning levels. Thus, G/Ts should have some different characteristics according to children's learning levels.

It is seen that teachers do not exactly know the modern teaching and learning theories. Thus, it is not possible for teachers to apply these theories in their courses as expected. In a study done by Çepni and his colleagues (Çepni, Şan, Gökdere & Küçük, 2001) science teachers that work at the primary schools explained that they do not have sufficient knowledge about modern teaching theories and that is why they cannot apply the required practices in their science courses. On the other hand, just knowing these theories does not mean they are certainly going to be used. Thus, as well as knowing how to use them, teachers should be also aware of their importance and contribution to the G/C's development and improvement in intellectual area. Modern teaching theories especially of Ausebel, Gagne, Bruner, Piaget and Kelly should be introduced to the SG/Ts and they should be encouraged and supported to use these in their science courses. Colette and Chiappetta (1989) explained that these teaching theories would have positive reflections on science teachers' classroom teaching practices.

It is also understood that SG/Ts with some individual preferences use different kinds of teaching methods in their science courses. These methods are understood to occur as a result of an individual's professional experiences and not based on any objective criteria. Especially measurement and evaluation techniques which are based on determined criteria have an important mean to increase and develop the effectiveness of the assessment practices and also learning processes to be reached (Angelo & Cross, 1993). In the preparation of questions for the G/C, SG/Ts

should use thinking keys, questions matrix and Bloom taxonomy (Painter, 1996).

SG/Ts have mostly used their university course books, course notes and TUBITAK (Scientific Academy of Turkey) sources as teaching materials. Here, it is important to explain that at the interviews some of the sample teachers said that they were keen on educational research, such as chemistry education, but, they do not start to reach and read any academic works in this area. Science teachers working at the SACS, like teachers working at the normal kinds of schools, cannot use Internet contexts and educational technologies effectively as teaching sources. This is maybe as a result of the Internet being a new technology to both normal kinds of school and SACs' teachers, and also it has not much use in Turkish schools. However, in the present too much initiative is seen to make its use widespread into all school types. G/Ts should be informed about how to reach periodical publishing and internet sites about G/C's education in other countries with the help of an organized course. Another important problem is that, most of the SG/Ts' not following the development on their subject areas is due to a foreign language problem.

Teachers demand some amount of help from the experts about the subjects' areas in which they are not sufficient and help In service courses that identify laboratory approaches and increase laboratory skills, guidance and research, planning and conducting research projects. Turkish teachers do not plan or conduct research projects and this is an important and widespread problem (Küçük, 2002). But, this problem for the SG/Ts must be solved as soon as possible. If SG/Ts are weak at research design, it is not appropriate to expect them to develop G/C in research area and also make them scientists. One of the aims of SACs is to grow G/C as scientists.

If I turn back to sample's responses about teaching and learning methods and also assessment techniques used in G/E, also roles to have, shortly it is seen that there is a contradiction between the Turkish and other contexts on the education of G/C and G/Ts. This is a clue of the Turkish SACs not achieving their aims and as long as the current practices are not changed, the results will not be as they were hoped for.

5. Implications

In this work I have examined the SG/Ts' problems in the Turkish context and presented some suggestions for them. However, the sample does not include all the Turkish context and thus, more expanded studies should be done at the other SACs and also with the other subject area teachers. Some criteria such as age, academic achievement level, graduate program, professional experience, curriculum vitae and appropriate training can be used in the process of SG/Ts' selection. However, an appropriate selection process should be developed while selecting teaching staff who would educate the G/C and different criteria should be used according to branch differences (Feldhusen, 1997).

Some deficiencies were determined from SG/Ts' interview data, thus, the SG/Ts' performances should be measured with the help of valid and reliable assessment scales continuously. In addition, cooperation between the National Ministry of Education and universities is quite important. In the selection process of the G/Ts, graduate degree from a university should be considered. Teachers are not fully aware of the giftedness concept and G/C's education. Thus, meaning of the gifted concept and aims of capacity development programs should be explained for all G/Ts in detail and G/Ts should be aware of their roles like having certain differences from the normal school teachers (Sisk, 1987). G/Ts should not exceed limited years old and be in a level to be able to address G/C's cognitive developments. Teachers'

numbers should be increased at these centers and teachers should be directed towards developing determined age groups of children's abilities. In addition SG/Ts should be supported to complete their post graduated education and required appropriate circumstances should be provided for them. This may help them to plan and conduct projects with the G/C in SACs.

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Appendix 1.

Interview Questions

1. How can the best learning be constructed in G/E?
2. How do you explain your role in the G/E as a science teacher?
3. Which are the most helpful sources for your studies in the SACs?
4. Which are the most important problems you have faced while you work at the SACs up to now?

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ARTICLE RECORD / FICHA DEL ARTÍCULO

Reference / Referencia	Küçük, Mehmet, Gökdere, Murat & Çepni, Salih (2005). Difficulties of Turkish Science Gifted Teachers: Institutions of Science and Art Centers. <i>Revista ELección y EValuación Educativa</i> , v. 11, n. 1. http://www.uv.es/RELIEVE/v10n2/RELIEVEv11n1_5.htm . Consultado en (poner fecha).
Title / Título	Difficulties of Turkish Science Gifted Teachers: Institutions of Science and Art Centers. <i>[Dificultades de los profesores de ciencias turcos de niños bien dotados: los Centros de Ciencia y Arte]</i>
Authors / Autores	Mehmet Küçük, Murat Gökdere & Salih Çepni
Review / Revista	Revista ELección y EValuación Educativa (RELIEVE), v. 11, n. 1
ISSN	1134-4032
Publication date / Fecha de publicación	2005 (Reception Date : 2005 March 25; Approval Date : 2005 May 13; Publication Date : 2005 May 31)
Abstract / Resumen	<i>The purpose of this study is to determine the fundamental problems of science gifted teachers (SG/Ts) who teach Turkish gifted children (G/C) and compare it with the international milieu. Turkish G/C are taught in different educational contexts named "Science and Art Centers" (SACs) in which better opportunities are presented for them. In this pro-</i>

	<p><i>ject, field observations were done at three of the SACs in Turkey - in Bayburt, Sinop, and Trabzon - and, semi-structured interviews were conducted with each of ten SG/Ts who work in these centers by one of the researchers. Data analysis showed that SG/Ts do not perceive their duties holistically and feel they need help with measurement and assessment techniques, modern learning theories, planning and implementation of a research project, questioning techniques and using laboratory-based methods for G/C. Moving from the research data, it is suggested that in service education courses, which include the above issues, should be organized for the SG/Ts and they should be encouraged to use an action research approach in teaching G/C in SACs.</i></p> <p>Este estudio pretende determinar los problemas fundamentales de los profesores de ciencias de niños bien dotados (SG/Ts) que son los encargados de enseñar a los niños dotados turcos (G/C) y los compara con el entorno internacional. Se enseña a los G/C turcos en contextos educativos específicos denominados "Centros de Ciencia y Arte" (SACs) en los que se les procuran las mejores oportunidades. Se hicieron observaciones del campo en tres de las SACs de Turquía - en Bayburt, Sinop y Trabzon - y se llevaron a cabo entrevistas semi-estructuradas con cada uno de los diez SG/Ts que trabajan en estos centros. El análisis de los datos mostró que esos SG/Ts no perciben sus obligaciones holísticamente y sienten la necesidad de ayudar con técnicas medición y de evaluación, teorías de aprendizaje modernas, planificación y aplicación de proyectos de investigación, técnicas de cuestionamiento y usando métodos basados en la investigación de laboratorio para los G/C. A partir de los datos de la investigación se sugiere que deberían organizarse cursos de formación en los centros que incluyan los problemas anteriores para los SG/Ts y que hay que animarles a que adopten un acercamiento de investigación acción para la enseñanza de los G/C en los SACs..</p>
Keywords Descriptores	<p>Science and Art Centers, Science Teachers of Gifted Students, Turkish Educational Context</p> <p>Centros de Ciencia y Arte, Maestros de ciencia de niños bien dotados, Contexto educativo turco</p>
Institution / Institución	Karadeniz Technical University Artvin Faculty of Education, Artvin & Ondokuz Mayıs University, Amasya Faculty of Education, Amasya (TURKEY)
Publication site / Dirección	http://www.uv.es/RELIEVE
Language / Idioma	English (Title, abstract and keywords in spanish)

Revista **EL**ectrónica de **I**vestigación y **EV**aluación **E**ducativa (RELIEVE)

[ISSN: 1134-4032]

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