International Horizons of Talent Support, II.
Best Practices Within and Without the European Union, II.

Géniusz Books

Géniusz Library contains volumes published under Magyar Géniusz Program co-ordinated by the Association of Hungarian Talent Support Organizations. The series is designed to provide extensive and comprehensive assistance and guidance to professionals and helpers active in talent support.

OTHER TITLES IN SERIES (only in Hungarian)

1. M. Nádasi Mária: Adaptív nevelés és oktatás
2. Revákné Markóczi Ibolya–Futóné Monori Edit–Balogh László: Tehetségfejlesztés a biológiatudományban
3. Vancsuráné Sárközi Angéla: Drámapedagógia a tehetséggondozásban (2. kiadás)
4. Szivák Judit: A reflektív gondolkodás fejlesztése
5. Czimer Györgyi–Balogh László: Az irodalmi alkotótevékenység fejlesztése
6. M. Nádasi Mária: A projektoktatás elmélete és gyakorlata
7. Balogh László–Mező Ferenc: Tehetségpontok létrehozása, akkreditációja
8. Orosz Róbert: A sporttehetség felismerésének és fejlesztésének pszichológiai alapjai
9. Turmezeyné Heller Erika: A zenei tehetség felismerése és fejlesztése
10. Kirsch Éva–Dudics Pál–Balogh László: A tehetséggondozás lehetőségei fizikából
11. Mező Ferenc–Kiss Papp Csilla–Subicz István: Képzőművész tehetségek gondozása
12. Gyarmathy Éva: Hátrányban az előny – A szociokulturálisan hátrányos tehetségesek
13. Bohdaneczkyné Schág Judit–Balogh László: Tehetséggondozás a közoktatásban a kémiatudományban
14. Inántsy-Pap Judit–Orosz Róbert–Pék Győző–Nagy Tamás: Tehetség és személyiségfejlesztés
15. Kovács Gábor–Balogh László: A matematikai tehetség fejlesztése
16. Csernoch Mária–Balogh László: Algoritmusok és táblázatkezelés – Tehetséggondozás a közoktatásban az informatika területén
17. Gordon Győri János (szerk.): A tehetséggondozás nemzetközi horizontja, I.
18. Gordon Győri János (ed.): International Horizons in Talent Support, I.
19. Bodnár Gabriella–Takács Ildikó–Balogh Ákos: Tehetségmenedzsment a felsőoktatásban
20. Balogh László–Mező Ferenc–Kormos Dénes: Fogalomtár a tehetségpontok számára
21. Polonkai Mária (szerk.): Tíz jó gyakorlat a hazai tehetséggondozásban
22. Mönks, F. J.–Ypenburg, I. H.: Ha tehetséges a gyerek…
23. Pappné Gyulai Katalin–Pakurár Miklósné: A debreceni példa
24. Dávid Imre: „Jó szóval oktasd…"
25. F. Gagné: A tehetségfejlesztés nemzetközi horizontja az esélyegyenlőség szemszögéből
26. Demeter József (szerk): A Kárpát-medencei tehetséggondozás jó gyakorlatai

International Horizons of Talent Support, II

Best Practices Within and Without the European Union, II

Edited by János Gordon Győri

Magyar Tehetségsegítő Szervezetek Szövetsége, 2012

Prepared in the framework of Grant Scheme No. NTP-EU-M-12 entitled "Task implementation related to the operation of European Talent Centre, Budapest" announced by the Hungarian Institute for Educational Research and Development and the Sándor Wekerle Fund Manager of the Ministry of Administration and Justice on commission of the Ministry of Human Resources, from the Training Fund Segment of the Labour Market Fund.

Translated by Fruzsina Balkay

Responsibility for the professional content of this volume lies with the authors of its chapers.

ISSN 2062-5936

CONTENTS

FOREWORD

Hungary has launched several talent support initiatives recently, which are outstanding also in European and even global comparison, by pooling public and other non-profit resources. Its national co-operation and talent support network of talent points is a unique venture, and the still expanding *Genius Books* series covering diverse aspects of the theory and practice of talent support published by the Hungarian Association of Talent Support Organisations is also unique in its kind.

One line covered by *Genius Books* is the presentation of foreign best practices in talent support in the context of the educational policy system or, as the case may be, the talent support strategy of the country concerned, providing the reader a detailed close-up of one best practice in each case.

The present volume, available both in Hungarian and in English, is the third one dedicated to this topic, similar in structure and content to its predecessors and, in regard of the presentation of best practices of countries with major traditions in talent support, an organic follow-up of the papers in *International Horizons of Talent Support, I*.

To provide an authentic close-up of the best practices under study, it is imperative to carry out thorough desk research, to have personal meetings with the foreign colleagues concerned and, if possible, to gain an insight into their implementation. Similarly to *Horizons, Vol. I*, this volume presenting nine best practices from three continents could not have come about without the unselfish assistance of foreign colleagues engaged in talent support and the information they supplied to our researchers. Besides the contribution of Hungarian researchers and foreign talent support professionals, special mention should be made of the valuable input of our Vietnamese and Saudi colleagues whose studies give an overview of the talent support efforts of their respective countries.

We sincerely hope that the second *Horizons* volume, co-ordinated by the European Talent Centre in Budapest established in Spring 2012 as the successor of the foreign relations panel of the Hungarian Genius Programme, and edited as its predecessor by Dr. János Gordon Győri, will be as successful as the first volume, and will provide its readers with similar inspiration and lessons.

Csilla Fuszek
Director of the European Talent Centre
Budapest

Balázs Hornyák

The Millennium Youth Camp for Young Researchers in Finland

I. INTRODUCTION

1. The concept of the "camp" – international camping practice

As summer approaches, the various organisations, institutions of education, religious communities, sports associations of many countries come up with their offer of camping opportunities for young people. By definition, a "camp" is usually a series of leisure events lasting for several days, co-ordinated by an adult supervisor, targeting a specific range of participants (usually children or teenagers), accompanied by some special training (thematic camp) or without that. A distinction is made between residential and non-residential camps. In the latter, children go home every day, but their meals and programmes for the day are arranged by the camp leaders.

In the beginning of the 21st century, young people can choose from a wide array of camps in every country to acquire artistic, religious, sports or scientific knowledge/skills. According to the relevant statistics of the American Camp Association, in the US alone, the almost 10 million camper children can choose from some 12,000 camp offers annually (American Camp Association 2011). Parents find it hard to choose from this excessive supply of camp which will offer their children the most, at a good price. The situation of gifted students is especially difficult: apart from offering leisure activities, the camp is expected to boost their motivation and their commitment to a chosen subject or field of knowledge, and help expand their contact network with other young persons interested in the same topics.

The US comes up with a record amount of camping offers, but quality supply in this area has kept expanding also in Europe. The most popular options are those offered by the countries which have been in the vanguard of science and technology recently: in Germany, the XLAB Camp on the campus of Georg

August University, Göttingen; in Croatia, the annual Summer School of Science organised in the small town of Visnjan on the Istria Peninsula, and the Millennium Youth Camp in Finland, which offers out-of-school enrichment programmes to talented secondary-school pupils on topics similar to those of the previous two schools.

2. Educational achievements and forms of talent support in Finland

Its economic and educational policy results achieved in the past one-and-a-half decade have directed the attention of the world to Finland. According to the PISA surveys[1] of the OECD[2], an organisation which currently gathers 34 advanced countries, the Finnish 15-year-old produce outstanding results in the scientific as well as the humanities fields. Furthermore, the Finnish school system has excellent results in talent support and in bridging education as well. The country operates several complex talent support programmes, and close co-operation between the universities and the secondary schools makes it possible for students aged 16–19 to accelerate, to do independent research work (of course under the guidance of an expert), and to complete university courses in their upper-secondary-school years (Hornyák 2011).

Thematic summer camps are a key component of the complex talent support programmes. Camps give an opportunity to deepen and expand knowledge, and to build contacts between the talented pupils.

3. Traditions of camping in Finland

In Finland, the more extensive spread of camps dates from the period after World War II. At that time, Finnish teachers proclaimed wholeheartedly that industrialisation and the concurrent fast urbanisation were not good for the development of children. They considered it important that children should have first-hand experience of the values associated with living in the countryside, as in the period before the world war, to become honourable citizens.

After World War II, new traditions appeared on the initiative of the local churches: for example, confirmation camps were organised for the children as a way to combat the secularisation of society. This initiative was particularly suc-

[1] Program for International Student Assessment investigating the mathematics, natural sciences, problem-solving and reading skills of students.

[2] Organization of Economic Cooperation and Development.

cessful, so much so that significant numbers of the 13–16 year old go to such camps to this day.

But children can choose also from the many non-religious options – the Prometheus Camp[3] is one of them. The talent support camps being organised nowadays are increasingly popular, and not only among the youth of this Nordic country, but also among foreign students. Many Finnish NGOs organise camps in Finland for children of all ages. The most active among them are the scouts, the sports associations and the Evangelical Church. Finland has grown into a European centre of science and technology in the vanguard of educational attainments, and it plays a leading role also in the organisation of extracurricular programmes for students. The National Board of Education has been organising space research and physics camps for 16 years, and the LUMA centre provides research opportunities for teenagers familiar with mathematics and the natural sciences. Last but not least it is worth mentioning a programme launched only two years ago, which offers an international camping opportunity to students coming from all over the world, selected by the organisers of the Millennium Youth Camp.

[3] Non-religious camp organised for young persons aged 14–15 by the Prometheus Camp Association founded in 1990. On the occasion of open debates, discussions and drama sessions, the youth consider ideological and ethical questions.

II. THE MILLENNIUM YOUTH (MY) CAMP

1. Start of the Camp and its organisers

With the co-operation of several institutions of education, NGOs and ministries, a new initiative was launched in Finland in 2010 that will hopefully prove to be long-lasting. The Technology Academy Finland, the LUMA centre[4] , the Ministry of Education and the Centre for School Clubs created a special camping opportunity for talented young persons. Besides the above-mentioned, many other scientific organisations, ministries, universities and the representatives of the corporate sector take part in the project, too.[5] One of the most recent initiatives is the Millennium Youth Camp (MYC) organised every summer. The MYC was designed primarily to identify young talents and to help them launch their career. During the one-week camp, students meet researchers and scientists; they go to presentations and workshops, and they make projects in

[4] The LUMA centre was founded in 2003 in close co-operation by ten institutions including also representatives of the industrial sector besides the institutions of education. Its primary objective was to popularise and support the tuition/learning of natural sciences, mathematics and informatics, and to build networks of schools, universities and partner institutions. The Centre organises seminars, workshops and summer courses for teachers, and club sessions and international camps for the youth throughout the year.

[5] Other co-operating partners: strategic large companies of the country (Nokia, Kemira, Vaisala, Fortum, UPM, ST1), Helsinki University, Aalto University, National Board of Education, Heureka Centre, Ministry of Education and Culture, Finnish Academy, Association of Biology and Geography Teachers in Finland (BMOL), Association of Mathematics and Science Teachers in Finland (MAOL), Chemical Industry Federation of Finland, Economic Information Office (TAT), Federation of Finnish Technology Industries, Finnish Cultural Foundation, Ministry for Foreign Affairs of Finland, Technology Industries of Finland Centennial Foundation.

One of the most recent initiatives is the Millennium Youth Camp (MYC) organised every summer. The MYC was designed primarily to identify young talents and to help them launch their career. During the one-week camp, students meet researchers and scientists; they go to presentations and workshops, and they make projects in team work. The first Camp was organised in June 2010, and out of almost 1000 applicants, 30 talented young students from 14 countries took part in the programmes free of charge.

team work. The first Camp was organised in June 2010, and out of almost 1000 applicants, 30 talented young students from 14 countries took part in the programmes free of charge. The MY Camp targets the age group of secondary school students, i.e. the 16–19 year old, committed to science and technology. Its base is in Kiljava, located near the capital, but the programmes of the Camp take place at many locations, from the leading Finnish universities through the research centres of mammoth companies to the famous sights of the capital.

1.1. Goal of the Camp

The Camp has many goals, that is the reason why it is so extensively supported by institutions of science as well as the public sector. The organisers want to provide young people with similar interests and advanced skills in science and technology programmes which give them an opportunity for further development, for preserving their motivation, deepening their knowledge and getting to know their coevals coming from other cultures. Getting acquainted with science is a priority target, since it is well known that the age group of secondary-school students is the most receptive to advanced knowledge, and lifelong commitment to specific fields of science actually develops in these years.

In the framework of the varied programmes, MY Campers obtain information on the further education options from each other. Many of the Camp participants prepare to go to the most prestigious universities of the world such as Harvard or Cambridge. The Camp makes no secret of its ambition to introduce to the participants the Finnish universities and employment options; to sketch work opportunities for the professionals of the future, and to recruit talented young people from all over the world. Another key objective is to encourage the youth to seek answers to the most urgent questions of their society. Therefore, MY Campers work on issues to which science is expected to give a solution. This is how climate change and the use of the renewable sources of energy came to be included in the list of the project topics (see Section 2.4.2).

1.2. Participants and selection

The selection process starts at the end of the year before the Camp. The call for applications by talented and motivated young persons from all over the world is announced in October. In 2010, 995 applications were received from 62 countries of the world, and their number is increasing. In 2011, the organisers could choose from among almost 1,500 applicants taking part in the two rounds of selection. In 2010, the 30 participants came from 11 countries; one third of them from Finland. The proportion of boys and girls was by and large equal. In

2011, the 30 lucky young persons aged 16–19 selected from the 1,452 applicants were the citizens of 22 countries. The number of applicants grew by 50%, and all five continents were represented: in 2011, besides the Finns, the Camp had participants from Austria, Bulgaria, Croatia, Ghana, Indonesia, Ireland, Japan, Kazakhstan, Mexico, Nepal, New Zealand, Nicaragua, Romania, Russia, Serbia, Slovenia, Thailand, Uganda, Ukraine and the US. The Camp of 2012 had places for 13 boys and 17 girls and, similarly to the previous years, the 30 students came from 22 different countries. The language of the Camp is English, and the participants are expected to have advanced written and oral skills in that language. Fluency in English is a precondition of the efficient co-operation of those who work on a common project.

Talented students undergo two rounds of selection. In the first round, applicants are to demonstrate their interest in and commitment to mathematics and the natural sciences, and present their foreign language skills. A hundred young people remain in the contest after the first round. The list of their names is published by the organisers by early February. The second round is more complex: the applicants make project plans according to the specified guidelines. The research topics of the Camp workgroups are announced at the time of the call itself, so people can orient themselves according to their fields of interest. Many project plans are so well developed that they are suitable for implementation without alteration. The applicants often prepare works illustrated with creative elements (video, sound effects, images). The results, that is, the final list of names is published by the middle of March.

1.2.1. Research outputs of MY Campers

The organisers and mentors of the Camp focus on the social sensitivity, motivation and commitment to the research topic of students coming from all over the world. Johannes Posti, staff member of the Department of Chemistry of the Helsinki University conducted a research survey among the Campers and presented the first results at the ESERA (European Science Education Research Association) Conference held in September 2011 in Lyon, France.

The applicants to the Camp of 2010 completed a questionnaire querying their commitment to their chosen field of research, their social sensitivity and the reason why they sent their applications. They showed above-average interest in the sciences and expressed their concerns regarding the environmental topics. As could be expected, there were notable differences in the opinions of male and female students, and also among students coming from diverse countries concerning certain topics. Europeans were less interested in the economic, and more in the social issues. Students from Oceania were most inter-

ested in travelling to Finland, whereas those from Europe were the least motivated in going to this Nordic country. The Finns emphasised their interest in their field of research, but they showed less interest in the economic and social aspects.

1.3. Costs of the Camp

The Camp is highly attractive to students since all costs (accommodation, travel, meals) are covered by the organisers, which makes this quality professional programme accessible also for the talented, but socially underprivileged youth. Contrary to the practice of other European countries, higher education in Finland is free of charge also for foreign students. This is the reason why the organisers compile a rich and complex program free of charge for young people on the brink of university studies. This is feasible thanks to the extensive co-operation of the universities, the public sector and the strategic large companies of the country. Co-operation established in the interest of creating the Millennium Youth Camp is exemplary indeed.

2. Programmes and didactic methods of the Camp

The programme of the Camp has three pillars: science, technology, and nature. The organisers compile the programme so as to have recreational panels in adequate quantity and quality beyond the lectures and professional events. Apart from project work, the one-week stay at the Camp offers many interesting and useful enrichment programmes and experiences. This colourful array gives the students an opportunity to get acquainted with the culture and natural values of this Nordic country.

During the period of time spent at the Camp, the youth get to know the capital, Helsinki University, Aalto University and the activity of the co-operating research centres and companies. Thus they do not only learn at conventional school lessons, but gain first-hand information from scientists and researchers on the latest results and innovations.

2.1. The programme of the week

The crucial things for the youth coming from different cultures and backgrounds is to get acquainted with each other and to form a good team which creates the conditions of efficient collective work as soon as possible. For these reasons, the organisers arrange informal sports and leisure activities on Day 1.

The official programme starts on the evening of the first day, when students introduce each other and Finland from an aspect concerning their topic to be processed during the Camp in the form of Pecha Kucha[6] presentations. Thus thanks to the well-devised thematic structure of the Camp, they get some experience of the presentation technique to be used at the Gala, where they are to present their projects worked out in their own thematic group in a similar form. The presentations of the first and the last day provide the Camp something of a framework structure.

Besides the short presentations, the programme of the first evening is coloured by various sports activities. The obstacle course and other agility exercises are excellent team-building activities. There are also many excursion sites and lakes near the residential premises. It is possible to use the sauna and to take a swim in the cold water of Lake Sääksjärvi.

On Day 2, the participants of the Camp go to an excursion. It is important that this is scheduled for the beginning of the Camp, since later on students spend a significant part of their time working in groups of six. The excursion is ideal for informal discussions and for getting to know the others. During the excursion, campers visit the sights of the capital and they can admire the Helsinki archipelago on a boat course. (In the Camp of 2010, the visit to the capital was scheduled for the last day. In 2011, the campers visited the Heureka Centre[7] on the day after the Gala.)

Project work (see Point 2.4) starts on the evening of Day 2, when campers assigned to the same group sketch their ideas concerning their joint work. The organisers ensure that students have several working hours a day to work on their project.

On Day 3, campers visit the Kumpula Campus of the Helsinki University[8]. After a collective greeting session, the researcher students can take part in dif-

[6] The owner of the Pecha Kucha Night concept is the Tokyo-based Klein Dytham Architecture. In 2003, Astrid Klein and Mark Dytham came up with the idea of an open forum where young designers could meet and present themselves to the large public. Each presenter could show 20 images, for 20–20 seconds each. That is, they had 6 minutes and 40 seconds before the next one took over. Such presentations are concise and dynamic; the interest of the audience does not wane, and more people have an opportunity to speak.

[7] Heureka is an interactive scientific museum offering lectures and experiments to make the laws of physics understandable for the youth and to present the related scientific and technological achievements.

[8] Kumpula Campus is a modern university establishment meeting every requirement of the 21st century. The buildings host a natural sciences faculty with an enormous library and laboratories suitable for advanced research work.

ferent programmes depending on their field of interest and related to their field of research. The entire university infrastructure is at their service to assure the success of the programme. The student groups working on different topics during the Camp are co-ordinated by two adult leaders each: one is with the group all the time, assists with their work and helps them solve everyday issues, and the other is a professor or a recognised senior researcher of the topic who provides primarily professional support.

In the chemistry and physics laboratories, the student participants of the Camp could model a hydrogen-driven car. Of course, during the experiments, they were instructed by university teachers. On the following day, they visit various companies[9] and research centres. The managers and staff members of the co-operating companies are glad to take part in the enrichment of the talented youngsters and they are confident that the future generations will be successful.

The programme of the Camp changes every year, but the organisers have tried to preserve the most popular components of the previous three camps.

2.2. Corporate contribution

In the recent years, corporate contribution, volunteering in education as a form of social responsibility, has become increasingly popular. Moreover, a company taking part in such activity appears in the local community and in the longer term in society overall with a positive message and this enhances its reputation.

It is not exceptional for companies to take an active part in educational programmes in Finland. Under the Mathematics Programme of the Päivölä School[10] located near Valkeokoski, for example, students can acquire work experience at the Toijaa centre of Nokia already during their school years. This takes place as part of the curriculum, in 10–12 hours a week (Hornyák 2011).

Nokia plays a significant role also in the Millennium Youth Camp. In 2011, MY Campers in the applied mathematics group visited the company's centre in Espoo. The size and architecture of the centre was a remarkable experience for the students in itself. At the centre, the researchers offered the Camp participants an insight into the secrets of the latest researches.

[9] The co-operating companies are the following: Nokia, Vaisala, Kemira, Fortum, UPM, ST1.

[10] This programme was shown in detail in Volume I (International Horizons of Talent Support).

The workgroup focusing on the topic of climate change visited the Vaisala company. The company which manufactures meteorological measuring devices and equipment is concerned also with giving an answer to global problems. It is a global company delivering its products to every part of the world which applies advanced technology to manufacture equipment that provide an increasingly accurate picture of the weather factors threatening the values of the population and of production. The research staff of the company does its utmost to make the visits more and more interesting on each occasion.[11]

As for the answers to the global problems maturing at the level of the companies, the campers could hear about them also at Kemira specialised in water chemistry. Kemira's experts think that the supply of clear drinking water will be one of the most serious global problems of the future. They are preparing for that by selling the chemical substances they produce to alleviate the situation together with the relevant services, that is, they want to be present throughout the process, from manufacturing to utilisation. The visit to this company had a great impact on the campers working on the water project.

2.3. Enrichment

The term "enrichment" is generally used to indicate a form of the differentiated education of the talented youth, but it often refers also to so-called supplementary curricula, irrespective of the level of competencies of the targeted student population. In Renzulli's (1977) triad model, the objective of the first type of enrichment is to involve the talented youth to exploration activities in various fields; the second type concerns collective development activities to teach methods of evaluation and thinking, and the third type is about studying real-life problems and solving real tasks individually or in small groups. Whereas the first two types may be adequate for all students, the third one consists of such advanced-level tasks as the ones that will be performed by the talented on a basis chosen by themselves. This type of task-solving activity stimulates the students to collect fresh data, to apply research methods matching the range of knowledge concerned and to share the output of their work with a suitable audience.

Project work in the MY Camp realises this third type of enrichment.

[11] In 2011, during the visit to Vaisala, the students of the Camp were shown a space probe developed by the researchers of the company, which could be attached to a meteorological balloon to measure the carbon-dioxide content, temperature and pressure of the atmosphere.

2.4. Project work

Project work is the most decisive component of the Camp. Project development includes the sketching and solution of the problem, but also the exploration of as many correspondences related to it as possible. One of the great advantages of project work in the Camp is that those who work on a joint project produce individual products by individual research. It is key for the future of the young researchers to master the competencies which they can learn through project work and put to use later on also at companies, as members of research groups. Group activity develops the skills of task division and of paying attention to one another. It teaches patience and respect for the other.

Project work starts with a joint consultation, a brainstorming session, in groups of 6. Participants can express their opinions, and no one is subject to negative criticism. The project in its final form contains the work of every participant.

2.4.1. The origin of the project method and its significance in the development of talented students

Given the multicultural background of the Camp, it is worth taking a glance at the origins of project work and its objectives at that time.

The term "project" was first used in public education in a pedagogical context in the US in 1990, in connection with vocational education. It was thought that the term was suitable to cover the entire process whereby the youth specify their own ideas and the algorithm to realise them on their own, and after making it themselves, they present it for evaluation (Nádasi 2003).

Later on John Dewey and William Heard Kilpatrick extended the meaning of the term to education beyond vocational education, also in the US. These outstanding reform teachers aspired to use this approach to secure the role of the genuine personal learning experience, of real activity as a counterpoint to education based on reception, on the distilled lexical knowledge of the subjects alien to the children. They deemed it essential to make students responsible for the realisation of their projects as a means of education to democracy (Nádasi 2003).

For a long time, project-based education has not played an important part in the practice of European public education.[12] Today, however, it is quite a widespread pedagogical method, albeit it is still disregarded at many institu-

[12] Practice was predominated by the Herbartian pedagogy, which was content-centred and hence gave no room for student autonomy or the lack of external regulations of content and process concurrent with project-based teaching (Nádasi 2003).

tions. For the talented students arriving to the Finnish talent camp from 22 different cultures, on the other hand, it is clearly the most effective and the most enjoyable method of development.

The project method is a key tool of the education of highly gifted children in several respects. The children concerned like to act freely and independently, they like genuine tasks and challenge. The projects are so complex that they embrace a wide array of implementation skills and hence they provide an opportunity for the manifestation of many kinds of talent (Gyarmathy 2007).

2.4.2. Potential project-work topics

During project work, the participants of the Camp are divided into six groups depending on their sphere of interest. Orientation towards a given subject matter is decided upon already during the selection process, so the participants have time to prepare for it, and they have sufficient advance knowledge of the field. This is important *inter alia* because each of the topics offered concerns a complex research area demanding comprehensive knowledge/skills:

- *Climate change:*
  The first of the potential topics is climate change, a current scientific issue and also a global social and political challenge.
- *Renewable natural resources and energy:*
  One of the most complex tasks for the students working in the Camp is to study the renewable sources of energy. The significance of the renewable sources of energy lies in that their use correlates with the guidelines of sustainable development, that is, their use does not deteriorate the environment, while they do not restrain the development options of mankind either. Contrary to the use of e.g. fossil fuels, they have no cumulative negative effects such as the greenhouse effect, air pollution or water pollution.
- *Water:*
  The water workgroup is to examine the options of economical water utilisation: in our fast-developing world, the demand for water is on the rise and hence it is imperative to protect it.
- *Information and communication technology and digitisation:*
  The ICT group focuses on the internet, on mobility and on computer systems. They are to seek options that would make communication more efficient, simpler and more enjoyable.
- *Applied mathematics:*
  Many areas of mathematics, such as linear algebra, probability calculation, mathematical analysis play a significant part in engineering work.

Those in the applied mathematics group can visit the centre of Nokia during their week at the Camp.

Students divide the above general topics into several more specific ones to make joint work even more efficient. At the end of the project, the workgroup members make a presentation with illustrations.

2.4.3. Illustration and presentation of the projects

It may be justified for several reasons to make a graphical representation of the internal correspondences encountered in the project. There is no good or bad solution; the essential thing is that it should provide a suitable basis for project work, it should guide thinking and activity. Consequently, several visualisations can be made of the same topic as thinking progresses (Nádasi 2003). The outputs of project work, the forms of presentation can also vary[13]. Students are inspired by planning them as an objective of their work. During project work, MY Campers represent the correspondences related to the topic on a poster and then they make a presentation material.

The end-products are presented at the MY Camp Gala. The group members present the results of their group at a ceremony, and they receive a diploma from the camp leaders. This certificate has a high value: the students who take part in camp work are admitted to certain courses of the Helsinki University without an entry exam.

3. Mentors, facilitators

Mentoring is an efficient method in education and teaching, applied by many renown scientists and thinkers from the Greek philosophers through Erasmus to Rousseau, to raise great personalities similar to them. The great schools of medieval England, such as Cambridge and Oxford, institutionalised mentorship (Gyarmathy 2007).

Anyone can be the mentor of a talented child whose field of interest and style corresponds to that of the latter. In a musical camp, the proximity of the artists who teach there is the most important for the students. A camp concert, a course can have a great impact on the future artists, and acquaintances made in a camp and the instructions of a mentor can play an outstanding role also in career orientation. Similarly to the artistic camps, for students interested in the

[13] Here are some of the possible target results: posters, statistics, photos, films, verbal or oral reports, "book", vocabulary, model, blueprint, expo.

sciences it is a decisive experience to meet a famous person or to find a mentor at the camp with whom they can work also later on and whose assistance they can count on.

3.1. Mentors and idols in the Camp

It is an essential component of the Millennium Youth Camp programme that students meet scientists and researchers, i.e. potential idols. Consequently, the apexes of the one-week programmes are the events offering such opportunities. Besides the two permanent facilitators, the campers meet renown scientists and researchers at the lectures, at professional discussions and at the scientific price award ceremonies.

> "The best thing at the Camp was that it provided an opportunity to build contacts with foreign campers and experts, and to meet Professor Michael Gratzel. The Camp gave me contacts and opportunities to get several steps closer to my dream, i.e. to research the topic I find most interesting in the world."
>
> Jarkko Etula
> camper, 2010
> Finland

One of the most interesting events of the Camp of 2010 was the Millennium Technology Prize[14] Award Ceremony. Tim Berners-Lee, the inventor of the World Wide Web was the first to receive the biggest technology award of the world, the Millennium Technology Grand Prize. In 2010, the main price was awarded to Michael Gratzel for the development of solar collectors, of dye-sensitised solar cells, driven by an electrochemical principle named after him. The students in the Camp could follow the event live with the candidates and the Members of the Academy at the Finnish National Opera. On the day after the ceremony, they met the prize-winners personally and could ask them questions.

[14] The Millennium Technology Prize is the biggest technological recognition globally. In the summer of 2012, the prize was awarded for the fifth time for a technological invention which im-proves the quality of human life and supports sustainable development to a significant extent. Candidates are nominated by scientific societies, universities, research institutes, companies and organisations, but the candidates cannot nominate themselves. The prize can be awarded to such persons or research groups of two or three whose work played a decisive role in a new technological development or innovation.

In 2011, Professor Steven Furber, winner of the Millennium Technology Prize in 2010, was the honorary guest of the Camp. The professor held a lecture and had consultations with the participants of the Camp, giving them useful advices concerning their research work and future plans. In 2012, students could meet researchers Linus Torvalds and Shinya Yamanaka who achieved outstanding results in computer science and biology.

4. Contact-building with coevals

"With the acceleration of technological development, it shall become natural for the scientists and researchers of the future to build up a network among themselves"

Ainomaija Haarla (Technology Academy Finland)

Outstanding performance is most often backed by a widespread personal contact network. To be among the most successful members of society, it is not enough to study with diligence; you must know how to build your personal contact network and how to find your way in the networks of other groups of people (Csermely 2005). The Millennium Youth Camp helps the talented youth acquire new knowledge and, moreover, it provides excellent opportunities for contact-building. Most students consider contact-building the greatest advantage of the Camp, which warrants the conclusion that they are fully aware of the importance of social capital already in their secondary-school years, albeit they have much less opportunity to develop it in the period before their university studies.

According to Freeman (1993), it is often thought that intellectually talented children are not gifted socially, their sociability is weak, they have no friends and they like to be alone. However, this is not always true. The case is often that they like to be alone more than other children, and this is misinterpreted. The differentiated talent model of Gagné (2009) highlights the importance of contacts with coevals and their effects. In his opinion, realised talent (talent as opposed to gift) is the product of development through the interaction of various abilities and of interpersonal and environmental catalysts. Among the environmental catalysts, besides the coevals, he mentions the significance of mentors, the diverse professional programmes and courses, and professional challenges. Thinking in the terms of Gagné's talent model, the Camp provides essential components of the environmental catalysts needed for the realisation of gift.

The most important thing for talented children is to develop appropriate contacts with peers active in the same field of interest. A healthy competitive

spirit is also necessary for outstanding performance. Several MY Campers had already had an opportunity to test their knowledge at international contests, at Olympic Games for Students. Former rivals may work on the same project. Thus the main goal is realised: the Camp teaches the skills needed for dialogue and common thinking to the young researchers who might one day find answers to the global problems of our days.

Hard professional work notwithstanding, the atmosphere at the Camp is very good indeed. As a result, students are amalgamated into a stable community in a few days time. Campers can play music, sing or pursue sports activities during their leisure time. They offer each other the most diverse activities at the international evenings. In 2012, students got acquainted with Czech folk tales and took part in a rubber-boot throwing competition led by the Finnish students on that occasion. These evenings usually end with singing together and this helps break down the walls and bring the students closer to each other. A tradition was born in Finland in the 1950s that has been adhered to by the students of the Camp: as in the Finnish schools, the group elects by secret voting the Smiley Boy and Girl of the "class". This symbolic recognition is due at the end of the Camp to the most friendly, most honest and helpful students.

The goal is that students should preserve this enthusiasm also as young adults. If they feel personal responsibility for the problems of society, work done in the interest of the common goal will be fruitful. Millennium Youth Campers experiencing the benefits of work in an international environment at the Millennium Youth Camp will return home richer by a lifelong experience.

III. SUMMARY

Teenagers interested in science and technology can choose from a vast array of summer camping offers. There are intensive enrichment programmes for talented students organised around the same topics in several countries of Europe. The constituents and goals of the XLAB Camp organised in Germany, the Summer School of Sciences in Croatia and the Millennium Youth Camp in Finland are similar.

Admission to the MY Camp is preceded by a two-round selection process. Contrary to the practice of other camps, selection starts at the end of the previous year. The complete list of the names of the 30 participants is published in early March.

Project work done in groups of 6 by students coming from different cultures is a key element of the Finnish camp. Each of the five research topics concerns a global social problem to be answered by science. During project work, the end-product, i.e. a formal presentation held at the MY Camp Gala, is given great emphasis. Campers experience many advantages of project work during their camp work. Project work develops the skills of labour division and of listening to one another; the students learn to work and to do research in an international team.

The participation of mentors and of well-known and renown professionals of science and technology is of key importance. The workgroups have two leaders each, with whom they co-operate during the week and, in addition, they meet the winners of the Millennium Technology Prize and can take part at the award ceremony held every second year. In course of the Camp, the participants are assisted also by experts of mammoth companies.

The Camp offers the youth many recreation opportunities, too, through which they can get acquainted with Finnish culture and the cultural values and traditions of their peers coming from other countries. It is the declared objective of the MY Camp to popularise the Finnish universities: the youth admitted to the Camp can study at the Faculty of Natural Sciences of the Helsinki University without having to pass an entrance exam. This is feasible because most Camp participants are committed and motivated students who had demonstrated their aptitude at international contests, and their project plan prepared

as a condition for application was also excellent. Besides talent counselling and nurturing, mentors provide talent identification as well.

Students consider the opportunity for contact-building one of the main proceeds of the Camp. The objective is that young persons with similar interests and of the same age develop a network among themselves; they should get acquainted and like to work in an international team, since the answers to the global problems can only be found in international co-operation, and young researchers will play a key role in that.

As for the possibility of the adaptation of the Camp programme to the domestic (Hungarian) scenery, the relevant didactic and methodological conditions are available, but financing would require the more marked contribution of companies than is typical for talent programmes in Hungary in general. Although Hungary has no global company similar to Nokia, there would be alternatives in every field of research. However, inter-sectoral co-operation is a must if Hungarian schools are to achieve significant educational results in global comparison. The Finnish example highlights the outstanding importance of the generation of coeval social capital of secondary-school students for career-orientation and future employment. It is inevitable and useful to build international networks as a means for establishing the conditions of finding adequate answers to global problems.

BIBLIOGRAPHY

American Camp Association (2011): http://www.acacamps.org/. Downloaded: 24. 08. 2011.

Balogh, L. (2004): *Iskolai tehetséggondozás* [Talent-nurturing at school]. Kossuth Egyetemi Kiadó, Debrecen.

Balogh, L. (2006): *Pedagógiai pszichológia az iskolai gyakorlatban* [Pedagogical psychology in school practice]. Urbis Könyvkiadó, Budapest.

Csermely, P. (2005): *A rejtett hálózatok ereje* [The strength of the hidden networks]. Vince Kiadó, Budapest.

Freeman, J. (1993): Parents and families n nurturing hiftedness and talent. In Keller, K. A.–Mönks, F. J.–Passow, A. H. (eds): *International Handbook for Research of Giftedness and Talent.* Pergamon Press, Oxford.

Gagné, F. (2009): Building gifts into talents: Detailed overview of the DMGT 2.0. In MacFarlane, B. – Stambaugh, T. (eds): *Leading Change in Gifted Education: The Festschrift of Dr. Joyce Van Tassel-Baska*. Prufrock Press, Waco.

Gyarmathy, É. (2007): *A tehetség: Háttere és gondozásának gyakorlata* [Talent: Its background and the practice of talent care]. Eötvös Kiadó, Budapest.

Gyarmathy, É. (2011): *A tehetség: Fogalma, összetevői, típusai és azonosítása* [Talent: Its concept, components, types and identification]. Eötvös Kiadó, Budapest.

Hornyák, B. (2011): *A tehetséggondozás pillérei Finnországban és a Päivölä Iskola Matematika Programja* [Pillars of talent support in Finland: The Päivölä School Mathematics Programme]. In Gordon Győri, János (ed.): *A tehetséggondozás nemzetközi horizontja, I* [International horizons of talent support, Vol. 1.]. Magyar Tehetségsegítő Szervezetek Szövetsége, Budapest, 75–96.

LUMA Centre (2011). http://www.myscience.fi/index.php?c=news. Downloaded: 24 August 2011.

Nádasi, M. (2003): *Projektoktatás* [Project teaching]. Gondolat Kiadói Kör, ELTE BTK Neveléstudományi Intézet, Budapest.

National Board of Education (2010): http://www.oph.fi/english. Downloaded: 8 September 2011.

Renzulli, J. S. (1977): *The Enrichment Triad Model.* Creative Learning Press, Wethersfield.
Technology Academy Finland (2011): http://www.technologyacademy.fi. Downloaded: 24 August 2011.
Ward, V. S. (1980): *Differential Education for the Gifted.* Ventura County Superintendent of School Office, Ventura.

János Gordon Győri–Tamás Nagy

Summer Talent Support Camp:
Talent Support Programme of the German Student Academy

I. INTRODUCTION

In our study entitled *The present of German talent support in the light of a talent support model* (Nagy–Gordon Győri 2011), we reviewed the history of talent support in Germany from its early stages till the end of 2010. However, since then changes have been introduced in the German talent support regulations primarily with regard to talent support in higher education that may also have an impact on the talent support programmes of younger age groups, and therefore we should review them for the purpose of this chapter.

Apart from describing those changes, this study intends to present an intensive talent support summer camp, placed in the 'middle' of the German talent support structure in terms of age. The Deutsche SchülerAkademie (German abbreviation: DSA) is a programme designed for the development of gifted secondary-school students, closely related to the Federal Ministry responsible for Education and Research (Bundesministerium für Bildung und Forschung, BMBF), and to the support services of its umbrella organisation, Bildung und Begabung[1]. Consequently, the operation and programme of the DSA form the background in a certain sense of talent development, which is clearly in the focus of attention of German talent support in higher education.

[1] These organisations were mentioned earlier in a chapter of our first book referred to above (Nagy–Gordon Győri 2011).

II. DEUTSCHLAND STIPENDIUM – GERMANY SCHOLARSHIP

1. Principles and objectives of the scholarship

The new German scholarship supporting talented students was introduced in the higher education institutions in the Summer of 2011. The main objective of the new concept is to support talented young people capable of significant performance and to establish a new scholarship culture funded partly by the German state and partly by the actors of the market sector or foundations and, according to the current ideas of the legislator, by talented young people with degrees who had received support earlier. The purpose of the new support scheme is to improve global German competitiveness, to prevent brain drain, and to contribute to the transformation of the higher education profile at national and regional level by putting in place a talent point network. In addition, the programme also focuses on offering compensation to disadvantaged students. Below there is a short summary of the Deutschland Stipendium (DS; Germany Scholarship) scheme based on the legal regulations applicable to the support scheme (www.bmbf.de 2012), and the information available on the website of the programme (www.deutschland/stipendium.de 2012).

2. Legislative background of the programme

The legislative background of the programme is based on a set of acts passed at the end of 2010 (Verordnung zur Durchfürung des Stipendienprogramm-Gesetz, Stipendienprogramm-Verordnung – StipV), which regulate in detail the implementation of the programme plan, its funding structure and the criteria of selection and performance. In terms of the regulations, those students are eligible for DS support, regardless of their origin or nationality, who study in the German higher education system, and whose results make it likely that they will be capable of outstanding performance in the future. The support criteria cover an extensive scale: secondary-school students or higher-education students with outstanding results are all eligible for support, but the scholarship may also be granted to students contributing a great deal to student associations and students showing special efforts in church-related, political or social

fields. At the same time, the support may also be granted on the basis of social criteria in line with the above principles. The new type of support may also be combined with the support system active in Germany for years called BAföG (http://www.bafoeg.bmbf.de), which guarantees learning and educational support to disadvantaged youngsters and young adults (meaning those who do not have sufficient funding) based on the provisions of the law.

3. The available support

The support consists of two separate and independent parts (see Figure 1). On the one hand, the German state provides EUR 150 each month, regardless of the financial and social position of the supported student. On the other hand, EUR 150 is provided by the private sector in the form of private support (originating from individuals, companies, various social organisations, foundations), but that amount is affected by the financial position of the supported young person. Private donors supply the support for at least one year, but the same applicant may obtain support in the amount of the partial sum indicated above from more than one private donors. Naturally, donors may offer not only financial support but also additional types of support to the scholarship students in the form of participation in practical training, further training or in technical and professional events.

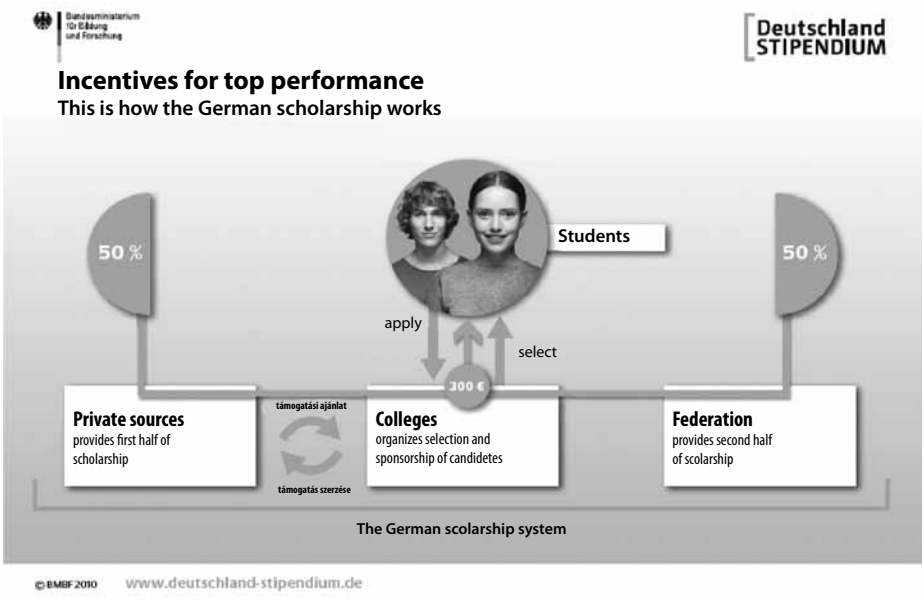


Figure 1. Structure and operation of the new German scholarship programme

4. Selection of students for support; supported students

The selection of students for support falls within the competence of the higher education institutions, in compliance with the criteria defined by the law. The institutions intending to take part in the new support scheme issue a public announcement stating the number of students they wish to support and the performance requirements, and then select the applicants to be supported.

Although the calls for applications are published by higher education institutions, private supporters may also be involved in the selection process as advisers, and they may also attend the board making the decisions. As it is a talent support system, naturally students with outstanding performance have an advantage in selection; however, the decisions are made not only based on study performance and results, but results in other aspects of life, and the capability of overcoming the obstacles of origin or social position are also taken into account.

During the 12 months since the introduction of the system more than 75% of the higher education institutions have joined the new support scheme and support from the private sector has also reached a large amount. Consequently, in the first year of the DS approximately 5,500 students could take part in this new type of talent support programme. Of course, after the successful start the objective is to involve even more gifted students in the programme. The programme intended to support approximately 8% of students learning in the German higher education system. Similarly, it is an objective of the DS managers to dynamically expand the range of participating higher education institutions and private supporters.

Anyhow, the involvement of the state is not limited to the supply of half of the financial support, because the state funds also the administrative costs of the participating higher education institutions with a flat amount and it supports the equipment required for training as well. The talent support and development programmes run by the federal provinces may be combined with the new state scholarship instruments if they provide supplementary training or courses to the scholarship students.

5. Evaluation of the programme

It seems that the Deutschland Stipendium programme and its implementation integrate well into the talent support structure developed over the previous decades: the state has cleverly joined the domain of the 12 large foundations (see: Nagy–Gordon Győri 2011) as an additional financier. While it supplies funds and provides infrastructure to talented students with the involvement of

higher education institutions, it builds a relational network, too, between talent support institutions and centres operating according to various preferred interests because, as mentioned earlier, the programme may be combined with other support instruments on certain conditions. In addition, it gives a direct opportunity for society and the market sector to support gifted students, by placing the support of a knowledge base, earlier locked in the framework of the years spent in higher education, into a modern business framework.

However, even with all advantages of the system it is still unclear whether social justice and an adequate focus-oriented support of the disadvantaged individuals can be fully achieved in such a contractual framework. The question is whether support is received by those who really deserve it and who really need it.

III. DEUTSCHE SCHÜLERAKADEMIE – GERMAN STUDENT ACADEMY

Among the instruments of the extra-curricular development of gifted students, the exploitation of school holidays, especially the long summer holidays is a well-known opportunity which is used widely in a diversified manner (see, e.g., Hornyák 2012; Olszewski-Kubilius 1997 in this volume). However, the type of summer camp training of children talented primarily in academic fields which will be described below was designed only a few decades ago.

1. International talent support background

1.1. History of the development of the Julian Stanley summer student academies

The idea of the summer student academy as a talent support method stems from the talent support research conducted by Julian Stanley and his colleagues at the Johns Hopkins university. The Center for Talented Youth (CTY) talent research centre of the University began the longitudinal work of identification and monitoring of young American (and later also international) mathematical talents in 1979 based on the research having been conducted by Julian Stanley since 1972 (Study of Mathematically Precocious Youth – SMPY). In the 1990s, thousands of Grade 7–11 students took part in the intensive summer talent support camps organised by the centre; in recent years, in total approximately 10,000 American and other international students have attended talent support summer camps organised in the US and in other countries of the world based on the adaptation of the American example each year.

1.2. The age group involved in the activities of the talent support camp

The original American programme offered three weeks of training in a camp (i.e. residential training) for talented students studying in the lower and upper forms of the secondary school (Grades 6–11), but not in the last years before graduation. Later the programme became so popular that in terms of age it was extended to all school-age groups, i.e. these days camps are organised in the

United States also for children studying in the lowest forms (even though the camps designed for that age group are non-residential camps). The camps are structured on a small-group basis: there are only 10–15 students in each group. Their activities are led by an instructor and an assistant teacher, i.e. there is one tutor for every 7–8 children. In any course requiring also laboratory work, slightly more students form one group because of the more limited opportunities and the costs of the laboratory.

The American programme may be attended primarily by students who have already reached a certain level in the mathematical talent selection test of the SMPY programme. Those children have an advantage if they wish to attend a talent support summer camp of the programme again in a subsequent year. In the American model there are two subsequent courses in summer, but usually students attend only one and they require a special permission if they wish to attend both. In the camps the courses are led by university tutors, PhD students, university students with outstanding performance and school teachers with high professional achievements.

1.3. Teachers working in the camp

As a large number of the courses cover complex integrated topics, PhD students, university tutors, and scientists holding titles and having a good knowledge in modern complex progressive inspirative topics have an advantage. In the American programmes a lot of stress is put on making sure that the possible impacts on society, the advantages and benefits of the specific topics, as well as the related difficulties and threats all be covered. Either the specialists or younger experts have the greatest knowledge about those topics. However, primarily university students studying on master courses teach in the CTY camps.

1.4. Ordinary daily schedule of the CTY camps

The CTY summer camps are based on rather tightly organised academic programmes. Talented students spend 7–8 hours doing academic work on average 5–6 days a week for 3 weeks. In addition, they are often given additional assignments, project tasks to be performed in teamwork and similar exercises. The academic activities are supplemented with personality development, community building, sports and music activities, recreation and leisure time. Other important features of the camp programme include the regularly recurring component of scientific lectures delivered to the whole camp, and activities performed in small groups, in pairs or individually.

The outline of a typical daily schedule of CTY camps is provided below (for Grades 7–9):

07:00 – 09:00	Wakeup, shower, breakfast
09:00 – 12:00	**Professional activities**
12:00 – 13:00	Lunch
13:00 – 15:00	**Professional activities**
15:00 – 17:30	Other activities (sports, etc.)
17:30 – 19:00	Dinner
19:00 – 21:00	**Evening professional activities**
21:00 – 22:15	Social programmes and all camp discussions
22:30 –	Bedtime

The lines in bold in the schedule refer to the professional programmes in a narrow sense of the definition: as indicated, they last from 9 a.m. to 9 p.m., in total for 7 hours a day, naturally interrupted with social activities and meals and recreation time. Anyhow, the fact that a student intends to take part in such an intensive training involving at least 7 hours of concentrated intellectual work in the holidays, and the fact that they complete such courses indicate an important and presumably rather exactly measurable opportunity in talent identification, because obviously only the most motivated students are those interested more intensively in a special academic field, already with higher qualification in it, are capable of attending such camps.

1.5. Logistic issues

1.5.1. Cost reimbursement

In the United States of America there are no attempts to making extra-curricular activities absolutely free. One of the reasons could be that pedagogically it is considered practical if children understand the need of contributing to the implementation of any special dreams and objectives. In America it is considered acceptable if children do smaller jobs and collect money, or save up otherwise in order to contribute to the costs of training, such as the summer talent support camps. In the spirit of that pedagogy and of course because of the actual funding requirements of the camps, the CTY camps are not free either. However, students who actually need it can receive compensation of their participation costs to the required extent (but almost always only a partial amount) from foundation resources and other sources of funding, arranged by the organisers.

1.5.2. Healthcare background and transportation

The camps are organised carefully with a sufficient healthcare background, in strict compliance with public healthcare and patient supply regulations. A lot of stress is put on the feasibility of transportation during the yearly planning, although it varies by camp and programme. The basic principle of the programme is that, with the exception of the youngest age groups, students should stay in the talent support camp even if they live in the settlement where the camp is organised. The main reason for that is that it is one of the main objectives of the camp to build intensive relations between the individuals of particular age groups, who stand out most in the community in specific fields already at school age, and to ensure that they have an impact on each other's intellectual and moral development, learn to work together and enjoy a lifelong professional and human experience in the camps.

1.5.3. Dissemination of CTY camps

The CTY organised camps in 6 large programme categories at nearly thirty locations all over the US for the summer of 2012, generally two consecutive camps at the same location[2]. Among the programmes two Hong Kong camps represent the international aspects. Apart from the academic and occasionally art-centred programmes, there are also programmes designated for the development of the managerial skills of talented managers.

1.6. International impact

The American summer student academies have been adopted by numerous countries over the last few years including Israel, Sweden, or Germany (see, e.g., Csermely et al. 2005). It is notable that each country adopting the original design adapted the American programme instead of simply taking it over, and these days the adapted versions are included among the most important talent support instruments of the respective countries. Another notable factor is that it seems that whenever this talent support instrument is introduced, it will operate and be effective in the long term, i.e. for decades.

[2] Note: There are numerous other similar talent support student camp networks in the United States of America. There are two reasons why we limited this study only to the CTY camps: on the one hand, these camps represented the direct professional background of the German talent support camps, which will be described in the subsequent parts of this chapter, and on the other hand, the professional standard of these camps really stands out and is generally good.

2. A European adaptation: Deutsche SchülerAkademie (DSA) – German Student Academy[3]

Germany was one of the countries adapting the CTY summer talent camp. As the German adaptation led to a large number of lessons in talent support, below we shall describe that system in detail.

2.1. The beginnings

The German summer student academic camps have been organised approximately 20 years ago, following the American example. The German talent development system was established on the basis of a pedagogical concept and a set of social requirements whereby if students making slower progress have their own training system, then the gifted students making faster progress should also be able to take part in a special training system designed for them to facilitate their maximum development at least in a part of the academic year.

The designers of the German academic camp system planned their own scheme in the second half of the 1980s following approximately one and a half or two years of preparation. They began their work by studying the American summer talent camps (the CTY camps) on-site for 1.5–2 months and by obtaining detailed information about the CTY talent camp system from the American experts establishing, maintaining and developing it. The DSA programme was established under the control of Professor dr. Harald Wagner, one of the outstanding figures in German talent support, who had been its leader for 26 years between 1988 and 2004.

2.2. Deutsche SchülerAkademie and Deutsche JuniorAkademien – Similarities and differences

The German development experts studying and adapting the American system first created a talent camp scheme organised and operated in the federal system and supervised technically and financially at the same level for older secondary school students (10–11/12 grades). That was the prestigious Deutsche Schüler-

[3] The DSA is described based on a study by Harald Wagner (Wagner 2003), the DSA website, and our research involving personal field studies. We express our gratitude to Dr. Stefanie Stegemann-Boehl, Petra Hohnholz, members of the staff of the Department of the Bundesministerium für Bildung und Forschung, managing the DSA, and to Dr. Michael Baer, and especially Volker Brandt who is in charge of the Bonn Office of the DSA Ministry Department for describing the system to us.

Akademie. Later, however, based on the success of that academy, a similar talent camp scheme was designed for the younger age groups under the name JuniorAkademien system (DJA) (http://www.deutsche-juniorakademien.de).

The two systems are different in basic components. The DSA is supervised and financed in part by the Federal Ministry responsible for Training and Research (Bundesministerium für Bildung und Forschung) (and other sponsors also contribute to the operation of the camps). Even at present a separate team is dedicated to the programme at the Ministry both in Berlin and in Bonn. The DSA system is structured by province, but it is controlled centrally, at federal level. That means that the Berlin/Bonn Ministry Department exercising the control and supervisory function holds the individual camps and programmes, in co-operation with individual provinces. At present the DSA programme is active only in approximately 50% of the German provinces, but not in the others. It is not a specific target to have a separate DSA scheme in each province, the individuals in charge of the scheme intend to create a DSA programme only in those provinces where it can be reasonably established and responsibly operated.

On the contrary, DJAs are organised only at local level as a result of local enthusiasm, without any central, federal, professional supervision or development and they do not receive any funding from the federal educational budget either. Owing to that and to other specificities, the professional prestige of the DSAs is a lot higher and their status is a lot more stable than that of the DJAs.

2.3. Main goals of the programme

The main goal of the DSA programme is to offer an opportunity to children most talented in academic fields, for maximum intellectual and social development during the summer holidays. It is an important goal to build a social network of contemporary talented students, which can be maintained even for decades between young people who are likely to become leaders of their own academic fields and science and society in general. Important objectives are:

- to develop the learning skills of children, their learning techniques and the capability of individual learning;
- to develop the thinking and problem-solving skills of children in interdisciplinary fields;
- to develop written and verbal presentation skills;
- to develop co-operation skills and techniques in teamwork;
- to present potential role models to students with the mediation of creative and inspirative scientists, tutors having outstanding knowledge;

- to show to gifted students what other talents exist in their specific field and how they can co-operate with, learn from and inspire each other;
- to assist gifted students in career-choice decisions;
- to strengthen their motivation and willingness to achieve high performance;
- to improve their feeling of self-efficacy;
- to develop their creativity;
- to develop their communication skills;
- to strengthen the basic ethic view and responsibility that they must use their personal capacities in ways that promote society and general human progress (Wagner 2003; Wagner–Neber–Heller 1995).

2.4. Scope of the DSA

In the framework of the DSA, 12 camp programmes are launched each year, attended by approximately 1,000 gifted secondary-school students. 60–90 children attend the programmes of each camp in a summer. One of the basic specificities of the programme is that the same student can take part in a DSA only once during the secondary-school years. The objective of that restriction is to enable more gifted students to have access to the summer camps and to prevent that the places be taken by the same gifted pupils all the time. Another purpose of the system is not to give any advantage to children in better financial positions against the others. Another argument for the system used by its developers was the German experience according to which children who attended such a camp once knew it well for the second time and hence their level of motivation and attention was weaker than on the first occasion.

As mentioned above, not all provinces have their own DSA camps. According to the 2012 programme brochure, this year 6 provinces organised DSA talent camps, including some where 3–4 camps were organised, but the same programme was not launched in the other German provinces. It should be noted that there are not many changes in the number of provinces participating and not participating in the scheme (by providing a site) in the various years.

Anyhow, based on the above figures, we can conclude that over the last 20 years this talent education system was able to provide an excellent development opportunity for approximately 20,000 young talents in Germany.

2.5. Target age under the DSA

The DSA is organised for students of Grades 11–12 (17–18 years of age). In the German school system this is the 1st and 2nd year before finishing secondary

school, because in Germany secondary education ends with the Grade 13 (at the age of 18–19).

2.6. DSA talent identification principles

The DSA applies four basic forms of talent identification:

- winning/good position in provincial, national or international contests,
- teacher's recommendation,
- school recommendation,
- self-nomination.

Although the last three nomination methods suggest a large number of subjective elements, it is important that in each year only one student may attend the DSA camps from one school; consequently the system is rather selective and most probably leads to a result that only student of each school, the best in academic fields, can actually attend one of the camps.

On the basis of teacher, school, etc. recommendations, the DSA organisation invites approximately 2,200 gifted secondary–school students to summer camps each year. Of those approximately 1,800 students express their interest in one of the programmes; and the 1,000 most promising gifted students are selected from them. Based on the approximately double excessive nomination, the most gifted are not selected in an academic selection, but much more according to social, demographic and pedagogic components, by making sure that girls and boys, village and town students, students from disadvantaged and non-disadvantaged families are picked on a proportionate basis.

2.7. Academic fields covered by the DSA

When the DSA was launched in Bonn in 1988 with only one camp, the camp covered three academic fields:

- mathematics,
- physics,
- foreign language.

Later the number of subjects increased dynamically and these days the camp movement covers four large, significantly different academic fields:

- natural sciences,
- social sciences and humanities subjects,
- music and other arts,
- management skills.

In addition, the German professionals intend to extend the list of available disciplines in the next years with the following two fields:

- information technology, and
- multicultural aspects (e.g., due to immigrant students).

A lot of stress is put on covering natural and technical sciences in the camps. This also indicates that the typical distribution ratio of the courses covering the large academic disciplines is balanced within each camp (naturally, mathematics and natural sciences are the predominant disciplines due to the SMPY roots and the current social requirements). Thus is an important specificity of the DSA system that each camp work is based on one mandatory mathematics course, at least 1–2 natural sciences course(s), and 1–2 human sciences course(s), but there are no major restrictions with regard to the topics of the other courses. The latter ones may be oriented in social sciences, music or any other arts, interdisciplinary topics or topics organised in other ways.

The annual programme brochures of the DSA contain hundreds of interesting course topics. In the programme brochure developed for 2002, Harald Wagner listed the following topics as typical camp course topics (and proportions).

- mathematical structure of basic physical theories,
- tumour research: an interdisciplinary challenge (biochemistry, medical science, bio information technology, etc.),
- introduction to legal sciences,
- democracy and consideration (How do pluralistic societies manage conflicts?),
- enlightenment or hypnotisation: The concept of 'culture' in our society,
- music in the Third Empire and in exile.

According to the summary prepared by Harald Wagner, between 1998 and 2002 the DSAs covered in total

- 56 mathematics,
- 51 physics, astrophysics, geology,
- 29 biology, environment, chemistry,
- 24 medical science, genetics, psychology, and
- 15 information technology, artificial intelligence natural sciences courses.

As an example, the mathematics courses covered topics such as geometrics, modern geometrics, non-Euclidean geometry, fractal calculation, arithmetic, dynamic systems, topology, game theory, game theory and optimum strategies,

group theory, graphs, networks, algorithms, stochastic processes, complex numbers, combinatorics, symmetric systems, vectors, mathematical models of election systems, mathematical methods in neurophysiology and many other.

Since 2002 the DSA has also been trying to apply a new thematic structure (Wagner, 2003): attempt was made to assign courses to one central topic ("Time") in six different disciplines or integrated disciplines within one camp. Specifically they included the following topics: a) time and chance: stochastic processes in nature, technology, economy, demographic, b) relativity theories: geometry of time, c) cosmic rhythm: time theories in astronomy, d) age and ageing: biological, sociological and medical aspects, e) current issues of life: philosophical issues, f) theory and implementation: How do visual arts handle time?

2.8. Tutors and other personnel working in camps

The camps and other programmes are generally led by a senior scientific expert (university tutor ranked as assistant professor or professor, research institute scientist). The individual courses are usually led by younger experts and practising teachers.

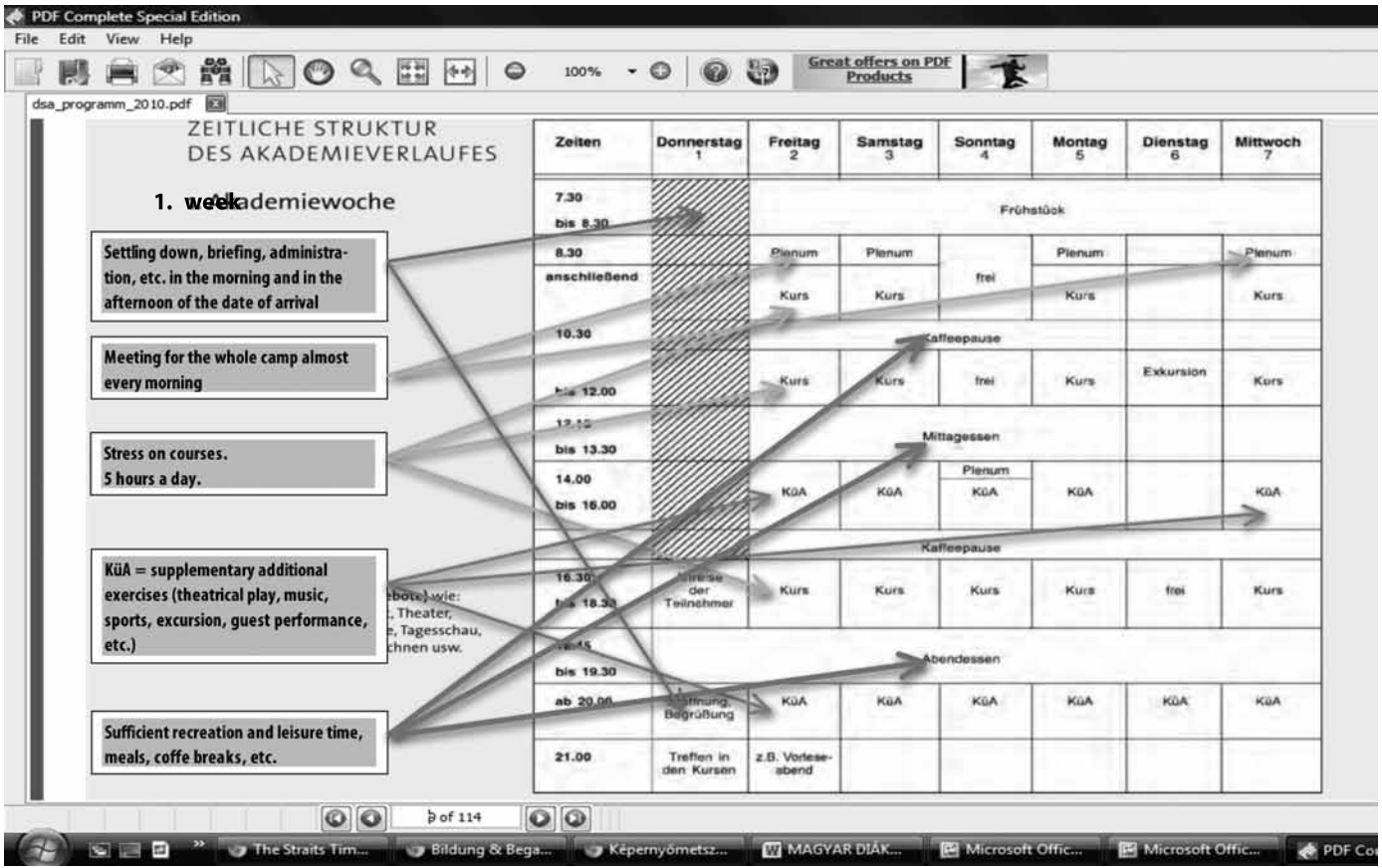
Each course is developed and delivered to children by two tutors. They spend 17 days with gifted students, building an intensive working relationship with them. The tutors are typically young, creative experts of 30–35 years of age, generally conducting doctoral studies or already possessing a title, willing to deal with unusual interactive topics, too. Very often a topic is made integrative by the fact that the course leaders themselves represent two different unusual and complex disciplines. However, the course leaders can also include secondary-school students who already achieved good results in talent support.

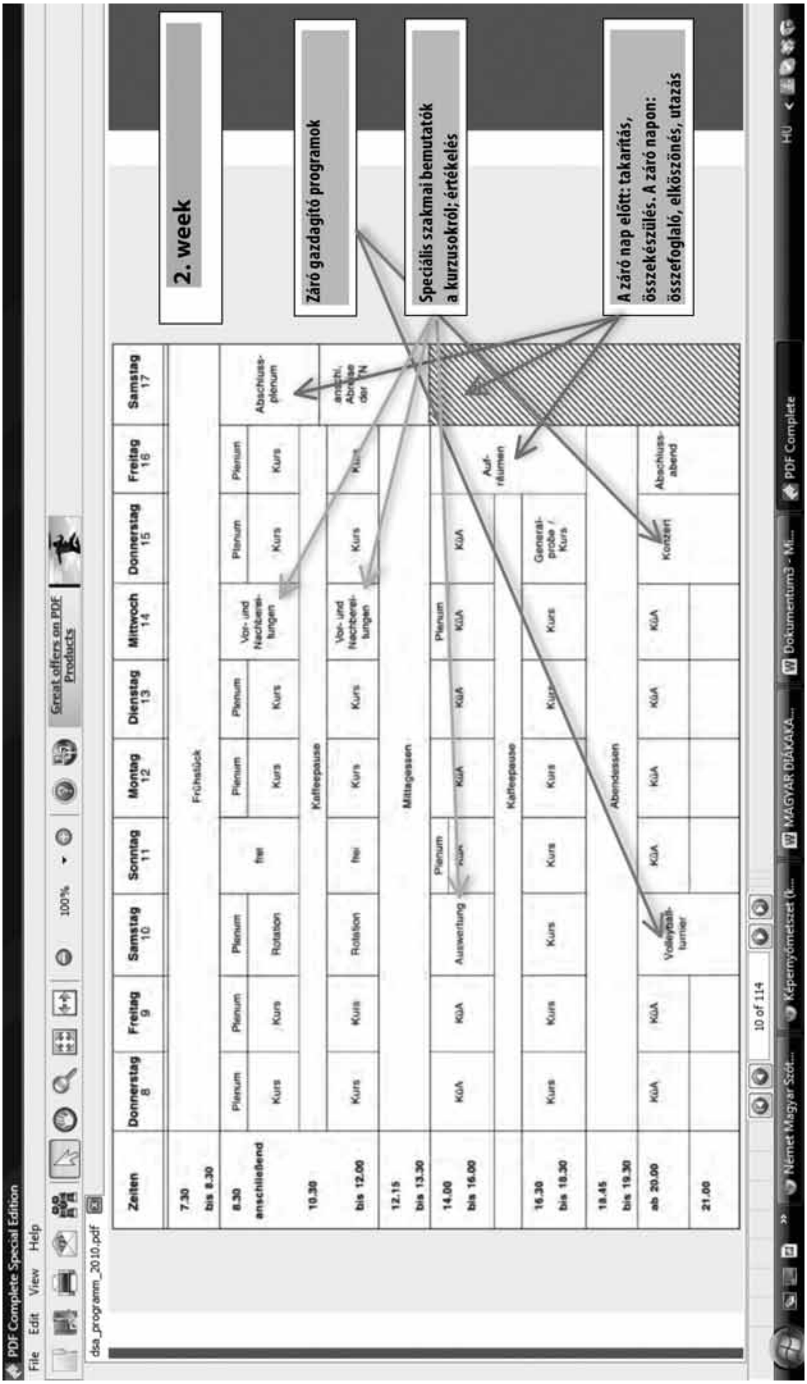
The camp manager is supported by an assistant (usually a former camp participant), and generally there is a separate co-ordinator for music, sports and community events.

2.9. Daily schedule of the DSA camps – programme intensity

As indicated above, one of the most important characteristics of the Stanley-type (and similar) talent support camps is intensive work. We have already indicated, on the one hand, that this is an important and valid talent selection factor and, on the other hand, we tried to make it clear and specifically express at this point that without intensive formation and work those camps would lose their meaning. It is obvious that summer equals valuable time; it provides valuable time for rest, recreation, spending time with friends and other school com-

Table 1. Typical daily schedule of the DSA champs





Zeiten	Donnerstag 8	Freitag 9	Samstag 10	Sonntag 11	Montag 12	Dienstag 13	Mittwoch 14	Donnerstag 15	Freitag 16	Samstag 17
7.30 bis 8.30	Frühstück									
8.30 anschließend	Plenum / Kurs	Plenum / Kurs	Plenum / Rotation	frei	Plenum / Kurs	Plenum / Kurs	Vor- und Nachbereitungen	Plenum / Kurs	Plenum / Kurs	Abschluss-plenum
10.30	Kaffeepause									
bis 12.00	Kurs	Kurs	Rotation	frei	Kurs	Kurs	Vor- und Nachbereitungen	Kurs	Kurs	anschl. Abreise der TN
12.15 bis 13.30	Mittagessen									
14.00 bis 16.00	KüA	KüA	Auswertung	Plenum / Kurs	KüA	KüA	Plenum / KüA	KüA	Auf-räumen	
	Kaffeepause									
16.30 bis 18.30	Kurs	Kurs	Kurs	Kurs	Kurs	Kurs	Kurs	Generalprobe / Kurs		
18.45 bis 19.30	Abendessen									
ab 20.00	KüA	KüA	Volleyballturnier	KüA	KüA	KüA	KüA	Konzert	Abschluss-abend	
21.00										

panions, doing sports, and gaining experience, but intellectually gifted and interested children can also educate themselves, make individual attempts in research, experiments and similar activities in the summer. It is obvious that all those advantages should "be sacrificed" only for a programme that in fact offers true development, long-lasting inspiration assisting in obtaining access to major knowledge systems, or one that provides opportunities for future development. A summer talent camp must be a camp of such nature, but it can only become such if in fact it can offer knowledge cumulation and professional development to children in a higher quality than the one being offered during the academic year. That goal may be attained only with busy schedule, by intensive and concentrated work.

It is also clear that a talent support camp must take into account the age specificities of children in their work capacity, even if a large number of gifted children do not have average capacities in that respect either, and the fact that the physical, intellectual and psychological development of children is important as a whole. Thus not only sciences, but also arts, ethical and social development is required, and students need time for themselves, leisure time, contact with the family at home and other things. Similarly, it is important to offer opportunities to students to learn about the academic disciplines of other gifted companions working in the camp, and occasionally to explore new, joint, knowledge fields out of those (by taking the first steps towards the establishment of a new future discipline and similar activities).

In that context we should take a look at the typical daily schedule of the DSA camps *(Table 1)* (Brandt–Klein–Kunze 2012):

As indicated by *Table 1*, summer courses last for 17 days including the introductory and closing days, i.e. slightly more than two weeks. It is important to maintain this length of the individual courses, because this is the only way to warm up and then study a topic creatively and intensively. In general, 50 lessons are dedicated to a particular topic in each course. This is a rather intensive intellectual course. The explicit goal of the programme is to enable gifted secondary-school students to study and work at university level during those weeks. In that sense the programme also carries the theoretical and practical basis of acceleration.

In total, the daily activities last for 12 hours, including not only academic course activities, but also social exercises, music, sports and others.

2.10. Work moral, problems of conduct

The DSA camps can be successfully and effectively completed only by children having higher-than-average commitment to work and work capacity. The rather intensive camp programme develops those characteristics very strongly.

No major conduct problem has occurred during the 20 years of DSA history; none of the selected students had to be sent home and none of the sender schools had to be notified about any discipline problems of particular students. Students consider being selected for such a summer course a major award.

2.11. Dissemination of the results of the work performed at the camp

The DSA camps usually publish scientific and technical summaries of their work conducted in the previous year in books, supported by the Ministry of Education. They contain the exercises constructed by the campers, indicating their names, and the related solutions, short summaries classified as scientific publication, the implementation and results of specific projects and other technical–scientific information (see, e.g., Krah–Günther–Brandt 2008). The books publish also the short written versions of the presentations that were prepared by the students prior to the camp as summaries of particular disciplines, and presented to their fellow course students some time at the beginning of their activities at the camp.

2.12. Creditation

Each student receives a certificate of completing the programme. It is not an official certificate, and it does not entail any university or college credit value, but in the higher education admission process universities take them into account as documents proving the outstanding capacity of the student and, as such, the certificates are very important in the subsequent progress of gifted secondary school students attending the camps.

2.13. Financial aspects

2.13.1. General revenue/expense items

The camps and the whole programme have expenses and revenues. Of those Wagner (2003) stressed the following:

a) Expenditures
   - -maintenance and operation of the central programme organisation[4]
   - -summer camps
     - accommodation and other premises
     - staff costs
       - camp leader
       - invited tutors (tutorial fee, meals, travel expenses)
       - course leaders
       - other staff
     - materials, technical devices required for the courses
     - health services
     - transportation
b) Fixed and potential revenues
   - contributions paid by the participants
   - central budget financing
   - sponsors.

In the DSA system the students invited to the camp must cover the costs of accommodation and meals, but everything else (e.g., travel costs, tutorial wages, costs of organisation and maintenance of the camps) are covered from the resources of the federal government allocated to the programme (Wagner–Neber–Heller 1995). The costs of the means-tested students, however, are covered from the central budget, even in 100%, depending on the degree of eligibility, and therefore it cannot happen that a gifted student is left out from the talent camp purely thanks to financial reasons.

2.13.2. Remuneration of programme managers and tutors

We do not have any information about the remuneration of programme managers and camp managers. The course leaders pick up only a small amount for their work. Even so, the system has been active for several decades, because according to young scientists and secondary school students the main remuneration is the ability to work with gifted students, the professional stimulating power involved in it, as well as the ability to study the special attitude of young talented students and similar factors. The fact that tutors do not only say it, but in fact it is so in reality and it is how they experience it, is also confirmed by the

[4] This item cannot be underestimated, because this itself absorbs half of the total annual budget (Wagner–Neber–Heller 1995).

very low tutorial fluctuation with the years: each year only 10–15 tutors change within the whole staff.

2.14. Camp sites

Experience shows that camps should be located in or around university towns, in a secondary school or university dormitory building. It is important, but according to experience not always feasible, to select a site that is suitable for conducting courses requiring laboratory work and which contains sports facilities, too, while being not far from the nature (in fact, if possible, the camp is located in a natural environment, where there is an area or room suitable for camp meetings for the delivery of presentations – access to computer and projectors, adequate location for interested camp or even external audience, etc.).

2.15. Steps towards the internationalisation of the programme

For the developers and operators of national talent support programmes, one of the main issues requiring consideration is almost always whether to keep the programme developed and operated by them as a national programme, or to internationalise it based on some principles. Basically, there may be two types of internationalisation of a talent support programme: the programme could be "exported" (like a franchise or in some other way) or gifted participants can be "imported" into a specific programme from other countries. In the first case a talent support programme is sold or transferred to other countries, into a different educational environment, by creating a kind of branch programme in addition to the original programme, preserving or changing its original profile to an extent varying by programme, or the programme is originally designed and operated so as to enable its national programme segments to be continued also in other countries forming a network (one of a typical examples of that option is the Hungarian talent network programme), or the programme could originally be designed for an international market. In the case of another method of internationalisation of the talent programmes, the programme itself remains within a particular country, but talents are invited to join it from other countries (naturally based on a set of criteria clearly articulated towards them, too, and by forming an adequate legal financial logistic, etc. environment for them). Occasionally further methods are also used for the internationalisation of talent programmes, including e.g., the co-operation of previously independent talent programmes of two separate countries, and naturally there could be other forms, too.

The developers of the DSA programme considered it was time to internationalise their talent support system at the turn of the millennium: since 2003, their programme has been extended by at least one international talent support camp as well. The DSA program owners opted for the 'importing' method of internationalisation, i.e. they organise the international DSA camps in Germany, but recruit students for one or two camps from abroad each year. The international camps are truly popular among international students: e.g., in the year of the preparation of this chapter (2012) two such camps were launched by the DSA, one in Wardenburg and the other one in Torgelow, and they did not find it difficult to fill them with gifted students at all. Hungarian students also attended the DSA international camps on several occasions; Hungarian participants representing the Researching Students movement founded by Péter Csermely attended the camps of the programme already at the end of the 1990s, before the true internationalisation of the German programme began.

There is a language restriction meaning that only such gifted students are invited to DSA camps from abroad who speak German fluently (definitely in the scientific discipline in which they are talented). While we consider this requirement natural, because nobody would be able to participate in a programme requiring intensive involvement and outstanding performance without high level language skills, it is not difficult to notice the underlying attempts for brain draining[5]. It is obvious that a gifted individual speaking German fluently who will find it much easier to integrate into such a new working environment (i.e. will be able to work more effectively) due to his language skills, can be invited later to join a German workplace.

Another factor that needs to be noted is that although a language restriction such as the one applied by the DSA is understandable and natural, it can be restrictive and excluding (causing losses both to the programme and to potential participants). It could be harmful for the programme, because the organisers cannot select from all potential gifted students since their choice is limited to those gifted students who speak German properly. And the programme can also be excluding towards gifted students, because occasionally a gifted student (coming from a more affluent family) who did not have to face any barriers in learning German as a foreign language could have a better chance to join the programme than other students having similar intellectual capabilities in the

[5] Which of course can almost always be noted in some form or another in the case of internationalised talent programmes.

specific talent field, but unable to learn German as a foreign language either at school or outside of it (financially supported by the family).

The plans included another direction for the internationalisation of the DSA programme, but unfortunately those attempts died with the first attempt. Harald Wagner recalls (Wagner 2003) and Volker Brandt mentions (Brandt 2010) that a joint German-Israeli student academy programme was planned for 2001. The camp would have been organised around four main topics:

- Euclidean and non-Euclidean geometry;
- The changing world and the dynamics of life;
- Special world of electrons: introduction to quantum mechanics;
- The role of values in the natural sciences.

Of the four courses indicated above, two courses would have been led by German and the other two by Israeli experts for 32 German and 32 Israeli gifted students. However, the programme had to be postponed due to the wave of violence that reached its peak in that period (the Arab-Israeli conflict), and as far as we understand it has not been implemented ever since; the DSA organisers have not launched any similar programme in the framework of any other international co-operation since then.

3. Differences between the initial model and the DSA system

Before summarising the talent support lessons of the DSA, let us take a quick look at the differences between the American talent camps described briefly and the DSA:

1. The American model is primarily based on the talent development work of one university, and although it is rather widespread, it still relates to the Johns Hopkins University and private sponsors, as well as business organisations acting as sponsors, etc. The DSA is run primarily by the highest-level official and technical institutions of national education policy, and the other stakeholders are only behind and beside them.

2. In the American programme, talent selection is based on the results of an annual talent selection subject (mathematics) test, organised for a large number of students each year (and other measuring options relate to it). Consequently, all students can be positioned on a talented/average scale in a single system. This form of talent identification relying on a solid, standard, basis for comparisons is not available in the German DSA or in most similar talent support camps of other countries, where the measurements are based on less solid and standardised forms.

3. The German model is related primarily to teachers and schools (see talent identification/recommendation system in DSA), while the American system is related primarily to the gifted students.
4. The activities of American children conducted in talent camps are acknowledged with higher education credits.
5. In the German model the quality of training in camps is much higher than the quality of training at school. Among other things, this is also guaranteed by the fact that in the German model the teaching staff consists of senior lecturers, Ph.D. students, young doctors and senior researchers, while in the American model typically MA students act as teachers.
6. One of the main objective of the American programme is to deepen the knowledge of students: to go into more details of the subject materials taught at school. The fundamental talent-enriching principle of the German programme is the supply of independent knowledge, instead of providing additional tuition of the subject material.
7. The activities of the American camps are supported by assistants as well, such as leisure time organisers, etc.

IV. SUMMARY

Summer or holiday camps organised for gifted students are an extremely important and effective extra-curricular form of talent support Feldhusen (1991) lists the following advantages of such camps: gifted students can make faster progress in such talent support programmes; they can go deeper into the subject material; students can learn at higher theoretical level; real research can be conducted; gifted students can establish interaction with real content with other talents in their own respective fields; the teacher expectations are higher than the ordinary expectations, and the topics may differ, even significantly, from the ordinary topics. The original American programme presented in this chapter and its German adaptation contains all advantages listed herein.

Based on Callahan and Hunsacker (1991), Heller (1995) specified approximately 14 criteria for evaluating the programmes designed for the development of gifted students, including also summer residential talent camps. Below there is a summary and evaluation of the DSA camps based on his system.

1. *Programme definition:* Gifted students may be trained in the summer, in residential camps, primarily in intellectual and academic fields.

2. *Programme philosophy:* Special talent support forms need to be built for the intellectually gifted children that could be truly effective for them. Although they are based on segregation and extra-curricular activities pursued in leisure time, in order to ideally develop intellectual talents, the same opportunities must be provided even if many are against, or at least ambivalent to, segregation and talent programmes using the free time of children.

3. *Identification of gifted students for the camp:* It is effective, but slightly uncertain. Only the most motivated and most talented children can complete the camp, but as in Germany there are no such standard tests available for selecting gifted students as in the US, experts have to use several talent identification methods that complement each other and do not have a standard base.[6] Apart from the basic criteria, the programme

[6] The talent identification procedures applied during the organisation of international DSA camps are even less certain, because it is not possible to use the same parameters to select gifted students in each country.

organisers need to apply supplementary ones based on the representation of social justice and other considerations (e.g., adequate proportion of girls and boys).

4. *Programme objectives:* In order to optimise the capabilities of intellectually gifted children, the objective is to create the most effective pedagogical environment imposing intellectual and social challenges, with the help of outstanding teachers, for the purposes of extra-curricular development in a phase of the year when children are not involved in school activities.

5. *Objectives of the gifted students:* To have access to study opportunities exceeding by far the ones offered at the schools in the intellectual fields of their interest by getting to know other gifted students and working together with them.

6. *Curriculum:* It provides a lot more opportunities for getting to know integrated, progressively combined complex knowledge fields than mainstream education. Thus, each course and part of the programme may represent pedagogical innovations themselves.

7. *Available knowledge sources:* Varies by topic and field.

8. *Budget:* It is not the cheapest form of talent support. Central and national co-ordination requires a lot of funding. It is important that children and families also contribute to the costs of the programme, but it is even more important to make sure that no gifted student should be left out purely for financial reasons. Sponsors, entrepreneurs, industrial and profit-oriented research institutions must definitely be involved in the national and local financing of the programme.

9. *Measurement of programme efficiency:* Practically, it is not feasible, because so many parameters should be taken into account that would make it impossible to assess the impact of the camp on its own. Consequently, efficiency may be measured with qualitative research measuring "success rates" based on anecdotic statements.

10. *Programme control:* The programme requires national and local control, organisation and co-ordination. The organisation of the camps of one summer requires a 12-month input from a central and a local staff.

11. *Educational techniques and strategies:* 20 years ago when the German programme was launched, the pedagogical methods applied in camp

work where progressive and innovative: project work, teamwork, etc. In today's pedagogy they are well-established methods, widely used also in mainstream education. However, it is important to note that all course leaders are individuals having outstanding special knowledge and results, but they are not necessarily formally trained teachers and may not have extensive, spontaneously gained knowledge in that field. Still, such course managers can work very effectively also in pedagogical aspects. The fact that some of them (perhaps quite a few) do not have teaching qualifications may have a positive impact, but it may also weaken the potentially attainable camp results.

12. *Programme opportunities:* A wide range of truly enriching opportunities (music, sports, social activities, excursions, etc.).

13. *Interconnectivity of the programme components:* In the original programme the individual courses were independent from each other in terms of themes. But, as mentioned above, this talent support form does not exclude the interconnectivity of themes, e.g. a camp may have a central academic topic which comes up in each course. Similarly, all courses may have components in which children work with the social, ethic, environmental effects of a particular topic or similar aspects.

14. *Staff*: Apart from central organisers there is a need also for local organisers, a camp manager, an administrative deputy, a person responsible for supplementary programmes and two teachers with special knowledge in each course. In the German system, assuming 10–12 camps, this requires the activities of approximately 120 individuals each year, some of whom work throughout the year, but most of whom work through one or two courses.

As the American and German examples presented in this chapter show, a summer academic talent camp is an excellent opportunity for talent support. Naturally, it cannot satisfy all needs in the education of intellectually talented students, because a lot of other individual and group opportunities are needed to develop the capabilities of intellectually gifted people (e.g., research institution activities, scientific student conferences, local, national and international contests organised in academic fields, university courses brought forward and lots of other activities), but there is no doubt that this form has great benefits both for learning and from social aspects. Another advantage is, as indicated earlier, that if designed well, this form of development could work effectively even for decades.

BIBLIOGRAPHY

Brandt, V. (2010): *Verbal statement.*

Brandt, V.–Klein, J.–Kunze, Ch. (eds) (2012): *Deutsche SchülerAkademie: Program 2012.* Bonn: Bundesministerium für Bildung und Forschung.

Callahan, C. M.–Hunsacker, S. L. (1991): Evaluation of acceleration programs. In Southern, W. T.–Jones, E. D. (eds.): *The Academic Acceleration of Gifted Children*. Teachers College, New York, 181–206.

Csermely, P.–Korcsmáros, T.–Lederman, L. (eds) (2005): *Science Education: Talent Recruitment and Public Understanding*. NATO Science Series: IOS Press.

Feldhusen, J. (1991): Saturday and summer programs. In Colangelo, N.–Davis, G. B. (eds): *Handbook of Gifted Education*. Love, Denver, 69–82.

Heller, K. A. (1995): Evaluation of programs for the gifted. In Katzko, M. W.–Mönks, F. J. (eds): *Nurturing Talent; Individual Needs and Social Ability*. Van Gorcum, Assen, 264–268.

Hornyák, B. (2012): MYCamp: Millennium Youth Camp for young researchers in Finland. In Gordon Győri, J. (ed.) (2012): *International Horizon of Talent Support I. Good Practices Within and Outside the European Union* MATEHETSZ Géniusz Projekt Iroda, Budapest.

Krah, N.–Günther, J.–Brandt, V. (eds) (2008): *Dokumentation zur Akademie Steinmühle 2007-4.* Deutsche SchülerAkademie, Bonn-Bad Godesberg.

Nagy, T.–Gordon Győri, J. (2012): The present of the German talent support in the light of a talent support model. In Gordon Győri, J. (ed.) (2011): *International Horizon of Talent Support I. Good Practices Within and Outside the European Union, I.* MATEHETSZ Géniusz Projekt Iroda, Budapest, 143–164.

Olszewski-Kubilius, P. (1997): Special summer and Saturday programs for gifted students. In Colangelo, N. – Davis, G. (eds): *Handbook of Gifted Education.* 2nd. ed. Allyn and Bacon, Boston, 180–188.

Wagner, H. (2003): Talent development in residential summer programmes. In Csermely, P. – Korcsmáros, T. – Lederman, L. (eds): *Science Education: Talent Recruitment and Public Understanding.* NATO Science Series: IOS Press, 117–128.

Wagner, H.–Neber, H.–Heller, K. A. (1995): The BundesSchülerAkademie: A residential program for gifted adolescents in Germany. In Katzko, M. W.–

Mönks, F. J. (eds): *Nurturing Talent; Individual Needs and Social Ability*. Van Gorcum, Assen, 281–291.

Websites

BAföG website: http://www.bafoeg.bmbf.de (Downloaded: 21 August, 2012.)
Deutsche SchülerAkademie website: http://www.deutsche-schuelerakademie .de/dsa_empfehlung_1.php (Downloaded: 17 August, 2012.)
Deutsche JuniorAkademien website: http://www.deutsche-juniorakademien .de (Downloaded: 21 August, 2012.)

Andrea Frank–János Gordon Győri

Freedom and Creativity –
Programmes of the Israel Center for Excellence through Education

"We live here, in this country. We have no choice, but to use our wits. If we lived in a rainforest, we would not need this drip irrigation system to grow flowers. But without water, you devise a solution to make the desert bloom. We don't just teach our children to pass tests, we want them to be creative like you, to be considered for Nobel Prizes like you. Lacking natural resources, our only major exportable resource is brainpower."

(Hezki Arieli, Director of ICEE)

The following chapter presents the talent support activity of an Israeli private foundation which strives to trigger quality changes in education and society through the children it develops.

I. TALENT SUPPORT IN ISRAEL: THE PAST

Theories on the nature of talent as well as the various forms of talent support go back to the civilisations of Antiquity (Gyarmathy 2006), but the majority targeted relatively narrow groups of society. It was only in the 20th century, after the American "Sputnik Shock" of 1958, that the leading actors of economic and educational policy turned more intensively to talent support, so much that in certain countries talent development became a strategic issue.

Being a small country, relatively poor in natural resources, the new state of Israel proclaimed in 1948 belonged to the latter group: the first talent support programmes were launched somewhat more than a decade after its foundation. Why this delay? Firstly, the young state was at war with the neighbouring Arab countries from the very start; it had to wage two wars to survive in the following decade and, at the same time, there was a steady inflow of immigrants whose so-

cial integration absorbed immense resources. Secondly, the new country had to develop its infrastructure and create a new system of health care and education first.

Moreover, the effect of the egalitarian ideology typical of Israel in the early years and the consequent emphasis on equality and neglect of the differences in educational needs due to the different gifts/abilities of children may also have contributed to the delay. The subsequent change in approach in politics and in the economy – a shift in favour of market economy and democratisation – manifested itself also in educational policy: it was realised that genuine equality could only be secured by providing equal chances commensurate with the different abilities of the persons concerned, i.e. by compensating for any disadvantages and by providing, at the same time, an adequate framework for unfolding the abilities of the talented (Gordon Győri–Frank–Kovács 2011).

The first official talent support programmes dating from 1961 are associated with the name of Professor Moshe Smilansky. Besides the development of the students, his projects drove the attention of society to gifted pupils in a disadvantageous situation, struggling with learning difficulties (Smilansky–Smilansky 1967). His programmes raised considerable attention globally, and the follow-up surveys confirmed his point: the teenager participants of the programmes who had suffered from many problems put to use what they had learned there very well, and they became creative adults, leaders in their respective professional fields. In consideration of the results, some universities took an interest in gifted secondary school students, and afternoon activities were organised for them at more and more places.

However, it was only from the early 1970s on that support for the gifted children gained a real impetus: in 1971, the Minister of Education declared in a speech held at the Knesset that every child, including the gifted, had the right to unfold his/her abilities to the maximum. Soon after, two talent classes were created in Tel Aviv as a pilot (Burg 1992), and then the Department of Gifted Children was set up at the Ministry of Education under the leadership of Dan Bitan in 1973. Bitan was also one of the chief organisers and the first president of the World Council for Gifted and Talented Children (WCGTC) formed at that time and joined by Hungary in 2011. Under the effect of the WCGTC, many programmes were launched globally to educate gifted children, and Israel, although a small country, was in the vanguard when it came to the introduction of various forms of talent support (Burg 1992).

II. THE PRESENT

Today the talent support programmes for gifted children are co-ordinated professionally, financially and in terms of organisation by the Department of Gifted Children of the Israel Ministry of Education. As part of the effort, the Department has a certain insight also into the non-public programmes maintained from private or foundation sources. The staff nurtures contacts with the school principals, the local educational committees, the colleges and universities in Israel and abroad. Besides talent development, the Department promotes that talented persons should unfold their talents for the benefit of society. Instead of central curricula, the Ministry issues guidelines to harmonise talent support activities while granting the institutions concerned considerable freedom in regard of the selection of the educational content and the methods.

1. Talent identification in Israel

Israel was no exception to the initial global trend of identifying talent by its component easiest to measure, i.e. intellectual qualities (Gordon Győri 2004). Once Israel had realised the importance of talent support in the 1970s, it institutionalised national screening based primarily on intelligence tests which could be made quickly and yielded unambiguous and comparable results. Nevertheless, the underlying uni-dimensional talent concept has been criticised from the start by several professionals in favour of the multi-dimensional approach considering also other criteria (motivation, creativity) for identification. Although the Ministry of Education took up position in favour of the broader concept on two occasions, in 1988 and in 1995, the method of selection has not been altered to this day (Milgram 2000).

For decades, Israel has conducted nation-wide talent screening in primary school Grade 2 (for Arab children, in Grade 3). Testing has been supervised by a private institution, the Szold Institute. Internationally well-known intelligence tests and exercise series examining reading literacy and logical thinking are used for the assessment. The process has two stages. First every pupil takes part in talent identification at his/her own school, then the top 15% is subjected to a second round where their abilities are assessed again, and the best performers are offered participation in various talent support programmes. Children suffering

from learning difficulties are also given special attention, e.g. they have more time to do the exercises and new immigrants can write the tests in their mother tongue.

The top 1–3% of pupils attaining the best results are called "gifted"; they are followed by the next 3–8% who make up the group of "talented" pupils. The testing process itself is, closed: neither the parents, nor the teachers see the test papers, they are informed only of the results and hence there is no appeal either. If parents disagree with the decision of the Szold Institute, they can ask the Ministry of Education to repeat the procedure at a later date (Gordon Győri–Frank–Kovács 2011).

2. Talent support programmes

Talent support in Israel today is most colourful. The decisive majority of its forms is supervised and financed by the Ministry of Education – with major differences in the extent of funding. Institutions and systems maintained from private or foundation funds may also receive (8–10%) support from the state, and institutions maintained by the Ministry of Education and the local municipalities can also request parent contribution and accept donations and foundation payments. Irrespective of its funding structure, every talent support institution strives to give grants to the under-privileged. Almost 1,500 children take part in development programmes within the system of state-funded talent support, and several times that many in foundation programmes (Rachmel 2010; Heem-Younes–Freedman 2006; Landau 2010; Rashi Foundation 2010).

Talent support programmes can be classified by several criteria, e.g. intra- and extra-scholarly forms; programmes based primarily on public/private funds, and by the level of abilities, i.e. gifted or talented children. The figures below show the programmes for the development of the gifted (*Figure 1*), and for the talented (*Figure 2*).

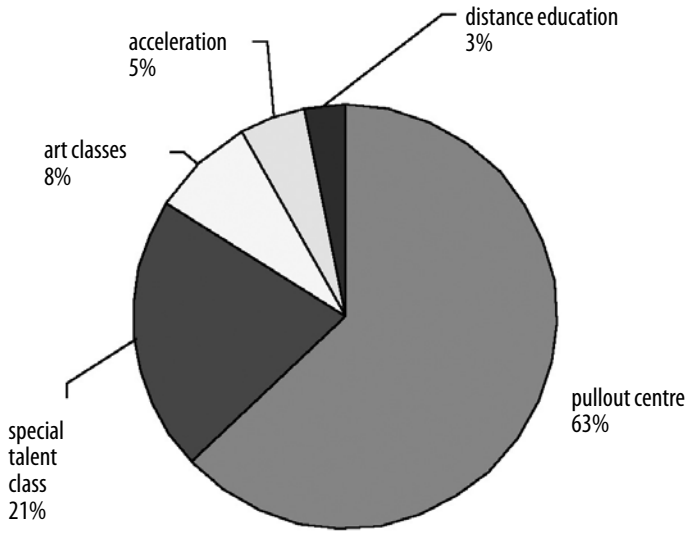


Figure 1. Forms of the development of gifted students in Israel (based on Rachmel 2010)

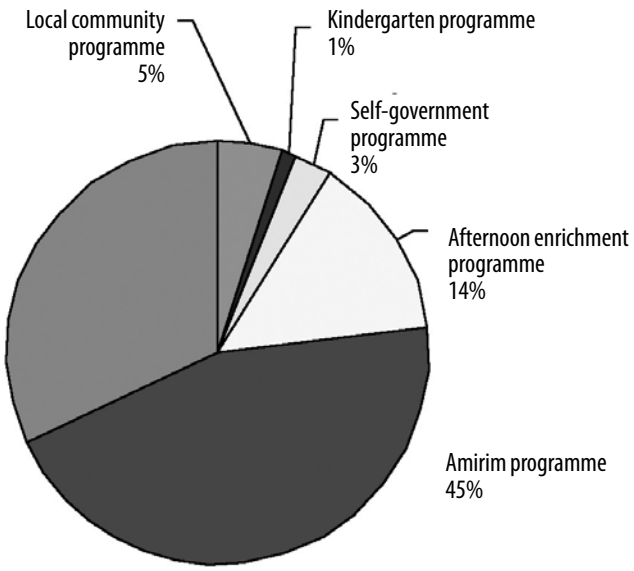


Figure 2. Forms of the development of the talented students in Israel (based on Rachmel 2010)

Volume I of the *International Horizon of Talent Support* presented the operation of the mainly publicly funded pull-out talent support centres organised for gifted children by the Department of Gifted Children of the Israel Ministry of Education (Gordon Győri–Frank–Kovács 2011). This chapter will present a private enterprise created on the ground of the critique of public talent support more than two decades ago, which has grown into a global organisation by now.

3. The Israel Center for Excellence through Education (ICEE)

The ICEE was founded in 1987 to develop the talent, creativity and management skills of students coming from the most diverse social backgrounds to the school environment. The ICEE's programmes cover a total of around 10,000 children; the organisation maintains a secondary school (Israel Arts and Science Academy) and a talent support programme (Excellence 2000). Its goal is no less than to raise the desire for quality and excellence in education in students and teachers alike.

In spite of its good international reputation, the PISA results of the Israeli system of education are not particularly good: in most fields, Israeli students are only in the medium brackets or lower among the countries subjected to the assessment (Hemmings 2010). Moreover, one can hear many stories of the deficiencies of the school system also in conversations with everyday people and with teachers. Here is what a typical parent says: *"This Israeli epidemic is a tragedy: mediocre teachers, undisciplined students, careless parents, merciless bureaucrats, a dull curriculum, poorly equipped classrooms and schools of a fast-declining quality"* (Troy 2011).

The Excellence programme was created in response to such criticism. The public talent support concept, in effect for almost a decade, had a considerable impact on the guidelines, but the ICEE's "founding fathers" intended to set out in the opposite direction. As mentioned already, the public system identifies gifted children at a very early age, with intelligence tests, channelling the top 5% to the support programmes. Due to their fundamental objections to this system, according to Hezki Arieli, Director of the ICEE (Hoffmann 2009), the designers of Excellence have always refrained from using the term "gifted" and applied "excellence" instead. They considered it a more accurate expression of the essence, namely the combination of outstanding abilities, motivation and interest. Initially, they used no intelligence tests either to select children for the programme, since they proclaimed that motivation and interest were more important indicators than IQ (today they already use such tests, as well as part of the complex identification process).

The ICEE pays particular attention to developing tools and methods through which they can motivate excellent children whose abilities often remain undisclosed in the educational system. They firmly believe that support for excellence in the schools will raise the quality of the entire educational system.

General objectives expressed by the ICEE are to:

- develop and motivate talented students to empower them to think and be innovative;
- train the local teaching staffs;
- increase the value and importance of excellence in the schools; and
- in the entire educational system.

In the opinion of Hezki Arieli (Arieli 2010), it is also important to provide equal opportunities to every student and to every institution of education. There are many programmes also for school principals, teachers and parents, designed to ensure that they should be able to use what they learned there amidst their different circumstances (Heem-Younes–Freedman 2006).

3.1. The secondary school operated by the ICEE: Israel Arts and Science Academy (IASA)

Secondary education has two levels in Israel: three years of lower secondary school is followed by three-years of upper secondary school. The Israel Arts and Science Academy located in Jerusalem and founded by the ICEE in 1990 to educate the talented students of the country belongs to the latter category. To be admitted to the institution, students must excel in natural sciences and humanities, in music, and in visual arts. The composition of students is quite varied: they come from all social groups. The school considers it its mission

- to provide a model example in Israel and globally;
- to co-operate with the universities and with other research institutes;
- to promote creativity, artistic vision, and the ability to do independent research; and
- to emphasise social responsibility through voluntary work and the development of management skills.

One distinctive feature of the school is that it educates children talented in the academic areas and in arts together. The relevant literature knows of many researches on the impact of arts on cognitive development (see e.g. Barkóczi–Pléh 1977; Gévayné Janurik 2010; Gyarmathy 2011). Besides the aesthetic and affective effects of listening to music or actively playing it, there are also some transfer

effects boosting the development of the understanding skills. In a longitudinal study, Zanutto (1997, quoted in Gávayné 2010) monitored the development of the study results of his instrumentalist students for five years, and found that they had better results in mathematics and the natural sciences in the annual measurements than their peers who did not learn music in every school year under study.

Guidelines of the IASA: Excellence and equality – these apparently contradictory notions are at the basis of the credo of the school. The IASA believes that people are born with different gifts, and there are some pupils/students who strive to achieve excellence and should therefore be assisted to realise their goals. But they are also convinced that students striving for excellence may come from any social group, and they consider it their mission to open the way to excellence for all. Around 10% of the students are Arabs; an equal proportion comes from Orthodox schools, and 20% is immigrant. More than 80% of the 200 students studying at the IASA now have grants.

What does the IASA regard as excellence? As expressed by a teacher of the institution (Erez 2003), "Excellence can be approached from many aspects. It can be regarded as talent or as a state. In the approach stressing passivity the talented child differs from his classmates in that he can master more educational content, but no activity is presumed on his/her part. Another problem is that this approach assigns every other student to the 'not talented' category. The other approach focuses on performance and, contrary to the previous one, it is not passive. An excellent student is one who shows the best performance when competing with his companions. However, it is a drawback of this approach that it tries to quantify the results, often representing them on the time axe. That is, a talented student is one who masters the same amount of educational content over a shorter period of time than his/her peers. The primary objective is perfectly memorising the knowledge acquired. This approach is very frequent in talent support, and the students concerned are labelled by Renzulli the 'school talents'. Nevertheless, the question arises whether in this fast-changing and developing world of ours, where the age of entering adulthood is being postponed, getting to the same point by covering the same road in a shorter time than one's peers will offer any genuine, social benefit."

The IASA's curriculum defines excellence primarily as creativity. Creativity is the capacity to interpret a problem in an original, idiosyncratic manner. It is the capacity to approach the question from various aspects. "The greatest creative discoveries often come from a fresh approach to an old problem" (Sternberg–Lubart 1992, quoted by Erez 2003). To use a sport metaphor, the IASA

wants to identify cross-country motorbike racers looking for their own, individual, courses and not car racers who are the first home on the race course. Excellence as they interpret it implies permanent dissatisfaction with yourself, with your performance. To be motivated to develop your skills and abilities constantly, you must never be fully satisfied with yourself, which in turn recurrently encourages you to intensify your performance, to upgrade your abilities (Józsa 2007). This steady striving for excellence is an internal driver that is particularly typical of talented children. It differs from that of the other students in intensity, but also in quality. Such students will not want to follow the well-known, well-trodden paths; they are ready to take risks and look for new courses (Rachmel–Zorman 2003). The IASA secondary school looks for and expects students of this type.

However, since it is not easy to identify prospective talents, they have worked out the *Discovery Program* based on the observations and work of local teachers who have to select the top 10% of the best learners and engage them in scientific and mathematics enrichment programmes to develop and observe them. The talent support programme "Excellence 2000" has evolved from the Discovery Programme. One of the key principles of the IASA is that it is imperative to have a sufficient degree of freedom for the development, in both the active and the passive sense of creativity. Outstanding performance may be reached also if the student can move only within a narrow educational scope defined for him/her, but that is seldom innovative: the goal there is that the student should reproduce what he/she learned as accurately as possible. The traditional examination system also acts against creative learning. Students encouraged to redefine problems, to approach them in a special way, may easily commit errors, since it is quite possible that they will not find the 'right' answer (the one expected and regarded as the only one by the examiner). That is, if you want to educate your students to be creative, you have to alter the methods of education as well as the evaluation processes and tools (Erez 2003).

Freedom referred to above is, of course, not unlimited, it does not take responsibility off the teacher's shoulders, but it is of the extent that leaves the student the option of choice. The function of the teacher is to set a direction, to offer interesting educational contents and devices, options, and to let the student process that content on his/her own. Freedom is important also to enhance the sense of responsibility. One cannot be responsible for something unless you have the opportunity to take decisions. If students are given freedom in the learning process, they will also assume responsibility for learning.

According to the IASA guidelines, the paternalistic approach, i.e. the concept that the teacher is to show the student the right way, should be given up. With

that approach, students learn on the basis of the experience of the teacher, without learning and knowledge based on their own experiences, including errors. There are of course many areas where this is the right attitude. For example, there is no need for the student to experience an electric shock to learn the laws of physics. Or to experience drug addiction to be aware of the detrimental effects of drugs. In most fields, however, where there are no such risks, the paternalistic approach prevents intensive, personal learning. Learning based on trials and errors promotes the intellectual processing of the material at hand and, moreover, it creates emotional involvement. Therefore, permitting errors is a key principle of the IASA secondary school.

Our understanding of the correlation between freedom and creativity can be enhanced by the distinction made by Diezmann and Waters (2000) between evolutionary and revolutionary thinkers. With its limited degree of freedom, the educational system gives preference to evolutionary-type thinkers. Revolution, however, in inconceivable without freedom. In revolutionary thinking, the freedom of making mistakes is a must: the revolutionary changes of mankind, the same as the revolutions themselves, derive, so to say, from mistakes. The paternalistic approach permitting no errors gives ground for thoughts which fit into the mainstream, which are always evolutionary, but never revolutionary (Erez 2003).

In connection with the above, the IASA's developers had to face the question – reiterated in almost every talent support programme – whether the teacher acting as talent developer is to be talented himself. The answer of the IASA secondary school is a definite "NO". In their opinion, the teacher aspiring to boost student creativity must assume that his students are more intelligent than he himself. Of course, there is no need to actually test that objectively; this is more about the frame of mind of the teacher. For a teacher working with talents, to be able to help his students find their way, to be able to check his inclination to force his way and ideas on them, he must believe that his students are more intelligent than he is. Should he not adopt that attitude, he cannot provide his students sufficient elbow room.

What is the goal of the scientific education of talented children at the IASA? On the one hand, to expand their scientific knowledge; on the other, to boost their creativity. When it comes to creativity development, the arts represent an efficient means. At the IASA secondary school, students focus on scientific research and on arts within the walls of the same institution, based on the observation that arts have a positive effect on scientific creativity. Some students may even combine these studies, and hence they can transfer knowledge and experience acquired in the field of arts to the sciences or *vice versa*. For example, if they learn that a daring approach is effective in the first area, they may apply that knowledge to their experiments.

It is a long-debated topic whether it is more expedient to provide relatively superficial knowledge over a broad spectrum or specialised, but deep knowledge over a much narrower one. The first approach has the advantage of offering an outlook on several scientific fields. Its disadvantage is that such knowledge is superficial and the fields concerned are not interconnected, except for such disciplines which are close to one another anyway, as e.g. physics and chemistry. Another drawback is that students focusing on several fields have no time to absorb in a field, and lack of time is often conducive in learning to the simple rendering of what the teacher presented, this being the least time-intensive form. This form of education expands knowledge, but not necessarily understanding.

The other approach, the one stressing immersion in one field, may lead to creative, autonomous learning. The IASA curriculum has adopted the second approach. Students learn by trials and errors, a rather time-consuming method limiting the potential fields of study to a few. Teachers must train themselves to permit and accept errors, instead of adhering to the paternalistic approach of protecting the child from committing errors on the pretext of saving him from the concurrent frustrations. Learning from errors is an essential component of autonomous learning. The drawback of this approach is its relatively narrower horizon, and that students have to choose the field in which they want to specialize relatively early.

Besides innovation, the IASA values the preservation of the traditions and respect for culture. Consequently, every field of science is taught within its historical, philosophical and sociological context, the relevant ethical problems included. The secondary school has a twofold aim with this approach: to educate specialists with a thorough knowledge of their field, but who are also broad-minded and socially and morally sensitive.

House of Sciences Programme: The House of Sciences programme, under which science students may choose one of the three traditional disciplines of experimental science (chemistry, biology and physics) as their major subject for the following three years, was launched for the above purpose. Students make their choice with the support of the teachers after a preparatory course. They devote approximately 10 lessons a week to their major subject, twice the amount of time granted by the core programme. During the extra lessons, instead of covering new segments of the relevant material, they deepen their knowledge. They treat ethical issues and learn research methodology (academic reading/writing, research plan design). In the second year, they draw up independent research programmes in groups of 3 or 4. In the same year, they study two more fields of science, but only to the extent required by their major subject; for example, a student majoring in biology will learn biochemistry and biophysics and acquire

information also on the ethical dilemmas of the fields concerned, e.g. genetic engineering or human cloning. Programme design takes into consideration the age-specific features, the maturity of the students. In the following (12th) grade, they do interdisciplinary research combining all three fields of science and test the philosophical and sociological paradigms through scientific research. The teachers of the scientific and humanities subjects co-operate to arrive at the highest degree of integration of knowledge regarding the fields concerned.

Two-level interdisciplinary education at the IASA: The distinctive feature of creative thinking is probably the capability of approaching problems from an unusual aspect (Simonton 1999; Gyarmathy 2007); of identifying interconnections between apparently unrelated things. Interdisciplinary education is an excellent tool for developing this ability.

Interdisciplinary education is realised at the IASA secondary school at two levels. At Level 1, science and art students live together in the student hostel. (Until the past academic year, the secondary school operated exclusively as residential school – Arieli 2010). The underlying idea is that a student who is not interested in music, but shares an apartment with someone for whom music is the centre of life will become curious to know why his friend is so fascinated by music. He may even have musical experiences by listening to his friend's practicing or by going to his concerts. Such experiences may bring him closer to loving and understanding music.

Level 2, the really inter-disciplinary one, is that of the interdisciplinary educational programme. A good example is an optional course in Grade 12 exploring the great dilemmas of the human soul. Ten teachers are involved – this work requires exceptionally close co-operation on their part –, each an expert of his/her field, who look at the issues from their respective angles.

In sum, the IASA secondary school strives to create an educational environment to develop the entire personality of the student. Its programmes are designed to turn the talents they teach into people with great knowledge, capable of hard work, who are courageous, creative and also morally sensitive.

3.2. The Excellence 2000 (E2K) Programme

Excellence 2000 was designed on the basis of a very different philosophy from segmentation, the predominant approach in Israeli talent support in the beginning, and different also from the otherwise deservedly popular pull-out philosophy (Rachmel 2010; Gordon Győri–Frank–Kovács 2011). In the pull-out centres characterised by partial segregation as opposed to the talent classes developing talented children in complete isolation from the average ones, the se-

lected children are taken to a talent support centre once a week, during the school hours, where they can participate in many interesting programmes. On the other days of the week, they study together with their classmates who have average abilities. The latter see that the selected children disappear once a week, and it is up to the personal attitude, motivation of the latter to what extent they share with their mates what they learn and experience at the pull-out centre.

The designers of the Excellence 2000 programme did not want to pull out the talented students either fully or partly from among their peers, so they took the talent support programme to the school. The enrichment classes take place in the morning, so they are integrated in school life as organically as possible. Although participation in the Excellence 2000 programme is also conditional on talent identification, a larger student group (the top 10%) is selected than in public education.

The programmes focus first and foremost on the development of mathematical and scientific thinking, but their talent-pedagogical objectives in the broader sense are also important. The objectives are summed up in 9 points:

1. appreciating excellence, encouraging creativity and educational leadership among students while providing equal opportunity to all segments of the population;
2. taking the student as a thinking, initiating and creating person;
3. posing challenges to the students and encouraging depth and realization of potential;
4. providing students with the tools for developing scientific and mathematical thought;
5. enhancing student motivation to understand natural phenomenon through research and experiment;
6. providing the students with professional tools and knowledge in the arts and encouraging self-expression;
7. encouraging the student to strive for excellence and advance to higher academic levels;
8. empowering teachers and assisting in changing teaching patterns so that research, experiment and teacher-guided self-study are integrated; and
9. strengthening the local school system as a result of strengthening and integrating the strive for excellence in students and teachers participating in the program.

The objectives are periodically adjusted to keep up with the times and the needs of the changing children. The core objectives are the same, but new emphases are added from time to time. Today, the aims are much wider and the main goal is to influence the teaching and learning culture in the schools while developing and integrating school excellence.

At the moment, the programmes have four parts:

1. training of the local school staff by the Society for Excellence through Education;
2. a unique learning program providing literature on various subjects not studied in the regular curriculum. This program was developed by the Society for Excellence through Education;
3. an enrichment program including a wide variety of supplementary activities with the aim of deepening and diversifying knowledge; and
4. summer camp for eighth-grade graduates who participated in the program throughout the year.

3.2.1. From the Discovery Programme to Excellence 2000

Excellence 2000 has run for 16 years in its current form. In the 10 years preceding this period, it was called Discovery Programme, and its goal was to develop the mathematical and scientific thinking of students not admitted to the talent support programmes due to their disadvantageous situation, or who lived very far away, near the frontiers of the country or in the desert. In the course of this programme, students got acquainted with the arts and with other fields of culture. The programme covered three years, lower-secondary-school grades 7–9. At that time, the prospective students of the IASA secondary school also came from among the participants of the programme. In the past years, the programme underwent many changes – that is why its name was also changed to Excellence 2000 –, and it has become very widespread. In 2006, it was on in 150 schools, with the participation of 500 teachers and 8,000 children. There has been a permanent marked need for the programme. It was introduced in primary school grades 5–6 and upper secondary school grades 10–11 in several institutions.

3.2.2. Students participating in Excellence 2000

At the start of the programme, no tests were made to identify students. Two months after starting school, teachers had to identify the students to be sent to the programme on the basis of the following criteria:

1. high academic achievement;
2. high learning potential and a will to face new challenges;
3. exhibiting curiosity and creativity;
4. determination and willingness to invest above-average efforts; and
5. students commitment to take part in the program from start to finish.

Motivation was regarded as the prime criterion. By now, the Szold Institute has joined in the selection process: in Grades 7 and 8 they make tests with the students to investigate their mathematical and scientific thinking and motivation. The second step is a face-to-face interview conducted by a teacher participating in the programme to obtain a clearer view of the fields of interest of the student, and two questionnaires are completed, which are evaluated according to predefined criteria. Ten percent of students with the highest scores are recommended to the programme. That is, the Excellence organisation broke the 40-year practice of public talent identification, i.e. the screening of the most clever students in the Grade 2 population by intelligence tests, and joined the global trend characterised by the latest possible rating of the talented and by giving considerable weight to the observations of the teachers (Erez 2003).

3.2.3. The curriculum

The curriculum focuses on two main fields: mathematics and the sciences, devoting two classes weekly to the development of each. At the time of the pilot programme there was no written curriculum: teachers improvised in response to the needs of the students. Most teachers, however, devised no special curriculum, but taught the usual content in more depth or covered the materials of higher grades. Therefore, the developers of the programme wrote detailed curricula a few years later (Heem-Younes–Freedman 2006). They developed worksheets for the students, and they provided manuals, aids and training to teachers in addition to the detailed curricula.

3.2.4. The classes

There are 15 to 20 students in an Excellence 2000 class. This headcount is much lower than the normal one in Israeli education, which is often 40. The Excellence classes meet in 2×2 hours a week, with a two-hour block in the morning and an other in the afternoon. The morning date is important because it is meant to stress that the programme is part of school life, which makes it more attractive for the other students, and the participants feel a greater sense of pride for going there.

3.2.5. Supplementary programmes
To integrate the programme in school-life, several supplementary projects are implemented for the entire school:

Scientific Fun Days:
Students in the Excellence programme and their parents organise "fun days" for the other students. They report on what they learned during the year in interesting presentations.

Scientific Adventures:
Each of the participating schools may choose three programmes a year organised within or out of school. Their topics are related to the content processed in the previous year and they are meant to popularise the Excellence 2000 programme.

Ilan Ramon Sape Team Programme:
Schools participating in the Excellence programme for several years are given the possibility to join the programme organised by SEE (Society of Excellence through Education) in co-operation with the Asher Space Research Centre at Technion. Students listen to lectures, visit the observatory and the planetarium, and work at the research lab. Currently, 14 schools take part in the space programme; their teachers receive 28 hours of extra tuition and the students deal with space research in six hours a week.

Online Programmes:
Excellence 2000 organises online competitions and other virtual programmes in the country and abroad, for example for children at schools in America and in Singapore which have also adopted the programme.

Gildor Family Project:
This competition is announced annually for students in Grade 9. They have to create a scientific–technical product in which they can put to use knowledge acquired that far. This is also part of a national competition, the prize of which is awarded by the Gildor Foundation.

3.2.6. Teacher training

Teachers intending to join the programme must complete a 56-hour training course. Experienced and beginner teachers are trained apart. Excellence in the Teacher's Room, a pilot project, was launched nationally in 2007 for the other teachers and the principals of the schools participating in the programme, to

embed the Excellence 2000 programme more deeply into the life of the school and to make the teachers participating in it transfer their experience to their colleagues.

3.2.7. Excellence Advisors' Course

Together with the Ministry of Education and the Davidson Institute (located next to the Weizmann Institute), Excellence introduced a new project to boost the quality of the educational system. They invited the schools to nominate one member of the teaching staff to be responsible for the talented children at the school. These teachers take part in a two-year training concerning their own scientific field and also teaching methodology. The contributors of the course include the most excellent scientists, e.g. the staff members of the world-famous Weizmann Institute. The ICEE makes no secret of its intention that these highly trained teachers should then transfer their knowledge to their teacher colleagues.

3.2.8. Contacts with parents

The organisation gives particular attention to contacts with parents in order to have an effect on the micro-communities through the families. Moreover, they consider parental support key to the progress of the children. Parents are invited to many programmes during the academic year, where they can also hold presentations on their respective specialist fields.

3.2.9. Excellence 2000 for students coming from poorer countries

The programme offers immigrants from Ethiopia or from the Muslim countries of the former Soviet Union special classes. This programme segment helps overcome the differences in education and contributes to giving talents coming from poorer countries a possibility to continue their education in secondary school. In 2006, there were 11 such groups in the country; in 2007, another 13 were set up.

3.2.10. Excellence 2000 abroad

The ICEE designed its programme so as to make the licence easy to adapt in the countries which may buy it. The programme leaders have been in close contact from the start with the Research Institute for Science and Mathematics, Illinois, and some 2,000 students from several states of the US take part in the Excellence 2000 programme today. A pilot project has been launched in the recent years also in India.

The success of the programme is indicated by the fact that the E2K was purchased a few years ago also by Singapore, a country boasting a system of educa-

tion producing excellent results (Gordon Győri 2006), in acknowledgement of the fact that it provides children something that is missing from the Singaporean educational system, i.e. freedom and creativity. Co-operation between the professionals of Israel and Singapore started in 2008. Programme implementation took place in two phases in the Southeast Asian country: Phase 1 lasted from July 2009 to July 2010, and Phase 2 from July 2010 to April 2011. The programme was launched at 27 schools, with at least one E2K class in each. Forty teachers took part in in-service training to be prepared for the programme. The first part of the course was devoted to the first three parts of the curriculum, and they gained first-hand experience of the operation of the programme as "students". In the second part, during the learning process, teachers having been active in the programme for years transferred their experience. Sixty-seven teachers acquired qualification and 1500 students started the programme at 27 Singaporean schools altogether (including several GEP* schools in addition to schools based on the normal curriculum). The Israeli experts visited the schools concerned several times following the training, and they gave them permanent support and advice through virtual channels. Children participating in the Excellence 2000 programmes of the three countries have also been brought together at a natural sciences competition organised for them in 2010, and won by a team of one of the Singapore-based schools.

Singapore provided very positive feedback on the E2K programme. The teachers liked the open-ended problems where students had to design and implement the experiments, answer the questions freely – and they learned a lot by their errors in the meantime. Students became more open and able to learn also from one another. The greatest experience, however, was that they could do so without exam nerves or anxiety (Luisita 2011).

* Similarly to Israel, Singapore realised the importance of organised talent support relatively early, in 1984, and they launched their Gifted Education Programme (GEP). Gifted students are identified in Grade 3, and they can participate in various programmes depending on their performance. The top 1% is admitted to the GEP schools, but the next 2–5% is also provided priority talent support programmes (Gordon Győri 2006).

III. SUMMARY

Talent support in Israel excels for several reasons: the educational policy executives there realised more than 40 years ago, at an early date also in international comparison, the importance of having a nationwide public talent support system and, moreover, the country operates a uniquely wide range of programmes for this purpose. The programmes, organised and financed mostly by the state, are often supported by private foundations, and also the state contributes to the programmes operated by the latter. The Department of Gifted Children of the Ministry of Education makes no secret of the fact that its goal with this scheme is to secure excellence in talent support. The effectiveness of the national programmes going back to several decades is witnessed by Israel's economic and scientific/technological development.

As mentioned above, the performance of Israeli students as measured by the PISA and TIMSS surveys was consistently lower in the past ten years than the average results of the other 25 OECD countries representing the basis for comparison. The gaps between the results of the various student groups participating in education were also wider than in other countries (Ben-David 2009), so it would be easy to come to the conclusion that the performance of Israeli education lags behind the expectations. However, although it is useful to participate in international surveys (they highlight the weaknesses, help identify educational differences between the various social groups and develop the curriculum, etc.), the measurements concerned provide a unilateral assessment of the success and quality of education. The goal of the school activities is not simply that children should produce outstanding results in their major subjects. It is equally important that they develop a liking for learning; that they dare undertake risks; that their imagination, self-confidence, management skills, self-discipline should be enhanced; that they become open and successful, satisfied adults acting in an efficient way. These effects of the school cannot be quantified, but that does not mean it is less important than measurable performance.

There are also other factors which may have impact on the quality of education and through which the effectiveness of education can be measured, such as the quality of school life, the student/teacher relationship, the independence of the students, the number of registered patents, the number of new books and films per person, the number of participants of cultural events, of persons ad-

mitted to universities abroad etc. To obtain a more complex and realistic picture, such indicators should be combined with the measurable, objective results of the educational system. In Israel, for example:

- The participation rate of students in education keeps rising, but in international comparison it is high already.
- The number of students completing secondary school and of GCSE holders keeps rising.
- Teachers have higher qualification and they are more experienced than in the past decades.
- The gaps between schools in the poorer and the more prosperous neighbourhoods have narrowed.
- The results measured by a single standardised psychometric test show increase by 10 points among Jewish students, and by 17 points among the Arab ones from 1991 to 2008.
- Israeli students complete their studies with success abroad; their scientific and technological results are often world-famous.
- The Israeli high-tech industry, which employs young workers freshly out of school, is the engine of growth of the economy, and one of the most developed globally.
- The brain-drain phenomenon – a potential sign of warning for higher education and a factor with a negative effect on economic development – would not manifest itself if these persons had not received excellent education at the universities. It could be prevented by increasing the number of vacancies for persons with high qualifications at the research institutes.
- Seven of the world's 500 best universities are in Israel. Hence Israel ranks third after New Zealand and Sweden globally (in terms of their ratio to the population).
- According to the World Economic Forum Index, Israel is the 23rd strongest economy of the world (Blass 2010).
- It is a noteworthy yet not commonly known feature that the number of per capita scientific papers is the highest there.
- In the past decades, Israel gave the world half a dozen Nobel Prize winners (Gordon Győri–Frank–Kovács 2011).

Note also that Israel produced these outstanding results despite such hard circumstances as an almost permanent state of war; the continuous inflow and integration of a large number of immigrants; far-reaching demographic changes conducive to the growth of the poorer social groups. That is, in spite of its weaker performance results in the international assessments and the many challenges, the educational system produces outstanding results. And, what is par-

ticularly important from the point of view of the present chapter, the talent support practice of the country contributes to this effectiveness to a large extent (Frank 2011).

Talent screening based on intelligence tests has been the routine of public talent support for 40 years. Every pupil in Grade 2 is subjected to testing, whether he/she lives in downtown Tel Aviv or in a Bedouin settlement of the Negev Desert. Today, the best-performing 8% is admitted to the public talent support programmes, i.e. the segregated talent classes, the pull-out programme and the afternoon enrichment sessions. But why has this "obsolete" talent support practice survived in such a fast-developing and democratic country in the vanguard of the world in many respects? The answer lies in the history, geopolitical situation and economic needs of the country.

For almost 2000 years, there was no state of Israel. It was after World War II and the holocaust that the global political situation offered a possibility to re-establish the Jewish state. On the day after this solemn moment, the tanks of the neighbouring countries attacked the new-born country which was forced into war with its neighbours several times in the 60 years since then. The citizens of Israel face permanent threats of terrorism and attacks. This circumstance determines the development of the country, defines its economic priorities, and manifests itself in its educational policy and the goal, content and methods of talent support (Gordon Győri–Frank–Kovács 2011). Obviously, the defence industry strives to apply the most up-to-date technology and, to finance that, it is imperative to have advanced technology and a prospering economy. The history of several countries (e.g. Finland, Singapore, Japan) has shown that the only means to overcome a crisis, economic difficulties, is to invest in education, in the most efficient development of the talented. This is what happened also in Israel: they have realised the importance and necessity of talent support. Economic and high-tech development requires a permanent supply of excellent professionals. Public talent support identifies the engineers and researchers of the future among Grade 2 pupils, to be able to provide them special education until the end of their university years. That is, they aspire to identify clever children who can be educated efficiently as soon as possible – and intelligence tests offer an adequate and fast method for that –, irrespective of where, in which part of the country the young child concerned was born. For the above-mentioned geopolitical reasons, Israel cannot afford to lose talents, and it wants to supply the new generations of professionals in the most cost-effective way, even at the cost of disregarding the more modern talent-pedagogical considerations.

A talent professional could nevertheless harbour some doubts whether the above practice was exclusive in Israel. But as shown by the above presentation of the ICEE organisation and of some other pieces of information, this is not the

case. There is an abundant supply of programmes in the country (for more detail, see Gordon Győri–Frank–Kovács 2011 in the previous volume). Under the name *Amirim programme,* the state itself has also launched a national programme governed by the most modern talent-development principles (e.g. Renzulli's theory of the enrichment triad), and the private sector also offers many opportunities for the talented children.

Talent support is a key educational and economic-policy topic all over the world. Accelerated technological development makes it impossible to know in advance what vocations/professions will be needed in 5–10 years, so the generations being raised now should be educated so as to have such competencies that will make lifelong learning, changeovers from one special field or even vocation/profession to another natural for them.

To develop pupils/students along the same principles, any other country considering the adoption of a programme or the entire system of the ICEE must accept that freedom and creativity are indispensable for the efficient development of the gifted child. The Israel Center for Excellence through Education works to make education more effective through talent support, and the state pursues the same goal in public education, even if the ICEE expresses some heavy criticism on its efforts. It is important to see that several talent-support systems critical of each other can coexist and operate efficiently in the same country, and they can produce real development jointly – as is demonstrated by Israel's internationally outstanding scientific and economic development –, provided that the professionals concerned can recognise and acknowledge the merits of the established systems while being capable (and having the opportunity, socially) of criticising their weaknesses, and that they possess adequate visions and options to complement or even correct the bases of the existing programmes at the critical points. It is also worth attention that talent systems maintained by the public and the private sector, co-operate in Israel while being also rivals retaining their autonomy. The result is a critically inspiring and innovative social/educational/economic context which gives the experts and committed professionals an opportunity to develop the most talented members of the next generations.

BIBLIOGRAPHY

Arieli, H. (2010): Verbal statement.

Barkóczi, I.–Pléh, Cs. (1977): *Kodály zenei nevelési módszerének pszichológiai hatásvizsgálata* (Psychological impact assessment of Kodály's music-pedagogical methodology). Kodály Zoltán Zenepedagógiai Intézet, Kecskemét.

Ben-David, Dan (2009): *Israel's Education System – An International Perspective Policy.* Paper Series, Taub Center for Social Policy Studies in Israel, 1–44.

Blass, N. (2010): Israel's education system: Updated international comparisons. In Ben-David, D. (ed.): *State of the Nation Report: Society, Economy and Policy in Israel.* Policy Paper Series, Taub Center for Social Policy Studies in Israel, 327–336.

Burg, B. (1992): Gifted education in Israel. *Roeper Review*, 14, 217–221.

Diezmann, C.–Waters, J. (2000): An enrichment policy and strategy for empowering young gifted children to become autonomous learners. In *Gifted and Talented International,* 15(1), 6–18.

Erez, R. (2003): Meditations on the realization of an educational vision: Israel Arts and Science Academy. In Mönks, F. J.–Wagner, H. (eds): *Development of human potential: Investment into our future. Proceedings of the 8th Conference of the European Council for High Ability (ECHA).* Rhodes, October 9–13, 2002. K. H. Bock, Bonn, 177–189.

Frank, A. (2011): *Tehetséggondozás Izraelben.* Szakdolgozat (Gifted/talented education in Israel. MA-thesis). ELTE PPK, Budapest.

Gévayné Janurik, M. (2010): *A zenei hallási képességek fejlődése és összefüggése néhány alapkészséggel 4–8 éves kor között* (Development of hearing and its correlation with some basic skills between 4–8-years of age. PhD-thesis). *PhD értekezés*. Szegedi Tudományegyetem, Szeged. http://www.edu.u-szeged .hu/phd/downloads/gevayne _ janurik_ertekezes.pdf/. Downloaded: 2 July 2012.

Gordon Győri, J. (2004): *Tehetségpedagógiai módszerek* (Methods in gifted education). Gondolat Kiadó, Budapest.

Gordon Győri, J. (2006): *Az oktatás világa Kelet- és Délkelet-Ázsiában: Japán és Szingapúr* (The world of education in East- and South-East Asia: Japan and Singapore). Gondolat Kiadó, Budapest.

Gordon Győri, J.–Frank, A.–Kovács, B. (2011): Tehetséggondozó központok Izraelben. In Gordon Győri, J. (ed.): *A tehetséggondozás nemzetközi horizontja I. Jó gyakorlatok az Európai Unión belül és kívül* (Centres for talent development in Israel). In J. Gordon Győri (ed.): *International horizons of*

talent support, I., 121–144. MATEHETSZ Géniusz Projekt Iroda, Budapest, 121–144.

Gyarmathy, É. (2006): *A tehetség: Fogalma, összetevői, típusai és azonosítása* (Giftedness: Its concept, types and methods for identification).Eötvös Kiadó, Budapest.

Gyarmathy, É. (2007): *A tehetség: Háttere és gondozásának gyakorlata* (Giftedness: its background, and methods in gifted development). Eötvös Kiadó, Budapest.

Gyarmathy, É. (2011): A tudományhoz is a művészeteken át vezet az út. Konferencia-előadás (The route to science also leads through arts. Conference presenation). Tehetségpontok Művészeti Tagozata, Géniusz Programmesés az ELTE BTK szervezésében. Budapest, 29 January 2011.

Heem-Younes, A.–Freedman, Y. (2006): *Excellence 2000 III.: Evaluation Study Report Summary*. Henrietta Szold Institute, Jerusalem.

Hemmings, Ph. (2010): *Israeli education policy: How to move ahead in reform*. OECD Economics Department Working Papers, No. 781, OECD Publishing.

Hoffmann, C. (2009): 135 and beyond. *The Jerusalem Post.* http://www.havonta-school.org.il/Portals/0/135%20and%beyond%20-%20Jerusalem%20Post.pdf. Downloaded: 10 December 2010.

Józsa, K. (2007): *Az elsajátítási motiváció* (Mastery motivation). Műszaki Kiadó, Budapest.

Landau, E. (2010) Verbal statement.

Luisita, A. (2011): Science for high-ability learners (HAL): Excellence 2000 (E2K) Science Programme. *The Exchange: The Gifted Education Newsletter, January,* 20–22.

Milgram, R. (2000): Identifying and enhancing talent in Israel: A high national priority. *Roeper Review, 22*(2), 108–110.

Rachmel, S.–Zorman, R. (2003): Enhancing gifted students as path breakers: The Israeli experience In Mönks, F. J.–Wagner, H. (eds): *Development of human potential: Investment into our future: Proceedings of the 8th Conference of the European Council for High Ability (ECHA).* Rhodes, October 9–13, 2002. Bonn: K. H. Bock, 119–128.

Rachmel, S. (2010): The new policy for promoting education for outstanding and gifted students in Israel. In Csermely P.–Korlevic K.–Sulyok K. (eds): *Sience education: Models and networking of student research training under 21.* IOS Press, Amsterdam, 130–139.

Rashi Foundation (2010): Promoting excellence in science and technology education in Israel's periphery. http://www.rashi-foundation.org.il/upload/ListItems/AttachedFile1517.pdf. Downloaded: 30 June 2012.

Simonton, D. K. (1999): *Origins of genius: Darwinian perspectives on creativity.* Oxford University Press.
Smilansky, M. – Smilansky, S. (1967): Intellectual advancement of culturally disadvantaged children: An Israeli approach for research and action. *International Review of Education,* 13(4), 410–431.
Troy, G. (2011): Oases of Israel excellence at IASA and elsewhere. http://giltroyzionism.wordpress.com/2011/01/19/oases-of-israel-excellence-at-iasa-and-elsewhere/ Downloaded: 28 June 2012.

Szilvia Péter-Szarka

Talent Support in Poland:
Programmes of the Teacher Training Centre of Swietokrzyskie Region

I. INTRODUCTION

1. Polish economy and society

When in Poland, Hungarians can easily ascertain the truth of the saying "Polak-węgier dwa bratanki, i do szabli, i do szklanki" – in English: "Poles and Hungarians: Two good friends; together they battle and drink their wine". The traditionally good relationship of the two nations, hallmarked also by the *Day of Polish—Hungarian friendship* held on 23 March, the parallels in their history and the positive changes of the Polish educational system in the recent years make it possible and worthwhile to examine what we can learn from our Polish colleagues in the area of talent support.

Poland has a territory of 312,679 km^2, and it joined the European Union in 2004. Its population headcount exceeds 38 million. This figure has not changed significantly in the recent years, and this could be considered as a positive "process" relative to the neighbouring countries characterised by declining headcounts. However, many Poles are currently working abroad and they will not necessarily return home.

There is a total of 16 regions called voivodeships in Poland, comprising 379 counties (powiats). The capital and also the biggest town is Warsaw (with a population of around 1.7 million), and the country has several significant medium-sized towns, too (Łodz: 770,000; Krakow: 750,000; Wroclaw: 640,000; Poznan: 570,000, and Gdansk: 460,000 inhabitants).

The state of the economy is stable and improving; Poland boasts the fastest economic growth besides the Czech Republic and Slovakia among the former post-communist countries; in 2009, its GDP growth was the fastest also among the EU countries (Eurostat 2012). Recession has basically bypassed the country, but the impoverishment of certain social strata has become permanent.

Poland has areas which are very rich in mineral resources, but there are significant regional discrepancies in industrial development.

Ninety-five percent of the population is Roman Catholic, but there are some Greek Orthodox, Lutheran, Protestant, Jewish and Muslim people, too. This is worth noting, as church affiliation permeates every area of everyday life; even non-religious schools have crosses in the classrooms, and studies of the values of Christian culture and arts form an organic part of the curriculum. Ethnically the country is homogeneous, but there is a growing number of immigrants, mainly from Ukraine, Belarus, Russia and Vietnam.

Polish culture and science have significant traditions. The outstanding talents of the country from the past centuries and the present include the astrologist Nikolaus Kopernikus, Maria Skodlowska-Curie who won the Noble Prize in chemistry, Lazar Markovics Zamenhof who created the Esperanto language, social psychologist Solomon Asch who emigrated into the US, the Nobel Prize winner writer Henryk Sienkiewicz, and the Nobel Prize winner poets Wyslawa Szymborska and Czesław Miłosz; Roman Polański, Andrzej Wajda and Krzysztof Kieślowski in cinematic art and Lech Walesa, Nobel Peace Prize winner politician. Karol Józef Wojtyła, that is, Pope John Paul II, considered an outstanding spiritual leader of the 20th century worldwide by believers and non-believers alike was also Polish. The list of great Polish talents (or talents of Polish origin) could be continued endlessly.

2. The Polish education system

The Polish education system, looking back on great traditions, has been assigned at administrative level to the competence of the Ministry of National Education and the Ministry of Science and Higher Education since 2006. In 1999, education was restructured. As a result, mandatory schooling now lasts from age 6 to 16, that is, for ten school years.

The first of these is the last kindergarten (pre-school) year before primary school, followed by six years of primary school and 3 years of "gimnazjum", i. e. lower secondary school. There is part-time compulsory education for the 16–18 year-old in a school or other environment but, of course, they can also continue their studies in regular school-based education (Eurydice 2011). The mandatory age to start schooling was reduced as of 2012, thus pre-primary and primary education starts now at the age of 5 and 6, respectively. This is in line with the general lowering of the school-starting age observable in the European countries (Eurydice 2012).

To enter lower secondary school, pupils must complete primary school and pass the leaving exam. In lower secondary school, the general subjects are

taught in a way similar to the practice of Hungarian upper primary schools, and the studies are terminated by a leaving exam in both countries. Upper secondary school lasts for 3 or 4 years, at a general upper secondary school (liceum) with a general curriculum or a specialised or technical school.

Kindergartens, primary schools and lower secondary schools are maintained by the municipalities, whereas the operation of upper secondary schools is assigned to the competence of the counties. Higher education is divided according to the Bologna System into first-cycle (basic), second-cycle (master) and third-cycle (doctoral) education, but undivided master education has been maintained in some areas. Around one third of the 20–22-year-old study in higher education; the number of women is somewhat higher among them than that of men.

As in other European countries, one must have a higher education degree to be qualified as a teacher. Teaching at primary or lower secondary school requires a BA or an MA, whereas upper-secondary-school teachers must have MA-level teacher qualification. The main difference in teaching careers in Hungary and Poland, respectively, concerns the forms of support provided to career-starter and practicing teachers. Whereas in Hungary career-starter teachers receive almost no special support, in Poland they are assisted in four ways: regular meetings for the discussion of progress or problems, assistance with planning and assessment, participation in other teachers' classroom activities and/or classroom observation, visit to other schools/resource centres. These options lay the ground for continuous renewal, openness and co-operation, which are indispensable in a teacher's career.

Besides restructuring, the educational reform of 1999 triggered changes also in terms of contents and pedagogical approach. The institution of the lower secondary school (or upper primary school) extending primary school by one year was concurrent with the introduction of new curricula, in-service teacher training, and a change in pedagogical/methodological culture. In the countryside, education was concentrated into up-to-date centres, but at the level of the curricula the introduction of local syllabi resulted in significant decentralisation (Setényi 2010). At the turn of the millennium, many of the circumstances determining the system of education were similar in Hungary and Poland: both countries were strongly marked by the legacy of the change of regime; the presence of an industrial proletariat with low schooling; fast economic change and the consequent demand for labour of a novel type; the poor efficiency of upper-primary-school education; highly selective secondary schools conducive to major performance gaps, and the resistance and inertia of the educational system to any change (Radó 2010). The Poles, however, responded to these chal-

lenges by radical educational policy measures made up of three main components:

1. *school restructuring* resulting in a new type of school, the lower secondary school,
2. *decentralisation* through the curricular reform and
3. *tighter output regulation* through the extension of the examination system. In all probability, these measures could not have produced such deep-going changes one by one as they did in combination (Radó 2010).

3. Tracking the PISA results

The success of the Polish education system is spectacularly reflected by the results of the PISA measurements. *Table 1* shows the results of Polish students participating in the last four PISA surveys in three knowledge areas subjected to measurement.

Table 1. Polish results based on PISA measurements

	2000	2003	2006	2009
Reading literacy	479	497	508	500
Mathematics literacy	470	490	495	495
Natural sciences	483	498	498	508

Source: http://www.oecd.org/dataoecd/54/12/46643496.pdf and OECD, 2011.

The figures make the improvement of reading literacy particularly obvious: the relevant figure was below the OECD average in 2000, corresponded to it in 2003 and exceeded it 2006, when the Poles had the 9th best results among the participating countries. In an OECD (2011) paper, Jakubowski et al. assumed that the positive development was to be attributed to the effects of the educational reform introduced in 1999 and in particular to the significant changes in vocational education. Before the reform, the structure of the Polish education system was highly similar to that of the Hungarian one: mandatory one-year (0 grade) pre-primary education followed by 8 years of primary school and then by 4 years of general secondary school, 5 years of technical school or 3 years of skilled-worker training. The 1999 reform restructured this system to a 1+6+3+3/4 year one, as discussed in detail in the previous section. In vocational education this meant that instead of entering one of the three types of secondary schools after Grade 8, students could postpone the relevant decision by one year, finishing Grade 9 in lower secondary school (upper primary school) which has the same curriculum for all, and decide on further education

after that. This corresponds to the extension of primary school by one year in the sense that students keep learning the basic subjects in the same number of lessons for one more year, whereas at e.g. vocational schools they would learn them in a reduced number of lessons. Since the PISA measurements are carried out with students aged 15, in the survey of 2000 the sample of Polish students consisted of children coming from three different school types, whereas in later measurements all of them came from lower secondary school. The results of this age group are significantly improved by the extra one year in general education and in particular by the higher number of lessons. Furthermore, with the introduction of periodical assessments and tests in parallel with the educational reform and restructuring, students got used to the various forms of output surveys, and this, too, may have improved their performance. The picture, however, is shaded by the fact that the data of students in later ages, i.e. in Grades 9 and 10, suggest that the knowledge level of the 16–17 year-old in skilled worker training shows a significant backlog similar to the pre-reform period as compared to the results of other secondary school students, that is, despite the significant increase of the general knowledge level of the 15 year-old, the gaps between the secondary school types have remained significant (OECD 2011).

All things considered, it seems that the positive results are to be attributed in first place to the postponement of vocational education, that is, to the beneficial effect of the targeted improvement of the performance of one of the most critical target groups in public education overall (Seténi 2010). In Hungary, the fragmented nature of the curricular reforms and the fault lines in the educational system corresponding to family backgrounds make it much more difficult to introduce a reform on a similar scale, since that would have to include educational as well as administrative measures, as was the case also in Poland with the redefinition of the roles of the various levels of public administration. On the other hand, Hungary has certain advantages (more than 10 years have passed since the introduction of the Polish reform) such as the established measuring systems, the resources available for development or professional autonomy at schools, which may promote the creation of a system leading to a similar performance improvement.

II. TALENT SUPPORT IN POLAND

1. General characteristics of talent support

The social demand for identifying and supporting young persons with outstanding gifts/talent increased also in Poland in the past years or rather decades. The changes of the past and present century have left no doubt regarding the significance of innovation, creativity and competitiveness, and talent support in education is the point of departure for all of these qualities. Since it has become obvious that the unfolding of talent requires, in addition to individual abilities and personality traits, also the interaction of certain environmental and social effects (Gagné 2008), it is fully justified to review the situation of the key actors of education in this context.

Dyrda (2012a) mapped the general features of talent support through a large-scale research conducted in the Silesian region, and most of the relevant findings are typical also of the country overall. There are several signs suggesting that the significant changes implemented in education in recent years have not reached every area of talent support: according to the author, researches show that countless children start school as talented, creative and inventive individuals only to lose this potential after a few years, and despite devoting the academic year of 2010/2011 officially to talent support, the general opinion is that schools still aspire to raise average, conformist and adaptable students rather than students characterised by a special and creative way of thinking. Neither the results of the PISA surveys are reassuring in every respect: the reading literacy average decreased somewhat from 2006 to 2009 and what gives even more serious ground for concern is that the rate of students in the topmost category in the reading literacy tasks dropped by around one third, i.e. at a pace faster than the average.

Dyrda (2012a) mapped the general situation of talent support by triangulation, which has the great advantage of applying both qualitative and quantitative methods to examine the question under study. First she made school case studies, in the course of which she analysed school documents and made one-hour interviews with 33 teachers active in talent support. Then she studied the opinion and status evaluation of teachers through questionnaire surveys and, finally, she analysed the career paths of gifted students. The case studies showed

that talent support was present in some form at the level of school documents almost everywhere. In the interviews and the questionnaires, on the other hand, several teachers mentioned that the guidelines expressed on paper did not always make their way to practice. They stressed the inadequacies of communication, the poor efficiency of the methods of organising education, the difficulties inherent in co-ordinating and aligning multi-level activities, and the deficiencies in co-operation with the organisations providing pedagogical/psychological support and with the parents (Dyrda 2012b). The emotional and social problems of gifted students imply special difficulties which cannot be overcome by the teachers alone without proper professional support. The majority of extracurricular classes is devoted to making up the arrears; the abilities and individual traits of the students are not mapped fully. It is particularly difficult to identify and support gifted students who are in a disadvantageous situation. The review of the career paths of students confirms the importance of support by the environment, i.e. the priority role of the parents, the family in the broader sense, the school, the peer-group, the coaches and mentors, and of the critical points (e.g. adolescent age – see Csíkszentmihályi 2010) where overcoming the fiascos and difficulties may represent a pivotal point in the career of the talented.

In sum, Dyrda urges comprehensive and system-level steps which cover the entire talent support process, i.e. the steps of initiation, implementation and supervision. At the same time, she advocates the creation of a database, a knowledge warehouse that would provide teachers access to various teaching and research materials, measurement tools and the best practices of other schools. The alignment of the systems of measurement and evaluation, the creation of consultation options and support for contact-keeping with the actors outside the school would be a great asset for teachers in their work with the talented.

The design of a national-level, comprehensive and complex strategy is in progress yet, but the envisaged legislative changes treat talent support as a priority issue, and there are several excellent local-, county- and regional-level initiatives in the country which may lay down the bases of the framework setting and contents of national action plans. The majority of the latter concentrates on one critical instance of talent support such as teacher training, assistance to underprivileged students or the teaching of (natural) sciences, but given their level of specification, every programme could serve as the starting point of the development of a specific sub-area. It will be possible to compile a complex national talent support strategy by organising the components of these initiatives into a whole and by covering the missing fields.

2. Significant local initiatives

The *DiAMEnT* project is a remarkable talent support programme in the voivodeship of Malopolska, the output of the co-operation of the Maloplska In-Service Teacher Training Centre (Małopolskie Centrum Doskonalenia Nauczycieli), and of the Nowy Sacz University and the Chicago-based National Louis University (http://www.diament.edu.pdf). The project lasting until 31 December 2013 is to create complex and novel forms of teaching and organisation for students with outstanding abilities, primarily by following tested methods developed in the United States. It focuses on competency areas which were not in the foreground in earlier programmes: creative thinking and argumentation for children in grades 1–3; mathematics, business and enterprising, English language and IT for those in grades 4–6 and in lower and upper secondary school (grades 7–9 and 10–12, respectively). The design of the programmes to develop creative thinking and the specification of the student selection methods have already taken place in the first part of the project; the teacher training courses which will have a total of around 8,000 participants have started as well. One of the key components of the programmes offered to students is the establishment of local talent support centres which will be accessible in all 22 counties of the voivodeship. One Saturday a month the centres provide gifted students a session of five hours based on problem-based learning and on the project method. Furthermore, research clubs use the tool kit of e-learning on an online interface to provide an opportunity for joining on-going researches, and a one-week summer school is organised with the participation of domestic and foreign lecturers. By the end of the project, these programmes will have reached some 1,200 students with outstanding abilities. Given the success of the programme, the plan is to create similar organisations in the future in other voivodeships.

The programme entitled "Pomerania – a good way towards education. Supporting students with high potential in mathematics, physics and computer science" or, in short, "Pomerania's gifted children" is the priority talent support project of the voivodeship of Pomerania, which will last until the end of August 2013 (http://zdolnizpomorza.pomorskie.eu/index.aspx). Its main goal is to develop a comprehensive talent support system in the region in addition to the existing school competitions and scholarship programmes, which will be accessible to every institution of education, not only to some privileged schools. For this reason, particular attention is paid to the establishment of local creative teaching centres in every county to assist the teachers working with gifted students. The key points are the development of a regional programme and of partnerships between the schools to support gifted students, network-based

co-operation between the creative teaching centres, the development of the pedagogical practice of talent identification and nurturing, and the creation of a teaching website. The envisaged student programmes include extracurricular events, university co-operation, science camps, workshops and scholarships. In the academic year of 2011/12, 674 students took part in the programme, and some 1500 participants are expected next year.

The *Pearl-divers* (Poławiacze Pereł) programme created by the Jagello University, Krakow targets gifted upper-secondary-school students aged 16–19 and aims primarily at identifying students with outstanding abilities in a disadvantageous situation in some respect (http://www.wszechnica.uj.edu.pl/polawiacze_perel/). The starting point of the *Pearl-divers* is that opportunities presenting themselves in life should not depend exclusively on where and in what environment you were born, so they help underprivileged students recognise their own strengths, provide them with opportunities to gain intellectual experiences, and to meet people who will help them take important decisions. The programme started in 2006 by supporting 43 students in 4 regions, but the positive social response to it made it possible to extend it in the subsequent years to 100 students. Its long-term effect is felt mainly in the areas of openness and contact-building, but results in other areas of personal development, such as enhanced motivation and higher self-esteem are also important. The monitoring surveys have shown that the student participants of the programme took qualified and responsible career decisions.

Talent support is an organic part also of Warsaw's educational strategy for 2008–2012. Besides the identification and support of gifted students and the consideration of their individual needs, the programme emphasises support to teachers and schools, and to involving the broader environment and the parents. The programme called *Wars and Sawa,* named after two characters in a legend about the foundation of Warsaw, is an organic part of the strategy, and it aspires to offer education adjusted to individual features (abilities, learning style, type of intelligence, interest) enhancing personal learning motivation of students and their responsibility for their own learning within the school walls (http://www.edukacja.warszawa.pl/index.php?k=272). To implement it, schools must be very committed and ready to undertake methodological reforms, occasionally even restructuring, and for this reason the ones that take part in the programme receive a certificate to acknowledge their above-average talent support activity. The certificate is valid for three years. During that period, the schools must undertake to perform certain tasks and at the end of it they have to present their outputs. As for the undertakings, priority tasks include the mapping of the individual abilities and the learning style of the stu-

dents, which will then lay down the basis for the development of personalised, individualised forms of teaching, which are also crucial in the programme. Certified schools must set up a talent support workgroup, to be provided extra training on the topic, within the teaching staff. Seventy-nine Warsaw-based schools have already got the certificate, and many more are applying for it. Besides support to schools, the programme operates various student grants and summer and winter science camps. All things considered, this programme is rather similar in its design to the system of talent points active in Hungarian institutions (http://geniuszportal.hu/content/mit-jelent-az-hogy-tehetsegpont).

The list of positive endeavours would not be complete without mentioning the establishment of the Copernicus Science Centre (CSC) in the capital. This is the first interactive scientific exhibition in Poland; an institution communicating the main natural-science principles in an entertaining and intelligible manner. The facility is similar to the Palace of Wonders in Hungary: it hosts hundreds of interactive expos promoting the exploration of the laws of the universe through first-hand visual experience, testing and triggering the curiosity and interest of children. The first steps of the establishment of the facility go back to 2004, but it was only in 2010 that the design and construction works and the installation of the exhibitions terminated. On the first weekend, the Centre had some 13,000 visitors, who could enter the institution free of charge on the opening days. The CSC had five exhibitions at that time (Swiat w ruchu/On the move; Czlowiek I Srodowisko/Humans and the environment; Korzenie Cywilizacji/Roots of civilization; Strefa Swiatla/Lightzone; Bzzz!/Buzzz!), and four more were added in the meantime, including the Planetarium and the Robot Theatre, a unique endeavour in the world. The Robot Theatre presents short plays of around 20 minutes presented by programmed walking and gesticulating humanoid robots expressing also simple emotions. At the time of the Polish EU Presidency, in the second half of 2011, the institution served as the venue of several official programmes, and it took part also in many European interdisciplinary projects to solve problems triggered by the development of science and civilisation, and also the problems of scientific communication.

3. Best practice: Teaching programmes of the Swietokrzyskie In-Service Teacher Training Centre

3.1. General information on the Swietokrzyskie In-service Teacher Training Centre (Świętokrzyskie Centrum Doskonalenia Nauczycieli – SCDN)

There are in-service teacher training centres similar to the one operating at Kielce, the seat of Swietokrzyskie region, in every Polish voivodeship. They

provide assistance and support to active teachers. These organisations, reminiscent of the Hungarian institutes of pedagogy, focus on regular and personal contact-keeping with teachers, on counselling and on supporting their activities. Besides providing theoretical and practical support to teachers, they organise training events, consultations and competitions, and implement international projects.

Driven by the principle of lifelong learning, the SCDN offers programmes not only to teachers, but also to school principals, educational counsellors, officials/administration workers in education, parents and students. The quality of the work of the organisation created several decades ago was acknowledged by an accreditation qualification granted in 2006: all of its 39 staff members have considerable teaching experience and qualifications based on it, so they are the best in their profession to help those who request assistance. They have operated various EU-financed large-volume applications for years, and they took part in several study trips to various European countries and to the US. They have a significant stock of books in German thanks to co-operation with the Goethe Institute, and they manage the bimestrial periodical *Inspiracje* (Inspiration) publishing professional papers and reporting on the major events taking place at the institution.

Besides its everyday counselling and organisational activities, the SCDN currently manages 14 projects, the majority of which concern also the area of talent support. Seven among them target expressly the teachers and the enrichment and expansion of the pedagogical, psychological and methodological aspects of teaching; five projects aim at involving students and two help design efficient teaching and extra-scholarly student programmes in which around 20,000 people are involved in the region annually through the reinforcement of foreign relations.

Most student projects are accessible not only to the already identified gifted students with outstanding abilities, but by and large to all, and this means a significant step forward also in talent development, as is known from the inverted version of the 3D model. The 3D model presents the hierarchically structured stages of talent support, from the description of talent through its discovery and development (Description, Discovery, Development). However, as noted by Éva Gyarmathy (2006), the order is just the reverse in efficient talent support in the 21st century: if we want more and more kinds of talent to unfold in our society, talent support must be integrated into everyday teaching. That is, if talents are identified through development and activities, identification will become almost automatic, and every student will have an opportunity to demonstrate his/her competencies/abilities through their performance.

Each programme designed for teachers targets the professional and methodological preparation of teachers and the expansion of their IT knowledge and skills. The content and form of projects developed for students is more interesting from the point of view of talent support. The Młodzieżowy Inkubator Przedsiębiorczości, i.e. Junior Incubator Entrepreneurship, gives an opportunity primarily to talented secondary-school students in vocational education to get to know in theory and practice the issues and tasks related to creating their own business. The programme "Od grosika do złotówki" (From penny to make a buck) is to make trainees familiar with financial matters. The *Otwarta Twoja Kariera* (Open your career) project is about conscious career choice and planning, whereas *Moje wymarzone miejsce pracy* (My dream job) relays information on various vocations. The aim of the programme entitled "Poznaj swój wybrany zawód" (Know your chosen profession) is again to raise the interest and to motivate students in vocational education; moreover, the participants learn about the future possibilities of the given vocations, about individual coping strategies and enterprise development.

"Towards a Better Future – Education as a means to promote the development of Świętokrzyskie Region and Abruzzo Region" is an international project with the aim of raising the quality of vocational education, and making it more attractive to students of tourism and the hotel trade in the District of Kielce. The Comenius Region project (Szkolne Centrum Aktywności – Kultura Café/ School Activity Centre – Culture Café) maps the co-operation possibilities of schools and local organisations with the participation of Finland in order to create the option of extra-curricular activities that will benefit the students, the teachers and the local communities alike.

In the following, I shall present in more detail four projects of priority importance also in the process of talent support, and the competitions and best practices in class which play a significant role in specific sub-areas of talent development.

3.2. Projects

3.2.1. "Like Mozart": development of teacher/teaching efficiency; programme of creative teaching

"Like Mozart" (*Taki jak Mozart*) is a programme based on a 4×8 hour in-service teacher training course boosting teaching efficiency and creativity, developed in consideration of the fact that in today's education and in particular talent support, there is a great need for teachers capable of innovation, ready to learn new things, who accept and even encourage change, and adjust to the changed circumstances flexibly. The first step towards that effect is to

strengthen the creativity and self-evaluation of teachers. The main target of creativity development is to boost openness, the propensity for innovation, positive self-assessment, original thinking, involvement in tasks, imagination, flexibility, autonomy, courage and sensitivity to problems. The developer of the programme, Lidia Pasich, referred to the main traits of four Greek mythological figures for the thematic arrangement of these qualities: Zeus stands for positive self-assessment, autonomy and courage; Odysseus for inventiveness, creativity, originality and innovation; Icarus for problem-sensitivity, curiosity and perseverance and Daedalus for openness and flexibility. These four characters can also be assigned to the components of Renzulli's three-circle model (Zeus: above-average ability; Odysseus: creativity; Icarus: perseverance, commitment; Daedalus: gift, performance), which makes it easier for the teacher participants of the programme to memorise and apply both the Renzulli model and the components of the training. The 8-hour modules focus on the enhancement of teacher efficiency, but each of them takes a glance also on how the same methods/exercises can be applied in working with gifted students. In the Zeus module, for example – aimed primarily at boosting positive self-evaluation, autonomy and courage – confirmation given to the teachers is coupled with the question how teachers can reinforce the self-assessment of their students and how they can encourage them to be autonomous. Completing the module will make teachers feel, based on their realistic self-assessment and self-assurance, that they will be able to test new methods, they will not be afraid to thread unknown paths and, ideally, by applying the programme components in class they will empower their students to feel the same way.

The schools where at least 20% of teachers complete at least one module and apply it for at least one academic year receive the title of "school of beautiful minds", which provides an opportunity primarily for contact-keeping between the schools concerned and with the Centre. This, in turn, facilitates monitoring, the acquisition of support for empirical tasks and the specification, checking, presentation and sharing of homeworks. Once a school wins this title, it is to document that it has really integrated the module components into everyday teaching practice by lesson plans, photos, case studies or the development of teaching activities. So far 17 schools of Swietokrzyskie region have been awarded the title recognising that their teachers strive to unfold their own creativity and that of their students; they aim to develop and find new solutions, and to understand their respective fields of interest.

3.2.2. Open your career – My dream workplace – Know your chosen profession

It is mandatory for lower-secondary-school students (aged 13–16) to take part in at least one officially documented project work; consequently, whichever school type they enter later on, this form of work will be familiar to them. The

implementation work of students and teachers alike is facilitated considerably by centrally co-ordinated and widely accessible projects within their sight, such as the one operated by the SCDN. The interdisciplinary approach, autonomy and student activity are the core components of every project work; as a result, the student experiences the process of working autonomously, but in co-operation with others, based on their own choice. Project work consolidates also the motivational and creative bases needed for the unfolding of talent first and foremost through the free choice of the assignment, absorption in the given field and the tackling problems which have several solutions; at the same time, the programmes presented here are designed to make it possible to identify and develop the highest possible number of talent types and occurrences of outstanding performance in practice or in a field of profession.

The SCDN compiled several new projects following consultations with schools, in the wake of noticing the motivational problems of students. The projects "Open your career", "My dream workplace" and "Know your chosen profession" help secondary school students, students in vocational education and those on the brink of career choice plan their future. This topic is particularly important in talent support and in motivating underprivileged students so that they can develop a realistic vision of the future and see it in a wider perspective. Each project work ends with the presentation of the output materials and with getting acquainted with the work of others.

"Open your career" introduces students to various professions/occupations so that they can take more qualified and deliberate decisions concerning their future careers. At kindergarten, they do "Find out who I am" type of tasks; at primary school they draw the family tree of occupations, and later on they think over/find out the "workplaces of the future", they get to know/test specific vocations and their fields of interests are mapped. The process ends with impressive project works, presentations which widen the career-choice perspective of the students. So far 12,400 students of 84 institutions have taken part in the programme and some 1,800 written, fine arts or multimedia projects works have been created.

Instead of introducing a certain number of vocations, "My dream workplace" focuses on quality, that is, the student groups choose a certain occupation, and they collect, write down and present its historical antecedents, education-related features, everyday practice and future options very thoroughly.

The content of the "Day of entrepreneurship", a nation-wide programme in Poland in the framework of which students can take a look for one day at the everyday activities of a vocation chosen by them, is related to these two projects. The project gives the participants an overview of the labour market; they get acquainted with the local work opportunities and companies and with the idea of

establishing co-operation. Similar programmes can also be organised within the school walls by presenting and trying out the vocations/professions (school librarian, visiting nurse or administrator) present there.

The "Know your chosen profession" project is to help students in vocational education obtain a more thorough picture of the occupation they are learning, also from the side of practice. Here again there are many possibilities to establish contacts with local companies, enterprises, and to do research work based on the individual's field of interest.

These projects can be interpreted in several respects as the follow-up of the educational reform of 1999. As a result of the reform, the performance of students in lower secondary school increased significantly, but the knowledge gaps between the higher-level school types have remained as wide as before. This highlights the problems of vocational students, for which such projects as the above may offer a solution. Considering Gagné's (2008) talent model, it is obvious that intellectual as well as practical talent manifesting itself in a vocation/profession should be supported, that is, students in vocational education must also be provided with the conditions ensuring the maximum unfolding of their competencies/gifts.

3.3. School competitions

The majority of school competitions organised by the SCDN go beyond the frameworks of a single subject: they are of interdisciplinary nature, sometimes to the extent that they focus on fields where the humanities, mathematics and the natural sciences overlap. At one of these primary school competitions, for example, the description of the topic in the call already indicates that knowledge in literature, history, arts history and the media will figure jointly in the tasks which, instead of focusing on lexical knowledge, stimulate the interconnection of pieces of knowledge and creative task solution. Here are some examples: Write a story that could be illustrated by the painting shown here. Make a fictitious interview with the artist who made one of the well-known statues of Kielce. Identify and explain the details of the Sienkiewicz monument in Kielce. In December 2011, 2000 pupils applied for the first, school round of the competition, 500 among them went over to the county round and finally 90 reached the regional finals and 39 among them got a prize. The organisers of the competition drew several conclusions after the tournament: teachers must accept that this competition goes beyond the customary subject limits; the virtual, interactive museum pages through which one can get closer to the works of fine art must be introduced to them and to the pupils; apparently, it is necessary to integrate local knowledge components into teaching and to provide extra-mural teaching oc-

casions and e-learning possibilities; to organise training in creative thinking / creative writing; to get acquainted with talent support exercises; to create practice books, databases and knowledge warehouses accessible also via internet.

Tasks and questions of a similar type are encountered also at all three (school, county, regional) levels of the literature-and-language competitions for lower-secondary-school students: e.g. make a short verbal presentation of a specified topic; describe a fictitious creature based on a poem; select one branch of art (film, painting, sculpture, architecture) and answer related questions (e.g. How would you define that in a dictionary? If this were your field of interest, how would you develop yourself? How would you raise the interest of others in the topic? What specific works do you know in this branch of art?). In the past academic year, 2000 students entered the competition, 66 reached the third, regional round, and there were 26 winners. However, one of the lessons learned was that although the tasks were liked by the majority of the competing students, evaluation was rather difficult due to the subjectivity of the topics.

In the school-year of 2011/12, the main topic of the mathematics and natural sciences competition organised for grades 4–6 was the forest. Putting the various tasks into a uniform context underlines the applicability and practical usefulness of the sciences for the students. The tasks included the calculation of the area of a flowerbed of a special shape or the description of the effect of acidic rain on marble. At the "Magic of Maths" competition organised for every age group, students solve tasks in four categories: the *abacus* block is about the solution of mathematics tasks; the *decoder* block concerns mathematics riddles; the category of *creator* the design of parlour games and the *manager* block the popularisation of mathematics. The interdisciplinary approach and the importance assigned to applied science is discernible also at other school competitions; for example, at the history contest, the situation in a given age is to be described on the basis of diagrams, paintings, illustrations provided for that purpose; in astrology and space research the verbal presentation of an individually processed topic is demanded, at an ecological competition the presentation of a play on environmental pollution takes place.

When in Kielce, we had an opportunity to take part at the finals of the Swietokrzskie Innovation and Creativity Tournament which is basically the creativity competition of the secondary school students of the region. The name itself suggests the interdisciplinary, i.e. not subject-specific, nature of the tournament. The main goal is to develop logical thinking, creativity and team work; to popularise the concept of innovation; to raise awareness of the innovation centres active in the region and to increase the involvement and activity of the students and the schools. Secondary schools can apply to enter the two-round tournament with groups of three. In the first round, the teams match

their strengths in pentomino (a geometric puzzle game) and they complete a knowledge test. Of course, the exercises in the latter are not subject-specific, they are logical problems, puzzles, tasks requiring creativity, and the questions concern the local specifics of the region related to innovation and science. The knowledge quiz is implemented with multimedia tools, that is, students answer the projected questions on the computer before them, over a pre-defined period of time. It is much easier for the organisers to check and administer the answers this way. The teams reaching the second round must solve three tasks. The first is to be prepared before the competition: they have to design and construct a robot which will be spectacular and arouse attention primarily in the visual sense. The students take that to the competition with them, where they expose it and the jury evaluates their works. There is a knowledge test also in this round, similar in structure and topics to that in the first round, but the tasks are more difficult. Finally, the teams are given an empirical task, too: they have to build as high a tower as they can from wooden Jenga blocks by observing certain conditions. Between the tasks, there are interesting presentations: short pieces of music or dance and professional shows by young people participating in police or military training. The team of each secondary school is accompanied by a fan group of 10–20 who show to the jury what rooter verse or song they invented to inspire their team. The realisation, topic and nature of the competition is quite unusual and highly inspiring; it would be worth organising such tournaments also in Hungary.

3.4. Talent support as part of the teaching lesson

The lesson is a particularly important scene of talent support: with appropriate guidelines and work forms, it promotes the differentiation and motivation of the students, and hence the unfolding of their individual abilities. The positive effects of system-level support provided to career-starter teachers and the benefits of the up-to-date content of local teacher training programmes are clearly visible in the practice of teaching. We had the opportunity to visit lessons at several leading primary and secondary schools, and to get a certain impression of the work being done there. The scenario of the lessons can be characterised along the following key concepts: co-operative work forms, use of audio-visual devices (interactive board), interdisciplinary approach, creativity development, motivation. The environmental and interpersonal factors, enhanced by the use in class of the pedagogical and methodological components mentioned above are given a significant role also in Gagné's talent model.

Besides the methods of frontal teaching, task-solving based on collaboration, co-operation and team work is quite marked at the lessons. The teachers

integrate these work forms to different extents, depending on the nature and topic of the lesson. At a secondary school biology class working on summing up what they had learned by way of preparation for a test, the students kept working in teams throughout the lesson: the groups did tasks requiring comprehensive knowledge of the given thematic sub-unit one after the other, and their solutions were presented at the end of the lesson by one student from each group. At other lessons, this method was used to solve specific partial tasks allowing several solutions or requiring discussion. Besides their activation, motivation and involvement, the co-operative methods make it possible for the students to get to know each other better and to be more tolerant to diversity (Baloche 2005). The latter results are obvious in the interpersonal relationships and in the atmosphere of the school. In the context of talent support, the co-operative forms of work raise motivation and enhance creativity.

The use of the interactive board and other audio-visual tools was quite impressive and seemed useful at several lessons. The ease and technical expertise with which students and teachers alike handled these devices made it obvious that it was not only a demonstration for our sake: the tools concerned were part of everyday teaching practice. We were especially impressed by the biology and Polish classes we visited at the St. Hedviga Secondary School, where the teacher sisters used the interactive programmes with obvious ease. Excerpts from films, presentation of old photos and of music, process-modelling, reconstruction of patchy figures, lesson plan writing and saving, presentation-making – all of these work types occurred at the lessons we visited. The variegated, multi-channel use of the interactive board helps satisfy the students' hunger for information, it makes them more familiar with the use of the IT tools apart from extending their subject-specific knowledge through learning by experience, and it contributes to the development of a multi-perspective approach, to thinking based on analogies and autonomous work

Apart from the competitions, the interdisciplinary approach is present also at the lessons at several points. The presentation of a historical era through music or poetry; the insertion of a film segment into the illustration of a concept; a short literary text to trigger a discussion – all of these promote the development of communication between the various fields of science/artistic branches; they boost associative thinking and flexibility.

It is difficult to isolate the manifestations of creativity development from the co-operative work forms, the use of the audio-visual tools and the interdisciplinary approach, since creativity development derives in part from learning about the different opinions and viewpoints of others encountered in the context of co-operative work, from the complex and flexible ways of thinking triggered by the colourful multi-channel use of the interactive board and by the

interdisciplinary approach. Moreover, creativity is stimulated also by tasks to be approached from several directions, requiring several solutions to be reached through the components of brainstorming, as well as open questions and assignments promoting the development of one's own opinion or collective discussions.

Efforts to boost motivation are based to a significant extent on the processes listed above, but there are also many other ways of enhancing motivation, e.g. experiences of success, opportunities for autonomous learning, formative feedback and individual evaluation. Let us highlight in connection with the school-based workflows co-operation with other institutions, in particular museums and laboratories, designed to ensure that students get to know in real life what they learn in theory.

Best practices in class are conducive to the development of the already identified gifted students, but according to the 3D model mentioned above, they also make it possible to teach as many young persons as possible in a pedagogical environment where they can understand their own abilities, recognise their fields of interest and their strengths through school-based activities, so talent identification is present in the learning process itself.

III. SUMMARY

The establishment of the institutional background of talent support and the relevant strategic planning has started already at regional level in Poland, as indicated by many significant local initiatives and projects. At the same time, there are further tasks ahead in regard of the comprehensive and standardised national measures. Apart from the possibility of system-level intervention, there are many excellent initiatives and best practices at the level of everyday teaching practice: the quality conceptions and programmes of dedicated teachers and well-equipped institutions have paved the way for the consolidation of a well-functioning national-level talent support strategy and practice in the near or more distant future. Building reconstructions and assets procurements funded mainly from EU grants provide the physical environment for learning which, coupled with the expertise of the teachers, may well produce outstanding results, as witnessed also by the PISA measurements. Teachers use the audio-visual tools, the interactive board with ease and self-assurance; they integrate the co-operative forms of work into class work; they activate and motivate students and differentiate among them based on their abilities and performance. All these achievements are really impressive. There is a lot Hungary can learn from Poland in this respect, and also in the areas of support for teachers starting their career and other forms of in-service teacher training. Almost every talent-support-related programme relies on co-operation with the teachers, on in-service teacher training and on providing them with permanent and accessible support. As for the content of education, the interdisciplinary approach and hence also the development of creative thinking is spreading to more and more areas, to competitions and tests and also to the class activities, and this promotes the flexible application of knowledge and the detection of correspondences, which may be a key issue of talent support in the years to come.

All in all, the establishment and maintenance of a national talent support strategy relying on network-based co-operation and functioning so well in Hungary is at a less mature stage in Poland, albeit the country has taken decisive steps in this direction. At the same time, Polish teaching practice, the use of the audio-visual tools, the methodological and pedagogical culture and the diversity of professional support to teachers working with the talents at the levels of educational regions, schools and classes, respectively, are all exemplary for Hungary.

BIBLIOGRAPHY

Baloche, L. (2005): Developing cooperative contexts for creativity. In Shepherd, D. (ed.): *Creative Engagements: Thinking with children.* Inter-Disciplinary Press, Oxford, 53–60.

Csíkszentmihályi, M. (2010): *Tehetséges gyerekek: Flow az iskolában* (Talented teenagers: The roots of success and failure). Nyitott Könyvműhely, Budapest.

Dyrda, B. (2012a): *Edukacyjne wspieranie rozwoju uczniów zdolnych: Studium spoleczno-pedagogiczne.* Wydawnictwo Akademickie Zak, Warszawa.

Dyrda, B. (2012b): Personal Narratives of School Educators on Supporting the Development of Gifted Students. *The New Educational Review*, *27*(1), 97–110.

Eurostat (2012): http://epp.eurostat.ec.europa.eu/tgm/table.do?tab=table&init=1&language=en&pcode=tec00115&plugin=1/.

Eurydice (2011): National systems overview on education systems in Europe: Poland. http://eacea.ec.europa.eu/education/eurydice/documents/eurobase/national_summary_sheets/047_PL_EN.pdf.

Eurydice (2012): *Key data on Education in Europe, 2012*. Education, Audiovisual and Culture Executive Agency, Brussels.

Gagné, F. (2008): Building gifts into talents: Overview of the DMGT. http://www.sfu.ca/~kanevsky/428/Gagne.pdf/

Gyarmathy, É. (2006): *A tehetség: Fogalma, összetevői, típusai és azonosítása* [Talent: Its concept, components, types and identification]. Eötvös Kiadó, Budapest.

OECD (2011): The Impact of the 1999 Education Reform in Poland. *OECD Education Working Papers*, No. 49, OECD Publishing. http://dx.doi.org/10.1787/5kmbjgkm1m9x-en/.

Radó, P. (2010): *Egy fontos bejegyzésről és a lengyel csodáról* [On an important entry and the Polish miracle]. http://oktpolcafe.hu/egy-fontos-bejegyzes roles-a-lengyel-csodarol-294/.

SeténYi, J. (2010): Felvezető: Egy tanulmány a lengyel csoda nyomában [Introduction: A paper in the wake of the Polish miracle]. http://oktpolcafe.hu / felvezeto-egy-tanulmany-a-lengyel-csoda-nyomaban-292/.

Further reading

http://www.diament.edu.pl/
http://zdolnizpomorza.pomorskie.eu/index.aspx/.
http://geniuszportal.hu/content/mit-jelent-az-hogy-tehetsegpont/.
http://www.oecd.org/dataoecd/54/12/46643496.pdf/.

Mohammed Jamalallail

Gifted Education in Saudi Arabia

I. INTRODUCTION: THE KINGDOM OF SAUDI ARABIA – COUNTRY AND PEOPLE

Saudi Arabia is situated in the southeastern corner of Asia, strategically located close to the crossroads of three continents: Asia, Africa, and Europe. The country has the most important Islamic cities Makah and Medina, and it is the world's largest oil exporter, while also one of the world's largest petrochemical products producers. This resource base has helped support the transformation from an essentially nomadic subsistence society (approximately 70% of the population) to one where the literacy rate is close to 80% in a time-span of seven decades (CIA World Factbook). However, its population close to 28 million (Saudi Ministry of National Economy and Planning, 2010 census, and the CIA World Factbook), of which 8.5 million are foreigners, is young. It is estimated that above 60%, or approximately 13 million, of its native population is under the age of 19, with school-age children being around 9 million. As a result, Saudi Arabia's expenditure on education places it in the top 20% of the countries in terms of expenditure as a proportion of GDP (6.8% of GDP), or number 28 in rank according to the CIA World Factbook. This demographic profile, and Saudi Arabia's joining the WTO have created twin challenges in terms of development requirements: creating employment and developing the set of skills that allow the country to compete in an increasingly open global market. Therefore, to put more emphasis on human resource, as a key to overall development, the Kingdom embarked on a formal gifted and talented education program in 1999 (Al-Nafi et al. 2000).

There have been three stages of the development of Gifted Education in Saudi Arabia during the last three decades. The first stage was the development of the National Project for Identifying and Serving the Gifted. The second was the implementation of this programme and the third stage is establishing the King Abdulaziz and his Companions Foundation for Giftedness and Creativity (Mawhiba) (Al Hamdan 2013).

II. SAUDI EDUCATIONAL SYSTEM AND GIFTED EDUCATION

The Ministry of Education was established in 1953. It is considered the largest centralised educational agency in Saudi Arabia. The Ministry's main objective is to provide general education for all students, therefore, it runs elementary, intermediate and secondary schools. Moreover, the Ministry of Education is responsible for policymaking and planning curriculum, teacher and superintendent training, and special education.

The broad aim of education in Saudi Arabia is to satisfy the needs of the individual and the society. One of the special aims is harmonizing education and psychological development of students. This includes helping the individual to develop spiritually, mentally, emotionally, and socially in a well-rounded way, as well as studying individual differences among students so as to give them proper assist in their decisions.

Identifying gifted children and nurturing their abilities in Saudi Arabia and in other Arab countries got in the focus of attention in the last quarter of the 20th century. Nevertheless, this attention did not transform into a methodological and academic endeavor until 1990, when the findings of the first study focused on gifted children in Saudi Arabia entitled "The National Program of Identifying and Nurturing Gifted Children" were published. The study officially adopted and arabised the Wechsler Intelligence Scale for Children–Revised (WISC-R) and The Figural Torrance Test of Creative Thinking (TTCT). It developed also the General Aptitudes Scale – Group Test (a scholastic aptitude scale). Since that time, the scales used in identifying gifted children have been limited to the WISC-R, the General Aptitudes Scale and, though seldom, The Figural Torrance Test of Creative Thinking (Al-Jughman 2012).

The Saudi educational system consists of twelve years, divided into six years of elementary school, three years of lower secondary school, and three years of upper secondary school. One of the main aims of education at all levels is the development of different skills and abilities, including the development of creativity. The Ministry of Education sets overall standards for the country's educational system and is also responsible for overseeing and implementing the Saudi educational policy regarding gifted education. In the Ministry of

Education there are two administrative branches for identifying and serving the gifted. They consist of four units:

- Programs unit
- Planning, Coordination and Training unit
- Identification unit
- Administrative Communication unit.

Through these units, the Ministry of Education provides the following programmes for the gifted in the public schools:

- *Acceleration*: where a student can be moved from one grade to the next after he/she passes certain criteria. Acceleration is implemented in elementary and middle school.
- *Grouping*: gifted students of similar abilities take special courses in a special class for the gifted.
- *Enrichment*: holding enrichment lessons for the gifted according to their abilities (Al-Hamdan 2013). Enrichment models are widely used in gifted education in the country.

III. THE PROGRAMME OF SPECIAL EDUCATION FOR THE GIFTED

According to the Ministry of Education, the main programme for gifted education is defined as follows: All students in public education are entitled to equal opportunities to identify their gifts and develop them. Therefore, it is to be hoped that teachers of gifted students, each in his/her own school, will make efforts to develop get various educational experiences that will help them discover the variety of gifts of the students, and develop these gifts through special programmes and assignments to special classes.

The general goal of the programme is to prepare qualified, full-time teachers in public education in the field of gifted education. These teachers will be called "teachers of the gifted" and will undertake the responsibility of discovering students' gifts and fostering the unfolding of these in the frame of systematic programs suitable to their variety.

The detailed objectives of the programme are:

1. Preparation of qualified teachers in the field of gifted education in every school.
2. Setting up a specialised educational plan which reveals students' gifts by school staff members in every institution.
3. Providing equal and various educational opportunities for all students to develop their talents.

The beneficiaries of the programme are male and female teachers in public education, and male and female students in schools of public education. In the year 1424 a number of courses and sessions were organized in the field of gifted education, including methods of teaching gifted students, creative problem solving, and qualifying specialised female teachers to recognize gifted girls.

IV. THE THEMATIC COMPOSITION OF GIFTED EDUCATION

1. Programmes for scientific activity

1. *Science Competitions* include a variety of competitive programs which contribute to test students' scientific knowledge and promoting the spirit of fair competition.
2. *Mathematics Competitions* help developing students' mathematical concepts and their applications, and promotes the spirit of fair competition.
3. *Scientific Inventions Competitions* aim at promoting students' inventive tendencies.
4. *Teaching Resources Competition* gives students the opportunity to present their works and inventions in the field of teaching resources in a way that contributes to the teaching process.
5. *Special Education Students' Competitions* aim at giving students the opportunity to make practical contributions to various scientific activities such as the Sciences and Mathematics Competitions.
6. *School Scientific Clubs Competitions* promote the spirit of fair competition among school scientific clubs and gives them the chance to present their projects for evaluation.
7. *Chemistry Competition* consists of the presentation of theoretical concepts and practical applications in the field of chemistry among secondary school students.
8. *Computer Sessions* aim at providing groups of students with information and skills in computer use and applications, in a systematic training schedule.
9. In the *First-Aid Sessions* students learn the basic rules and procedures of first-aid practices, especially in a school environment.

10. *Electricity and Electronics Sessions* provide students with theoretical and practical information in the fields of electricity and electronics, and aims at promoting inventiveness in these fields.
11. *Scientific Lectures and Panel Discussions* consist of a number of scientific lectures and activities which aim at augmenting students' general science education.
12. *Scientific Research* offers a number of research projects at the students' level in an effort to promote scientific methodological thinking.
13. The *School Scientific Radio Stations* programme represents scientific-cultural activities in schools and promotes school, social and home education.
14. The *Reading Programme* has various functions:
    - offers prizes for the ten best research projects in the field of reading
    - includes a précis programme
    - organises book exhibitions in cooperation with publishing companies as well as panel discussions and lectures offered by intellectuals and university
    - organises workshops related to reading skills
    - transmits knowledge and increases the need for better and different educational services and materials.

2. The Cultural Activities programme

1. *The program of student skills training* is based on the principle of "development of students through training", whereby the general administration of student activities prepares and qualifies a number of Saudi trainers, assigning them to subjects related to students' lifestyle. This is done on the basis of a study of the students' needs, and the trainers are qualified to apply their program in secondary schools. The subjects of the program include:

   a) *Personal skills sessions*, including
      - ten habits of distinction in school
      - art and skills of fast reading
      - creativity and success
      - student development through training.

b) *Administrative skills sessions*:
   - the art of time management
   - the art of planning for the future.

c) *Sessions of mass communications skills*:
   - the proper dealing with the globalisation of mass communication,
   - mass communication skills.

d) *Sessions of social skills*:
   - the art of interaction with others;
   - the proper method of choosing friends;
   - building self-confidence;
   - the art of dialogue;
   - meeting with issues of national importance.

2. In an effort to further expand this program, the General Administration of Students' Activities encourages the Departments of Education to establish a program of *students' volunteer training sessions*.

3. With the aim of improving students' training, the General Administration of Students' Activities has set up a program qualifying trainers. The subjects of this program emphasise the art of dialogue and interaction with others, in addition to self-management and choosing friends.

4. In the year 1424 Hijra, efforts of the General Administration of Students' Activities were directed toward the project of *Students' Training Centers*, which will be set up throughout the Departments of Education as a collaborative project. These Centers will offer sessions to students throughout the year and will offer training consultations as well.

3. Programmes for social activity

A number of social activity programmes have been offered, too, on a yearly basis, according to the following fora:

- Centers of Students' Summer Trips
- Centers of Social Works
- Summer Educational Meetings
- Centers of Summer Students' Activities.

Many students participate in these programmes throughout the Departments of Education in the Kingdom in order to take part in the social activities offered.

4. Programmes for sports activity

A great number of sports activities have been organised at domestic, regional and international levels. The most important of these activities are school sports tournaments in the Kingdom, and international student tournaments in Arab countries. The Kingdom of Saudi Arabia achieved first place in the Arab Scholastic Sports Tournament held in Morocco in 1419 Hijra, the cup in the first basketball championship held in Lebanon in 1421 Hijra, the cup for second place in the soccer tournament held in Lebanon in 1422 Hijra, and the cup for handball and athletics held in Jordan in 1422 Hijra. The Kingdom won many other gold, silver and bronze medals, too, in a number of sports activities in 1423 Hijra.

5. Students' Transportation Programmes

1. The *Cooperative School Transportation Project* aims at transporting students by public transport with the help of the private sector.
2. *Financial Rewards and Aid*: In the state's effort to develop education and encourage learners by facilitating their movement to places where schools are available, financial rewards and aid have been assigned to certain groups of students. The total amount of rewards distributed in the year 1423–1424 (Christian 2003/2004) Hijra was 666,815,140 Saudi riyals.
3. The *Safety in Transportation Means* programme was first implemented during the school year 1422–1423 Hijra. It aims at training annually the 20% of the students to the proper use of the means of transport, in addition to teaching drivers, supervisors and follow-up personnel to safety procedures in transportation. The main reason for setting up this program is the lack of awareness among students of the proper use of the means of transport. To reach the final goal of the program, that is, assuring the safety of students, requires teaching all personnel working in the departments of students' services to methods of providing safety on transport means.

6. The School Transportation System

The Ministry of Transportation has given priority to school transportation systems, especially for girls, and has now a large fleet of school buses. The number of buses operated is 3,600, in addition to 5,000 buses leased from the private sector. The total cost of leasing buses is 159,000,000 Saudi riyals, and

female students using the transportation system are about 30% of the total number of students.

7. The School Health Programme

1. The *Health Advisor Program* is a preventive programme aiming at raising health awareness in the society and at schools by training teachers in school health programmes. The General Administration of School Health issued a guide to health advisors which is the textbook for the programme.
2. The *Program of Nutrition Education*: is another educational programme designed to establish safe nutrition basis for children aged 7–12. The programme is called "Your Food, Your Life".

8. Advising Programmes

A number of advising programmes have also been implemented in Saudi Arabia. They include:

1. The *Prevention of Child Violence* programme aims at caring for children and protecting them from certain negative influences. It also attempts to prevent harming, neglecting or abusing children in their social environment and in schools.
2. The implementation of the *Rules of Proper Behavior and Attendance throughout the Stages of Public Education* aims at inculcating good behavior in students and enhancing their proper attendance of school in order to fulfill the educational role of the institution.
3. The implementation of the *Student Fund Project* is a welfare project which aims at offering direct and indirect aid to students who suffer from socially and financially difficult conditions. The Fund Project contributes to social co-operation according to the Islamic religion and to help students co-operate with one another both at school and outside of it. The project includes vocational and educational services, too.

9. Summer enriching programmes

The general goal of these programmes is to offer enriching courses during the summer holiday for gifted male and female students in order to develop their

academic potentials and mental abilities to the utmost possible degree. In the frame of the courses gifted students

1. practise skills and then apply mental strategies in a much more profound and varied manner at school;
2. apply scientific research methods in analysing natural phenomena and situations related to the main enriching programme;
3. learn new cultural and scientific subjects which may not be included in the general curriculum;
4. employ some technical applications to deal with and present the contents of the main enriching programme; and
5. develop their communication skills and practise interaction with various social groups.

V. CLOSING REMARKS

The Saudi government strongly believes that gifted education, and education in general contributes to respond better to the challenges facing our society. These include interacting with world culture, preparing citizens to the new forms of globalisation within a comprehensive system of moral values, accepting the inevitability of change as a basis for development, and developing individual and institutional capabilities to meet the new requirements, and also utilising changes according to a comprehensive institutional strategy which aims at continuous development.

BIBLIOGRAPHY

Al-Hamdan (2012): *The Status of gifted education in Saudi Arabia.* http//:www.worldtal.org/.

Al-Jughman, A. (2011): *The Oasis enrichment model: Comprehensive care for promising talents.* http://aljughiman.net/.

Al -Mafi (1977): *Gifted education in the Arabi world.* http://www.kfu.edu.salar/.

Ministry of Education (2004): *The Development of Education*. Riyadh, Saudi Arabia.

Mawhiba.org.sa

János Gordon Győri

Mathematical Talent Support at the National University of Singapore High School of Mathematics and Science

We have already described in detail the main characteristics of talent support in Singapore in the first volume of this series (Gordon Győri 2011) and in other publications (Gordon Győri 2006). These writings presented Singapore as a highly industrialised and modernised, knowledge-based country, one of the most successful examples of modernisation in Southeast Asia. We have highlighted that social and economic achievements are concurrent there with a most convincingly effective and internationally renown educational system – the latter being both the precondition and the result of the former (OECD 2011). We have also spoken about a new Singaporean talent support institution, the National University of Singapore High School of Mathematics and Science (NUS–HSMS) in connection with the detailed examination of the centralised talent support programme (GEP – Gifted Education Program) of the country.

After a short introduction, the present chapter will focus exclusively on the NUS–HSMS, representing a remarkable model example but also a challenge for institutional talent support today, not only in Singapore, but internationally as well.

I. EDUCATION AND TALENT SUPPORT IN SINGAPORE

1. An effective educational system

Singapore is a small country in the Southeast Asian region with a territory of less than 710 km², which gained independence quite recently, in 1965, two years after its secession from Malaysia. At that time it had less than 2 million inhabitants. Today, this highly developed, rich, innovative, technocratic society enjoys the benefits of the third highest GDP globally, having a population of 5 million, made up of four large ethnic groups: the Chinese (74%), the Indians (13%), the Malay (9%) and Western people (3–4%).

Singapore had many educational problems at the time of gaining independence at the end of the 1960s, but now it operates one of the most efficient educational systems of the world. In the early days, higher education was the privilege of a very narrow social stratum; most young people completed no more than primary school. Even as late as the 1970s, "of 1000 children starting primary school, 206 acquired no marketable qualification whatsoever, since they did not continue their studies after the first nine years" (Goh–Gopinathan 2006, p. 20). Furthermore, there was a remarkable gap in educational attainment levels of the Chinese, the Tamil (Indian) and the Malay population, in favour of the Chinese. For these reasons, Singapore did its utmost to gradually extend primary school education to the broadest social circles, while also standardising education and raising its quality as high as possible. As time went by, the country set out to do the same at higher educational levels, keeping in mind principles of meritocratic performance and of equal opportunities. In spite of many ardent social debates, a system of educational streaming was introduced in the 1970s to ensure the highest possible primary-school completion rates. The system channels students finishing 6-year primary school to the normal technical, normal academic and social, and express educational streams, respectively, based on their performance measurement results (the better their performance, the more academic type of education they receive).

2. Talent support

The above system contributed later on, in the 1980s, to the relatively smooth social acceptance of putting highly gifted children in special educational streams. Following performance measurement at age 9 (after primary school Grade 3), the best may join the GEP, the Gifted Education Program or the HAL, the High-Ability Learners' Program. Those in the top 8% can take part in another round of testing, and the Ministry of Education offers GEP and HAL education from Grade 4 on to those in the topmost 1% and the next 4%, respectively. For a few years now, the Gifted Education Branch (GEB) of the Ministry has been offering an even more attractive talent support option: the most outstanding 3 pupils in every 100,000 (based on the statistical headcount) are provided a very special and highly individualised form of education, with personalised curriculum and topics, and the support of a special professional training staff.

Talent support in primary school (GE) takes three forms in Singapore. Firstly, talented students are trained under differentiated school programmes implemented by teachers provided with special talent support training in their respective special fields for this purpose. Secondly, at certain secondary schools designated for this purpose students can choose from various learning streams (programmes) based on their interests and outstanding abilities. These educational programmes lead to the acquisition of advanced knowledge and various special qualifications. Thirdly, talent support takes place at specialised talent support schools. The Singapore Sports School active since 2004 educates children gifted in the sports, from sailing to badminton. The School of the Arts, active also since 2004, develops talents aged 13–18 in the fields of music, dance and the fine arts. The reason why the NUS–HSMS (National University of Singapore High School for Mathematics and Science) founded in 2005 is special is that it is the first and so far the only school of the country specialised in educating academic talents. In what follows, we shall present the programme of the NUS–HSMS as a Singaporean best practice in talent support.

II. THE NUS–HSMS[1]

As indicated by the above, Singaporean talent support reached the stage of establishing talent support schools with a subject-specific profile in the early 2000s. The option of creating a special school for intellectually gifted children presented itself in parallel with and after the realisation of special education in sports and in music. The National University of Singapore set out to create this institution with the approval of the educational administration. This is important since not only public education, but also higher education experts took/take part in designing the profile, system of operation, curriculum and teaching guidelines of the school, taking into account fully, of course, the demands of higher education, regarding the knowledge and skills upon exit of gifted secondary-school students. They took into account also the demand that today a new talent school must prepare its students for further education not only in their home countries, but also at the best universities all over the world.

The NUS–HSMS is a so-called independent school[2] which took the opportunity to design an educational structure and curriculum comprising many novel components, to select the teaching staff most carefully and to select its prospective gifted students through a multi-step selection process annually (Ministry of Education Singapore 2012).

---

[1] Chapter II of this paper relies to a large extent on the 2012 programme of NUS–HSMS displayed on the website of the school (NUS–HSMS, 2012a), and on the very rich verbal communication with Mr. Goh Hock Leong, Deputy Principal of the school at that time (Goh, 2010). The author would like to thank the Deputy Principal for his unselfish contribution as he presented the operation of the school saving no time and energy, sincerely hoping that this chapter is an appropriate rendering of the Deputy Principal's message.

[2] "Independent schools" authorised in the system of Singaporean private schools since 1987 enjoy a higher degree of autonomy than public ones: they have considerable freedom in employing teachers, in specifying their remuneration and in designing the curriculum. Although they receive public support, they may also demand tuition fee from the students – hence this school type is mostly chosen by students of more favourable social situation (Barr–Skrbiš, 2011; Tan, 1993).

1. The structure of education

The NUS–HSMS is a six-year secondary school which provides modular education divided into three stages:

- Foundation (1st and 2nd year),
- Advancement in theoretical and applied knowledge (3rd and 4th year) and
- Specialisation, i.e., advanced courses in special fields of knowledge (5th and 6th year).

In the Foundation and the Advancement years, students choose from among compulsory modules of the following subjects: Mathematics, Biology, Chemistry, Physics, English, Mother tongue, Arts/Music/Humanities. In the years of Specialisation, they have to study Mathematics and two other natural sciences subjects, and they can choose at least one more mandatory subject from the following: Arts, IT, Economics, English Literature, Geography, History and Music, or a module of one more natural science subject.

There are core, elective and enrichment modules. The modules mostly have certain preconditions; of course, the core modules must be completed by all; the elective modules deepen the knowledge acquired by the students in the core modules and the enrichment modules expand that even further in function of their lines of interest. For the core and elective modules, students receive marks like A+, A, A–, B+ etc., that is, quasi-marks in an 11-grade (A+ to F) performance evaluation system, whereas the enrichment programmes and the modules of the Da Vinci Programme are evaluated by the school on a four-grade scale (excellent, adequate, satisfactory, unsatisfactory).

Although this structure in itself favours the gifted, the most able students have further options. For example, students completing their modules with outstanding results before the Specialisation years may choose so-called Major(s) with Honours in Mathematics, Biology, Chemistry and Physics. To do so, however, they have to complete the Major(s) with Honours in English or their mother tongue and another such module called Advanced Research Project (ARP) which is part of the school's programme named after Da Vinci, to be presented below. Another special acceleration option for outstanding students is their exemption from certain modules based on a preliminary exam passed with outstanding results, instead of which they can choose more advanced modules in the field of knowledge they are interested in. Nevertheless, every student must complete at least 4 academic years at the NUS High School, that is, no faster acceleration is possible.

2. Mathematical talent support programme of the High School

Mathematics and the natural sciences subjects represent the central fields of education of the school. These subjects are taught in a total of 9 lessons a week in the first two years, 14 lessons a week in the two Advancement years, in 17 lessons in the years of Specialisation – that is, tuition in these areas keeps intensifying. Thus, while in the Foundation years the rate of other subjects than Mathematics and the natural sciences is 57%, in the Advancement and the final years it is no more than 46% and 34%, i.e. one third, respectively.

In the Foundation years, students master the bases in the broad sense of algebra, geometry, trigonometry and statistics.

The topics preceding the calculus, i.e. such Major(s) with Honours as e.g. functions, trigonometry, sequences and series, are taught in the Advancement years. Students must be familiar with the function properties/operations, function graphs and the determination of the values of trigonometric functions. They study the vectors, the numerical methods and mathematical demonstrations. A simplified interpretation of the differential and integral calculus is also introduced in these years.

Students have to master differential and integral calculus at a higher – basically high school/university – level in the years of Specialisation. They also increase their knowledge of theoretical mathematics and statistics. In addition, they can choose the direction in which they would like to deepen and expand their knowledge from a wider array of offers.

In the academic year of 2012, for example, the school offered the following topics under the core (mandatory) modules to its students in various grades:

- Basic mathematics, I;
- Basic mathematics, II;
- Basic mathematics, III;
- Basic mathematics, IV;
- Advanced mathematics, I;
- Advanced mathematics, II;
- Advanced mathematics, III;
- Advanced mathematics, IV;
- Polar co-ordinates;
- Parametric and vector functions;
- Advanced algebra;
- Statistics;
- Database design;
- Data structures;
- Algorithms;
- Advanced study of algorithms;
- Linear algebra;
- Advanced mathematics, V;
- Software development;
- Computer networks;
- Numerical analysis;
- Game theory;
- Discrete mathematics (graph theory);
- Abstract algebra;
- Introduction to algebra.

The elective and the enrichment modules, on the other hand, cover the following fields:

- Basic Olympic preparation training, I;
- Advanced Olympic preparation training, I;
- Advanced Olympic preparation training, II;
- Introduction to GUI programming;
- Advanced Olympic preparation training, III;
- Higher level basic mathematics;
- Grounding for the programming processes;
- OOP (Java etc.) programming, I;
- Advanced Olympic preparation training, IV;
- OOP II;
- Advanced statistics.

In the final years, students have the opportunity to take – according to their abilities and results – the American exams needed for starting higher education there, such as the SAT/ACT and the AP exam[3].

The mathematical training programme of the school, however, does not end with the modules mentioned above, nor within the walls of the school. Training intensity is considerably enhanced by the Da Vinci Programme, the Boarding School Year, and the Einstein+ Programmes.

3. The Da Vinci Programme

The Da Vinci Programme is one of the key educational components of the school. The six-year programme is designed to enhance the students' scientific research, innovation and entrepreneurial skills in the context of combined subjects, to boost their multidisciplinary skills in response to the incessantly changing economic and market needs. The background for the programme is provided by the outstanding research institutions of Singapore (e.g. Science Centre Singapore and A*STAR) and by the school's parent institution, the National University of Singapore. That is, the students of the school practise research under the mentorship of their own teachers and of the senior teachers and researchers of the university and the research institutes.

[3] To make it possible for NUS High School students to be admitted to the American and British universities, they have an opportunity during their school years to pass such admission exams as e.g. the SAT/ACT required by the universities concerned (for the SAT/ACT exams and the AP in Hungarian, see Gordon Győri 2001).

The modules of the Da Vinci Programme cover the following topics:

- Da Vinci grounding (grounding of research skills)
- Planning and engineering skills
- Creative problem-solving
- Knowledge concerning the presentation of scientific results
- Research methodology
- Da Vinci seminars
- Advanced Research Project (ARP; in the Specialisation years)

In their third and fourth years at the school, students take part in autonomous research projects in the framework of the Da Vinci Programme, they have to complete a research methodological module, co-operating with a mentor–teacher. Moreover, they have to take part in a high-level national research programme, e.g. the Young Defence Scientists' Programme (DSTA) or the Social Sciences Research Programme (SSRP).

In their fifth and sixth years, that is, in the two final years, students must take part in the Advanced Research Programme in Mathematics and the natural sciences. These programmes are designed for a relatively long period of 10–18 months. The school organises a Research Congress in the spring of each year where students can showcase their work; the school evaluates the presentations on a four-digit scale. Older students, or those who produce significant results are encouraged by the school to present their results at national or international scientific fora, or even to publish them[4].

4. The Boarding School year

One component of the NUS–HSMS educational programme, rather unusual even in international comparison, is that students in the 11th year (students studying in Grade 5) must complete a boarding-school-based programme, i.e. a residential year in the boarding school of the institution accommodating 500 people. In addition to the tuition fee, foreign students must pay a special monthly fee for accommodation at the boarding house, whereas the corresponding expenses of Singaporean students are covered by the state.

During their boarding school year, students are required to carry out advanced research: the completion of the Advanced Research Programme is one of the exit conditions of the school. To be able to execute such projects,

[4] We shall return to the scientific publication activity of the children below.

students have lessons in research methodology (as under the Da Vinci Programme), separate time is allocated to research team discussions, and they have informal discussions with scientists. The underlying pedagogical concept is that the social skills, and in particular the managerial and co-operation skills, of the students are greatly enhanced by a year spent in the boarding school.

5. Scientific publications

As mentioned already, the NUS–HSMS organises a scientific conference for students in March every year where they showcase most of the scientific research projects realised as part of the Da Vinci Programme. Older students are encouraged to present their work also outside the school, at national education and scientific, and international scientific fora.

The school requires that students make their scientific achievements accessible also to social groups outside the school walls. A minor part of students published articles in renown scientific reviews, and some wrote book chapters or contributed to editing scientific books, too, in the past years.

As an example, the publication below came out in 2011 in a prestigious scientific review; some of the co-authors were still NUS–HSMS students at the time of the relevant research work or its publication:

Reddy, M. V.–Silvister Raju, M. J.–Sharma, N.–Poh, Y. Q.–Nowshad, S. H.–Hsu, E. E.–Peterson, V. K.–Chowdari, B. V. R. (2011): Preparation of Li1.03Mn1.97O4 and Li1.06Mn1.94O4 by the Polymer Precursor Method and X-ray, Neutron Diffraction and Electrochemical Studies. *Journal of the Electrochemical Society*, 158(11): A1231–A1236.

Furthermore, the students of the school have held presentations at two dozens of international conferences since 2008.

6. The Einstein+ Programme

The Einstein Programme designed for the most gifted among the highly gifted is one of the prides of the school. As a matter of fact, Einstein+ is the talent support programme of the High School in the strict sense.

The NUS High School Overseas Student Academic Programme (NUS–HSMS OSAP) is a key component of the Einstein+ which makes it possible for selected students in Grade 4 and 6, respectively (ages 16 and 18) to spend two weeks in a partner school abroad in such countries as e.g. Australia, China, Switzerland, Russia, South Korea, Thailand, Japan, France or Hungary. At the time of writing this chapter, the NUS–HSMS has a student exchange relationship in Hungary with the Fazekas Mihály High School in Budapest and in particular with the special mathematics classes there.

7. Academic mentoring

The NUS–HSMS appoints mentors from among its teachers to the selected students to ensure their even more efficient training in the areas of mathematics and the science subjects. Some exceptionally gifted students, however, are mentored by professionals invited from the National University of Singapore, the parent institution of the school, who provide them with individual mentoring.

8. Olympiad training programmes

These programmes prepare the most talented and motivated students of the school to participate at the national and international student Olympiads. Singapore has been present at the international mathematics Olympiads since 1988, and won 6 gold, 34 silver and 64 bronze medals, in the recent years mainly thanks to the NUS–HSMS students. This is not a particularly good result in international comparison – obviously, one of the endeavours underlying the entire NUS–HSMS educational programme is that Singapore should raise more mathematicians and natural scientists in command of more advanced and better knowledge, up to the international standards. The country and the school are on the right track, as witnessed by the fact that in 2011 Singapore finished 3rd in the non-official ranking of the student Olympiad in mathematics after positions between 14th and 41st in previous years – preceding for example Russia –, and occupied the prestigious 7th position also in 2012 when, in addition, Jack Lee, student of NUS–HSMS won absolute first place at the Olympiad.

9. The Einstein Club

This is a special programme of the school in the sense that it is organised for primary school (hence outsider) pupils from Grade 5 (ages 10–11) on. At the club, selected primary school pupils can make experiments, listen to introductory lectures on the bases of science, scientific work and the like.

10. Co-curricular programmes

As most talent schools worldwide, the NUS–HSMS strives to develop its pupils as extensively as possible. Special emphasis is put on the development of managerial skills, since the school regards its students as prospective professionals and social leaders of Singapore and the region, or even other parts of the world. There are several sports clubs, arts programmes, social science and volunteering programmes at the institution.

11. Student performance measurement; characteristics of further education

Student performance is measured in a double system: the GPA (Grade Point Average) indicates the student's average performance calculated on the basis of the courses completed and their results under the core and elective modules in the given semester. The 5-point CAP system, on the other hand, shows the cumulative average results in all basic subjects and under the core and elective modules already accomplished by the student in the semester concerned. The indicator of overall student performance is the GPA and CAP quotient (GPA/CAP). Hence the total performance indicator comprises both the actual and the preceding results of the student and can therefore be regarded as a multi-criteria performance indicator.

After completing the NUS−HSMS, students receive a four-grade comprehensive diploma (outstanding, excellent, satisfactory, passed). Although the system operated by the NUS−HSMS is radically different from that of any other school in Singapore, its final certificate is accepted by all higher education institutions of the country. The diploma guarantees admission to a series of elite English and American universities, e.g. Cambridge, Oxford, the MIT, Harvard, Yale, Stanford and others. Similarly, the NUS–HSMS final certificate is recognised and accepted in many countries of the world. Given these options, former NUS–HSMS students are now present at the most outstanding higher education institutions of the world, and especially at the American and British elite universities.

12. Selection of gifted students: the admission process

Each year the process of screening and identifying gifted students starts with a programme to raise awareness of the activities of the school. The NUS–HSMS open days are highly popular: in 2001, for example, the school had 5,300 visitors on such occasions. Simultaneously, the professional staff of the school visits primary schools to popularise the NUS−HSMS.

The admission exam is a programme of several rounds focusing primarily but not exclusively on test filling. Each of the 1800–2000 applicants received by year completes a mathematical and a natural sciences test. The 400 best performers go to a camp where the teachers assess their knowledge in biology, chemistry, physics, and English, and they select some on that basis. They also observe the degree of motivation and creativity of the children, whether they can strike the right note with other children and whether they are good at team work, etc.

The 150 most gifted students identified at the camp are then admitted to the school. Some (very few – no more than 15–20) students are admitted directly on the basis of their primary-school-leaving certificate if their results there are obviously outstanding. Hence a total of around 170 students start their studies every year.

The NUS–HSMS, however, takes also the opportunity offered by the 6-year school system, and the fact that the majority of students in Singapore finish their studies in 3-year upper secondary school after passing an exam at the end of lower secondary school. At this point the NUS–HSMS selects another 70 students. This is how the final student headcount is attained, with 170 students in each of Grades 1–3 and 240 in each of Grades 4–6. Consequently, the total student headcount of the school is 1230, with minor fluctuations.

13. The teacher/student ratio

A high teacher/student ratio is an important precondition for the talent nurturing activity of the NUS–HSMS. The approximately 1200 students are assigned to the care of 115 teachers, hence the teacher/student ratio is almost exactly 1:10. The majority of teachers have an MA degree and some a PhD degree as well. The class headcount is usually 20–25, but at lessons under the enrichment module it is only 6–8. There are also some, but not many, foreign students.

III. EVALUATION OF THE TALENT SUPPORT PROGRAMME OF THE SCHOOL

The NUS–HSMS is a talent support school worth of attention in several respects. Certain circumstances of its foundation are noteworthy in themselves. For example, this is the first school in the history of the country targeting the education of the intellectually gifted children and in particular those who are gifted in the natural sciences. Note also that the first Singaporean talent support institutions with a thematic profile were established right before or soon after the NUS–HSMS: the Singapore Sports School (SSS) received its first students in 2004; the NUS–HSMS was founded in 2005 and the Singapore School of the Arts (SOTA) opened its gates in 2008. That is, it was in the first decade of the 21st century that Singapore started to feel the need for establishing specialised schools to support the gifted, deeming special education provided to them at the general educational facilities insufficient. At the same time, albeit the date when the establishment of a new institution of education becomes necessary and feasible is obviously influenced by many factors, it is probably not by accident that the NUS–HSMS was not the first, but the second in chronological order among these schools.

For, it is common knowledge that the foundation and operation of classes or schools specialised in sports or in the arts triggers definitely less social debate than that of schools offering academic education. Apparently, educating the artistically or physically gifted youth in specialised institutions and under special programmes seems more natural to public opinion and the professionals concerned than the same for the intellectually gifted, as the latter evokes two debated issues almost inevitably. One is the question of equality and inequality in education, and the other is whether special education focusing on the scientific fields can actually guarantee the harmonious development of the entire personality. Since these questions are generally non-existent or at least less marked in connection with the schools of arts or sports, it is fortunate in the strategic sense that the first talent support schools founded in Singapore to nurture those with non-intellectual gifts gave a kind of "flank" to the one designed for the intellectually gifted. In other words, the NUS–HSMS as specialised educational institution for the intellectually gifted started operation

when it had become obvious that the society would accept specialised schools of its kind.

Furthermore, it is important to consider that the NUS High School specialises in nurturing children gifted in the natural sciences. On the one hand, this is the most typical tradition in the domain of specialised talent support schools – similar institutions were created in the former Soviet Union as early as the 1960s – and, on the other hand, these are the fields upon which a country focusing on technological development like Singapore should concentrate its talent support resources. Giving priority to the development of children gifted in natural sciences and technology is an international trend observable in the technically advanced countries building knowledge societies. Of course, one must not forget about ensuring the most complex development at the highest possible level of these students, and also of children gifted in sports, arts or humanities.

The foundation of the NUS–HSMS and of the two other specialised schools highlights that today's talent support cannot be realised exclusively in mainstream education, not even in such an efficient school system as the Singaporean one. Neither the curricular parametres, nor the time schedule is suitable for that in schools providing traditional education. Intensive subject-specific training requires special capacities not only on behalf of the teachers and the students, but also of the institutions, which must be focused on development in the special subject(s), while being more flexible and adaptable to the individual needs of the gifted than other schools and forms of training. Furthermore, the motivation level of gifted children is often higher than average in their special fields due to their outstanding abilities and achievements, and that may be concurrent with a higher concentration capacity, and more focussed and lasting performance. Let us add, however, that there may be extreme individual differences in this respect.

Modular education is an important feature of the NUS–HSMS. Extensive electivity – looking back on significant traditions not only in other Singaporean talent support schools, but also in the US and many other countries globally – seems to be an important feature of talent support, especially in the field of natural sciences. Although there are arguments against the modular educational system, there is no doubt regarding its high potential, especially in the field of talent support. This form of learning organisation and the underlying special curricular systems can serve both uniformity and individualisation in education, and this twofold approach is most necessary in nurturing talents.

The boarding-school-based research programme of one year, to be completed in Grade 11, is a rather unusual component of the NUS–HSMS

training programme. Although this point is likely to recall the traditions of talent support at boarding schools going back to hundreds of years in many countries, the practice of this Singaporean school is rather different, since children move to a common building for only one academic year, in Grade 11, whereas in the preceding years and in the final year of their studies they go to school as usual. Let us consider what the pedagogical basis of this atypical system might be. In all probability, age is the point of departure: at the age of 17, gifted students with sufficient preparation (provided by the NUS–HSMS most carefully and thoroughly) are mature enough to practise the moments/process of independent research work. The extraordinarily gifted can produce already achievements worth of being published at that age, too. Research in our world almost never – not even in exceptional cases – means work done in solitude, but a collective activity pursued in a laboratory with mates for a longer time. If researchers of the future are not prepared for that, if they are not sufficiently prepared for engaging in (at least partly) collective scientific activities with others, simply because they had no such experience and their managerial and co-operation skills are underdeveloped and not up to the task, it is in vain for an excellent talent teacher or talent school to prepare them: their research skills will not be up-to-date. And that, in turn, hinders their employment in scientific workshops as some deficiency in their relevant professional knowledge. It can be stated with certainty that the NUS High School decided to meet this challenge.

However, to make such a special residential system operational, a good many conditions must be met. The institution must have sufficient capital to own a boarding school accommodating hundreds of students, and also funds to maintain it with appropriate laboratories, materials and measuring devices – and, of course, it must have adequately prepared teachers and mentors to ensure and support the quality work of the children. Another important condition is that most students (their families) should be able to pay the monthly/annual boarding school fee – in this case in addition to the secondary-school tuition fee and other costs[5]. It is also important that the students of the school concerned should not live very far from it, otherwise they could not visit their parents at least for the weekends. Singapore and the NUS High School fortunately meet practically every condition. The school is a public education facility related to the National University of Singapore which enjoys favourable financial conditions, hence financing the material expenses of the boarding

[5] Of course, the NUS–HSMS provides adequate support to reimburse the costs of students in need.

school building has never been and probably will never be a problem. Furthermore, its association with the university and its priority talent school status attracts talented teachers to the institution. For most children and their parents neither is the boarding house fee a problem: the Singaporean middle class is rather extensive and prosperous, so they can assume such burdens (and the others are assisted by the school). Finally, since Singapore is a city-state where even the longest distances can be covered in a matter of hours, nothing hampers that students go home for the weekend.

The outstanding role assigned by the NUS–HSMS to the internationalisation of the institution and the individual students is also worth of attention. The school has an elaborated short- and long-term strategy for internationalisation. It is essential for an institution to be included in the international talent school system specialised in natural sciences, to promote the increasing professionalisation of the institution, the school management and the teachers. The goal is to give every student at least one opportunity for international experience exchange during his/her years spent at the school, whether as part of a student exchange or a summer talent support programme, or in the form of a study trip, as participant of e.g. a conference or a competition. The goal of the Internationalisation Programme is that students should become knowledgeable and competent young persons ready to participate in international work, well-prepared both in the cognitive and the physical sense for a career and a life of this kind, ready to gain international experience while recognising the values and the place of Singapore in the globalised world more sensitively than before, being attached to it even more strongly, and having the opportunity to meet and co-operate with their coevals in the fields of mathematics, sciences and research in any part of the world (NUS–HSMS 2012b).

Obviously, this programme is driven in the first place by the assumption that the educational institutions (and especially talent support schools) of our days must define themselves and their work not only in the national, but also in the international context. They must develop adequate framework conditions for ensuring that their students become able to hold their own not only in a closed national labour market, but if necessary, or if they want it so, anywhere in the world. Clearly, this self-definition of the school matches the objective of the parents who mostly support these concepts.

Considering the above we can state in summary that the NUS–HSMS as a talent support school associated with a university applies sufficiently modern and efficient talent nurturing methods to be able to identify and develop talent, and even encourage the further international education or employment of the

talented young members of a technocratic country characterised by a high social income in a way that matches the social and economic environment. The fact that the school is assisted in the efficient realisation of its educational goals by the above factors serves also as a warning that the same model may not be as efficient or may not even be feasible in a different context – e.g. in a technically and economically much less advanced society, a less learning-centred culture, etc.

BIBLIOGRAPHY

Barr, M. D.–Skrbiš, Z. (2011): *Constructing Singapore: Elitism, ethnicity and the nation building project*. Copenhagen: NIAS Press.

Goh, H. L. (2010): Oral communication.

Goh, C. B.–Gopinathan, S. (2006): *The Development of Education in Singapore since 1965*. Springer Int. Handbooks od Education.

Gordon Győri, J. (2001): Az irodalomtanítás elmélete és gyakorlata az Amerikai Egyesült Államokban I.: Az iskolarendszer, valamint a irodalom- és anyanyelvtanítás alapvonásai [KÉREM A SZERZŐT, ADJA MEG ANGOLUL!]. *Új Pedagógiai Szemle,* 51(11), 74–82.

Gordon Győri, J. (2006): *Az oktatás világa Kelet- és Délkelet-Ázsiában: Japán és Szingapúr* (The world of education in East- and South-East Asia: Japan and Singapure). Budapest: Gondolat Kiadó.

Gordon Győri, J. (ed.) (2011): *A tehetséggondozás nemzetközi horizontja, I: Jó gyakorlatok az Európai Unión belül és kívül, I.* (International horizons of talent support, I. Best practices within and witout the European Union, I.) MATEHETSZ Géniusz Projekt Iroda, Budapest.

Ministry of Education Singapore (2012): Secondary school education. http://www.moe.gov.sg/education/secondary/files/secondary-school-education-booklet.pdf/. (Downloaded: 1 December 2012).

NUS–HSMS (2012a): Academic programme of studies. http://www.highsch.nus.edu.sg/userfiles/file/Programme%20Of%20Studies%202012/Programme%20of%20Studies%202012%20_Public%20Version_12.01.06.pdf/. (Downloaded: 1 December 2012).

NUS–HSMS (2012b). http://www.highsch.nus.edu.sg/index.php/. (Downloaded: 1 December 2012).

OECD (2011). *Lessons from PISA for the United States: Strong performers and successful reformers in education.* OECD Publishing. http://dx.doi.org/10.1787/9789264096660/. (Downloaded: 1 December 2012).

Tan, J. (1993): Independent schools in Singapore: Implications for social and educational inequalities. *International Journal of Educational Development,* 13(3), 239–251.

Anna Cseh

National and Local Achievements of the Slovenian Talent Support Programme

I. INTRODUCTION

Slovenia, Hungary's south-western neighbour became independent in 1991. It has a population of 2 million; it is part of the euro zone, and it is a model for the countries orchestrating gradual transition from the socialist to the modern market economy. Slovenia considers education a key to progress. The importance of this sector is indicated by the fact that the independent republic passed individual acts for every level of the educational system, from kindergarten to university. These acts state the principle that every child has equal right to education matching his/her abilities, hence *inter alia* the disabled and those with special educational needs and, since the latter group comprises the gifted, talent support is listed side by side with compensation for any disadvantages. Slovenian education has embraced a new approach to teaching; it stresses holistic personality development, the equality of intellectual and artistic education, the importance of health education, of the sports, the foreign languages and IT (Ministry of Education, Science, and Sport 2001).

In 1996, the Ministry for Education, Science and Sport and the National Education Institute of the Republic of Slovenia (Zavod RS za šolstvo) (hereinafter: Education Institute) joined forces with some primary schools to launch a really enviable pilot: they set out to develop a national talent identification and support programme to be rolled out later to the entire public education sector. The document was finalised in 1999, entitled "*Concept: Tasks of talent identification and talent management for the students of 9-grade primary schools* (hereinafter: Primary School Concept), layed down the theoretical bases of the programme and specified its implementation. Thanks to the introduction of the programme, to date 450 primary schools have offered a continuous option for testing whether a child is gifted, for identifying the outstanding abilities of gifted children and for supporting the optimum unfolding of their abilities and talent through personalised development plans. The highly complex process of talent nomination

and identification starts at age 9, as is recommended by development psychologists, and special development starts in Grade 4; moreover, children have the opportunity in every subsequent year of 9-grade primary school to be included among the candidates, in a new development phase, with the contribution of other teachers (Cseh 2011).

"The Concept of education of gifted and talented students in secondary school" (hereinafter: Secondary School Concept 2007), i.e. the next component of the talent support scheme worked out gradually had become completed in 2007. The programme is governed by the same principles as its predecessor, and it takes into consideration the age-specific features of the generation concerned as well as certain professional/methodological criteria. It has been introduced in 11 secondary schools so far, so we can speak of no national roll-out as yet.

Central budget funding is provided to cover the total costs of implementation during the school year, and part of the expenses of the summer programme components.

II. SUMMARY OF THE RESEARCH REPORT ON TALENT SUPPORT AT PRIMARY SCHOOL

1. Description of the research protocol

The Education Institute subjected the national *Primary School Concept* to thorough analysis in the academic year of 2009/2010 when it celebrated its 10th anniversary, with the aim of upgrading talent support on the basis of the research findings. Mag. Tanja Bezić, Professor of Pedagogy and Psychology, Senior Member of the Education Institute was kind enough to prepare the *Abstract* of the document *"Analysis of the implementation of the identification and treatment of talented students in 9-grade primary school" (in the school year of 2009/2010) and essential changes in the process of identification of talented students, and in the tools and methods promoting their development"* to be used by the author of this paper prior to its publication (Bezić 2011).

The research applied 22% stratified random sampling to examine 98 of the 451 primary schools. The expert group for the teaching and education of gifted students compiled two electronic questionnaires. One recorded the answers of programme co-ordinators, and it was based on school data, whereas the other queried data concerning Grade 4 and Grade 9 students registered as gifted from the school counsellors (Bezić 2011). The research examined the three main fields matching its objectives: the characteristics of registered and identified talents; the alignment of pedagogical work with the needs of gifted students, and the realisation of the *Primary School Concept* and of the in-service teacher training events at the given school.

2. Characteristics of registered and identified talents, and their distribution by certain criteria

Pursuant to the reform of the Slovenian system of education, 8-year primary school was gradually replaced by 9-grade tuition from the 1999/2000 academic year on (The White Paper 2011). Due to the gradual approach, 23.7% of the population enrolled to Grade 4 was registered and 20.3% was identified as gifted, whereas in Grade 9, the corresponding rates were as high as 30.7 and 25.3%, respectively. Since identification starts in Grade 4, it is to be expected

that in the future this will be postponed to higher grades only in exceptional cases (Bezić 2011).

As for the tests and scoring systems used for identification, the conclusions of the research group agreed with the opinions of the schools themselves. Consequently, tests identifying the main fields of the manifestation of talent – general intellectual abilities, specific learning skills, creativity, managerial skills, visual and performing arts, psycho-motoric skills – will be simplified a little. General intellectual abilities and creativity will be pinpointed exclusively by psycho-diagnostic tests – Raven Progressive Matrices, WISC III and Torrance Tests, and the test applied to measure learning skills will be reviewed and revised.

One key issue of the research was whether the bottom limit of 90% in at least one measurement for rating children as gifted was to be retained. It was found that the number of the latter would only decrease by 2.8% by raising the threshold value to 95%, so the 90% limit was retained.

The research investigated also the distribution of gifted children by sex. The results indicated no significant statistical gaps. The paper notes that, for example, more boys were identified under the heading of psycho-motoric skills and more girls in the managerial and artistic fields.

Only 1% of gifted students possesses a certificate entitling them to special educational and other assistance, whereas the corresponding rate for children in the total population is 5%. Tanja Bezić refers to a fundamental issue of talent support when she remarks that "It is an open question whether talents actually overcome learning difficulties as effectively as that, and have no need for special assistance for that reason, or whether the talent of some students remains hidden already in the registration stage. We propose a special research to find that out" (Bezić 2011, p. 6).

3. Survey data concerning the individual development plan

If children identified as gifted and their parents so request, the headmaster, the subject teachers and the school counsellor together work out an individual development plan (INDEP) specifying the annual talent support programme of the student. In Grade 4, 76.5%, in Grade 9, 81% of the gifted students wanted to have an INDEP. In Grade 9, only 5% of students or parents refused to sign the document after all. On the other hand, in the opinion of the counsellors, the INDEP may not be necessary for every child.

The relevant international literature and practice offers the talent support institutions many forms of activity and training (Balogh 2004). The research found that "the training forms known and established/tested in the world

spread but slowly [in Slovenia]" (Bezić 2011, p. 9). In Grade 4, the most frequent forms applied to inspire the gifted are individualised assignments given in class, extra-curricular activities, special lessons, and special homework. Around 50% takes part in co-operative learning.

In Grade 9, the list is headed by the appropriate optional subjects, followed by special lessons, individual assignments related to regular education, and preparation for competitions. Then come the various extra-curricular activities, "study clubs", by order of frequency. Around half of the students joined the most advanced groups in one or several subjects, and their INDEP comprised programmed seminar tasks and special tasks to be accomplished at home, as well as joint learning and participation in several collective forms of learning (Bezić 2011, p. 9).

For 30% of students talent support is restricted to participation in study clubs for the younger and in research work for the older ones. It is a positive feature, however, that thematic days, special summer camps and Saturday development sessions have appeared. On the other hand, there is hardly any example of acceleration, parallel programmes, publication of creative activity and the like.

The research investigated also the correlation between the results of domestic and national contests in Slovenian language and literature and in mathematics with the participation in INDEP. The effect of the research camps is most obvious in the effectiveness of learning mathematics, whereas the effects of creative study clubs, project work, thematic days, musical school and the development of social skills manifests itself primarily at the contests in Slovenian language and literature. The research did not cover any other subject. At the time of the research, the majority of students had been working on the basis of an Individual Development Plan for 2 years only, so the relevant results must be treated with caution.

Eighty percent of the co-ordinators considered INDEP "definitely important" or "very important" for the general development of gifted students. The workload of the co-ordinators will be reduced by the likely transfer of child-specific programme planning and co-ordination to the headmasters. According to the research, professionals deem it necessary to provide graduate and post-graduate training in talent pedagogy and professional in-service training to teachers to ensure the specification of quality development plans. It is indispensable for subject teachers and form masters working with gifted students to have extensive knowledge of the various forms of teaching and the pedagogical methods of talent support.

4. Local implementation of the Primary School Concept

Talent identification and development is part of the annual work plan and the relevant report of more than 80% of schools. The educational institutions concerned consider also the documents provided to support implementation. It still happens that the school suffers a delay in timing and the process itself and in particular registration starts only in Grade 4. The institutions are concerned by the prescribed 50%+ rate of students with excellent school results among the gifted: this high rate may question the appropriateness of the registration criteria.

The ratio of schools findings it difficult to do talent identification according to the rules is 8.2%. Many have no school psychologist, nor two evaluating teachers to do the complex process. The excessively high number of candidates to be subjected to identification is also a problem at many places. To eliminate subjective assessment, teachers should be provided more thorough grounding in this area.

The research group thought it essential to discover how the schools themselves evaluated their own work. It was found that more than 50% analysed contest results, discussed their experience at sessions of the teaching staff, eval/uated the realisation of the INDEP periodically and made interviews with the students and examined their study results. They were of the opinion that the quality indicators of the *Secondary School Concept* worked out in a later phase of the gradually introduced system ought to be adapted also at the primary schools.

The schools pay considerable attention to in-service teacher training, but successful implementation would require also more advanced and more frequent joint work and projects among the schools. Moreover, the accomplishment of the activities indicated by the co-ordinators, i.e. the more intensive motivation and activity at regular classes of gifted students and support to make their emotional and social development as balanced as possible, must be integrated into the in-service training material.

The co-ordinators deemed the implementation of the guidelines of the concept highly successful. Nevertheless, they thought that special attention was to be paid to acceleration, to the principle of "faster progress in the learning process". They considered every form of development/training important for the future of gifted students, but in their opinion they are to be provided to students on a much wider scale. Furthermore, personalised teaching, project and research work at regular classes, as well as extra-curricular enrichment programmes, Saturday school and camps should also be made more intensive. Anyway, these areas represent an enormous reserve of unexploited potential.

One of the guidelines of the programme is to provide for the full-scale development of gifted students. The schools pay a great deal of attention to this goal and a significant part of the relevant programmes (e.g. social games, thematic headmaster's lessons, mutual help in learning, exercises to overcome stress, conflict solving, meditation, moral evaluation exercises, communication and managerial skills development, voluntary work, assistance in learning, interactive workshop and biblioprevention activities, portfolio development and emotional intelligence development) are realised within the class community (Bezić 2011). Although artistic activities such as drama playing, puppet theatre, study clubs are organic parts of school life, they are less aware yet of the fact that these are also essential parts of talent support.

The answers to the questionnaire have shown that around two thirds of schools still need the assistance and guidance of external professional organisations in talent support (Education Institute, Ministry of Education and Sports, guidance centres, institutions of higher education, etc.).

Tanja Bezić sums up the opinion of the co-ordinators on the local implementation of the *Primary School Concept*: "The Concept is realised with minor difficulties, in the opinion of 39.8% the realisation is successful or highly successful. Only 5% of co-ordinators spoke of major causes for concern. Some schools (4.1%) said they were still in the initial stage and hence they could not know all the problems. The latter should be provided extensive professional assistance covering every field" (Bezić 2011, p. 17).

III. SLOVENIAN TALENT SUPPORT PRACTICE: BEST PRACTICES IN DOMŽALE AND IN MARIBOR

In this section, closely linked to the previous one, I would like to present two specific best school practices to show how the theoretical concept is applied and implemented. I visited classes for a few days at the Rodica Primary School and at the Prva Gimnazija, Maribor, which was a great experience.

1. Rodica Primary School

1.1. Working conditions of teachers and pupils

Rodica is a garden suburb in the heart of Slovenia, a part of the town of Domžale, a quiet suburb of Ljubljana, which keeps attracting new residents, people who want to move out of the capital.

The school which was built at the end of the Tito era is a well-kept and nice facility. The functional style is relieved by shading from the outside and by coloured surfaces and a nice decoration from the inside. The conversation corners (with seating furniture, drinks machines) located on the staircase landings and in the corridor corners are never empty: both the teachers and the pupils use them. There is a shady courtyard next to the sports ground and a grove behind the fence. At a distance of less than 400 km from Budapest, the place recalls a Mediterranean scenery.

Morning classes are held in two buildings, 27 classes and 9 grades. The more than 650 pupils study in classes of 20–25.

Apart from the technical conditions it is important to know that this school focuses on the integrated tuition of children with special educational needs in line with its pedagogical programme. Besides the 3–4 SEN pupils per class, there are also gifted children, identified in varying numbers, who are now also assigned to this collective category.

To understand the personnel conditions, one should be familiar with the breakdown of the mandatory number of lessons of teachers in Slovenian public education. Principal Milena Vidovič specified the obligations of class teachers in Grade 4: 18.5 of the mandatory 22 hours must be held by the teacher in class. As for the remaining 3.5 hours, 1 is to be allocated to bridging education, 0.5 to

assisting pupils with problems, 0.5 to excellent performers and 0.5 to headmaster activities, and 1 hour is a special allocation to cope with the special difficulties encountered in Grade 4. Teachers of Slovenian language and literature must teach 21 hours. Teachers with a service period of 30 years get a 2-hour relief with special ministry financing. Slovenian primary school teachers usually have 22–25 lessons a week; the legislation provides for a scope of motion between 19 and 27 lessons. The number of hours missing from the mandatory number of lessons can be replaced by assignments of other types.

1.2. Local history of talent support

At the opening ceremony, students receive the annual institutional calendar of the school, a compulsory document of such institutions. Besides the most important pieces of information, the unique nature of this attractive publication derives from the list of optional subjects, extra-curricular activities and programmes. Ten years ago the calendar was a thin booklet in Rodica; now it contains an outstanding supply of offers to pupils. What is the reason for this change?

The special development of pupils with outstanding abilities has been put to the foreground of public education nationally. The Rodica Primary School started to introduce the *Primary school concept of talent identification and support* approved in 1999 in 2002 (Slivar et al. 2011). The precisely elaborated concept reviewed the school and the methods of evaluation and quality assurance. Implementation was to be carried out by the school, with the permanent support of the Education Institute.

Initially, many questions occurred. How can the established tasks and time management in general be transformed so as to have time, classes, for working with talented pupils? What about funding and in particular the remuneration of the teachers concerned? What development forms should be used? The wording of the Educational Acts pinpointed the necessity of a radically new approach. With reference to the Slovenian educational acts, the report made for the UNESCO in 2004 entitled "Quality Education for all Young People – National Report on the Development of Education in Slovenia" assigned the gifted children to the category of pupils/students with special educational needs (Quality Education 2004). The concept underlines that the education of pupils with outstanding abilities must be organised in consideration of their abilities, personality, in a personalised way. Previous practice focused on the results, on participation in competitions rather than on special development.

Class-based tuition and the talent support sessions underwent significant development over the past 10 years. The various forms of talent support, dif-

ferentiation at class and individualisation have been introduced gradually. These forms proved to be highly expensive and required thorough grounding from the teachers' part. At the same time, there was a growing choice of optional subjects and afternoon sessions offered to the children. The school looked for development options outside the school. Students had more and more opportunites also to participate at competitions, regarded as the primary form of talent support previously. The school promoted participation in sports and in artistic training as well.

In the context of extra-curricular activities, guided research done by the students themselves was also designed to help unfold creativity. It has created a new taxonomic level of tuition, too: learning instead of teaching was put into the focus. On 5–6 occasions annually, school life is enriched by Saturday programmes; these days offer a concentrated option for thematic enrichment sessions outside the classes. The communication and problem-solving training events forming part of the programme target the psychological development of gifted pupils. The teaching of non-violent communication to promote conflict management was launched to counter school violence present throughout the world.

According to the Primary School Concept, the talents of gifted pupils are to be boosted primarily within their own age group, in the class community, but extra programmes are to be offered to them as well. Based on its own experience, the Rodica Primary School decided to make the sessions and events inspired by talent support available to every pupil of the institution. This reduces the isolation of identified talents, and it may be a significant motivator for the others.

The school takes part in many national and international projects and co-operation activities. It is a member of the e-Twinning programme (the community of European schools); and of the ACES (the Academy of Central European Schools). It works also in the Comenius multilateral projects focusing on children with special educational needs and in the Comenius Regio biblio-prevention project. At the same time, the spirit of the school is determined by being a UNESCO school, an Eco-school and a Healthy School. The relevant co-operation activities create opportunities for the active use of foreign languages at an early age, at student exchange programmes and conferences, and also in everyday life, through the use of the IT tools.

The systematic introduction of talent support has led to the renewal of teaching and community life at school.

1.3. Innovative learning environment: Brief review of the OECD project

It was in 2008 that the OECD CERI launched its three-part project called Innovative Learning Environment (ILE) to answer the following research question: "How can the schools of our days be transformed into a teaching and learning environment where the individual becomes a lifelong learner and which prepares students for the 21st century?" (OECD 2011).

In the first phase of the work called "Learning Research", senior researchers summed up the latest international theoretical research findings concerning learning, teaching and the learning environment.

In the second phase (2009–2012: Innovative Cases), action research was conducted to identify and analyse the innovative learning environment, and the work process and the results were recorded in case studies. The OECD website displays 150 best practices and the detailed analysis of 40 among them, from many countries of 4 continents. They examine what makes the dynamically interacting key components of the learning environment (students, teachers, content, resources, organisation, pedagogy, evaluation etc.) innovative (Synthesis 2012).

The third phase, to be terminated in 2013 (Implementation and Change), is meant to engage educational politicians, researchers and reform teachers sensitive to reforms in a discussion on how to make the educational systems study-driven by applying the research findings concerned (Synthesis 2012).

1.4. Participation of Rodica in the ILE research

1.4.1. Factors inspiring participation

In spite of the success of the introduction of a growing number of alternative treatments to unfold the skills and abilities of gifted pupils, the teaching staff of Rodica School soon faced yet another challenge. The overwhelming majority of the 30% gifted/potentially gifted pupils by age group is selected in Grade 4, based on above-average intelligence, creativity and motivation. However, teachers frequently observed that the motivation of pupils in Grade 6 or above dropped: they hardly took part in optional, extra-curricular activities, they turned down special tasks offered in the class framework and the unfolding of their abilities slowed down. After the observation, evaluation and documentation of this process, the school set up a research group of 10 teachers to find an answer to the following research question: "What enrichment programmes should be offered to gifted children to ensure their motivated participation?" (Slivar et al. 2011).

In a survey conducted in Spring 2008, the school collected the comments and proposals of gifted children regarding the enrichment programmes to be offered to them. Seventy-nine percent of pupils deemed the supply abundant. Based on the answers, the workgroup compiled another questionnaire along the research question to examine the motivation of gifted students, the reasons for their presence or absence from the enrichment programmes. The teachers evaluated the inputs themselves, and they designed and launched the necessary changes. The outputs and evaluations of the 2008/2009 academic year were integrated into the programmes of the following school year.

The process was richly documented by observations, action descriptions, field-work reports, interviews, audio and video recordings and photos. Individual work took place simultaneously with the quality co-operation of the teachers through the exchange of methods, opinion, proposals. The changes made the pupils re-formulate the research question to "How could I be even better – thanks to some excellent pastimes?"

1.4.2. Forms of the enrichment programmes and evaluation of the participants

The school introduced the system of extra-curricular activities devised and launched in collaboration with pupils in order to ensure the complex development of the gifted. The 5 main fields of activity (artistic, research, international, linguistic and social field) give some clues regarding the details. The expansion of the learning strategies and the development of creativity, research, autonomous knowledge acquisition, public appearance and presentation skills have remained priority goals. The pedagogical objectives were expanded to include the improvement of the social competencies and personality development (self-evaluation, autonomy, responsibility).

To attain the goals listed above, the school initiated further enrichment programmes besides the ones mentioned already. Pupils interested in artistic activities may choose theatre, editing of the school newsletter, calligraphy, the fine arts workshop, film-making, creative writing or composition of music.

The school offers many options to boost research and autonomous learning in a breakdown by age and topic. The relevant extra-curricular activities are the following: "Young researchers", "Little researcher", "I research and demonstrate", "Riddles and logical problems", "Local history research".

The school links the development of foreign language skills to creativity: foreign languages are used as a means e.g. at the study clubs "We create in English" and "English – differently".

The workshops preparing pupils for public appearances, the debate club, volunteerism and the book club help unfold the social and rhetorical skills of the participants.

It follows from the nature of the classes/activities listed above that work carried out in these forms is not subject to formal evaluation. However, during joint work, children are provided immediate and continuous feedback by their peers and their mentors. These occasions of being together provide an opportunity for regular pupil/teacher communication. At the same time, every student keeps a folder of his/her individual results and outputs: the portfolio comprises their work done under the given programme and the comments, etc. of the teachers.

1.4.3. Results of the ILE project at the Rodica Primary School

It is a noteworthy feature of the enrichment programmes described or mentioned above that the school designed and realised them jointly with the pupils, providing thereby an exceptionally liberal learning atmosphere to the gifted. The pupils proceeded from the status of "executor" to that of "initiator". This has inevitably led to the gradual transformation of the traditional knowledge-transferor function of the teacher. In their new role, teachers became mentors, counsellors, facilitators in the changed educational environment, and this was concurrent with the obvious increase of their inner motivation and their commitment. Today, 15 instead of the original 10 teachers take part in the programme.

Thanks to the changed dynamic of the learning process, the liberal atmosphere and the option of active initiation and participation, children showed more lively interest and their motivation became more permanent. In the interviews made at the end of the project, the majority said that they would like to pursue secondary school or university studies related to the topic of their projects. Joint work has made problem solving, autonomous research and acceptance/tolerance of the opinion of others an integral part of their learning methods. Personalised tasks and syllabi let children proceed at a pace matching their abilities. The interest in extra-curricular programmes has kept rising: the participation rate increased from 17% to 27% from 2006/2007 to 2010/2011, and there was only a minimum number of drop-outs.

The children and their teachers presented their works on many occasions at musters within and without the school walls, at competitions, on the day of creativity and at cultural events. There was ample opportunity also for formal dissemination. Besides the printed and digital pages of the school, people could learn about the Rodica best practice from the local and national printed press, TV and radio programmes, technical periodicals, at science fora and at in-service teacher training events.

The methodological innovations and certain contents mastered during the enrichment programmes have gradually found their way to curricular educa-

tion. This circumstance and the fact that the activities intended originally for identified talents have been made available to every pupil of the school shows that the project outputs have reformed the learning environment.

The Education Institute provides professional support for the project and the programmes through the school counselling system. There are no central or international funds to finance the project; the institution covers the expenses by reallocating its own resources and from the contributions of local entrepreneurs and parents.

The case study of the implementation of the ILE project at Rodica can be traced in every detail on the website of the OECD's Centre for Educational Research and Innovation (CERI) (http://www.oecd.org/edu/ceri/).

1.5. Difficulties related to the programme

The accurate preparation, implementation, evaluation and documentation of the Primary School Concept in compliance with the relevant central requirements imposes severe burdens on the schools. In Rodica, the co-ordinator's functions take up 75% of the working time of the school psychologist who has a degree also in pedagogy and is familiar with social work; the psychologist is responsible for talent identification and for composing and evaluating the necessary tests (the evaluation of a single Torrance test takes 30 minutes). She provides guidance together with a colleague, in a breakdown by grades.

In the school, where the number of students has grown to 600 by now, talent support developed into a well-functioning system over 10 years. Teachers do the development tasks with special attention and diligence, but they can no longer fulfil all the administrative tasks due to their increased workload. Today, 100% of the growing number of nominated and identified gifted pupils and their parents agree to participate in the selection process and they all sign the Individual Development Plan, but that does not make participation in the relevant activities compulsory. Taking that into consideration, it is no miracle that not all the Individual Development Plans, parent and pupil reports and feedback could be recorded in writing in the past two years, although the co-ordinator, the counsellor and the teaching staff tried to make up the arrears.

Another problem is that the teacher's evaluation sheets used for nomination are often completed subjectively. According to the school psychologist, too many children are identified on the basis of the teachers' evaluations, and that questions the very essence of the whole endeavour. For this reason, the teaching staff decided in Autumn 2011 that nomination should be made with more consideration to reduce the number of children to be identified. Parents, on the other hand, have increasingly urged the nomination of their children also in

higher grades, due *inter alia* to the financial implications: the state provides Zois Scholarships to the gifted from the first grade of secondary school to the beginning of their university studies based on their previous achievements, that is, they are motivated also financially. The two main criteria for being granted the scholarship are outstanding study results and a good ranking at national competitions.

1.6. Mathematics class in Grade 4

I witnessed an impressive example of the adoption of the new approach in a class in Grade 4. Taking into account the need of the children to move about, the teacher plans the lesson so as to make them accustomed to sitting by the table gradually. At this class held at the end of September, the lesson plan implied place changes every 2–5 minutes. The assignments were about choosing a pair or a place; children had to find instructions glued to the bottom of the chair, they checked results in pairs at the board, chose tasks marked by colour or by cartoon figures, and good performance was remunerated by cartoon figures they had to cut out – all of these assignments gave an opportunity for movement, and working in pairs was excellent for guided verbal communication. To keep the noise level down, they listened to Mozart during the lesson. They evaluated their work sitting cross-legged in front of the board.

Conducting the lesson this way, in consideration of such age-specific features as the need for motion and for motivation to retain interest, encouraged the acquisition of knowledge in coeval pairs and stimulated autonomous work. At the same time, it let children work at their own rhythm.

1.7. Bibliotherapy sessions

The therapeutic effects of works of art, hence of literary works, have been known to the successive cultures for a long time. Bibliotherapy, that is, curing by books, their special processing, has existed as an independent psychotherapeutic strand since the 19th century. Besides its therapeutic use, it is increasingly widespread also at schools, children's homes, social and cultural institutions as a preventive method.

> A bibliotherapy session is organised around a work selected in advance, which targets a problem similar to that of the group members, if possible. A discussion takes place, facilitated by the group leader, in connection with the work (or its excerpt). Comments made on the à propos of the text help the group members specify their relationship to the topic suggested by the work. This is conducive to important realisations concerning themselves and

> their judgements of others, and this may reorganise their petrified individual structures. Although the participants often compare the session to a literature class, the group leader strives to make the personal experiences of the participants the collective property of the group rather than expecting analyses, literary exposés.
>
> The session is about the experience-level processing of the selected literary work in order to make progress by thinking over the problems jointly and to find and receive the messages matching the personalities of the participants (HLTS 2010).

It was a pioneering initiative when the librarian of the Rodica Primary School announced the first bibliotherapy course called "book club" for children in Grade 7 four years ago. It follows from the essence of biblioprevention that collective work requires the establishment of an open and trustful atmosphere which, in turn, requires the long-term welding of the group. In Rodica, a book club sticks together for 3 years. Once a week, the school librarian and a teacher of literature who is also a social worker receive the maximum 10-strong group in the school library hosting a collection of 25,000 volumes. They focus on the selected work for one year. They read the book together, and the pupils associate their own experiences to the personality and life situation of the protagonists.

This year's topic was suggested by the Pupils' Parliament of the school. Their central topic was "taboo". It gives food for thought that in the relevant questionnaire the children indicated "death" as a No.1 topic that their environment, their family, was most reluctant to discuss with them. In the youth novel chosen to work on this topic, the adolescent protagonist loses his parents. That is, the novel is about a life situation that fills every child with dread. By processing the book together, they can trace how the protagonist who is their coeval copes with the tragedy; they can express their own sentiments and fears, and look for solutions. The children said the courses were based on unconditional trust, and they became much more attached to the works than at literature classes due to the personal aspects involved.

My on-site impressions, class visits and the documentation I studied confirmed my opinion that the Rodica Primary School reacts to the changing needs of children with exceptional sensitivity. Its versatility and reform spirit makes it perfect for converting the Primary School Concept of talent identification and support to practice. In line with its buoyant, open and tolerant/inclusive atmosphere, its goal is that every pupil should enjoy the benefits of the innovative school environment developed, originally, in response to the tasks related to talent support.

2. Prva Gimnazija, Maribor

2.1. Brief presentation of the institution

Maribor is the second largest town in Slovenia and its second capital. The settlement, almost 100 year old now, has a population of 115,000. Due to the exceptional beauty of this town located in the area of the Slovenian "Štajerska", at the edge of the German-speaking area, it is often called the "Pearl of Drava". In 2010, it was the Cultural Capital of Europe and in 2013 it will be European Youth Capital.

The Prva Gimnazija in Maribor was founded in 1850 as the first general secondary school of the town. The impressive building which has a view on a spacious park, and being ina 2-minute walk from downtown was completed in 1873. Today its main rival is the II. Gimnazija, providing a very different impression with its ultra-modern block of buildings. So what attracts more than 900 students to the Prva Gimnazija? Is it the environment or the motto of "Per aspera ad astra" (Through hardships to the stars) promising heavy work?

The school provides 4-year tuition in two different branches. One provides the usual general secondary school education. In the classical one, on the other hand, students learn Latin for 4 years and Ancient Greek for 1 year. History, philosophy and other humanities are taught in a higher number of lessons than usual. At a certain point in their education, children can terminate their natural sciences studies if they desire so. Pursuant to the Slovenian Educational Act, there are no preparatory foreign language classes and there is no specialisation within the classes.

There are five general and two classical secondary school classes per grade. The 29th class of the institution is a special one preparing those young adults for GCSE who did not finish vocational secondary school.

There is no officially established rank order of Slovenian secondary schools, but the admission results of primary school pupils published in the press give some orientation. The Prva Gimnazija is in the top 10. Besides the excellent results of the school, the applicants are attracted most by the artistic and drama education and the high number of foreign language lessons. The 900 students are taught by a teaching staff of 60.

Let me note here that secondary- and primary-school teachers are subject to different central requirements in Slovenia. Secondary-school teachers have 20 mandatory lessons a week. According to the law, the weekly maximum is 25 lessons. A relief of one lesson is granted to teachers of Slovenian language and literature and to headmasters in Grades 1 and 4, and a half-an-hour relief to those in Grades 2 and 3, respectively.

2.2. Integration of talent support into the regular teaching process

The professional and ethical guidelines of secondary-school talent support in Slovenia were set by a document dated 2007: the "Concept of teaching and education of gifted students" (hereinafter: Expert Committee on Talent Support, 2007). In the same year, the talent support system was introduced as a pilot in 11 secondary schools. Prva Gimnazija is part of the programme.

The Prva Gimnazija has a well-earned prestige and it attracts the best students from Maribor and its surroundings. Every year, 50–60% of applicants come from the population of children identified as gifted, happy to go to the *alma mater*, but frightened of applying for the extra-curricular talent support activities. They fear the quality gap between the two school types. Only 10–20% applies for an Individual Development Plan. It is common practice in Slovenia that parents take their children at the kindergarten or primary school to many extra-curricular courses which often wears them out by the time they enter general secondary school and so they refuse to consider any extra options.

In Autumn 2011, 125 children in Grade 1 were identified as gifted by the time they got to the school. Although this circumstance apparently provides the school exceptional opportunities, some teachers are of the opinion that too many children are identified as gifted in the primary-school selection process. It is very difficult to ensure the balanced dynamic of classes of 30–32 students with a high number of identified gifted students. In an educational environment like that, preventing stigmatisation requires thoroughly prepared teachers: it is a pedagogical error to expect too much of gifted students.

2.3. Forms of talent support at the school

Similarly to the Rodica Primary School, Prva Gimnazija offers its courses introduced as part of the talent support programme to every student. They share the opinion that the programmes outside the regular lessons and the curriculum are the most suitable and adjustable means for implementing the talent support concept, if only because differentiation in class is aggravated by the high number of students there. Students often prepare presentations and projects or even hold lessons themselves. Independent research requiring stable inner motivation, perseverance and a systematic approach is rather rare among the children yet. Although acceleration is not common practice at school, participation at certain university courses is no longer exceptional thanks to the Secondary School Concept.

The institution looks for external professionals, mentors, to boost the commitment and concentration capacity of the youth excelling in various fields.

The management would like to find resources to honour mentoring which is done as a form of social work at the moment. Pursuant to the Slovenian Educational Act, 6% of lessons during 4-year secondary education, that is, 300 lessons in all, are conditional ones. The catalogue of the Maribor secondary school offers 68 optional (conditional) programmes. Here are some items of the supply:

- acting: the stage workshop boasting the awards of several international festivals has been active for 11–12 years with 4 parallel groups; its members are regularly accepted to the university of dramatic art; its priority goal is to have artistic talent accepted as something on a par with intellectual intelligence;
- improvisation/drama pedagogy: its main goal is to develop a complex self-image and sufficient self-confidence through stage appearance;
- music teaching: several choirs, a percussion course and a musical workshop launched by a student attract many musically gifted students to the Prva Gimnazija instead of a secondary school of music;
- arts training: there is a Slovenian- and an English-language photo club; there are courses in fine arts, and the everyday life of the school is coloured by a performance group. Expositions follow one another. The school management is open to traditional as well as unusual ideas; students have the possibility to show themselves. A student who had studied dramatic art in Prague surprised his peers by a new performance every week during his secondary school years;
- website editing, school newspaper in English and in German;
- media analysis: analysis of reality shows in connection with the sociology classes of students in Grade 3;
- foreign language courses;
- natural sciences clubs;
- robotics;
- voluntary work in homes for the elderly, at hospitals and in schools. Computer courses for the elderly;
- projects: this initiative started at the special Europe classes, but by now it has become frequent throughout the school;
- sports and thematic days;
- 'Learning for learning': national project to popularise autonomous learning at home, and the acquisition of information. A special teacher workgroup was set up at the school to work out new learning strategies;
- courses at various university faculties, and institutes of science;
- excursions, study trips, summer camps;
- Comenius projects, e.g. Eco-school, student exchange programmes.

2.4. Co-ordination tasks in talent support

Initially, the co-ordination tasks had been performed by a single teacher at this school of 900 students. Today, only Grade 1 students belong to the same teacher who is also a teacher of sociology in 10 lessons a week. In September, the co-ordinator makes interviews with the students in small groups; she records their fields of interest, wishes, and then shares that information with the teachers and form masters, who draw up the individual development plans. Students in Grades 2–4 are assigned to the competence of one of the school psychologists, whereas the other school psychologist provides only individual therapy.

2.5. Student opinions

Besides the measurable results, the effectiveness of pedagogy in the Prva Gimnazija is demonstrated quite tangibly by the enthusiasm of the students when they speak about their school. They receive personal attention, mentoring, personalised development that go far beyond what is experienced by their peers at other institutions. They feel that the school keeps searching for and offering options to let them unfold their talent.

IV. SUMMARY

The Slovenian talent identification and support project launched in 1996 first as a pilot and then nationally had been functioning for a period of 15 years in 2011. Today, almost 40% of primary schools applies the programme with great success.

The research report drawn up by the Education Institute by the analysis of the questionnaire results from surveys conducted in the 2010–2011 academic year is most informative and also exemplary for the Hungarian school system looking for new ways of talent support.

The research report states that in spite of numerous positive results in the field of Slovenian talent support since the introduction of the programme, the list of the tasks ahead is quite long – and it relates to the concerns faced by both the Rodica Primary School and the Prva Gimnazija in Maribor in the course of their everyday work. To provide more efficient talent support within and beyond the school walls, central as well as local/private funding should be extended. It would be important to increase the number of school co-ordinators and counsellors to ensure the quality of identification and to organise and document the full-scale development of the growing number of gifted children. Another imperative task is the personnel development of the Education Institute providing the relevant scientific and professional background. The report urges graduate and post-graduate teacher training and permanent research. The expansion of co-operation and experience exchange between the schools and the ministries, not to forget the international co-operation schemes, is also a precondition of the further successful implementation of the programme (Bezić 2011).

The White Paper expressing the Slovenian Educational Concept of 2011 devotes a separate chapter to talent support while sketching the road to the establishment of a knowledge-based society of critical citizens. Of course, it stresses the necessity of stabilising the central budget segment of the GDP that goes to public education, and the continuous increase of the specific funds concerned (White Paper 2011).

Initiated originally to ensure the special development of children with outstanding abilities, the national best practice of Slovenian talent identification and support taking shape in a gradually developed system has resulted in the

renewal of the entire learning environment, and its benefits will be enjoyed in the longer term by a growing part of the population of pupils/students.

Acknowledgements

M. Sc. Tanja Bezić (Professor of Psychology and Pedagogy, Senior Member of the National Education Institute of the Republic of Slovenia) assisted me in understanding the Slovenian educational system and talent identification and support programme for two years. I admire her for her committed work.

Although unfortunately we have not met in person, I am most grateful to dr. Branko Slivar (staff member of the Education Institute) who made the Rodica material of the OECD research available to me.

I was informed with honourable openness about the implementation of the Primary and Secondary School Concepts, the outputs as well as the problems at the Rodica Primary School, Domžale, by Principal Milena Vidovič, Professional Co-ordinator, and School Psychologist Irena Jeretina and also at the Prva Gimnazija, Maribor, by Deputy Principal Irena Smole Korpar and Teacher-Co-ordinator Ksenija Domiter-Protner.

I found the class visits and the discussions most enjoyable; my deepest thanks go for these opportunities to Draga Jeretina Anžin, Sabina Burkeljca, Janja Stariha, Bojan Sedmak and Ksenija Bračič.

BIBLIOGRAPHY

Balogh, L. (2004): *Iskolai tehetséggondozás*. [Talent support at school.] Kossuth Egyetemi Kiadó, Debrecen.

Bezić, T. (2009): The Concept of G/T education in Slovene primary and in secondary schools. In: *Talented and gifted creators of progress*: *First International Conference*. UN: Bitola. Cobbis.

Bezić, T. (2011): *Abstract from the Report of the Research.* Zavod RS za šolstvo. Unpublished, Ljubljana.

Cseh, A. (2011): Országos tehetségazonosító és tehetséggondozó program Szlovéniában. [Country-level talent identification and talent support programme in Slovenia.] In: Gordon Győri, J. (ed.): *A tehetséggondozás nemzetközi horizontja: Jó gyakorlatok az Európai Unión belül és kívül*. [International horizons of talent support: Best practices in and out of the European Union.] MATEHETSZ Géniusz Integrált Tehetségsegítő Program, Budapest, 209–228.

Gordon Győri, J. (ed.) (2012): *A tehetséggondozás nemzetközi horizontja: Jó gyakorlatok az Európai Unión belül és kívül*. [International horizons of talent support: Best practices in and out of the European Union.] MATEHETSZ Géniusz Integrált Tehetségsegítő Program, Budapest.

Innovative Learning Environment Project, Universe Case: Slovenia: Enrichment Programmes. http://www.oecd.org/dataoecd/40/45/49768501.pdf (Downloaded: 20 July 2012).

Kranjc, T.–Jeretina, I. (2010): Education of Children with Special Needs in Slovenia. Comenius meeting. OŠ Rodica. www.lukaszewicz.dami.pl/comeniusjg/images/dokmenty/Education_of_SEN_SLO.ppt (Downloaded: 23 September 2011).

Krek, J. (ed.) (1996): Bela knjiga o vzgoji in izobraževanju v Republiki Sloveniji (White Paper on Education in the Republic of Slovenia). Ljubljana: Ministry of Education and Sport. http://www.see-educoop.net/education_in/pdf /wp-001_028-slo-enl-t02.pdf (Downloaded: 27 September 2011).

Magyar Irodalomterápiás Társaság. HLTS (2010): Irodalomterápia [Bibliotherapy]. http://www.irodalomterapia.hu/ (Downloaded: 27 September 2011).

Ministry of Education, Science and Sport (2001): The Development of Education: National Report of the Republic of Slovenia. www.ibe.unesco.org/International/ICE/natrap/Slovenia.pdf (Downloaded: 16 November 2010).

OECD (2011): Innovative Learning Environments. http://www.oecd.org/edu / ceri/innovativelearningenvironments.htm/ (Downloaded: 10 September 2011).

OECD (2012): Teachers' salaries. *Education: Key Tables from OECD*, No. 6. doi: 10.1787/teachsal-table-2012-1-en/. (Downloaded: 2 August 2012).

Quality Education for all Young People – National Report on the Development of Education in Slovenia (2004): http://www.ibe.unesco.org/International/ICE47/English/Natreps/reports/slovenia.pdf (Downloaded: 25 September 2011).

Slivar, B.–Anžin, D.–Drobne, M.–Vidovič, M.–Koželj-Juhant, S.–Jeretina, I. (2011): *The Ile Inventory Case Studies: Enrichment Programmes at Rodica Elementary School, Slovenia.* http://www.oecd.org/dataoecd /0/62/49930727 .pdf/. (Downloaded: 5 September 2011).

Synthesis of Main Features of the Innovations in the ILE Universe (2012). http:// www.oecd.org/edu/ceri/49823097.pdf/. (Downloaded: 1 August 2012).

The White Paper on Education in the Republic of Slovenia (2011): http:// www. belaknjiga2011.si/indexen.php, http://www.belaknjiga 2011.si/pdf /white_ paper_introduction_2011.pdf/. (Downloaded: 10 August 2012).

Csilla Fuszek

Talent Support Programmes of the US Center for Excellence in Education

I. INTRODUCTION

Our paper published in *International Horizons in Talent Support, I.* reviewed the incredibly ambitious and still evolving and developing STEM* education programmes of the *Boston National Center for Technological Literacy* (Fuszek 2011). Now we shall present the programmes of the Center for Excellence in Education (CEE) which are of a smaller volume, but equally exemplary among the American talent support and STEM education programmes, focusing on the so-called Research Science Institute (RSI) as best practice.

The US has always been in the vanguard of theoretical and empirical research and programme implementation in talent support globally. For half a century, the country has operated several excellent talent support programmes and research institutes as well as talent support schools. Pursuing practically the same goals as at the time of its foundation and boasting established traditions by now, the CEE excels with its programmes among similar Centers of the non-profit sector.

Unfortunately, I have had no opportunity to visit the programmes sponsored by the Center on site, but I have met President Joann P. DiGennaro personally on several occasions; we had conversations about the achievements and difficulties of the past 30 years, and I got to know her as a dedicated and engaging personality striving always for the maximum. Although no summary paper has been written so far on the work of the Center, I have learned a lot about it from my personal encounters and from its website (http://www.cee.org) redesigned in 2012, displaying a major part of documentation and hence a lot of information related to the past 5 years. Beside the website, I have found

* STEM: science, technology, engineering, mathematics.

the Centerline newsletters most useful, forwarded to me by Maureen Palmer, its editor-in-chief and the Public Affairs Manager of the CEE, who also assisted my work with her letters and oral communication. I owe my thanks to both Ms. DiGennaro and Ms. Palmer.

II. FOUNDATION

The Center for Excellence in Education (CEE) is a self-sustaining non-profit organisation funded from donations, specialised in talent support in STEM, operating at its seat in McLean, Virginia. Its Research Science Institute programme has earned it fame and recognition not only in the US, but also worldwide.

Although at the time of the CEE's foundation in 1983 the shortage of people talented in natural sciences was not such a problem in either the United States or the countries of Europe as it is now, at that time, i.e. in the 1970s and 1980s, the mathematical and natural sciences performance of American students was among the poorest (Csapó 2007). It is not by accident, therefore, that the founders of the organisation, the late Admiral Hyman G. Rickover and the enthusiastic CEE President Joann P. DiGennaro actually considered assistance to promoting the career of young persons gifted in the natural sciences the key to the development of the United States and of the world.

At the time of the foundation of the Center for Excellence, Admiral H. G. Rickover, best known as the father of the nuclear navy, was 83, but his passionate – theoretical and practical – relationship with education looked back on a past of several decades. His sentences uttered in 1957 have lost nothing of their timeliness to this day:

"I suggest that this is a good time to think soberly about our responsibilities to our descendants – those who will ring out the Fossil Fuel Age. Our greatest responsibility, as parents and as citizens, is to give America's youngsters the best possible education. We need the best teachers and enough of them to prepare our young people for a future immeasurably more complex than the present, and calling for ever larger numbers of competent and highly trained men and women" (Rickover 1960, p. 97).

And neither has the original mission of 1983 of the organisation he founded, setting two essential aims, lost any of its timeliness, although its modern wording is somewhat different from what it used to be – on the contrary, it has acquired a new connotation at the beginning of the 21st century: *"To nurture high school and university scholars to careers of excellence and leadership in science, technology, engineering and mathematics, and to encourage collaboration between and among leaders in the global community"* (CEE website 2012).

The CEE's foundation actually began with Rickover's donation of USD 250 he received for a university lecture, and it was soon followed by the Research Science Institute (RSI), a summer talent support programme designed for high school students. The Institute is active to this day and sponsored jointly with the MIT.

The CEE's official inaugural took place on 28 February 1983, in the week of Admiral Rickover's birthday, under unprecedented circumstances, as three US presidents, Nixon, Ford and Carter agreed to be honorary members of the Board of Trustees of the Center being formed. This was the only Board of Trustees to this day – and this has a symbolic as well as an educational historical significance – where 3 presidents, demonstrating their commitment took up position jointly in favour of the importance of STEM education (Centerline 2009 Fall).

After Admiral Rickover passed away in 1986, co-founder Ms. Joann P. DiGennaro, a young jurist, became the soul of the CEE's; her personal commitment as well as her team working together for decades have built up and preserved the RSI programme, in the past 10 years supplementing the activity of the CEE with several new initiatives and many international collaboration agreements. Ms. DiGennaro is recognised the world over as a spear-head of STEM education, and in June 2012 she was elected on the U.S. News and STEMConnector websites among the 100 American women with the greatest achievements in STEM education, in acknowledgement of her initiatives at home and abroad.

Ms. DiGennaro's international success is closely linked to the various adaptations of the CEE RSI programmes in countries with a substantially different culture from that of the US, of which the Chinese, the Indian and the Saudi programmes, launched about a year ago, clearly excel. The most noteworthy of all is probably the Saudi programme, as it provides the first opportunity in the Saudi Kingdom for boys and girls in high school to learn the natural sciences subjects together. Ms. DiGennaro's work culminates in the collaboration agreements with foreign countries involved in the CEE RSI programme.

The volume of international contacts of the CEE and Ms. DiGennaro is hallmarked best by the fact that over the past 30 years she negotiated with 51 different countries related to the STEM educational programmes as President of the CEE, and as the person solely responsible for the international relations of the Centre and the exchange programmes of talented mathematics and natural sciences students.

She has always been engaged in creating ideal conditions for the RSI programme founded in 1984 – as shown by the StemConnector blog and my personal interviews with her – by her passion to provide high school students and

their teachers access to inspiring educational programmes offering experiences that would engage them with STEM for life. Her goal was to create and maintain an educational medium in which STEM education would go hand in hand with the development of creativity, for what could be a more fascinating experience, Ms. DiGennaro says, than helping the talented in giving birth to something new, to a real "Eureka!" experience (StemConnector blog 2012; DiGennaro 2012).

III. TALENT SUPPORT PROGRAMMES OF THE CENTER FOR EXCELLENCE

The Center has three major talent support/talent nurturing programmes with one common objective: to help keep the United States competitive in science and technology. Its student programmes are meant to give the participants lifelong motivation to become inventors, scientists, creators and leaders of the 21st century. As for its teacher programmes, the CEE's declared objective is to transfer adequate theoretical and methodological knowledge to make the teaching of STEM subjects a real experience to teachers to whom that would not be accessible otherwise for several reasons (CEE website 2012, DiGennaro 2012).

The oldest programme of CEE, the one looking back to the most impressive past and traditions is, as mentioned already, the Research Science Institute (RSI) organised for the first time in 1984. Its structure and achievements give this summer enrichment programme outstanding quality, focusing on excellence at all levels, and unique in the range of talent support options available globally.

Twenty years later, the RSI was followed by the CEE-sponsored USA Biology Olympiad (USABO) organised for the same age group of high school students, which has already acquired a leading role in its own field. The latest CEE programme is the Teacher Enrichment Programme (TEP) launched this year, in 2012. The development of all new programmes was inspired by the relevant demand experienced in practice. This paper will present the RSI programme in more detail, and it will only touch upon the fundamental aspects of the other two.

1. Financial background of the programmes

One of the prides of the history of the CEE and of the President herself is that all three programmes (RSI, USABO and TEP) are free of charge for the participants. The most difficult and most time-consuming part of the President's work in the Center is finding committed sponsors to ensure the necessary financial

conditions for selecting applicants to the otherwise quite costly programmes. The major sponsors to be found on almost 80 websites include universities such as the MIT and the Purdue, large companies such as IBM and Microsoft, but also private foundations, individuals, public agencies and ministries. The number of minor sponsors is several hundreds a year; every year the winter newsletter of the CEE lists the donors. Furthermore, both the US legislation and the various organisations receiving the small and big donations and transferring the money to the CEE create opportunities for numberless forms of donation on the website. Ms. DiGennaro is of the opinion that looking for sponsors should become a routine process also for public education employees in the United States, and that would bring the corporate and the educational sector closer to each other (DiGennaro 2012; CEE website 2012; Centerline 2008–2012).

2. Structure and personnel conditions of the CEE

The members of the 30-strong Board of Trustees of the organisation are linked firstly to the sponsors, secondly to the contents of the programmes and thirdly to educational policy; that is the reason why one finds among them the President of the Dranow Foundation, Mr. Mel Chaskin; the President-CEO of Vanguard Research, Inc. and, besides a professor from Harvard or the MIT, a member of the Lebanese Parliament, Mr. Bahia El Hariri.

Of the three former US presidents (two of whom passed away), Jimmy Carter, known also for his attachment to the navy, has remained an honorary member of the Board. It is not by accident either that the world-famous psychologist and expert, Julian Cecil Stanley, the proponent educational of acceleration, whose work has had a personal influence on Ms. DiGennaro's career as well, was also on the first Board of Trustees.

Strictly speaking, the CEE team consists of 14 persons headed by President DiGennaro, but at the time of programme implementation and especially during the summer RSI weeks it may temporarily exceed even 35. The programmes always have their respective professional directors who are not members of the permanent team.

3. From STEM to STEAM: The RSI summer programme

Here is the essence of the summer enrichment camp created in 1984 in one sentence: Intensive six-week introduction to the methodology of scientific research. Ever since the beginnings in 1984, the professional programme has

always been compiled together with the famous Massachusetts Institute of Technology (MIT).

Students admitted to the programme may test themselves in countless fields of science ranging from cancer research to applied mathematics and they gain first-hand experience in the leading science labs in the surroundings of Boston. Upon the invitation of research teams in science both from the public and the business sector, they participate in scientific projects, and they are given an opportunity to add their ideas. The professional content of each camp depends to a large extent on the scientific projects in progress in the given year.

3.1. Selection

Application through the registration page announced on the CEE website is terminated approximately six months before the launch of the programme every year. The applicants are screened on the basis of all sorts of criteria, but the decision-makers are most curious about the combination of their school achievements and leader skills.

Entry to the programme is channelled through three different selection routes depending on the school or citizenship background of the applicant. Most students – US citizens and Permanent Residents – may be admitted to the camp through the decision-making mechanism organised by the CEE, by applying directly to the CEE (Group 1). Application of a different type, but practically of the same content, is provided by CEE to the so-called DoDEA students, i.e. those who study at schools established by the Department of Defence in the US or at military bases abroad (Group 2) (DoDEA schools, 2012). Yet another route is provided for international students applying to the programme (Group 3). However, it is a requirement in all three systems that finalists, i.e. high school seniors, are not eligible to apply.

School nomination is not a precondition of applying directly to the CEE (Group 1), but applicants to the CEE RSI programme must be recommended by two teachers who are aware or their achievements and school progress, and copies of the documents certifying their high school results (the official high school transcript) must be attached to the teachers' recommendations. Furthermore, it is recommended to indicate also the scores of the applicant from the nationwide standardised performance tests in the US (e.g.: PS AT, SAT, ACT, AP, PSAT).

Prospective applicants are strongly encouraged to take the PSAT which is a precondition also for other similar national scholarship tenders announced in the US. The PSAT examines the performance of the students in three

fields: mathematics, critical reading, and critical writing in combination. It is recommended to have at least a score of 220 out of the maximum 240 to have a chance to being admitted, which in practice means 98–99% performance in all three areas (Evaluation of PSAT tests 2012). To be admitted with a lower score, the student must have some documented scientific research activity or high-level recommendations.

Those who apply to the CEE must respond in their essays in detail to the questions in the application form regarding their long-term objectives in STEM, their leadership aspirations, if any, and they have to indicate also the research area they are interested in. Preference is given in the admission procedure to students who have a record of study competition participations, completed university-level coursework or who active leaders of the student community at high school.

American students in Group 2 can only be admitted through the own internal selection procedures of the schools of the Department of Defence, and they constitute a relatively small segment of around 5% of admitted students (CEE website 2012; Centerline 2010 Fall).

The application procedure of international students (Group 3) differs by country. Eligibility is conditional on whether the country concerned is a collaborating partner of the RSI in the given year, hence the composition of the international team changes year by year depending on the financial possibilities of the partner countries. The CEE management considers international participation highly important due especially to the aspect of cultural diversity, and hence around one third of the students admitted to the camp has for years come from foreign countries, since promoting international co-operation is the other mission of the Center besides supporting STEM education (Centerline 2009). In the past 25 years there were 19 European states among the 50 different participating countries (DiGennaro 2012).

The first RSI summer "institute" started with 50 persons. In the recent years, some 70–80 students may expect to be admitted to the programme, including around 45–50 American students and 25–30 foreigners. The final decision is taken in February each year by the so-called Selection Committee made up of outstanding STEM professionals. They meet personally at the CEE seat in McLean to select the best students based on the above-mentioned guidelines; the rate of over-application changes year by year: it is usually 15–30-fold, but it is not rare either that 1400 students apply for around 50 positions (Centerline 2009–2012; Palmer 2012).

3.2. Six weeks at the Massachusetts University of Technology

The RSI is really a best practice in talent support: the pivotal effect of the six-week programme is witnessed by many data stemming from monitoring life-courses and from reports on written or video-sharing sites. The strict monitoring of life-careers is by no accident: it is absolutely necessary to demonstrate the effectiveness of the programme to the sponsors. According to the relevant survey, 80% of the 2000 former students who took part in the RSI programme by 2010 made an outstanding STEM career. The alumni database has been built up continuously since 1984, and it may be joined also by students who participated in the adapted RSI programmes of foreign countries. The database gives the alumni an opportunity for keeping in touch and for being in continuous interaction with one another (Centerline 2009 Spring, 2010 Fall; Palmer 2012).

„Coming from a small, remote high school, I learned what scientific research was all about for the first time at RSI. That experience has helped me throughout my career."

Daniel Lee, RSI 1985, Associate Professor, School of Engineering and Applied Science, University of Pennsylvania

„For the brightest stuents to be among their peers, learning about each other and about the wider world of schience, mathematics and engineering, is a tremendously enriching experience. RSI is truly an investment in our scientific and technological future."

Amy Sillman, 84' RSI Research Scientist II, Consultant

Reading or listening to the stories of former students leaves no doubt as to the RSI Programme being a decisive event in the life of the majority. First of all, many emphasise that they found the opportunity to be at the MIT, a most inspiring stronghold of science, and that it has widened their horizon. It has opened up new horizons and brought new friendships for them; they became parties to and building blocks of a scientific network for their lives, and all that was of decisive importance for their career.

It is not difficult to imagine what an incredible effect it may have on someone coming from a small school at a place far-away from scientific life to be suddenly in the centre of gravity of scientific life in Boston, and to have

access to all resources (computers, databases, periodicals) which normally only the leading researchers of the world can use for their work.

3.3. The structure of the programme

It follows from the nature of the six-week programme co-sponsored with the MIT that its content is different every year, whereas its framework structure and high standards are always the same. The programme starts with an introductory one-week warm-up period at the campus, followed by five weeks of intensive research, and it ends with the final, oral and written, presentations of the "Rickoids" (as RSI students are nicknamed in memory of Admiral Rickover) in the last week.

During Week 1 students visit intensive university courses held by renown university professors, and they are introduced mainly to theoretical issues of science. The teachers and/or the research mentors come from the best universities, from Harvard and the Northeastern University, the Boston College and Boston University besides the MIT, and also from the high tech companies located in the so-called Boston–Cambridge corridor. There are always some exceptions, too: RSI students have already had teachers, e.g. from the Universities of Washington and Princeton. A major part of mentors is the same every year, with only low fluctuation, however, as some professors may temporarily be abroad or their field of research may change. Mentors get a symbolic fee for their work with the students; as a matter of fact, they work with the "research seedlings" because of their own commitment to education and research and to the programme. It is a source of great pleasure that there are always some former RSI alumni among the teachers and research leaders.

The 6-week evening lecture series held in around 15 parts by world-leader scientists, high-tech investors and leaders (some of them Nobel Laureates) also begins the same week. This is an excellent opportunity to meet the lecturers personally. The 2-hour lectures generally begin at 5 p.m. and the ensuing discussion often extends late into the evening, ending at around 9 p.m., after dinner (Palmer 2012).

Students get their first home assignments from their research mentors – selected for them by the CEE team already before the start of the programmes in line with their respective fields of interest – by the end of the first week, so their first Saturday and Sunday is spent with concentrated preparations and reading. Since 2008, engineering has been added to the traditional RSI science areas, i.e. applied mathematics, biology, chemistry and physics (Centerline 2008 Fall; Palmer 2012).

The actual 5-week individualised programme and laboratory research of the students arranged in line with their specific fields of interest begins with Week 2, under the supervision of the scientist-mentor whom they got acquainted with the week before, either at the MIT or in the labs of the surrounding universities and companies. The pedagogical goal is that students take part in an entire research cycle, to get to know every phase of the research work (and as that often exceeds a daily 8 hours of hard work, it is not rare for the students to do "business hours plus").

Hard research work sometimes gives way to collective excursions to Boston, rich in cultural and scientific institutions and in natural endowments, or to the nearby area. Over the weekend, students get an insight also to the beauties of New England. The organisers try to adapt to the individual demands and desires of the students even in designing their leisure programmes. Pedagogically, these informal occasions also form an organic part of the RSI system: often, this is the first time for students stepping out of their high school environment to meet mates and friends thinking in a similar way and interested in the sciences (Palmer 2012).

Art has played an increasingly significant role in the history of RSI, too. STEM education will only yield abundant results if it can integrate also the arts – hence Ms. DiGennaro's slogan that one should no longer speak of STEM, but of STEAM education (DiGennaro 2012).

Students have to prepare an advanced-level oral presentation suitable to be showcased at a scientific conference and a paper on their research results by Week 5. These papers and oral presentations are evaluated by an outside panel of university and corporate scientists that selects five papers and five presentations for special commendation during the last week programme each year. The presentations are held again at the MIT campus, in the presence, naturally, of all the "Rickoids". The five prize-winner presentations are then uploaded to the CEE website, and the Fall issue of Centerline relays the news of the students who performed best. It happened on numerous occasions that a mentor recognised a researcher student as co-author of a scientific publication of his team, and hence the students may also acquire credits for their prospective scientific career. A few actually rejoin the lab and their mentor as undergraduates, and do research together (CEE website 2012).

At the end of the programme, the students choose the Rickoid of the year based not so much on academic achievement, but rather in recognition of the chosen person's leading role in the RSI community.

For several students the 6-week research practice and the results attained there provide the basis for their nomination to study competitions of national reputation, e.g. the annual Intel Science Talent Search, the International

Science and Engineering Fair (ISEF) or the Siemens Science and Technology Competition. Centerline covers their successes at the competitions the same way as it does their work in the RSI (Centerline 2008–2012; Palmer 2012; DiGennaro 2012).

3.4. In the spirit of excellence

A glance at the overall programme will show that excellence manifests itself in each and every segment of it: in the strict, multi-criteria selection system, the individualised participation in real, intensive, research at the most famous universities of the country, under the leadership of excellent researchers, and in the presentation to a jury at the end. Selection, research and the final evaluation all take place in the presence of the best researchers of the corporate and educational sector. The programmes, the monitoring system and quality assurance of laboratory work and continuous feedback serve, among others, to ensure the high quality typical of RSI (Palmer 2012).

Of course, the per capita cost of such a special, very high-standard educational option, especially if it includes the costs of accommodation and board as well, is rather high, at around USD 9,000. This is why Ms. DiGennaro has stressed from the start that it is vital for such a programme dedicated essentially to meritocracy, to provide equal access opportunities to all, that is, to have quality organisation and also suitable sponsors for the young talents most worth of it (Centerline 2009).

IV. OTHER CEE PROGRAMMES

1. The USA Biology Olympiad – USABO

The USABO was also created in the spirit of excellence in 2002, and it took over some of the best traditions of RSI: it is a preparation/enrichment programme for gifted high school students, realised jointly with a collaborating university – in this case the Purdue University. The CEE undertook to organise and sponsor a national biology competition and later on also a camp to prepare students for the international Olympiad. Its goal was, among others, to demonstrate the outstanding importance of biology to the sector of education, and to enhance the motivation of not only the students, but also their teachers through the national competition. Of course, the CEE's fundamental mission – to commit people to a science career – was also part of the system of objectives (USABO 2012).

It is very difficult to be admitted to the programme held at the Purdue University: since 2002, an average of 10 thousand students have taken part annually in the two-round exams to be admitted to the almost 2-week-long on-campus Olympiad preparation camp.

In the first round, a series of 50 multiple choice questions are to be answered in 50 minutes to identify the gifted students interested in biology all over the US. The top 10% may take part in another test of two hours. This is how the best 20 students are selected to the USABO camp. The four students who earn the right to represent the US at the International Biology Olympiad are selected at the camp (Centerline 2011 Fall; USABO website).

The USABO has been a success story ever since the first preparation camp: none of the selected team members has ever returned without a medal from the International Biology Olympiad organised with the participation of almost 60 countries. On six occasions, in 2004, 2007, 2008, 2009, 2011 and 2012, every American student of the team returned with a gold medal. This is well beyond the original expectations: the competition and the enrichment programme has yielded tangible results. The high standards and the excellent programme have induced excellence. Enthused by this success, Ms. DiGennaro's plan is that the CEE should get engaged in the organisation of the physics Olympiad as well

from 2013 on, in collaboration with the Association of American Educators. This will be the CEE's fourth programme (Palmer 2012).

2. Teacher Enrichment Program (TEP)

The TEP is a new CEE initiative which has crystallised by 2012, and is to be interpreted as a collective term for the totality of activities and resource centres promoting the acquisition of up-to-date knowledge by STEM teachers and also their networking in various forms.

A part of the TEP programmes is still under specification and development; some pilot components exist already in certain states, that is, relative to the previous two main programmes, one cannot speak of national coverage yet. The programme development process includes the mapping of classroom best practices and the collection and consideration of the concepts and lab experiences of teachers.

In all programmes designed for teachers, special emphasis is given to offering them participation free of charge and to compensating for the geographical disadvantages, i.e. to provide assistance first to the teachers of schools with low scores in the national measurements and especially those places where the teachers have no lab experience at all, and hence the introduction of research-based education is an almost impossible mission (Centerline 2012).

One TEP pilot is the best practice of Teachers' Roundtables, active so far in 3 states: California, Texas and North Virginia. It is somewhat similar to the RSI's series of evening lectures in science. A maximum of 25 high-school teachers are brought together with scientists outstanding in their own field, in the framework of an informal dinner. Apart from listening to the presentation, the dinner is an excellent occasion for the exchange of scientific ideas with researchers. It is important that the knowledge-sharing role of the teachers should come into the foreground during these discussions, to find out by the end of the evening in what way a certain research result could be taken into the classroom to be presented there.

The colleagues participating at the dinner may join the Lab Bench programme under which they have online access to presentations and also to other resources that can be used for the purpose of education.

Under the TEP programme, the CEE enriches and assists the teachers' activity by putting an enormous online resource centre at their disposal through its website (the Clearinghouse Program). To date it maps the online sources, lab activities, video collections, digital libraries, scholarships and applications provided by almost 110 companies, labs, banks etc. but only from those target

states, where the programme is in operation. Mapping comprises also database applications and explanations.

The system of free enrichment workshops of a few hours organised for teachers – on a few topics and as yet only in relation to a few companies – is also part of the TEP. Besides deepening their knowledge, this system provides teachers a perfect opportunity for networking activities, and the more recent initiatives include also online teacher mentoring by master teachers (Centerline 2010, 2012; CEE website 2012).

V. SUMMARY: FROM STUDENTS TO TEACHERS

Both programmes sponsored by the CEE – the RSI as the first flagship designed almost 30 years ago and the USABO launched 10 years ago – are outstanding success stories: two nationwide talent enrichment programmes in the US for the generation of high school students, shaping human lives. The programmes have attained their targets to 100% from the start (80% STEM career, Olympic medals). Interestingly, the third development strand targets no longer the students directly, but focuses instead on their teachers, as a demonstration – especially in STEM education – of the significance of training, up-to-date knowledge and skills, and adequate laboratory grounding of the latter. Meritocracy and equality, the collaboration of education and the business sector are key principles of every programme and the CEE is really a centre for excellence, true to its name.

BIBLIOGRAPHY

Centerline newsletters (2008–2012): Edited by CEE; editor-in-chief: Maureen Palmer.

Csapó, B. (2007): Az oktatási rendszer fejlesztésének tudományos megalapozása, a kutatási háttér kiépítése (Scientific grounding of the development of the educational system; deployment of the research background). In Csapó, B.: *Az oktatási rendszer fejlesztésének tudományos megalapozása.* http://oktatas.magyarorszagholnap.hu/wiki/Csapó_Benő:_Az_oktatási_rendszer_fejlesztésének_tudományos_megalapozása/. (Downloaded: December 2010).

DiGennaro, J. (2012): Oral communication.

DoDEA schools: http://en.wikipedia.org/wiki/Department_of_Defense_Education_Activity (Downloaded: 15 November 2012).

Fuszek, Cs. (2011): Programmes of the Boston National Center for Technological Literacy. In Gordon Győri, J. (ed.) (2011): *A tehetséggondozás nemzetközi horizontja, I.: Jó gyakorlatok az Európai Unión belül és kívül, I* (International Horizons of Talent Support, I; Best Practices Within and Without the European Union). Budapest: MATEHETSZ Géniusz Projekt Iroda.

Palmer, M. (2012): Oral communication.

Rickover, H. G. (1960): *Education and Freedom*. ISBN 0-525-47047-6. Quoted in http://en.wikipedia.org/wiki/Hyman_G._Rickover/.

Websites

CEE website: http://www.cee.org/. (Downloaded: 10 November 2012).

Evaluation of PSAT tests: http://www.testmasters.net/PsatAbout/Scoring-Scale (Downloaded: 17 November 2012).

StemConnector blog: http://blog.stemconnector.org/ Report with Ms. DiGennaro (Downloaded: 10 November 2012).

StemConnector website: http://www.stemconnector.org/sites/default/files/100-Women-Leaders-in-STEM-WEB.pdf/. (Downloaded: 10 November 2012).

USABO website: http://www.usabo-trc.org/index.php#/. (Downloaded: 10 November 2012).

Nguyen Van Tuan–Pham Xuan Hinh–Do Tien Dat

Talent Support in Vietnamese Education

1. INTRODUCTION

Vietnam is located on the Indochinese peninsula in Southeast Asia. It covers a total area of approximately 331,210 km^2 (excluding the Paracel and Spratly Islands). Vietnam shares a long borderline with China (in the north), Lao and Cambodia (in the West and Southwest) and is bordered by the Gulf of Tonkin, the South China Sea and the Gulf of Thailand. This special location has given Vietnam a tropical monsoon climate and exceptional scenery. There are two UNESCO World Heritage Sites – the Halong Bay, one of the seven wonders in the world, and the Phong Nha Ke Bang National Park which is famous for its cave and grotto system as well as for its longest underground river. There are six biosphere reserves in Vietnam, too, including the Can Gio Mangrove Forest, Cat Tien, Cat Ba, Kien Giang, the Red River Delta, and the Western Nghe An.

At present Vietnam's population is about 91.5 million, consisting of 54 different ethnic groups of which the Kinh people account for nearly 86% of the whole population, and the ethnic minority groups such as the Tay, Thai, Muong, Khmer, Hoa, Nung, Hmong and others represent almost 14%. Besides the official language – Vietnamese – and the increasingly favored languages like English, French, Chinese and Japanese, each ethnic minority group has its own dialect that has been preserved in daily life. In general, Vietnamese people are hospitable and most of them attribute high importance to relationships among friends, family and other outsider social groups. In addition, they are studious and seriously concern for education.

In the last ten years, Vietnam has gained significant achievements in economic and social development. Over that period, the economy has experienced rapid growth. Nowadays, Vietnam is in a period of being integrated into the global economy. Therefore, the country has established diplomatic relations with many countries, and joined 63 international

organizations, for example, the United Nations, the APEC, the ASEAN, the Francophonie and the WTO.

Vietnam's education system has sufficient levels of education from crèches and kindergarten to college/university with many disciplines. Education programmes are also increasingly diverse. Currently, Vietnam is in the process of international integration in the field of education and training in terms of educational collaboration, exchange and learn best practices from advanced countries.

II. EDUCATION IN VIETNAM

1. The education system in Vietnam

Education traditionally plays a crucial role in Vietnamese culture and society. It is considered as the route of advancement and almost all Vietnamese families try to ensure that their offsprings can get the required education. The following chart shows the current education system in Vietnam (according to the Education Law).

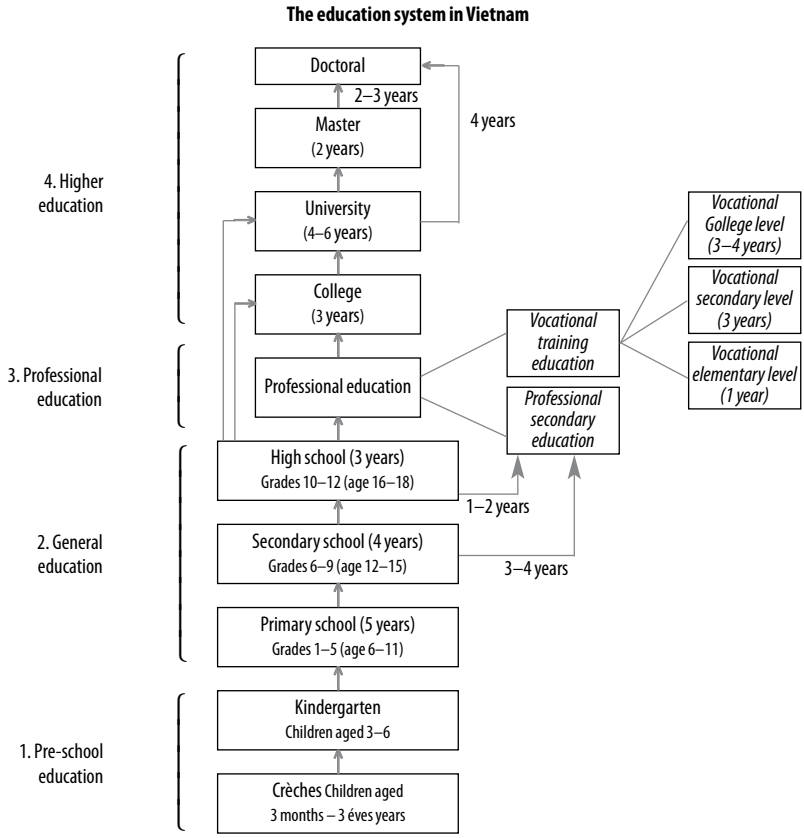


Figure 1. The Vietnamese education system as it is defined in the Education Law, 2005
Source: National Assembly of Vietnam (2005, pp. 8–17).

1.1. Pre-school education

Preschool education includes:

- *crèches* (for children under the age of three) and
- *kindergartens* (for children from three to six years of age).

1.2. General education

General education consists of:

- *Primary education*: for students from grade 1 to grade 5. Children normally start primary education at the age of six. Education at this level lasts for 5 years and is compulsory for all children.
- *Lower secondary education* includes Grades 6–9. Students continue secondary education at the age of eleven. Education at this level lasts for 4 years and is compulsory for all children. Students have to pass the Intermediate Graduation Examination (IGE) held by the local Department of Education and Training to graduate.
- *Higher secondary education* consists of Grades 10 to 12. The IGE is a prerequisite entrance examination for this level. The IGE score determines the schools in which students are able to enroll. The higher the score, the more prestigious the school.

Objectives of general education include helping students fully develop with *morality, knowledge, physical health, aesthetic values* and other basic skills; *developing their personal ability*, *dynamism* and *creativity* to be *responsible* Vietnamese citizens*;* to preparing for their further studies or working life or participating in national defence and construction.

1. *Primary education* aims to help students form initial concepts for their adequate and long-lasting moral, intellectual, physical and aesthetic developments, along with the development of basic skills to enter lower secondary education.
2. *Lower secondary education* helps consolidate and develop the knowledge students learned in primary school; and simultaneously provides students with knowledge at lower secondary level and preliminary understanding about engineering and career orientation, to create conditions for students to continue learning or going to work.

3. *Higher secondary education* helps students consolidate and develop what they learned in lower secondary school, completes their general education, helps their career orientation. That is, students get the necessary conditions to develop their personal abilities in order to choose their own ways of development, whether to enter universities, colleges, professional secondary education schools, and vocational training schools or to go to work.

The Minister of Education and Training will determine the general education programme, which includes content structure, the number of subjects, duration of the subjects, proportion of theory and practice, ensuring the objectives for each subject to be trained. Textbooks, syllabus and teaching materials must meet the requirements of educational methods.

The institutions for general education include primary schools, lower secondary schools, higher secondary schools, multi-level general schools, centres for general techniques and career orientation.

1.3. Professional education

Over the last decade, the Vietnamese Government has persisted in the policy of economic reform. The Government is deeply aware of the importance of human resources development (HRD) and makes great efforts to develop education and training. The reform of professional education is one of those efforts, the results of which can be seen in almost all aspects of professional education such as curriculum development, teacher retraining, partnership strengthening between business and training institution, establishing qualification frameworks, accreditation, management systems, and co-operation with international professional education institutions. Socializing professional education and making its courses more relevant to the labour market are important policies of the reform of education.

Professional education consists of:

1. *Professional upper secondary education,* which involves three to four years of study for learners with lower secondary education diplomas; and one to two years of study for those with upper secondary education diplomas; and
2. *Vocational training* which involves less than one year for vocational elementary level and one to three years of study for vocational secondary level and college level.

The objectives of professional education are to educate potential labourers equipped with the necessary knowledge, and professional skills at different levels, including also issues of morality, professional ethics, discipline awareness, industrial working style and physical health, thus, providing working people with employability, self-employability or ability to further study to improve professional qualifications.

The Minister of Education and Training shall define the core programme for professional secondary education. Professional upper secondary education schools will define their own training programmes based on the core programme.

Institutions of professional education include: professional secondary education schools, vocational training colleges, vocational secondary schools, vocational training centres, vocational training classes.

1.4. Higher education

Higher education in Vietnam consists of:

1. *College education* comprising two to three years of study,
2. *University education* involving four to six years of study depending on the discipline,
3. *Master education* from one to two years of study for university graduates, and
4. *Doctoral education* with over four years of study for university graduates, and with two to three years of study for graduates with master degrees.

The objectives of higher education are to transmit professional knowledge and practical skills relevant int he given field, to improve students' political and moral qualities, to give endeavour to serve the people, and to keep the youth in good physical health, meeting the needs of building and defending the country.

The Minister of Education and Training defines the core programme for each field of college and university education, on the basis of which colleges and universities design their own programmes.

Institutions for higher education include *colleges* providing college education; *universities* providing college and university education, and also master and doctoral education as assigned by the Prime Minister; and *research institutes* providing doctoral education, co-operating with universities to offer master education as assigned by the Prime Minister.

The following table shows the net enrolment rates at different levels of education in 2009:

Table 1. The net enrolment rates at different levels of education in 2009

Primary	Elementary	Secondary	Junior College	University
95.5 %	82.6 %	56.7 %	6.7 %	9.6 %

Source: Ministry of Planning and Investment (2011, p. 36).

2. Current education policy

According to Vietnam's current education policy, education and training play key roles in developing high-quality human resources. The Government holds that education is a priority national policy and strongly believes that investing in education is indeed investing in future development. That is the reason why the mission of education and training are not only to improve people's knowledge, to educate and train human resources, but also to foster talents so as to exploit the country's talent potential and provide the country with high quality labour-force.

In the spirit of the above missions, the country lay down the principles of the development of education and training. In order to improve the quality and efficiency of education and training, an education system is supposed to provide a comprehensive programme, innovative teaching and learning curriculum, and appropriate methodology as well as a well-functioning organizational structure and management mechanisms, with well-designed policies to identify, train, foster and use talents.

To reach these goals, the country holds investment in education as a priority. Vietnam mobilizes all resources for education development, school facility construction, school standardization and modernization.

Besides, on the basis of the quality and efficiency requirements associated with economic and social development, the scope of education needs to be continuously expanded. It is also of key importance to apply the principle of social equality in education as widely as possible. In accordance with this policy, participation in education is formulated as a right and obligation of every citizen, and favourable conditions for poor people to study and for talented people to develop their capacities are to be ensured. Furthermore, the

government aims to diversify the schools and education forms to create a learning-nurturing society and institutional system that serves the continuous learning needs of the people.

Finally, in our age of cooperation and exchange, Vietnam takes steps toward strengthening and promoting international cooperation in education and training.

III. THE TALENT SUPPORT MODEL IN VIETNAM

Appreciation and use of talents are of Vietnamese tradition. On the first stone turtle in Vietnam's Temple of Literature an engraved quotation from the eminent Vietnamese scholar, Than Nhan Trung, makes this approach explicit: "Talent is the life-sustaining element of the nation".

Erstwhile, the Vietnamese dynasties held many formal examinations to select talents for the country. Under the Ly dynasty, the first University in Vietnam opened its gates in 1070 (Temple of Literature) with the aim of selecting civil servants who were not from noble families, and the first examination was held to identify the first doctoral candidate, Le Van Thinh. From then on, national examinations were organized every four years for talent selection. It can be said that Vietnam has a long tradition in training and fostering talents, however, it is only since the 1960s that talent education has really been put into the focus of attention by the government and the secondary schools, related to two different student groups:

1. Good performance students (band score from 8.0 to 8.9 out of 10 points) and excellent performance students (from 9.0 to 10 out of 10) in primary and secondary schools. (Almost all primary and secondary schools have at least one talent class). Now, in Vietnam, there are 76 secondary schools with gifted education programmes.
2. Gifted students in arts, sports and athletics, music, dance and arts. (There are 6 specialized schools training them).

1. The talent selection and identification mechanism

In Vietnam, children with good and excellent performance are identified and selected into special classes at most primary and secondary schools (usually called specialized classes). Students gifted in gymnastics, music and arts are selected from primary schools and even from kindergartens.

At the high secondary level, the talent selection mechanism is carried out under Article 11 of the Regulations on organization and operation of gifted

secondary schools, according to which, students have to pass a two-stage examination:

1. *Preliminary selection*: Firstly, students with good and excellent studying performance (band score of the gifted subject is at least 8.0 out of 10) are selected from lower secondary schools.
2. *Formal examination*: After having passed through preliminary selection, students have to take a formal examination in three conditional subjects (mathematics, literature, and foreign language) and one/two more 'gifted' subject/s.

The three conditional subjects give basic knowledge and skills for secondary-school students while "gifted" subjects usually develop advanced knowledge and skills. The exams take the form of test writing and/or multiple choice questions.

Winners of the public provincial contests, of talent exams conducted by the Ministry of Education and Training, and of regional and international competitions, will get bonus pointst the at the entrance examination into the gifted classes (first prize: 2.0 points; second prize: 1.5 points; third prize: 1.0 point), provided that the subject(s) they took in the competition(s) are registered "gifted" subjects.

2. Methods of fostering gifted students

2.1. Objectives of education

"Specialized schools are established at upper secondary level for students with excellent achievements in learning to *develop their talents in certain subjects* while assuring *comprehensive* general education" *(Education Law*, see: National Assembly of Vietnam 2005, p. 76).

2.2. Achievements

Since September 1965 when the first "special class" was established 76 gifted high schools and branches (generally called specialized schools) have been opened (Ministry of Education and Training 2011, p. 43). High education quality is one of the significant characters of these schools. In the recent years, generally 100% of the gifted students are rated as having good and fair conduct (evaluation of students' attendance, behaviour and social, extracurricular

activities participation); and more than 95% of students achieve good and excellent academic results.

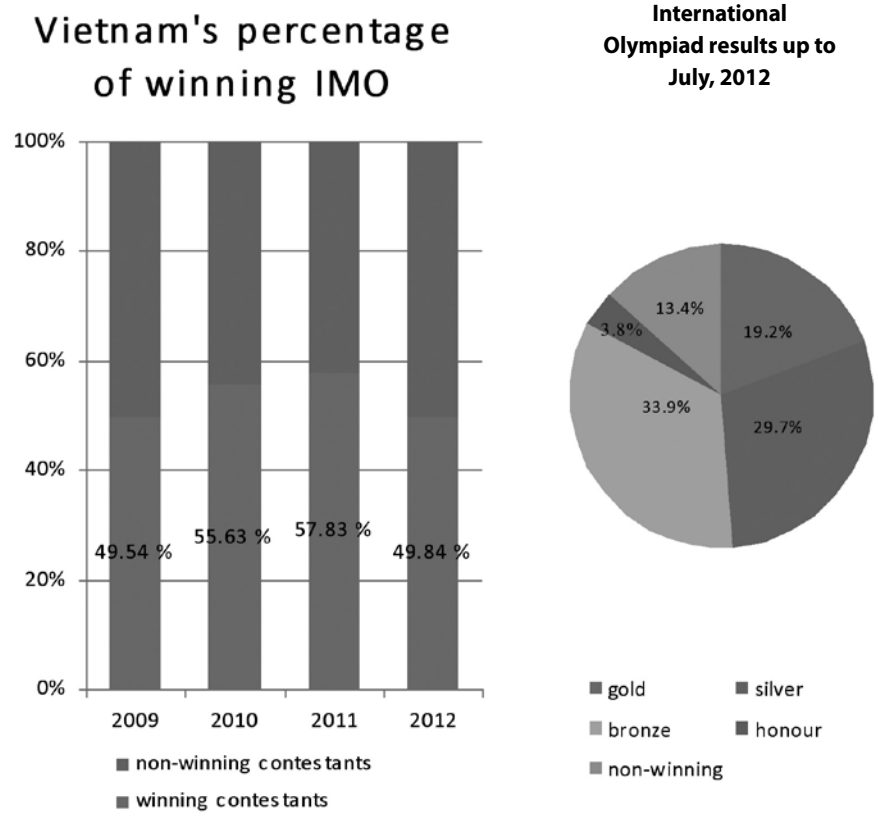


Figure 2. Vietnamese students' results at International Students' Olympiads.
Source: Data by courtesy of the General Department for Testing and Education Quality Accreditation; Ministry of Education and Training.

Up to July of 2012, 569 out of 657 (that is, 86.6% of) Vietnamese student candidates won prizes at the International Olympiads. The breakdown of the medals were as follows: 126 Gold, 195 Silver, 223 Bronze, 25 honours.

In addition, about 90% of gifted high school students pass the annual National University Entrance Examination and are admitted to universities in Vietnam. In the case of certain 'gifted' high schools, the ratio is 100%. After entering universities, many students learned or are learning in talent classes at the universities.

3. Gifted Education Content

Some basic criteria to develop the contents of courses to be taught in "gifted" secondary schools are as follows:

- Courses should be designed to *meet the needs of the learners*, allow them to *learn actively and creatively* as well as to *stimulate their love of learning* and thus, develop their desire for learning. Furthermore, the contents should help students develop *thinking skills*, *ability of self-learning*, *of applying accumulated knowledge and skills* to deal with problems in real life.
- Educational contents will be chosen by using *a "wide and deep" approach*, in which *"wide"* means being based on the compulsory contents of general education, though teachers can expand the existing topics or teach new ones. *"Deep",* on the other hand, means to *delve* into some given topics in more detail.
- The learning contents for gifted students include two branches:
  - f*undamental contents* are designed to consolidate and improve their knowledge and basic skills; while
  - *developmental contents* are used for more intensive teaching and studying.

3.1. "Gifted" Content for primary-school and lower-secondary-school students

The gifted programmes for these two levels include options and start from Grade 3 (8-year-old students) under the management, assessment and evaluation of the Ministry of Education and Training. The mechanism to identify if a 3-grader is talented involves three methods:

- analyzing study performance in previous grades,
- IQ test,
- consulting experts and the child's parents.

There are many teaching materials with the same content to match students' needs and to be integrated with several issues from daily life. And each school has its own plans to perform teaching and learning based on their students' needs and the conditions of the school.

Example:

Teaching the topic of "water" in science (elementary school) can be conducted as follows:

- Investigate the water resources and their impacts on the health of local people (and some water-related diseases); come up with some ideas to protect the water resources in reality!
- Learn about permeability and compare the permeability of several materials!
- Make some simple water filters!

Through this topic, students have the opportunity to pool and apply scientific knowledge about water to solve practical issues in life, by which students' practical and problem-solving skills are improved.

Such integrated topics require students to apply cumulative knowledge and skills in different areas of science and literature (for example: writing reports, conveying information) and also to apply technical knowledge (design, making instruments).

3.2. "Gifted" Content for higher-secondary-school students

Regulations on organization and operation of specialized high schools lay down the following principles (Ministry of Education and Training 2008):

Gifted schools[1] may have specialized classes in mathematics, informatics and computer science, physics, chemistry, biology, literature, history, geography and foreign languages. In each specialized class there may be *one or two intensive subjects* (it is possible to have two foreign languages as intensive subjects).

Each specialized subject includes an advanced programme and intensive content.

[1] A high school has to satisfy the following conditions in order to become a gifted high school: (a) the manager and teaching staff must have competence with professional qualifications equivalent to or higher than the standard level to manage the school as well as to teach and educate students; (b) the school must have premium facilities; teaching equipment required for national standard high schools and good dormitory for students; (c) the school must have a stable enrolment index.

compulsory topics, in which minimum required knowledge level and skills have to be stated clearly.

In specialized education, students are encouraged to figure out different solutions to the same problem; learning tasks stimulate the development of consciousness, creativity and conducting basic scientific research.

Students become equipped with basic and deeper, modern, systematic knowledge, which is equivalent to the required knowledge levels for good-performance students in developed countries. Also their basic and proficient skills are developed and trained in order to meet the requirements of the course as well to increase the capacity and train the personality of young people in our modern society.

As an example we present a specialized module in Physics named "Starry sky; celestial sphere and diurnal motion; celestial coordinate systems". There are three main content blocks and several requirements listed in the following table.

Contents	Knowledge level and minimum required skills
1. Starry sky	*Knowledge:* List some constellations and well-known stars!
	Skills: Identify some well-known stars and constellations in the sky!
2. Celestial sphere and diurnal motion	*Knowledge* • Understand the concept of celestial sphere and celestial poles! • Understand the concept of diurnal motion and its direction! • Understand the relationship between diurnal motion and the Earth's rotation around its axis!
	Skills • Be able to find the north celestial pole! • Know how to find the direction of diurnal motion in everyday life!
3. Celestial coordinate systems	*Knowledge* • State the (horizontal) coordinates in the horizontal coordinate system! • State the relation between the altitude of the elevated pole and the observer's latitude (prove that altitude of the elevated pole is equal to the observer's latitude)! • State coordinates in the equatorial coordinate system!
	Skills • Find out horizontal coordinates of a real specific astronomical object! • Be able to read the star maps (star charts)!

Table 2. Topic "Starry sky; celestial sphere and diurnal motion; celestial coordinate systems"

The educational contents include not only specialized subjects but also everyday skills, social skills, etc. for gifted students.

Besides teaching the contents provided by the Ministry of Education and Training, gifted-class teachers have used many other materials compiled by some top schools (University of Natural Sciences – Hanoi National University, Pedagogical University of Hanoi, Le Hong Phong Gifted High School in Ho Chi Minh City, etc.), supplementary and advanced exercises, selected topics in mathematics, physics, chemistry, biology, etc.; a collection of competitive examinations (provincial, national, regional, Olympiad, international), a selection of college and university exam, and other national and international specialized magazines such as the Youth Magazine, magazines in high school physics, quantum, mathematics in school, etc.

4. Teacher training for gifted education

4.1. Teacher training for "gifted"schools

The workshop on building a network of specialized-subject teachers in the 'gifted' high school system (April 2011) stated that "provinces, cities and universities (often referred to as local) have developed criteria and selection process for teachers teaching in specialized schools. Specialized schools can carry out the process of selecting and training teachers by themselves" (Ministry of Education and Training 2011, pp. 43–44).

Qualified teachers in "gifted" schools, especially those teaching specialized subjects have been told the preferences, and provided with funding support to participate in professional training workshops, to enhance their own expertise, professional development, and simultaneously, they have been selected through the assessment and screening mechanism every year to motivate other teachers to strive for success and to meet the proposed requirements.

The ratio of managers (principals, vice-principals, subject chiefs) and teachers in 'gifted' schools who are qualified with master and doctorate degree have been significantly rising recently. Including university lecturers, the proportion of doctorates account for 1.5%, and masters for 21.7%, while among managers those having doctorate degree represent 4.6%, and masters 41.2% (Ministry of Education and Training 2011, p. 44).

The Government compensates the special efforts of gifted school teachers in their salaries and allowances.

4.2. Teacher fostering for "gifted" schools

Teacher staff for "gifted" schools is one of the most important factors to make a high-quality school. Being aware of the importance of that in education, each

school has its own training plan for their teachers. Normally, preparing for school anniversary celebrations schools hold some symposiums to review, share teaching ideas, experiences, to set future development directions.

In the recent years, the Ministry of Education and Training held three major conferences for "gifted" schools. Such conferences and workshops identified important directions for teachers in fostering their professional qualifications and skills.

Every summer, the teachers of mathematics classes usually participate in professional training courses. Such training classes are conducted by Professor Nguyen Van Mau, former Rector of the Hanoi University of Natural Sciences. In international competitive exams, annually about two-thirds of the contestants coming from specialized mathematics classes of the Hanoi University of Natural Sciences win a prize. Therefore, such fostering courses usually attract teachers.

4.3. Secondary education development programme

Secondary education development programmes by the Ministry of Education and Training give important support in training and fostering school-teachers to improve their professional qualifications. Specifically:

1. Support for creating motivating working conditions
   - Professional development: Enhancing self-study, practical work involvement and participation in scientific research.
   - Teacher evaluation: Evaluating teachers to make sure that they feel more satisfied with their jobs and ready to serve their students.
2. Organization of conferences, seminars, training courses in the country for teachers of "gifted schools".
3. Providing financial incentives to teachers in general, including gifted-school teachers.

4.4. Training programmes for teachers of "gifted" secondary schools to improve professional skills reaching international standards

The training programme for teachers of "gifted" secondary schools to improve professional skills reaching international standards have been carried out by University of Education, Hanoi National University.

This training programme is for teachers and trainers accredited by the University of Cambridge International Examinations (ICE).

The basic approach of the programme is that all elements of a teaching process are highly correlated with each other in an inseparable way, they cannot exist independently. The programme uses needs analysis to determine subject objectives, lessons. The analysis consists of studying standards of knowledge, skills required for each subject in correlation with other subjects, studying specific teaching objectives, and studying the teaching environment. In the course of the training, trainees go through the steps of the teaching process of a subject and the results will become so-called subject profiles. A subject profile consists of three parts:

1. *Preparation*
   - Surveying students' needs, interests, learning styles, background knowledge before teaching a subject,
   - Setting the standards of knowledge and skills for the subject,
   - Surveying the teaching and learning environment in and out of school
   - Developing teaching plans relevant to each lesson.
2. *Implementation* – Lesson plans for each unit.
3. *Assessment/Reflection* – Note-taking after each lesson that helps teachers share and learn from each other's experience.

5. Gifted education methods and organizational forms

5.1. Teaching methods

In gifted schools/classes, teachers implement a number of approaches to the development of intelligence, the creative ability of students such as discovery and problem-solving skills, cooperation and teamwork, self-learning methods, self-study.

Annual surveys of the gifted education system have shown that the two following methods are very well implemented in Vietnam:

- improving problem-solving skills, encouraging students to learn creatively, think independently and to cooperate,
- encouraging self-study, self-discovery.

Three other relatively well functioning methodological elements are:

- building and developing team-work and cooperation skills,

- developing research skills to gather, classify and process information from resource materials, and applying information technology in teaching and learning,
- forming the ability of students to study independently, by developing their skills and research methods according to specific field of expertise.

Thanks to these results, Vietnamese teachers of gifted schools understand more about their students. Simultaneously, they improve their own professional qualifications. More importantly, this helps teachers update teaching methodology for the better teaching quality in gifted classes.

5.2. Organizing forms of teaching

Currently, talent fostering is optional in primary education, but is compulsory in secondary education. Schools also organize various additional forms of gifted education, too:

- extracurricular activities, exchange of teaching and learning experiences,
- newspaper writing, mathematics problem-solving contests, designing creative science competitions
- cooperation with scientific journals like youth magazines, mathematical magazines for children, etc., so as to organize activities that encourage students to study more
- collecting specialized material for improving students' independent studying.

In secondary education, fostering gifted students is organized in three forms:

1. specific schools (gifted schools, later: gifted classes in universities),
2. selected classes in normal schools,
3. special gifted groups in normal classes.

6. Constraints of specialized teaching staff

The number of teachers specialized in talent support, and thus also professional capacity in gifted education is still limited and has not yet met the requirements of the present age. Specifically,

- the number of specialized teachers in gifted schools is insufficient to respond to the education and training requirements; moreover
- currently almost all specialized teachers in gifted schools feel overloaded by the work they have to do,
- managers' capacities to organize, manage and gather specialized teachers are still limited.

However, with the support of the government and other organizations for gifted education, improvement in these fields is continuous.

IV. TALENT SUPPORT IN MATHEMATICS IN VIETNAM

1. The formation and development process of gifted education in mathematics

With the aim of training the young gifted mathematicians to become specialized and high-quality professionals serving the development of the country; the first gifted high school class in mathematics, named "the special math class" was established in 1965, located at the University of Natural Sciences – Hanoi National University. The idea was derived from former Soviet practice. Later, other math classes were launched at the Pedagogical University of Hanoi, the Vinh University and at certain high schools for the gifted.

Until now, 76 gifted high schools in the country have specialized math classes (excluding gifted schools for arts, music and sports). The establishment of specialized math classes expresses the government's interest in fostering the young talented generation to participate in the development of the country.

In order to create more favourable conditions for students to develop their talents, the Government has approved the project of developing the gifted high school system in the period 2010–2020 at a cost of about $111 million. With this investment, the schools in general, and specialized math classes in particular, will have strong development in the second decade of 21st century.

2. Education programmes for math classes

In the period from the beginnings till the 1980s, special math classes at schools of the universities[2] did not hold direct entry exams. Selection was carried out by the Ministry of Education and Training. Mathematically gifted students were listed, then they took an examination organized and evaluated by the Ministry of Education and Training. Admitted students would study in specialized math classes located at the universities. From the late 1980s, gifted math classes of the universities and then gifted schools around the country

[2] Lecturers of these universities can participate in teaching courses at these specialized schools.

have conducted their independent entrance examination process so as to select the gifted math students and intensively develop their talent according to their own requirements. Candidates for mathematics classes must usually take a special examination in two days.

- First day: Literature, Foreign Language, Mathematics
- Second day: specialized mathematics

This exam serves to assess the basic skills of the candidates related to ability to reasoning, to think logically, calculation, writing, and knowledge of the field. Students specializing in mathematics have an intensive study programme with approximately twice as many math lessons than other students. Contents taught in math classes consist of two main blocks:

- *Compulsory contents* – with the aim of helping students acquire specialized knowledge of math at high school level effectively, and at the same time helping them practice and develop mathematical thinking skills;
- *Mathematical topics*
  - The compulsory topics primarily help students further exploit the knowledge learned from textbooks, review and clean their approaches of problem solving. Thus students have opportunities to consolidate their abilities to detect, analyze and synthesize problems.
  - The optional topics enable students to maximize their abilities in acquiring knowledge at schools, and to develop thinking skills. At the same time, students are equipped with knowledge and skills to participate in national or international mathematics competitions.

Here is the list of (both optional and compulsory) mathematical topics:

<u>Grade 10</u>
- Mandatory topics
  - Topic 1: Inequalities
  - Topic 2: Some problems in mathematical combinatorics
  - Topic 3: Planar geometry
- Optional topics
  - Topic 4: Congruence theory/Arithmetic functions
  - Topic 5: Equations with integer solutions
  - Topic 6: Some elements of Graph theory and applications

Grade 11

- Mandatory topics
  - Topic 1: Algebraic combinatorics
  - Topic 2: Sequences and limits of sequences
  - Topic 3: Polynomials
  - Topic 4: Displacement and similarity
  - Topic 5: Tetrahedron and parallelepiped
- Optional topics
  - Topic 6: Probability theory
  - Topic 7: Inversion in the plane

Grade 12

- Mandatory topics
  - Topic 1: Supplementary and advanced problems about inequalities
  - Topic 2: Functional equation
  - Topic 3: Some concepts in geometric combinatorics
  - Topic 4: Supplementary problems about the anti-derivative, integral and their applications
- Optional topics
  - Topic 5: Complex numbers and geometry
  - Topic 6: Geometric transformations in space

With the aim of providing specialized documents for the mathematically gifted, the Ministry of Education and Training and the publishers of Vietnam have encouraged professors, good mathematicians of the country, who have won the international Olympiads, to write textbooks, materials on the above topics. Currently, there is already a collection of books supporting the young talented mathematicians in order to develop their own abilities.

Besides the curriculum prescribed by the Ministry of Education and Training, mathematically gifted students often initiate field trips or participate in workshops with mathematics researchers. Moreover, students are encouraged to join the competitions conducted by the Ministry of Education and Training, as well as the regional and international ones.

These students are encouraged to participate in many extracurricular activities, too. These include clubs and volunteer activities, community service activities for the overall development.

For the sake of good teaching quality, teachers for these gifted classes (at universities) have always been selected from among respected, highly qualified, experienced and enthusiastic teachers, or are appointed by the Ministry of Education and Training.

3. Achievement of the gifted mathematics classes

Thanks to the government's investment, professional teaching, enthusiastic and experienced teachers, with the social respect of maths, and with students' restless learning passion and effort, generations of gifted students in general and mathematical competitions in particular have achieved significant results to be proud of. From among 211 students who attended International Mathematics Olympiads from 1974 to 2011, there have been 194 winners (91.94%). The breakdown of prizes was as follows: 43 gold medals, 86 silver medals: 64 bronze, and 1 merit prize. After graduating from high schools, they have continued to study and research.

Many of them have become outstanding scientists, good economists, talented managers, teachers, good staff of universities and research institutes. One of the gifted mathematics students winning the Olympiad gold medal, Ngo Bao Chau (born 1972), a professor at the Paris-Sud University, and the University of Chicago, was awarded the Clay research award in 2004 for his achievement in solving the fundamental lemma proposed by Robert Langlands for the case of unitary groups. Chau also became the youngest professor in Vietnam in 2005. His proof of the general case was selected by the *Time* magazine as one of the Top Ten Scientific Discoveries in 2009. After that, he received the Fields Medal in 2010 and the Legion of Honour in 2012. He has been appointed Director of the Institute for Advanced Study in Mathematics.

4. Gifted High School, Pedagogical University of Hanoi – An example of the talent support model in Vietnam

In December 1966, the first specialized mathematics class was established at the Pedagogical University of Hanoi by the Ministry of Education and Training. The class of 33 students gifted in mathematics was the precursor of the Gifted High School, Pedagogical University of Hanoi (Gifted High School, Pedagogical University of Hanoi 2012). The school's development has gone through the following stages. From 1966 to 1995, the school was named "Mathematically Gifted Secondary Group, Pedagogical University of Hanoi". In 1995, it became Gifted Secondary System, specialized in mathematics and informatics (opened one more class specialized in informatics). In 2005, the name was left unchanged, but the system was widened by further classes, specialized in literature, physics, chemistry and biology. Since 2009, it has become Gifted High School, Pedagogical University of Hanoi. Students are screened and then selected into different classes in accordance with their talents in mathematics, literature, physics, chemistry, biology, informatics and English.

So far, there are 7 doctors among the teachers, and 25 of them hold Master of Science degrees. They are experts in the specific field with extensive experience in teaching in special classes. In addition, many university and institute lecturers are also invited to participate in teaching.

The main lecture building consist of 16 classrooms and one multi-media room for studying. The library covers an area of 6,000 m^2 with 31 rooms, and is equipped with modern facilities. Teachers and students can make use of the rich resources of literature like books, newspapers, magazines; and can use electronic systems to look up and borrow books. The school itself has two computer rooms, too, for studying informatics or documents. Students are given access to the facilities at the university main campus.

The more than 1,000 students are selected from different regions of the country so as to create a learning environment of cultural diversity. To encourage the comprehensive development of students even more, the school has taken the initiative of establishing further organizations of talent support.

- The Study Abroad for Gifted Students (SAGS) established in 2008 is an organization for overseas study orientation and English language improvement for gifted students through holding English clubs. Besides the SAGS regularly organizes extra-curricular activities, too, such as singing contests ("Stereo Hearts"), English-speaking contests, festivals like Halloween, Christmas, etc. With its well-organized extensive programmes, the SAGS has contributed effectively to enrich and carry out extracurricular activities for gifted students at the Gifted High School, Pedagogical University of Hanoi.
- The PTCmedia group, formerly known as PTC Times magazine, was founded in 2006. It supports information and communication activities, aiming to create comprehensive and effective education environment for the students. The PTCmedia has published its 17th issue as well as developed many different media contents for television, web, and radio. Currently, the PTCmedia is an influential organization in learning activities and professional student life at the gifted school, as well as for many other high schools.
- Sport clubs: The School operates many sport clubs as well, motivating students to play badminton, soccer, aerobics, dance rubric, and organizes Western and Chinese chess clubs.

With the teachers' enthusiasm and the students' passion and efforts, the achievements in international Olympiads were very impressive, with 100% of

the participants winning medals. For example, in IMO, they have won 38 medals including 10 gold medals, 19 silver medals and 9 bronze medals.

Many students have received medals twice, like Vu Ngoc Minh (two gold medals), Tran Quang Khai (1 gold, 1 silver medal), and Tran Trong Hung (2 silver medals). Being trained at the School, after graduation most students have become good researchers in different fields: mathematics, physics, computer science, etc., or lecturers at universities, economics experts and good entrepreneurs.

V. SOME FURTHER TALENT SUPPORT ORGANIZATIONS IN VIETNAM

The Vietnamese government and policy-makers as well as educators pay much attention to create the necessary environment for young talents to develop all their abilities.

In addition to this, the state funds further talent support projects managed by the Ministry of Education and Training, aiming at the improvement of secondary education. One of these is an infrastructure project that supports the plans schools buildings and the developmentof gifted schools. Int he frame of this project schools are provided with teaching equipment, specialized classrooms for subjects like physics chemistry, biology, informatics, foreign languages, and multi-functional classrooms, too. Another programme helps teaching-material and curriculum development. It develops curricula for gifted subjects with international-standard-oriented contents for teachers' training, helps gifted schools create the school's website and e-libraries, and invests in the online teaching of some advanced topics so as to promote the positive and creative thinking of teachers and students in scientific research.

Besides the government's support, some associations, organizations and individuals also have many initiatives to support young talents. Below we present three examples:

- The Vietnam Talents Assistance Fund (VTAF), founded and managed by the Vietnam National Foundation for Science and Technology Development (NAFOSTED), has been supporting programmes and talent development schemes for students who gained really excellent results in learning, in national and international competitions.
- The Scholarship Fund "Vinamilk grants scholarships to outstanding primary pupils" was established in 2003. "The fund served as a huge source of encouragement to primary-school students while creating a special platform for students to display their talents in the fields of culture, sports and arts." So far the Fund has supported about four thousand gifted students with a value of approximately $1 million.

- The Vietnam Young Talent Support Fund (operated by the Youth Central Committee) was established in 1993, and has awarded thousands of scholarships for young talents in the fields of culture, art, and science/technology.

VI. DEVELOPMENT OF THE GIFTED HIGH SCHOOL SYSTEM, 2010–2020

Gifted students are trained and developed in Gifted High School System. To consolidate and develop this system of specialized schools, on 24 June 2010 the Prime Minister of Vietnam approved the project plan of developing gifted secondary school system based on the following principles.

The *general objective* of the project is to develop the gifted secondary school system into a high-quality system complying with the national standards, where gifted high schools serve as models for other schools. Regarding the *specific objectives,* according to the A*pproving Decision on gifted high school system development project (in 2010–2020)* (see: Prime Minister, 2010), the project:

- strengthens, builds, and develops the existing specialized high schools; ansures that each province or centrally run city have at least one high school for the gifted;
- upgrades the gifted high schools to meet national standards and the requirements of high-quality education. By 2015, 100% of gifted high schools should meet national standards, including 15 key schools with outstanding education quality in the region and internationally;
- enhances collaboration between gifted high schools and prestigious overseas educational institutions.

The *mission and solutions* of the project are to:

- build and develop plans and to increase investment in facilities, and teaching equipment for gifted high schools;
- renew teaching programmes, materials, entrance examinations, and competitions among these schools;
- strengthen international cooperation for the development of the gifted high school system.

The funding for the project figures out 2,312.758 billion VND (111 million USD).

VII. CONCLUSION

Recently Vietnam has dedicated much effort and resources to foster and develop young talents in the first decades of the twenty-first century. With the intelligence and hard work of gifted Vietnamese students, the future success of the talents of Vietnam will hopefully continue to grow.

BIBLIOGRAPHY

Ministry of Education and Training (2008): *Regulations of organization and operation of high schools for the gifted*. Ministry of Education and Training, Hanoi.

Ministry of Education and Training (2011): *Proceedings of workshop on building an education network of specialized teachers in gifted high schools*. Ministry of Education and Training, Hanoi.

Ministry of Planning and Investment (2011): *General Statistics office Vietnam Population and Housing Census 2009: Education in Vietnam*: *An analysis of key indicators*. Ministry of Planning and Investment, General Statistics Office, Hanoi.

National Assembly of Vietnam (2005): *Education law*. National Assembly of Vietnam, Hanoi.

National Assembly of Vietnam (2009): *Education law amendments*. National Assembly of Vietnam, Hanoi.

Prime minister (2010): A*pproving Decision on gifted high school system development project* (in 2010–2020).

János Gordon Győri

Best Practices in International Talent Nurturing and Support

Reflections, Lessons and Questions

It is instructive and also entertaining to study unknown systems, such as e.g. unknown educational systems, and in particular talent support systems. It is an excursion, a real "adventure tour", and also a challenge to answer the "call" of the unknown that is gradually becoming known. But looking at a talent support practice from real close, that is almost like a family visit: you get in touch with the most internal sphere of talent education; you must have a relationship of trust with the "residents" partly to be allowed to enter and partly to be able to really understand something personal of their ideas, goals and values, their joy and difficulties experienced in their practice. Real understanding is feasible only from such a close perspective. Or, rather: mutual understanding is feasible only from this perspective.

We have taken up the thread of the previous volume of *Horizons*, and set out again to review one specific best practice from the talent support practices of a series of countries. Some of these countries, such as Germany, the United States, Finland or Singapore have been covered also in the previous volume and figure now with new examples. Others, such as Vietnam or Saudi Arabia are introduced to the reader for the first time. As before, we did our best to show instructive examples worthy of careful consideration. The present volume provides no outlook on the totality of the national talent support systems of the countries covered already in *Volume I*, except for covering in more detail some noteworthy new elements introduced in the national system since last year (as in Germany, for example). As for the new countries, however, great emphasis is given to presenting the "basics" – actually, with some editorial self-criticism we might say that maybe we overdid that in some cases and, in the chapters on Vietnam or Saudi Arabia, for example, the "basics" may outshine a little the best practices we intended to show.

In any case, we sincerely hope that the best practices described in this volume will provide important lessons for those engaged in talent education and talent support. In what follows, we shall touch upon some of these *in passim*, without aiming at completeness.

I. TALENT SUPPORT AND THE SCHOOL

The best practices we have collected suggest that it is less and less feasible to educate the highly gifted within the framework of a single traditional school or, more precisely, of a "normal" lesson. Some schools adopt special talent-support-oriented forms and focus exclusively on talent support; others strive to meet the special demands of talent education by adopting special extra-curricular forms such as co-operation with universities, or move the talent support function fully to extramural programmes**:** However difficult it may be for people like us, committed to the school and to education to admit it, as indicated already in the previous volume, that it is becoming inevitable for the schools to share their talent support functions with other educational or non-educational, not-for-profit or even profit-oriented organisations and with the programmes designed and administered by the latter.

Whether we like the underlying causes of the above or not, whether we are for or against them, we certainly cannot disregard them. The root cause of this is the high-level professionalisation of talent support and its concurrent elevation to international levels, and there are at least two other main reasons: the inevitable integration of the various levels of the school structure at different levels of education in talent development, and the requirement to interconnect talent support and the labour market. Let us say a few words about the cause components, in reverse order.

1. The requirement to interconnect talent support and the labour market

Although talent education driven by other than pragmatic social and economic demand has, may have, and should have a high ethos even in our days, it is not a realistic option anymore in the wider sense. It cannot be, since the *l'art pour l'art* approach, i.e. the idea that talents should be educated at the highest possible level and then they would break the ground for themselves in society or in their own special field cannot be the trend anymore, not even in the development of artistic or humanities talents. Schools, non-educational institutions, coaches, teachers, assisting professionals and the parents themselves all consider it highly important to educate such talents or, more precisely, to educate the

talented in ways that would provide them genuine and realistic career/progress options.

To do so, however, one must be in contact with the "career", that is, the special field itself, and attract resources from there as well. Providing for the professional supporters and the financial and life-career options, on the other hand, is always a mutual process the essence of which is that the designers and practicing professionals of talent support must take into account also the demands, terms and conditions of this stakeholder group. If you no longer conceive of talent nurturing in the spirit of the romantic ideals; if you do not consider the deepest misery the surest sign of the most outstanding genius, but you are driven by the opposite conviction, namely that one of the key features of the highest possible level of giftedness is the highest possible level of social/professional integration, you must accept that the profession, the knowledge field concerned, should also be permitted to shape talent nurturing according to its own possibilities and demands. In talent support as elsewhere, you give and you get, however, not in the sense of, say, boxing, but in that of mutually construing each other and of increasing professionalisation.

2. Inevitable integration of the levels of the school structure in talent support

The formal systems of education are becoming increasingly sophisticated, and the system components responsible for transition from one to another are also increasingly complex. The distinctive features of the various types and levels of education are specified in more and more detail, and although this may have many advantages for a major part of students, it has become clear that, for students with special educational needs, e.g. for the highly gifted, these framework settings are sometimes too rigid and really and literally ineffective or counter-productive, especially if they stand in themselves. That is, by providing special transition options between the various forms and levels of education, students mature enough for acceleration or for integrating several knowledge systems in themselves in diverse ways will become mobile, and with that the special flow of teachers and knowledge systems will also become feasible. These developments may lead to irreplaceable innovations not only in fostering highly gifted students, but also in the knowledge development of teachers, institutions and educational systems. Almost every example presented in this volume comprises some sign(s) of acceleration and knowledge integration: university teachers teaching also at secondary school; secondary school students working with university teachers and researchers; primary and secondary school pupils/students spending their summer in research

workshops, to quote only a few examples from the long list covered in this volume.

3. International levels in talent support

This is the golden age of educational efficiency measurements. The comparative educational approaches have never had such enormous social potentials, nor such responsibility and, nevertheless, we have never felt its backlog and limits so hard – compared to what would be needed. The PISA and TIMSS surveys, the university top lists and similar researches from primary school to university try to take stock of the indicators of educational efficiency to demonstrate the specific outcomes as precisely as possible. Today, no country, no professional field, no school and no educational programme can sincerely think that its activity can be evaluated *in itself*. It is also part of globalisation that talents unfolding as a result of talent support in Poland or Finland must be able to hold their ground also in Hong Kong or Canada, and they must be able to say and do important things in their own knowledge field also without their home region in the narrow sense. This is what is paid for by today's world to talents concerned, and this is what makes talent fishing one of the most important economic and social activities. Every actor has a genuine need for talents, i.e. persons who – based on their own knowledge and special creative abilities – can develop very high-level knowledge even further, and who can move knowledge fields, countries and companies out of a deadlock position or reverse their declining trend.

Internationalisation has quite logically spread to every level and area of talent education. Instead of reflecting the closed intellectual interests of narrow academic circles, the conceptualisation of talent now reflects the expectations and concepts of the open social systems. The international large companies look for and demand a similar part in talent nurturing as the special talent support schools and the teachers working there. Co-operation arrangements emerge and function at the level of summer talent camps, musical and other development programmes, the international scientific Olympiads or in the area of physical sports, the real Olympiads and world championships. It gives great pride to win a national championship, but in most fields this is just the admission exam to global tournaments. Similarly, talent identification and support, whether the talents concerned are in the unfolding stage or they have been unfolded and that makes them capable of efficient contribution to boosting the talents of others, actually take place on the global stages already. This, however, implies the need for the highest possible professionalisation of

the entire talent support field. The managers of the Saudi Chemistry Olympiad student team try to win (also) for their own cause the best Hungarian teacher-coaches, similarly to multinational companies that also regard the whole world as their own terrain, and the international musical competitions are also organised to search for talents everywhere, from Nigeria to Scotland, to develop or employ them.

4. Professionalisation of talent support

The somewhat antique, but no doubt valid ethos of small talent education workshops may be preserved and maintained even under the present circumstances, but their exclusiveness may not. They (we) cannot cherish the nostalgic illusion that talent support is measurable only against its own goals, and it will gain its ultimate meaning, sense, usefulness in itself. If a teacher of mathematics, a swimming coach or a teacher of economics cannot educate young people who can hold their own also at international level, who can move on under the guidance of further specialist talent support professionals waiting for them at the next knowledge level, then he/she is not an efficient talent support professional, but merely an agile, but provincial "talent worker". You may manufacture paper cars or other curios in your shed, but such workshops are in a hopeless situation when they are facing big motorcar manufacturers.

There is no other option but the absolute professionalisation in every field of talent support. To move on to the international levels and to establish the pathways along which the talented can enter the international grounds, talent support professionals have to be familiar with, and move about in a creative way at those levels. That is, talent support professionals themselves or the structural setting of a given field must be able to realise absolute professionalism.

The American and Israeli talent programmes described in this volume are excellent examples of high-level professionalisation: they target/have realised so far almost unknown levels of talent support, based on talent pedagogical philosophies which are aligned with the current formal educational systems or, what is more, they are in a fertile debate with them which develops both parties.

Given the above, it is no longer possible to consider or evaluate talent support efforts, professionals and the talented in themselves or in the context of their closest environment. Talent education and the talented themselves are inevitably and irrevocably situated *also* in the international arena.

II. FROM STEM TO STEAM

Whichever way you look at it, the major part of the papers in this volume suggest that contemporary talent support gives priority to the development of the STEM (science, technology, engineering, mathematics) fields. Given the rocketing development of these areas in the past decades – information technology included –, and its effects on the quality of life of individuals and the functioning mechanisms of social groups and society overall, plus considering the measurable profit-generating capacity of innovations in this field, it is no surprise that the balance has shifted lately in favour of these fields of scientific research and activity.

Nevertheless, this preference does not obviate *kalokagathia*, the ethos of educating students to fullness through the integrated development of body, soul and morals, nor, concurrently or as part of it, the desire that the potential leaders of the generations of the future, today's talent promises, should become the most fully developed personalities, well-versed not only in the world of numbers and of connecting wires, but also in the totality of the spiritual–psychic world of human beings. And, of course, neither does it eliminate the value *per se* of the humanities. The call of STEAM, that is STEM plus ART, is also perceivable besides or together with the miraculous appeal of STEM. That is, STEM notwithstanding, the desire to create culture in the fields of art, philosophy and the humanities is impossible to overcome – *And why should it be overcome?* – as Csilla Fuszek concludes in her chapter on talent support in the United States, reflecting the approach of CEE President Ms. DiGennaro.

It is worth noting that the demand for complex talent education has made its way to the institutional levels: educational programmes endeavouring to maximise and optimise the concurrent scientific and humanities education of gifted students have appeared and seem to be spreading. Society appreciates more and more those talents who are equally well-versed in technical science and in the arts; in the linguistic and the related areas; who find their way in the economic as well as the legal environmental issues, while being also morally advanced persons in command of outstanding leadership skills, capable of acting responsibly, and in an environmentally friendly way in several senses in both the world of nature and that of human society.

III. NEW FIELDS OF TALENT – NEW CHALLENGES IN TALENT EDUCATION

This volume may target the presentation of new talent fields – and best practices in talent support there – to a smaller extent than would be necessary or possible. But as the human world, its complexity and trend system, changes, so do, by necessity, the manifestations of talent and hence the theory and practice of the relevant development programmes.

1. The four different talents

It is important to notice that talent has at least four different kinds of manifestations today, depending on the features and changes of our world: (1) talents excelling in one area; (2) talents capable of changing over from one field or sub-field to another; (3) talents capable of co-operating with the most eminent representatives of other fields of knowledge, and (4) talents capable of integrating several fields of knowledge:

1. Talents who excel in a specific field – e.g. in one sport, in one field of mathematics, in instrumental music, poetry, or a branch of philosophy, in brain surgery or some other field/sub-field.
2. Talents who, after reaching the peak of their professional career in one field, choose themselves a new one to unfold some other gift to the maximum there. For example, a mathematician who, after asserting his talent in mathematics, becomes a successful artist.
3. Talents who are actually gifted in a single field only, but who are sufficiently advanced in other fields to be able to collaborate with the outstanding representatives of the latter. E.g. a man of letters who explores the development history of spiritual life in a given cultural age in co-operation with an art historian. An IT specialist doing excellent teamwork with a mathematician and a biologist to create a novel-type model for some complex system.

4. Finally, talents who are capable of integrating complex knowledge fields by (or: in) themselves. For example, a specialist who can integrate theoretical physics with mathematics and elements of physics and chemistry.

Each and every talent representing one of the above talent categories has its own value. However, for talent education to be adequate, the educational systems should permit the establishment and/or presence of development forms and the corresponding institutional implementation systems suitable for fostering these different talent types, i.e. for educating the focused, field-integrating and multiple field talents, respectively (in one or several special educational institutions).

2. New talent fields and/or traditional talent fields given little attention

With the incessant change and transformations of human society, new elements appear in the knowledge systems in the technical and also the intellectual sense; new fields, unknown before, emerge, where we have little or no experience and up-to-date information on the nature, identification issues and development of talent. In the age of Mozart, for example, no one could be talented in IT since the field itself was non-existent yet. Half a millennium ago, the wonderful basketball talents could not have been who they are now, since neither the field itself, nor its social valuation existed at that time. In World War II there were no talented drone soldiers and of course we know of no talented astronauts from the age of the crusades.

As the organisation of human societies and knowledge systems becomes more and more complex, previously unknown talent fields emerge. One of the main responsibilities of talent professionals is to spot these fields; to understand what old knowledge can be used for tackling them and for developing talent manifesting itself there, and what new considerations, objective systems and methods are needed for talent education in these fields. This is one of the most creative areas of talent education, where the creative presence of talent development professionals demands that they adopt the courage, inventiveness, perseverance and purposefulness of the pioneers – of course together with a deep and inherent understanding of the internal correspondences of the new fields concerned.

IV. "WHEN SUMMER'S HERE AT LAST …"

Hungarian readers will recall the following lines of a pop song from the 1960s: "When summer's here at last, and the sun shines all day long, we all go to the beach, 'cos that's what summer's for". However, as shown by the examples of the countries presented in this volume, instead of/besides going to the beach, gifted children are expected at the talent support camps. The examples make it impossible to miss the fact that the summer (holiday) camp has become one of the most important forms of talent support recently. The summer camp form has numerous advantages; here are a few, by way of example:

- Teachers and students alike are available for a longer, unbroken, period during the summer holidays. During the academic year, gifted students cannot be absent from school for 10–14 days or even longer to focus on the development of their talents alone. Teachers are similarly bound by the schedule of the academic year, by their daily chores and compulsory lessons, whether they teach at schools or in higher education. During the more extended teaching holidays, on the other hand, it is possible to organise programmes where gifted students and their teachers can deal with certain topics in depth, in a concentrated way and by adopting a more extensive outlook.
- Especially in regard of the science topics, one should not disregard the fact that labs and scientific research sites are also more likely to be free in summer and hence it is easier to reserve them for talented pupils/students these weeks.
- The two large areas of talent nurturing are professional development and social skills development; that is, intellectual and social experiences can be brought closest to each other in this form of talent support.
- Moreover, this is the form that gives the best chance for establishing lifelong human and professional networks among the talented children/youngsters. Some countries, e.g. the United States, realised the significance of such networks decades ago; others are about to realise it now. The importance of professional networks is evident already for every talent support professional and organisation, and for every country, the same way as the fact that their establishment requires conscientious

work, but it also represents a stable investment for decades. This circumstance has highlighted again that the functioning and operation of talent is, basically and in its balanced forms, not some sort of abstraction beyond social reality, floating in ether, but has a personal, social, collective and social reality. The presence of the talented person in his/her professional field is, today, a crucial component of the unfolding of talent that must begin in childhood and in young age, the same way as development in the field of knowledge where the talent manifests itself.

- Another major advantage of the summer camp form is that it provides an opportunity for children showing intensive interest in a given field where they would like to work – that is, for a homogeneous group of talented children – to spend a longer time together in the context of professional development while being also in a heterogeneous social environment comprising children of different ages, coming from different schools or even different countries, or heterogeneous in some other way. Of course, the camp form does not necessarily have to imply a homogeneous group (camp for children talented in the same area), it may imply a heterogeneous one (camp for children with scientific and artistic gifts, respectively).
- A further positive aspect of this form is that it is easy and simple to attract young talent educator professionals to such settings. Graduate and PhD students, young professionals, that is, young trainers who can play an outstanding role in working with the talented due to their proximity in terms of age and to their fresh knowledge, have lots of obligations during the academic year: research, development, education, construction of their lives as young adults (founding their families etc.) – so as a matter of fact the only period when there is a realistic chance of engaging them in the time- and energy-intensive activity of talent nurturing is that of the summer holidays. On the other hand, such times may be as useful an activity for them as for the school-children and the youngsters whom they develop.
- A similarly important advantage of the camp structure is that it is easier to link the development of the students' sense of responsibility towards the environment and the boosting of their talents in their respective talent fields than during the school-year, mainly within the school walls. There are extremely exciting cases of the use of this talent support form also beyond the examples of the present volume as, e.g., the Transylvanian literary camp of István Berszán, where language, culture, literature and nature are interconnected with creative talent nurturing in such in-

tegrity which deserves credit in every respect. But there are also many other good examples of such camps the world over.

- Last but not least, it is a major advantage of the summer talent camp form that it gives the children time to go through an entire project, from problem raising through the testing of creative solutions to the realisation of the products and the presentation of the results and the products. The various forms of work organisation, e.g., individual work, work in pairs or in teams, can be applied flexibly and/or in turns in the camps.
- Moreover, the camp gives the children an opportunity to enhance their autonomy and sense of responsibility in a protected environment that provides them socially rich impulses both for doing their daily chores and professional work. This includes keeping their own environment in order by themselves, as well as shared responsibility for the quality of work of others if they work as members or leaders of a group, in pairs or teams.
- Yet another feature of camp-based talent nurturing worthy of consideration is that although there is a good chance that the camp/workgroup leaders will evaluate the work of the children based on high standards, that evaluation is almost never associated with marks or some performance measurement systems. Although performance and hence also its measurement are quite natural for a good many talented children and they are usually also favourable for them personally, since they are *good or even excellent* in some field(s), it is not without benefits if not all performance is converted into exact measures or, to put it more simply: not every performance becomes a mark. Narrative (textual) evaluations, the finely stratified considerations expressed in the research discussions focusing on work being done are all efficient means of mirroring the values of the work and performance in general to the children.

Of course, one could keep listing the advantages of summer talent support camps for a long time, and this is one of the reasons why this volume refers to many manifestations of this form, from the Finnish example to the American and German ones. The summer programmes pool also many efforts of universities, schools, research institutes and other organisations wishing to ensure the most efficient talent support possible. The camps are best suited to talent enrichment, but they can also promote knowledge deepening and, *inter alia*, through the acquisition of certain certificates and credits, acceleration.

From whichever angle you look at it, the camp as a form of talent nurturing is one of the most intensive talent support options, carrying the most social and professional benefits, and providing its participants a lasting experience.

V. A TALENT-FRIENDLY ENVIRONMENT

One of the most frequently asked questions of laymen or persons not familiar with pedagogy at all is "Which, then, is the best school?". Obviously, they do not know that there is no such thing as "the" good or best, most efficient, school *per se*: the children themselves are diverse, and they need to be developed so as to meet the demands of a great variety of fields. Hence there are only *systems* of educational institutions which function well and efficiently, or not well enough/not sufficiently enough.

Although talent education has excellent methods, excellent professionals – great heroes, talented talent educator teacher personalities –, and we know that there are some outstanding workshops which can offer highly advanced talent education also at institutional level and over a protracted period, the best way of talent education is not a specific method, nor a specific teacher or school, but the complex environment in which the talent being raised is located. *That is, the best talent education method is to provide a talent-friendly social space.*

We, in Hungary, the editors and to a large extent the authors of the present volume and our colleagues in the vanguard of talent education globally – such as for example Professor László Balogh and Professor Péter Csermely – firmly believe and stress on every occasion that what the talented need most is a talent-friendly environment. An appropriate social atmosphere and attitude; an adequate professional environment; an adequate institutional system and specific institutions need to be established, and talent educators capable of efficient, dedicated and responsible education need to be trained and employed for that purpose. And of course many other things are also a must, from funding through the appropriate recognition/certification systems and setting up an adequate support scheme for the parents, to the establishment of national and international talent networks – i.e. the availability and adequate interplay of so many factors that it is difficult to take stock of them all, not to speak of what the talents themselves must do to create, operate in an adequate way and develop further such a space. This is a most complex and cumbersome task – but it is also the primary duty and function of those active in talent education. And that is where they can really let their creativity loose, to be the artists–architects of this space.