

Critical incidents in
the development
of academic talent
among Finnish
students gifted in
science

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Actualizing Finnish Giftedness

- Research Project funded by the Academy of Finland
- Funded for the years 1999-2007
- 166 Finnish Olympians in mathematics, physics and chemistry from the years 1965-2000
- 169 parents
- majority of the Olympians were 21-40 years old



Olympiad Studies

- International research project: USA, Germany, Finland, Taiwan, Korea
- Directed by Dr. James Reed Cambell, St. John's University, New York
- <http://www.OLYMPIADPROJECTS.com/>
- What factors help or hinder the Olympians to actualize their talents?



Data

- 166 Finnish Olympians in math, physics and chemistry
- International competitions during the years 1965-2000
- 65-70% response rate
- Only 16 females



Research methods

- Questionnaires to Olympians and their parents (70% answering rate)
- Open questions
- Personal interviews with the Olympians
- Telephone interviews with their parents

DT SEQUENCE ! EXTENDED OVERVIEW

1
Inhibition to book
brooked inquiry will
trial as the jumping
off point for the
computer dialogue
between participants

2
3 weeks
2.8

3
Distribution
of responses
and feed
back
3 weeks
2.20

Perceptions is a 6 week long conversation (verbal
Type 3 students and collaborators of their choos
levige — its various aspects, mechanisms, and its
project will serve as a means of inquiry into what
designers, and members of a community, nation,
and why we do it. The process of design, creation
ously examined as the project unfolds. Students
assess their own contributions and the project as
single collaborative entity.

Divided into 2 parts and six stages, the project
of exploration for a range of design issues. The
relements and research will coincide with the topic. It is ess
this area of the process not be neglected for it can act
tual and visual growth. W
s project.

This course are designed
is important for s
let each project in
making process. The
familiarize student
second project is des
ing and understand
attending to these
through the review of contributions made by stu
rators for differing disciplines.

RESEARCH
Research or shall I say presearch
role in the second project. Depend
inquiry it may also serve as a concep
interpretive signage/installation project
project 3.

successive stage of Project 2 will become manifest i
tion that will leave a record of your thought and
and your collaborators are to build with each

The interviews of Olympians (N=28)

- Childhood, youth, current life, future plans
- Professional and personal life
- Critical events in talent development
- Interviews lasted 1-3 hours (Spring 2001)
- Interviews were recorded and transcribed



Analysis methods

- critical events in the life histories of the Olympians
- experiences that helped the Olympians to identify their talent or to succeed in their career
- a content analysis was used to analyze the themes of critical events
- reliability of coding categories (interrater reliability.90)



The career choices of the Olympians

Profession	All (N=158)	Males (N=150)	Females (N=8)
Researcher	53 (35.5%)	49 (31%)	4 (50%)
Engineer	16 (10.1%)	15 (9.4%)	1 (12.5%)
Teacher	7 (4.4%)	6 (3.8%)	1 (12.5%)
Physician	5 (3.2%)	4 (2.5%)	1 (12.5%)
Computer Specialist	16 (10.1%)	16 (10.1%)	0 (0%)
Professor	6 (3.8%)	6 (3.8%)	0 (0%)
CEO or manager	22 (13.9%)	21 (13.3%)	1 (12.5%)
Student	30 (19.0%)	30 (19%)	0 (0%)
Retired	1 (0.6%)	1 (0.6%)	0 (0%)
Unemployed	2 (1.3%)	2 (1.3%)	0 (0%)



Academic productivity

Academic Productivity	All	Male	Female
Articles published	1006 (6.4)	930 (6.2)	76 (9.5)
Books published	53 (0.3)	53 (0.3)	
Research papers presented	1143 (7.2)	1096 (7.3)	47 (5.9)
Patens	38 (0.2)	36 (0.2)	2 (0.3)



Contributing factors

- The parents rated all the contributing items (N=14) more important to the development of academic talent than the Olympians
- “home atmosphere was very conducive to learning” the most important factor in talent development
- “good teacher(s)” the second important factor
- “my active use of library”, “self-discipline”, “my early learning in maths and reading”, “my own inner drive”, “desire to compete”, “hate to lose”



Hindrances

- Very few hindrances
- “Not enough challenge”, “Courses were taught at too low a level for me”.
- “Envy of other children”, “bullying”, “harassment”, “ignorance”
- The Finnish educational system with its emphases on equality

Qualitative data



- 6 female Olympians
- every female was chosen to have a male Olympian from the data that represented the same age group and professional orientation than the female
- one to two hour in-depth interviews
- childhood experiences, school experiences, the choice of career, job, spouse, life-style, friends and hobbies
- curriculum vitae

Females

Name	Age	Marital status	Field	Highest degree	Current position	Publications (1998)	Patents
Sirpa	26	Single	Medicine	M.D.	Medical doctor	0	0
Vuokko	29	Single	Physics	M.S.	Research Engineer	0	0
Riitta	53	Married, 4 children	Mathematics	M.S.	Secondary School Teacher	5	0
Hanna	36	Married, 2 children	Physics	Ph.D.	Researcher	28	0
Kaisa	52	Married, 3 children	Mathematics	Ph.D.	Researcher	33	2
Elina	32	Single	Physics	M.S.	Researcher	22	0

Males

Name	Age	Marital status	Field	Highest degree	Current position	Publications (1998)	Patents
Matti	54	Divorced, 2 children	Mathematics	Ph.D.	Lecturer	57	0
Timo	53	Married, 3 children	Mathematics	Ph.D.	Professor	20	0
Jyrki	36	Single	Computer science	Ph.D.	Researcher	21	0
Patric	36	Engaged, 1 child	Computer science	Ph.D.	Professor	58	2
Jari	29	Married, 1 child	Mathematics	M.S.	Analyst	0	0
Heikki	36	Single	Mathematics	Ph.D.	CEO	7	4

Critical events

Critical events	Males (N=6)	Females (N=6)
Events in childhood	18	6
Reading experiences	6	2
Mathematics experiences	6	2
Science experiments	3	1
Discussions with parents	3	1



Critical events

Critical events	Males (N=6)	Females (N=6)
Events in school	18	15
Academic competitions	6	6
Teachers' encouragement	3	5
Peer support	4	2
Hobbies	5	2



Critical events

Critical events	Males (N=6)	Females (N=6)
Events in college	7	6
Studies abroad	3	2
Choosing the right domain	3	2
Mentor's support	1	2



Critical events

Critical events	Males (N=6)	Females (N=6)
Events in adulthood	8	4
International co-operation	3	2
Mentoring the youth	2	0
Partner choice	3	2



*Kaisa:
professor
and expert
in
cryptology*

- one of 8 students who participated in the 1965 Mathematical Olympiad
- the questionnaire in 1999, interviews in 2000 and 2014
- Finnish Defence Forces and in Nokia, the biggest information technology company in Finland
- in 1997 Kaisa was appointed Adjunct Professor and in 2005 Full Professor at the Helsinki University of Technology, today the Aalto University School of Science.
- she has 72 scientific publications, twelve patents (9 pending), 8 doctoral or licentiate thesis supervised
- During the past ten years, Kaisa has received funding from the prestigious Academy of Finland and Matine and has supervised eight doctoral dissertations or licentiate theses in her field of cryptography

*Kaisa:
professor
and expert
in
cryptology*

- has held many important scientific positions of trust in Finland and abroad.
- The scientific honors and prizes in her CV are also important acknowledgements of her eminence in her field.
- All her accomplishments show that she has established a reputation in academia as judged by international standards, and her case can be used as a model for younger gifted females in mathematics and science.

*Kaisa:
professor
and expert
in
cryptology*

- gender-specific and gender-invariant factors in the development of mathematical talent.
- goal and task orientation, gaining international experience and networking.
- the need to focus on their careers in order to achieve success.
- expectations that were neither too low nor too high, but realistic and related to their academic success.

*Kaisa:
professor
and expert
in
cryptology*

- a strong measure of resilience and self-efficacy.
- understanding defeat as providing an opportunity for learning.

Pedagogical implications

- Teachers' and mentors' role in encouraging girls to science.
- The right field, studies abroad.
- International co-operation.
- The right choice of a partner.
- A Growth Mindset in Learning.



Teaching and Teacher Education

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In search of a growth mindset pedagogy: A case study of one teacher's classroom practices in a Finnish elementary school

Inkeri Rissanen ^a, [✉], Elina Kuusisto ^{b, c, d}, Moona Tuominen ^d, Kirsi Tirri ^{d, e}

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