Talent development of gifted physics-oriented students in the Finnish general upper secondary school

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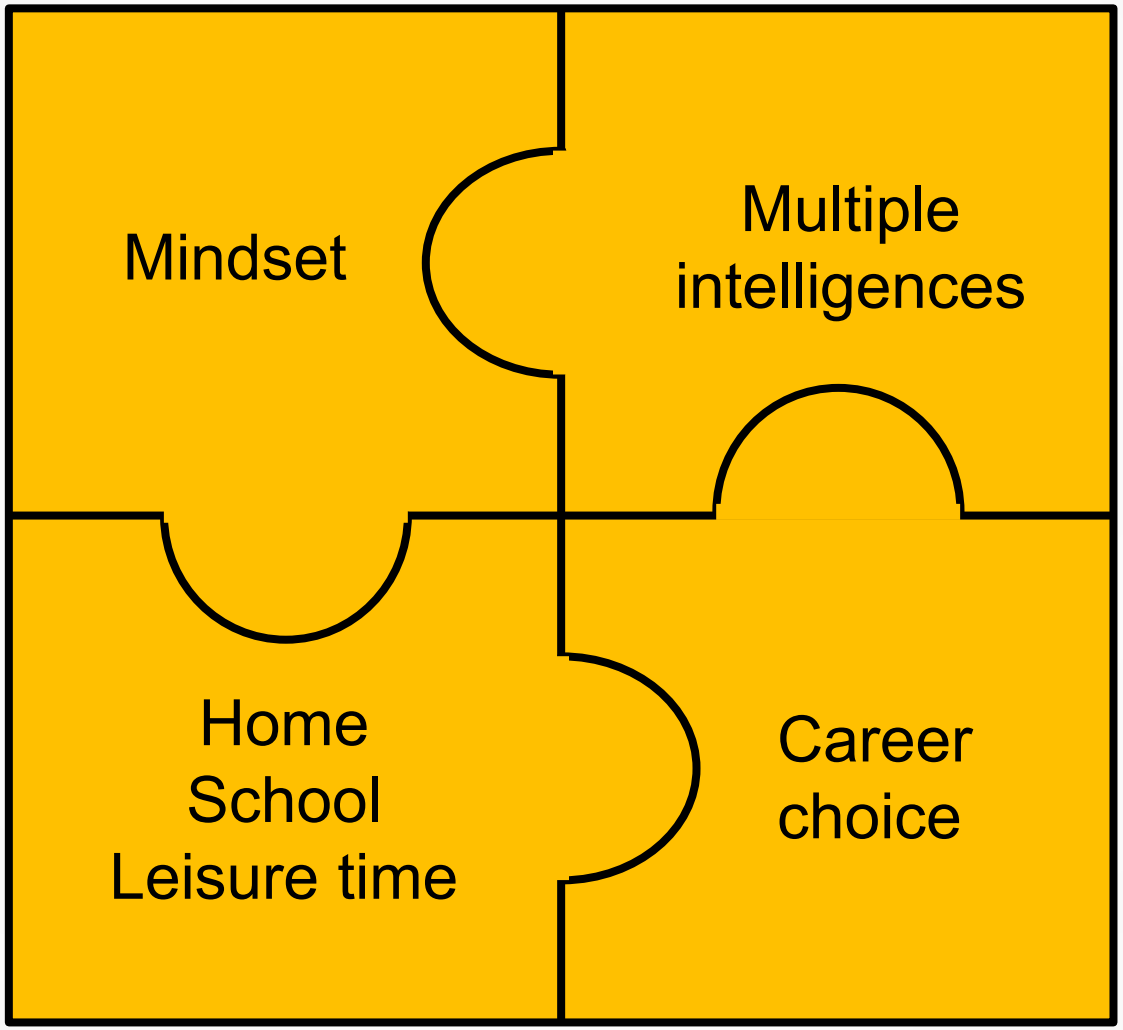
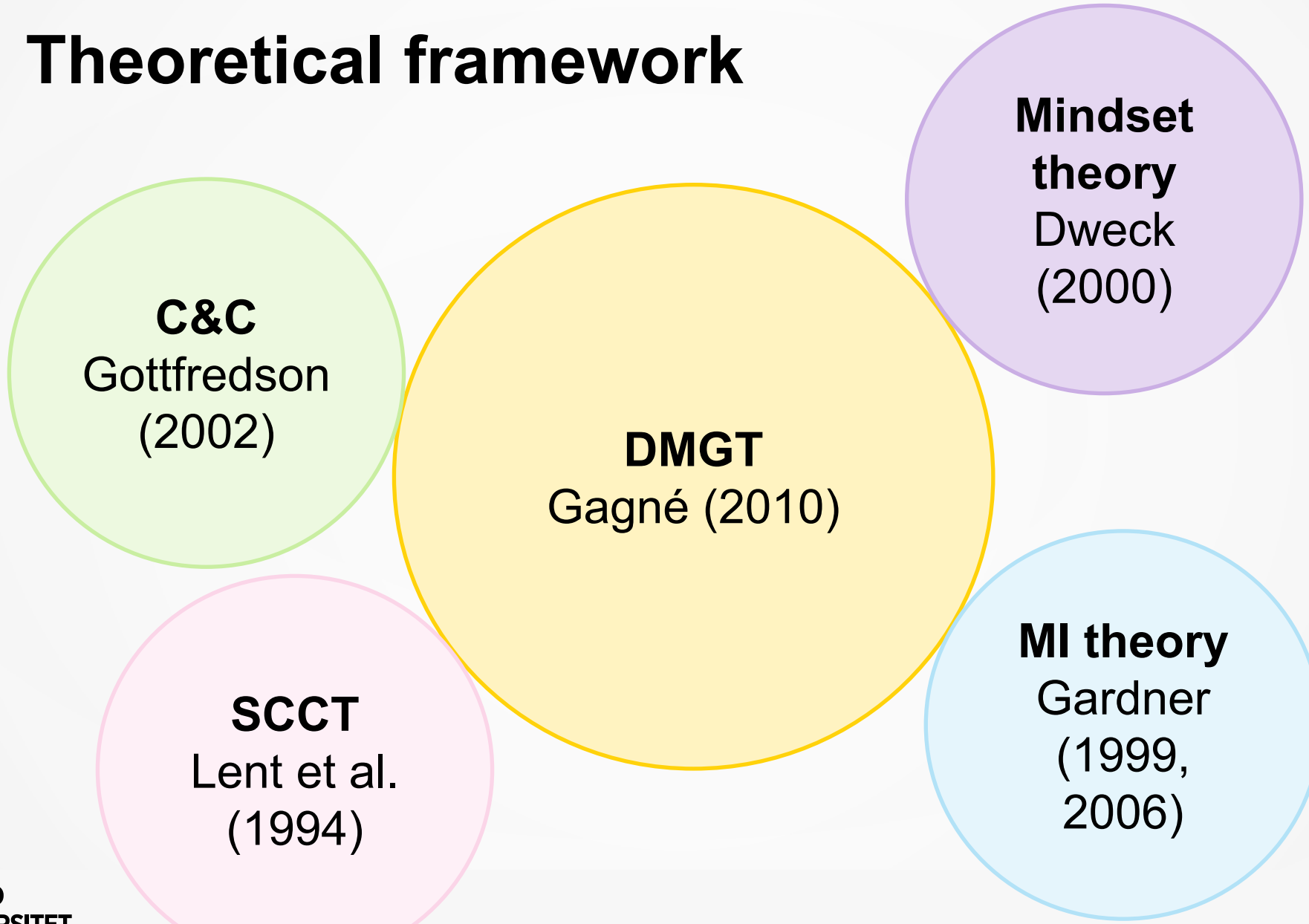
Background

- Professional experiences as a physics teacher of gifted students
- Gifted students not a priority in the Finnish education system
- Lack of students and experts in STEM
- Gender differences in STEM


Mindset
Multiple intelligences
Home
School
Leisure time
Career choice

Theoretical framework



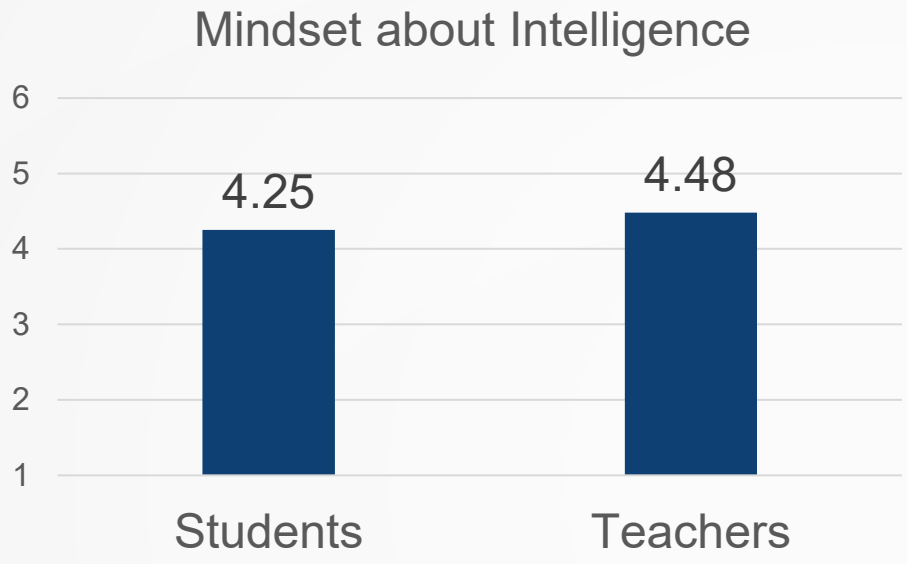
Study I: Mindsets

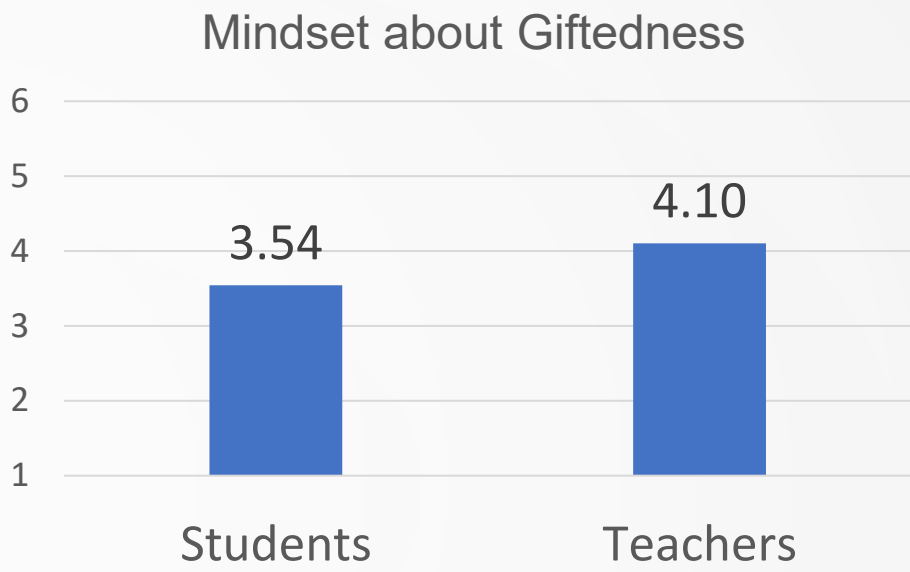
Research question	Participants	Method
What general and physics-specific mindsets about intelligence and giftedness prevail among gifted general upper secondary school physics students and physics teachers in Finland?	• Gifted Finnish general upper secondary school physics students (N = 164) • Finnish physics teachers (N = 131)	• Quantitative approach • Mindset questionnaire (Dweck, 2000): 4 x 4 items • Statistical analyses

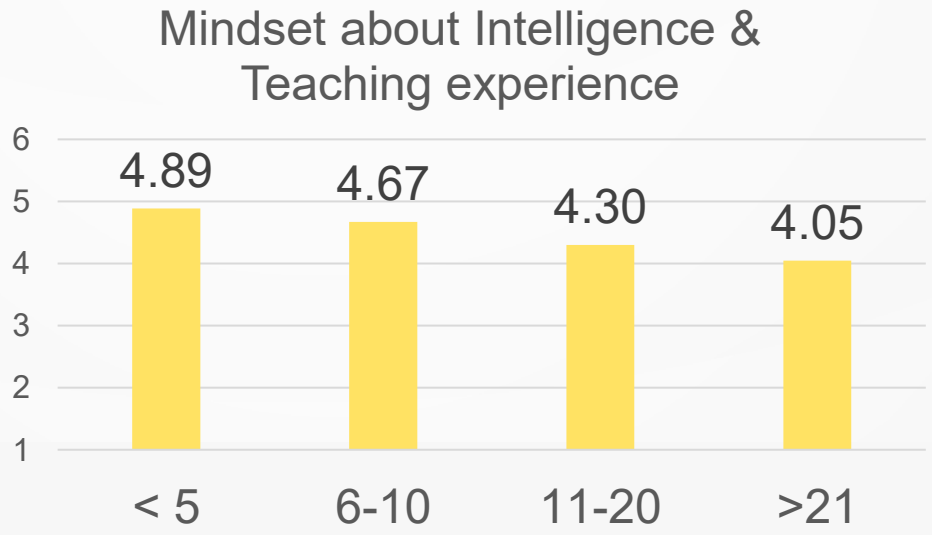
Results

6 Growth

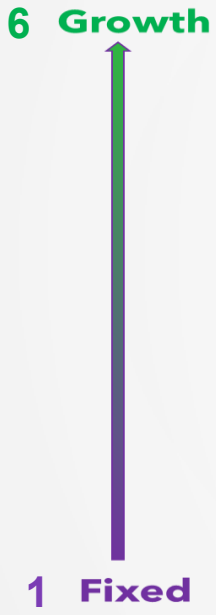
1 Fixed

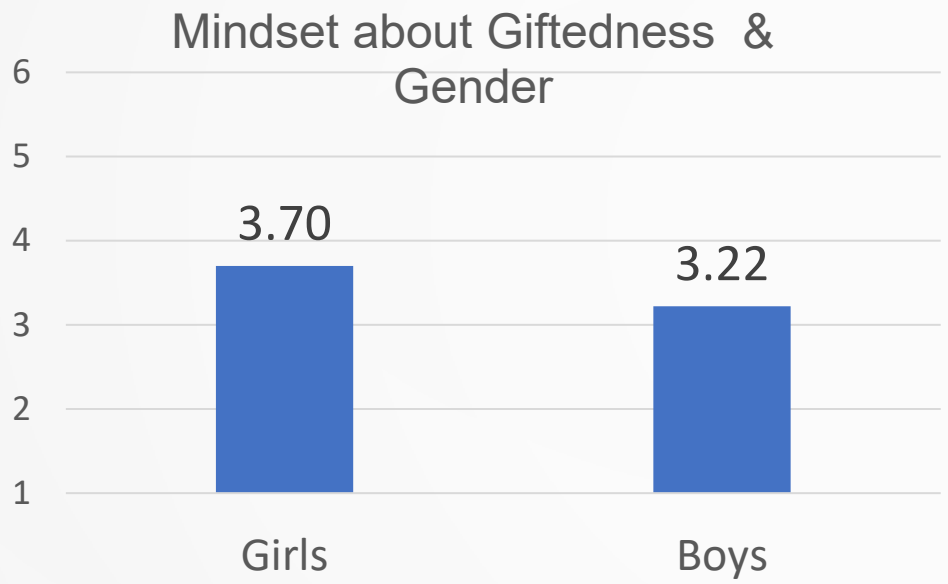


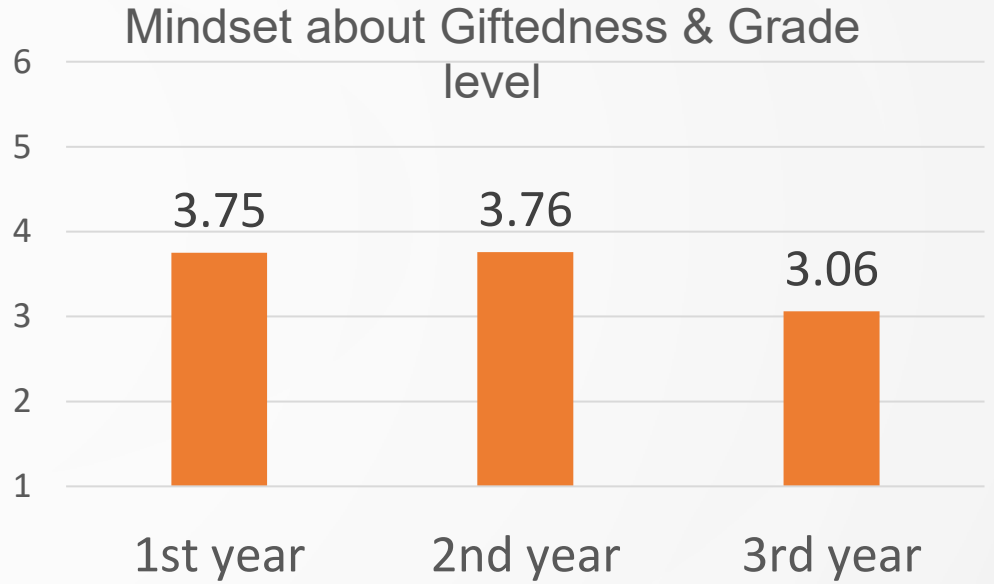




Results


6 Growth
1 Fixed


Mindset about Giftedness & Gender
6
5
4
3
2
1
3.70
3.22
Girls
Boys


Mindset about Giftedness & Grade level
6
5
4
3
2
1
3.75
3.76
3.06
1st year
2nd year
3rd year

Study II: Multiple intelligences

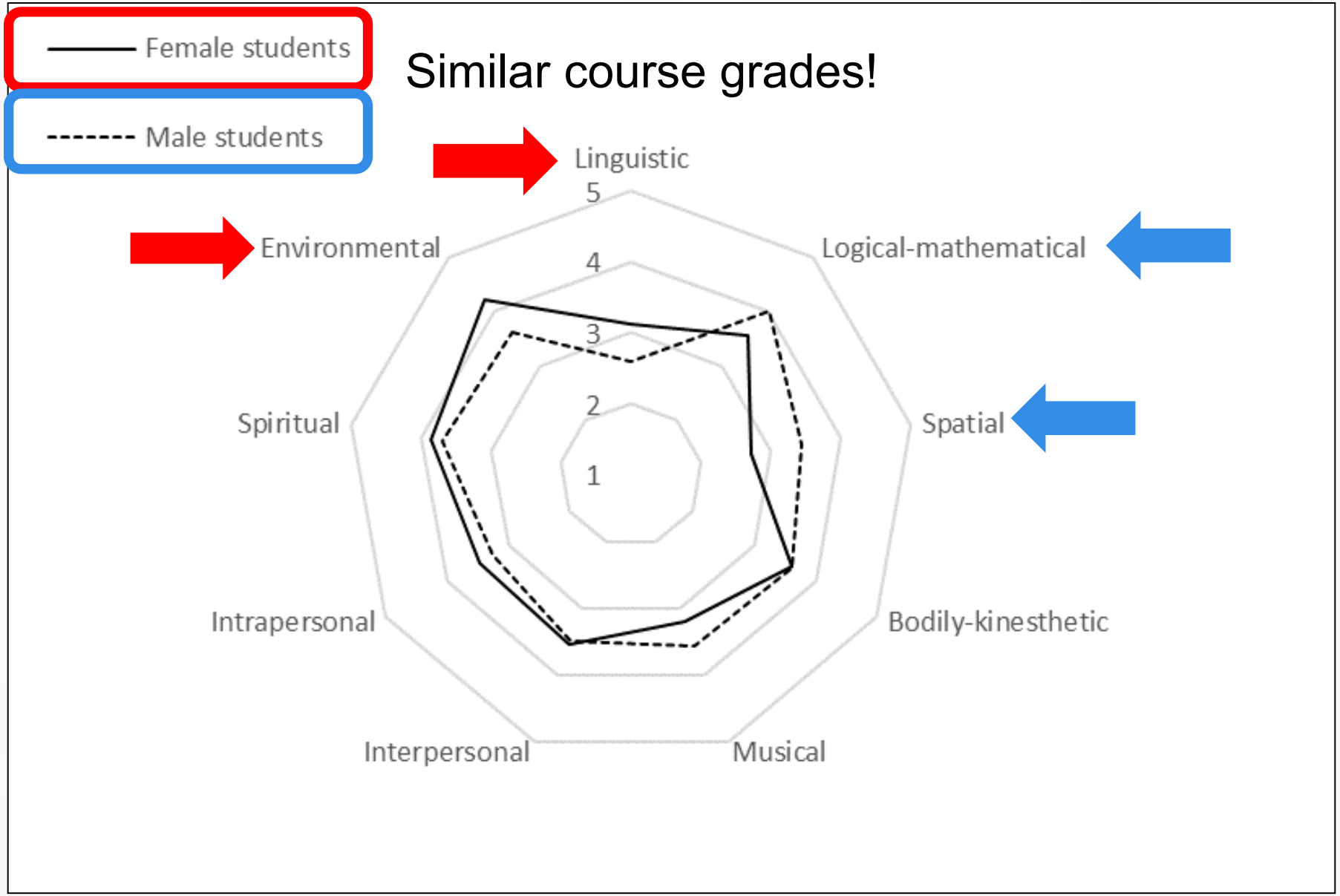
Research question	Participants	Method
What intelligence profiles emerge from the self-evaluated multiple intel-ligences of gifted physics students in Finnish general upper secondary education?	Gifted Finnish general upper secondary school physics students (N = 164)	• Quantitative approach • Multiple intelligences profiling questionnaire (Tirri & Nokelainen, 2008): 35 items • Statistical analyses

Results

Overall sample

Highest ratings
- Environmental
- Spiritual
- Logical-mathematical

Lowest rating
- Linguistic



Study III: Home, school, and leisure time

Research question	Participants	Method
What factors at home, school, and in leisure time do gifted Finnish general upper secondary school physics students identify as helping or hindering their talent development in physics, and how do these factors differ between students choosing a career in the natural sciences and engineering and students choosing a career in other fields?	Gifted Finnish general upper secondary school physics students (N = 24)	• Qualitative approach • Interviews • Critical incident technique

Results

- 183 critical incidents; 80% supporting talent development

Helping

- **Parental physics-specific support**
- Parental encouragement
- Material resources at home
- **Motivated/gifted peers**
- Teacher qualities
- Instruction- and curriculum-based opportunities
- Student characteristics
- **Physics-related media and events**
- Science magazines and books
- Independent experimenting

Hindering

- Discouraging attitude at home
- Disruptions at home
- Lack of parental physics-specific support
- **Unmotivated peers**
- **Students' low interest in physics competitions**
- **Lack of optional science courses in some lower secondary schools**
- Teacher qualities
- Student characteristics
- Time-consuming hobbies

Study IV: Actualization of talent in career choices

Research question	Participants	Method
How do gifted Finnish general upper secondary school physics students actualize their physics talent in their educational and career choices?	Gifted Finnish general upper secondary school physics students (N = 24)	• Qualitative approach • Interviews • Inductive content analysis

Results

- Natural sciences or engineering: 50%
- Reasons for a career choice:
  - Interest or enjoyment (n = 21),
  - High employment, income, or status (n = 9)
  - Inspiration given by a role model (n = 5)
  - Preference for working with people or living material (n = 4)
  - Preference for intellectual challenges (n = 3)
  - Other (n = 7)
- Gender differences
- Misconceptions about careers in physics and related fields
- Insufficient career information in STEM: 75%
- Transformational giftedness

Implications

- Growth mindset pedagogy
- **Gifted female students need encouragement** to acknowledge their STEM-related abilities
- High ratings in environmental and spiritual intelligences → new opportunities for physics instruction
- Training of spatial ability
- **Studying with motivated/gifted peers**
- More support to career choice processes
- **Career information in STEM**
- **Teacher education**

References

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Thank you!