

MULTI-LEVEL OUTCOMES OF A SPECIALIZED SCIENCE HIGH SCHOOL STUDY

Research Team

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Why Study Selective SMT Schools?

- National focus on next generation of STEM innovators
- Advanced students are not being sufficiently challenged in today's schools and SMT schools offer one way to meet their educational needs
- Curricular and environmental factors that appear to predict completion of STEM degrees might be adapted more widely

Study Research Goals

Overarching Research Question: What is the impact of participation in a selective SMT school or Talent Search program on completion of a STEM major in university

Sub-research question 1: What characteristics of (a) the SMT school/TS or (b) the participants contribute to this outcome?

Sub-research question 2: Do these characteristics differentially affect male and female graduates? Those whose parents are not college graduates? Those whose parents are not in STEM related careers?

Assumptions from the Retrospective and Prospective Literature and Biography

Persistence in science pipeline:

- Challenging curriculum
- Expert instruction
- Peer stimulation
- Apprenticeship/role models
- Appreciation of the utility and value of SMT



These factors exist in SMT high schools to various degrees

Study Description: Participants

2004-2007 graduates of 25 selective SMT schools
N=3,536

Comparison group of same age peers who attended Talent Search and enrolled in mathematics or science classes in the summer: N= 577

Gender

Males		Females	
SMT	1,589	SMT	1,806
Comparison	242	Comparison	308

Parental Education Level

BA+		HS-	
SMT	2,703	SMT	546
Comparison	534	Comparison	13

School Model Descriptions

- **Residential:** Draws from an entire state. All students reside on campus. (n=8)
- **Half-time:** Students attend a regional center for SMT courses daily. (n=7)
- **Full-time commuter:** Whole school is SMT and draws from local metropolitan population. (n=4)
- **School-within-school:** An academy within a regular high school. (n=6)

Completion of STEM Degree

- ▶ 50% percent of SMT graduates complete STEM undergraduate degrees

School W/I School: 58.3%

Residential: 51.7%

Half-Day: 48.4%

Full-Time Commuter: 42.3%

- ▶ 52.7% percent of comparison group
- ▶ 22.6% of students entering college (source NSF)

Percentage of Female Participants Completing STEM degrees (by discipline)

SMT		TS	
Male	57.8%	Male	61.9%
Female	46.1%	Female	50.5%

Subject	SMT	TS	NSF
Bio & BioMed	33.1%	26.3%	5.4%
Physical Science	9.3%	10.0%	0.9%
Engineering	11.0%	12.2%	1.4%
Mathematics	6.0%	6.9%	0.7%

A Parent Working in a STEM Field

SMT 68.2-53.2%

Comparison: 66.6%

- SMT schools with a parent in STEM 1.37 times more likely to complete a STEM related major than SMT respondents with no parent working in STEM related fields.
- Respondents from the comparison group with a parent in STEM were twice as likely to complete a STEM degree.
- Looking at those without a parent in STEM, there was no difference in odds of completing a STEM degree whether or not they attended an SMT school or TS.

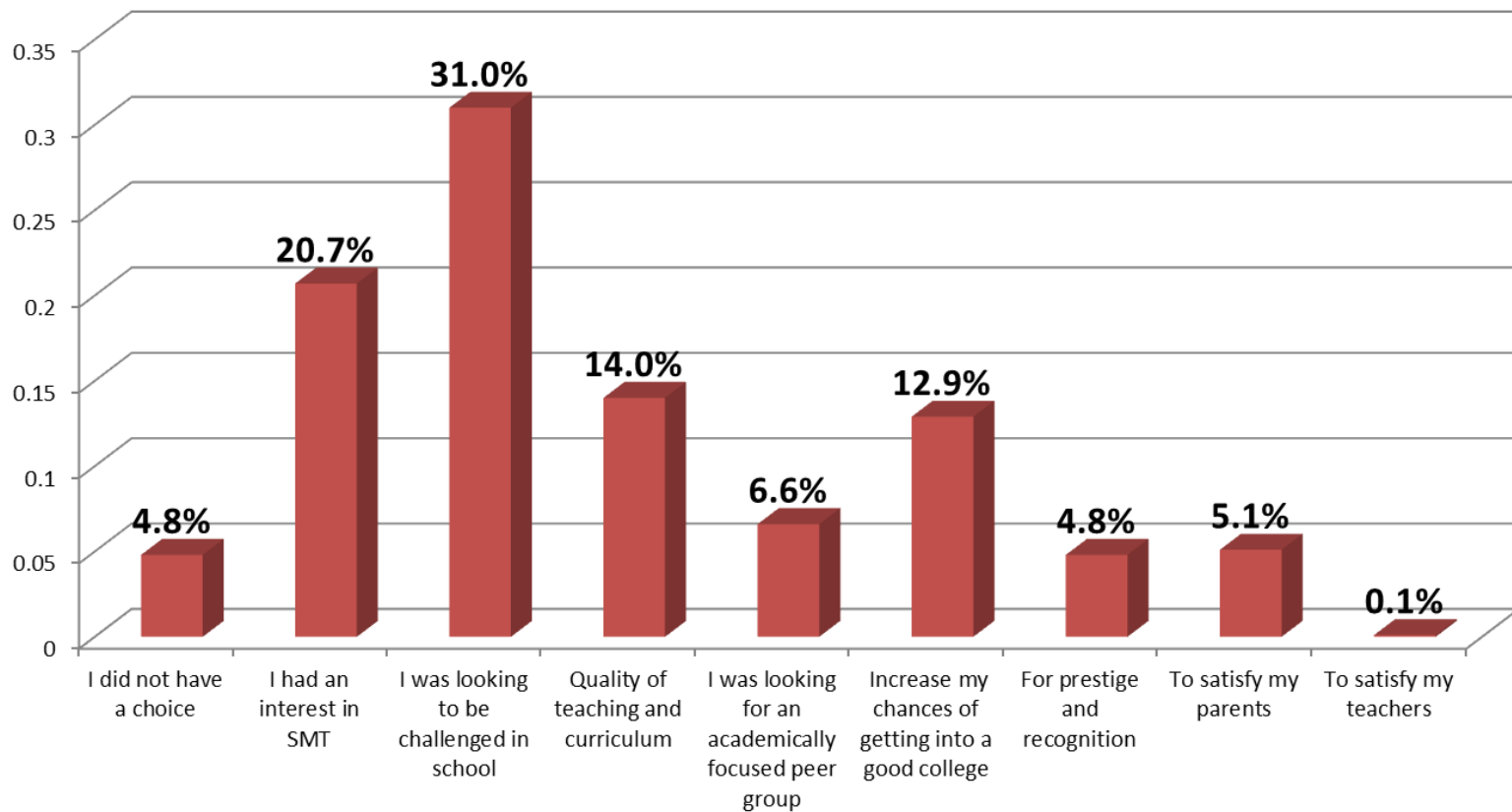
Parental Education

% who did not go beyond high school

Model	% of Respondents	% STEM degree
Residential	24.1%	49.8%
Commuter	22.9%	37.4%
Half Day	16.2%	51.9%
SwS	07.9%	43.5%
TS	02.8%	43.8%

Motivations for Attending Your High School

For graduates of Specialized SMT High Schools, which of the following
MOST motivated you to attend your high school?
n = 3,282



Motivations and Completion of STEM Degree

Grads most motivated by interest in STEM (holding demographic variables constant):

- ▶ Commuter school **4x** more likely
- ▶ Residential school **3x** more likely
- ▶ Half day **3x** more likely
- ▶ SwS **2.5x** more likely

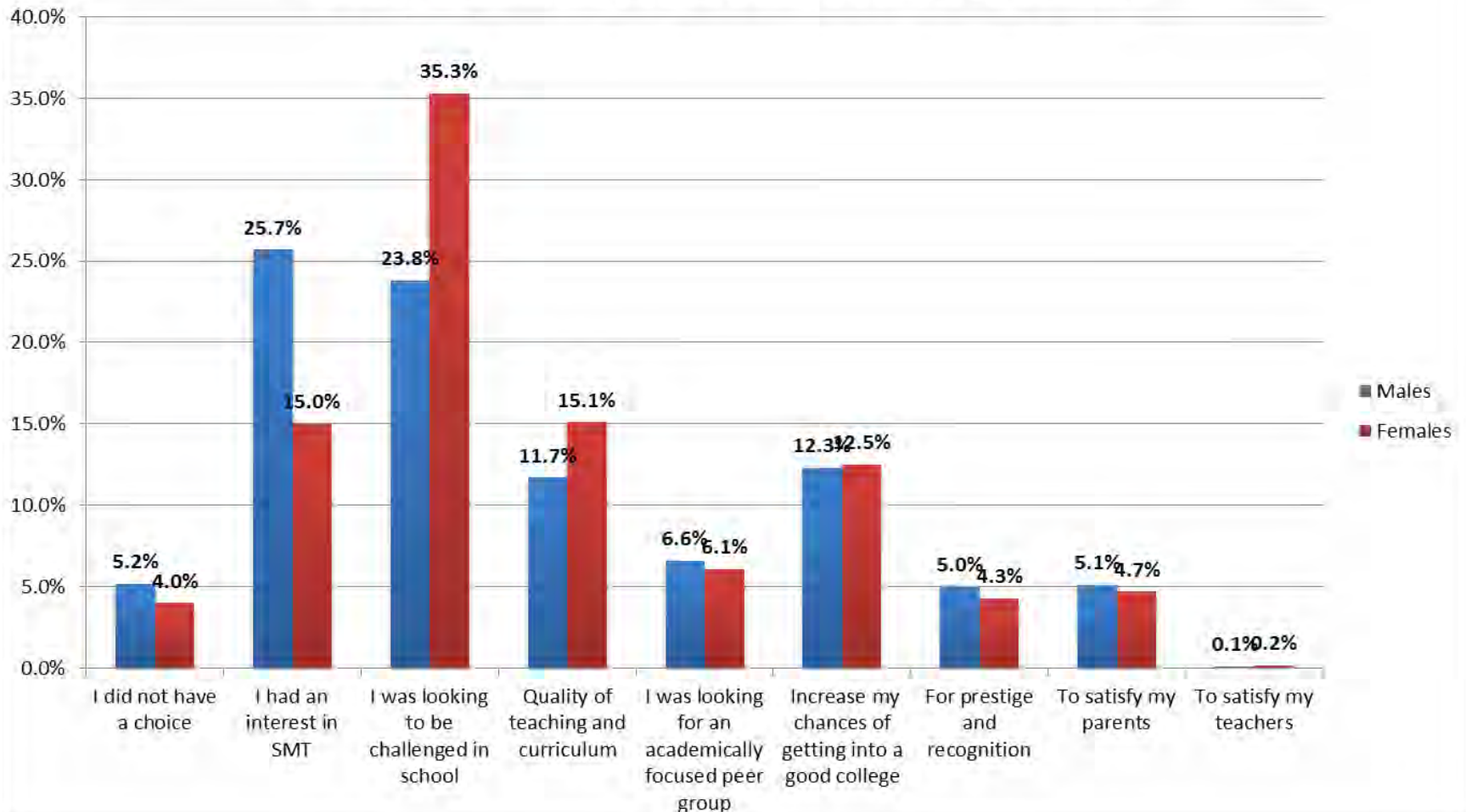
Motivated by academic peer group: -**30%**

Getting into a good college: - **25%**

Prestige and recognition: - **30%**

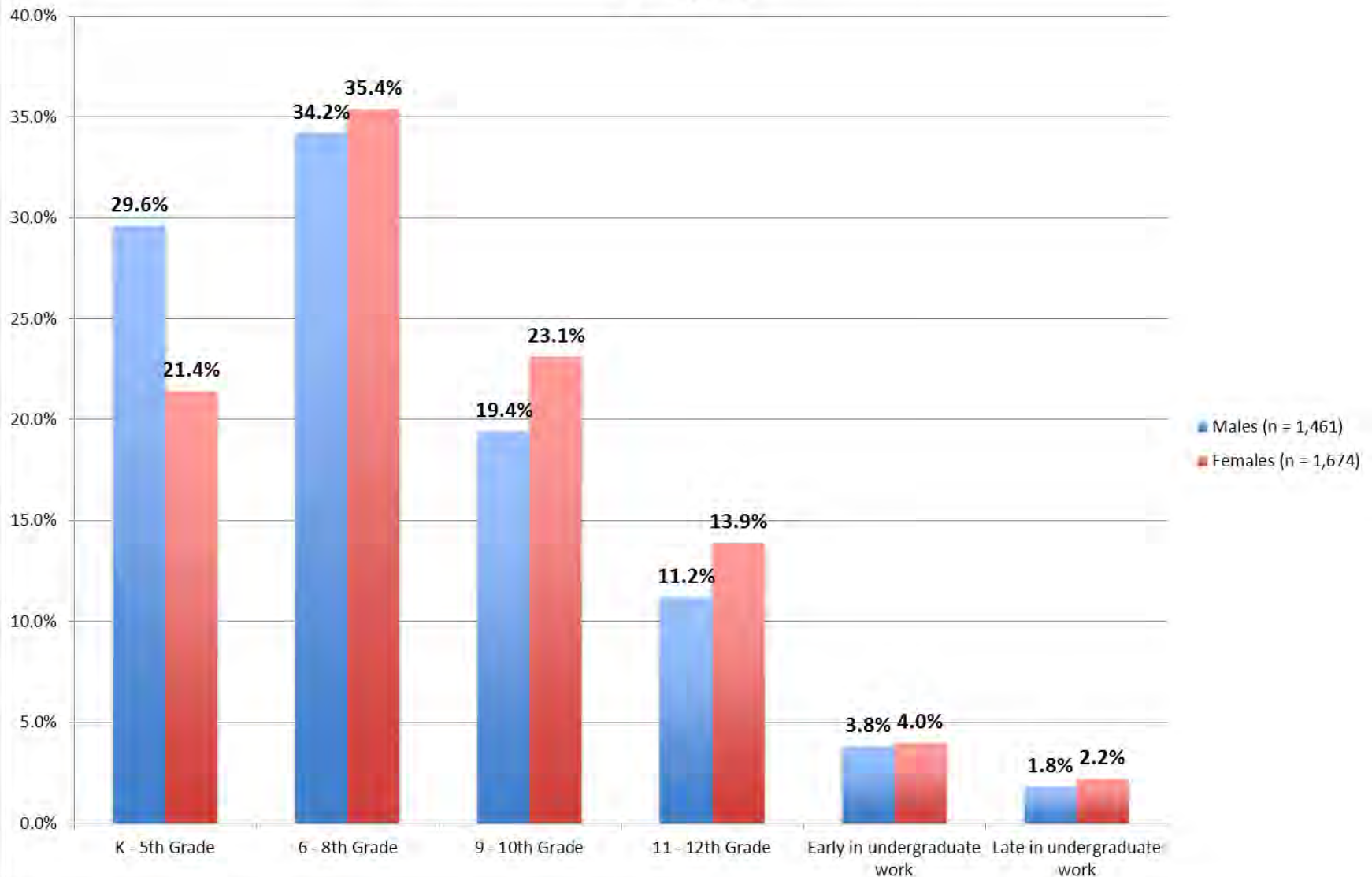
Motivation by Gender

For Specialized SMT High School graduates, which of the following MOST motivated you to attend your high school?

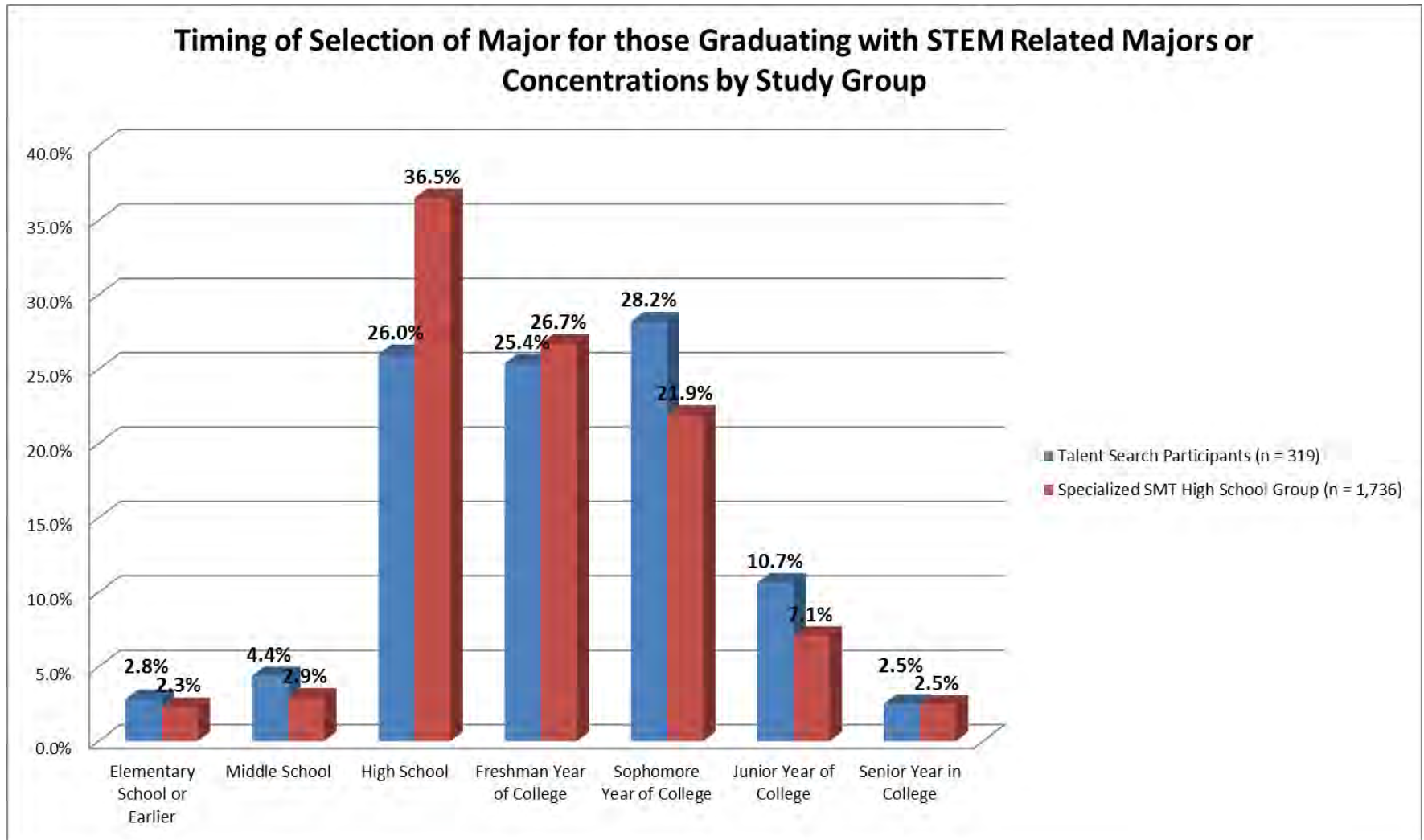


When did you become more seriously interested in science, mathematics, and/or technology beyond passing curiosity?

n = 3,135



When STEM Degree Completers Determined Choice of Major



Lost Interest In STEM

SMT		TS	
Temporarily	27.5%	Temporarily	27.7%
Permanently	10.0%	Permanently	12.0%
Never	31.2%	Never	29.6%
Increased	31.2%	Increased	30.0%

When permanent loss occurred

SMT		TS	
H.S.	47.0%	H.S.	33.8%
E.U.	37.4%	E.U.	52.3%
L.U.	9.6%, +3.2%	L.U.	9.2%, +3.1%

Participation in H.S. Research Projects

School within school	56.3%
Half-day	53.5%
Residential	34.2%
Full-time commuter	33.3%
Comparison group	13.3%

Females: nearly **2x** the odds (1.95) of completing a STEM university degree compared to females who did not

Overall, those who participated in high school research were nearly **2x** more likely to complete a STEM degree

What else might the high school research project contribute?

Apprenticeship Model

- Insider knowledge
- Connections to other professionals
- Intellectual sparring partners
- Introduction to the values of the field
- Exposure to the social dimensions of science
- Exposure to the role of failure/set backs in the life of a scientist



(UMC photo by Jay Ferchaud)

Dr. Robin Rockhold, right, assistant vice chancellor of academic affairs, examines slides with Murrah High School seniors Justin Brown, front, and LaMont Sutton.

Need Further Data Exploration

- ▶ Why a more intensive dose of talent development does not appear to be reflected in differentiated outcomes.
- ▶ SMT signature curricular factors explored so far affect the outcomes for SMT students but don't explain outcomes for comparison group.
- ▶ What can schools do to compensate for the contributions of parental cultural influence?
- Some SMT schools are more selective and science focused than others, irrespective of models; some percent of SMT students enroll because of overall school quality, not STEM focus;

Next Steps

- ▶ Still have variables to explore from the 80 item survey

Will be following up with 2400 participants:

- ▶ Current status beyond college
- ▶ Details about persistence or non persistence in STEM
- ▶ Mentors
- ▶ Parental influence
- ▶ Expectations when entering SMT
- ▶ Setbacks and reaction to them
- ▶ Research experience

Summary

- Both SMT schools and Talent Search programs contribute disproportionately to the pool of students who complete STEM degrees.
- Talent search program participants are as likely as SMT grads to complete a STEM degree. However, talent search is currently not publicly funded, has limited scholarship availability, and relies on support from high quality public and private schooling.

Some Additional Thoughts

4 big goals for STEM in federal context

- Ensure that students have an authentic STEM experience before leaving K-12
- Produce an additional 1 million STEM graduates
- *Prepare, support, develop 100,000 excellent STEM teachers*
- *Ensure that a significant percentage of graduates are from underrepresented populations including women, minorities and persons with disabilities.*
- *Other contributions that might be derived from supporting STEM talent development.*