

Student-Teacher Relationships and Students' Beliefs and Values in Math

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Background

Individuals who identify as female or non-White are underrepresented in STEM occupations (NCSES, 2023).

- 35% female
- 35% non-White
- 15% Hispanic
- 10% Asian
- 9% Black
- <1% Indigenous



Achievement-related beliefs and values in math predict career aspirations in STEM (Watt et al., 2017), but tend to be lower for individuals who are female or non-White.

To better understand factors that contribute to female or non-White students' achievement-related beliefs and values in math, the current study examined the influence of the student-teacher relationship on students' competence beliefs, interest, and importance in math.



Research suggests that teachers may perceive the student-teacher relationship differently due to cultural misunderstandings related to gender or ethnicity (Thijs et al., 2012).

Guided by Situated Expectancy-Value Theory (SEVT; Eccles & Wigfield, 2020), we examined the moderating effect of student-teacher gender or ethnic congruence on relations between the student-teacher relationship and students' competence beliefs, interest, and importance in math.



Research Aims & Hypotheses

- To examine the variation in students' competence beliefs, interest, and importance in math by gender or ethnicity. It was hypothesized that female and non-White students will report lower competence beliefs and interest in math, and importance in math will not vary.
- To examine the variation in the student-teacher relationship by gender or ethnic congruence. It was hypothesized that teachers will report having closer relationships with students when there is gender or ethnic congruence.
- To examine relations between the student-teacher relationship and students' competence beliefs, interest, and importance in math. It was hypothesized that the student-teacher relationship will predict students' competence beliefs, interest, and importance in math.
- To examine the moderating effects of gender or ethnic congruence on relations between the student-teacher relationship and students' competence beliefs, interest, and importance in math. It was hypothesized that gender or ethnic congruence will moderate these relations.

Method

Student Sample & Measures

1627 students (K-5) from eight schools in the Southwest United States were asked to report their competence beliefs, interest, and importance in math using a 4-point Likert-type scale in response to the following statements: (Competence Beliefs [Com]) "I am good at math", (Interest [Int]) "I like math", and (Importance [Imp]) "It is important for me to be good at math".

Teacher Sample & Measure

157 teachers (K-5) were asked to report the warmth and closeness within their student-teacher relationships using a 4-point Likert-type scale in response to 10 items on the closeness subscale of the Student-Teacher Relationship Scale (Pianta, 1984). For example, "This student lights up when I walk into the room."

Data Analyses

MANOVA, two-way ANOVA, and linear regression were used to address our aims and test our hypothesis.

Results

Achievement-Related Beliefs & Values in Math							Relations Between S-T Relationship & Beliefs & Values in Math				
Variable	Group	n	M	SD	F	p	Variables	β	SE	t	p
Competence Beliefs	female	748	2.20	.91	32.05	<.001	S-TRel ON Com	.08	.03	3.09	.002
	male	717	2.45	.81			S-TRel * GenM ON Com	.10	.04	2.79	.005
	non-White	791	2.27	.91	6.65	.010	S-TRel * GenNonM ON Com	.11	.04	3.01	.003
	White	674	2.38	.83			S-TRel * EthM ON Com	.08	.04	1.97	.049
	female	748	2.07	1.04	11.30	<.001	S-TRel * EthNonM ON Com	.07	.04	1.78	.076
	male	717	2.25	.95			S-TRel ON Int	.11	.03	4.25	<.001
Interest	non-White	791	2.18	.99	.32	.570	S-TRel * GenM ON Int	.11	.05	3.24	.001
	White	674	2.14	1.02			S-TRel * GenNonM ON Int	.12	.04	3.16	.002
	female	748	2.64	.70	.31	.579	S-TRel * EthM ON Int	.14	.05	3.76	<.001
	male	717	2.62	.78			S-TRel * EthNonM ON Int	.05	.04	1.42	.157
	non-White	791	2.60	.78	2.37	.124	S-TRel ON Imp	.08	.02	3.15	.002
	White	674	2.66	.70			S-TRel * GenM ON Imp	.06	.03	1.76	.079
Importance	female	748	2.64	.70	.31	.579	S-TRel * GenNonM ON Imp	.09	.03	2.45	.014
	male	717	2.62	.78			S-TRel * EthM ON Imp	.08	.03	2.06	.040
	non-White	791	2.60	.78	2.37	.124	S-TRel * EthNonM ON Imp	.11	.03	2.99	.003
	White	674	2.66	.70							

Teacher Reports of the Student-Teacher Relationship

Group	n	M	SD	F	p
Gender Congruent	731	3.19	.77	66.53	<.001
Gender Incongruent	688	2.83	.85		
Ethnic Congruent	671	3.09	.80	10.64	<.001
Ethnic Incongruent	748	2.94	.86		

Discussion

- Female and non-White students in grades K-5 feel math is important, but already show aversion to math in their competence beliefs and interest. Educators and caregivers should be intentional to provide female and non-White students with experiences that build their competence beliefs and interest in math.
- Teachers perceive to be less close with students whose gender or ethnicity is different from their own. When elementary teachers perceive less closeness with students, then students are more likely to have lower competence beliefs, interest, and importance in math. It would be beneficial for elementary teachers to foster close relationships with students, especially boys and non-White students.
- Since most of our teacher sample identified as female (n = 133) and White (n = 122), our findings suggest that the closeness a female or White teacher perceives within the student-teacher relationship is more influential to boys' importance in math than girls, and White students' competence beliefs and interest in math than non-White students.
- To better understand the social and contextual factors that are most influential to the math competence beliefs, interest, and importance of female and non-White students, future research should examine other classroom variables, such as peer relationships and style of instruction.