The Roles of Parents and Teachers in Latinx Middle Schoolers' Math and Science Identities

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ABSTRACT

Math and science identity are important predictors of persistence in STEM, where Latinx underrepresentation remains an issue. However, we know little about promoting these identities in early adolescence, when youth begin to explore possible career paths. Drawing upon Situated Expectancy-Value Theory and empirical findings from college-aged samples, this study examined the effects of parent modeling of academic behaviors, child-teacher attachment, and gender on Latinx middle schoolers' math and science identities. Survey data were collected from 194 Latinx middle schoolers and analyzed using regression. Results indicated that paternal modeling and teacher attachment predicted both math and science identity; maternal modeling predicted only science identity. Girls reported lower science identity. Follow-up analyses suggest that academic self-efficacy mediates the effects of child-teacher attachment. Our findings suggest that adult role models, particularly teachers, play a key role in promoting math/science identity in Latinx youth.

BACKGROUND

- Promoting Latinx adolescents' math and science identity may help address Latinx underrepresentation[1] in STEM.
- Latinx college students with higher math and science identities are more likely to persist in STEM majors and careers.[2]
- Promoting math and science identity in early adolescence
  - Early adolescence is an important period of identity development[3] and career exploration[4]
  - In middle school, higher science identities are associated with greater participation in STEM activities[5] (e.g., extra-credit projects, reading science books for fun)
- How can we promote math/science identities in middle school?
  - Latinx undergraduates with faculty role models report higher math and science identities[2]; for middle schoolers, teachers and parents may play a similar role
  - In line with Situated Expectancy-Value Theory (SEVT),[6] the beliefs and behaviors of parents and teachers (i.e., socializers) are likely to influence adolescents' math and science identities

RESEARCH QUESTIONS

1. Do child-teacher attachment and parent modeling of academic behaviors predict math and science identity among Latinx middle schoolers?
2. Does gender moderate these relationships?

METHODS

- Data for the study come from a mixed methods study on school climate and well-being among Latinx adolescents
- 194 Latinx middle school students
- Southwestern United States
- Surveys completed in English reporting on
  - Math identity (α = .96) and science identity (α = .95)[7] Maternal modeling (α = .94) and paternal modeling (α=.96)[8]
  - Teacher attachment (α = .93)[9]
  - Academic self-efficacy (α = .82)[10]
  - Regression analyses
    - Follow-up analyses: PROCESS for SPSS[11]

RESULTS

Descriptive Statistics

Table 1. Descriptive Statistics (Males Above/Females Below Diagonal)

Variable	1	2	3	4	5	6
1. Age (years)	-	-.09	-.15	-.12	**-.24***	**-.22***
2. Maternal modeling	-.02	-	**.29****	**.24***	.03	**.28****
3. Paternal modeling	-.19	**.25***	-	**.28****	.13	**.21***
4. Teacher attachment	-.04	**.47****	.14	-	**.29****	**.27***
5. Math identity	-.07	-.02	**.21***	.18	-	**.41****
6. Science identity	-.16	**.20***	**.21***	**.45****	**.57****	-
Male						
N	87	86	86	86	87	87
Mean	12.36	4.15	3.55	3.04	3.38	3.35
(*SD*)	(1.12)	(1.08)	(1.51)	(1.01)	(.70)	(.68)
Female						
N	104	103	103	103	104	105
Mean	12.40	4.33	3.64	3.28	3.38	3.19
(*SD*)	(1.19)	(.79)	(1.37)	(1.05)	(.83)	(.69)
Overall						
N	193	191	191	191	193	194
Mean	12.38	4.24	3.59	3.17	3.39	3.27
(*SD*)	(1.15)	(.93)	(1.43)	(1.04)	(.77)	(.69)

Note. *p < .05. **p < .01. ***p < .001

Regression Analyses

Table 2. Regression Analyses for Predictors of Math and Science Identity

Variable	Math identity				Science identity			
	B	(*SE*)	sr^2	R^2	*B*	(*SE*)	sr^2	R^2
(Intercept)	**3.39*****	(.08)			**3.37*****	(.07)		
Age (years)	**-.10***	(.05)	.02		**-.10***	(.04)	.03	
Female	.00	(.11)	.00		**-.22***	(.10)	.02	
Maternal modeling	-.01	(.06)	.00	.02	**.17****	(.05)	.05	.10
(Intercept)	**3.39*****	(.08)			**3.36*****	(.07)		
Age (years)	-.08	(.05)	.01		**-.09***	(.04)	.02	
Female	-.01	(.11)	.00		**-.19***	(.10)	.02	
Paternal modeling	**.08***	(.04)	.02	.04	**.09****	(.03)	.03	.08
(Intercept)	**3.41*****	(.08)			**3.39*****	(.07)		
Age (years)	-.09	(.05)	.02		**-.09***	(.04)	.02	
Female	-.04	(.11)	.00		**-.23***	(.09)	.03	
Teacher attachment	**.17****	(.05)	.05	.07	**.24*****	(.04)	.12	.18

Note. *p < .05. **p < .01. ***p < .001.

Summary of Primary Results

RQ 1: Do child-teacher attachment and parent modeling predict math and science identity among Latinx middle schoolers?

- Child-teacher attachment and paternal modeling predicted math identity, controlling for age
- Child-teacher attachment, paternal modeling, and maternal modeling predicted science identity, controlling for age
- For both math and science identity, child-teacher attachment accounted for the greatest amount of variance
- Effects of parent modeling and child-teacher attachment were larger for science identity than math identity

RQ 2: Does gender moderate these relationships?

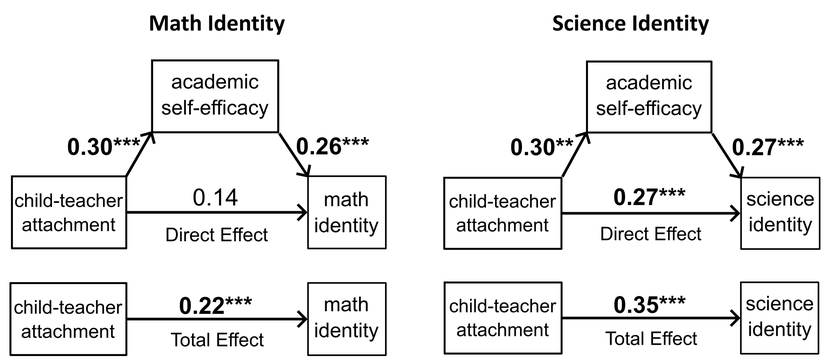
- Gender did not moderate effects on math or science identity
- Girls endorsed lower levels of science identity
- Gender differences were not observed for math identity.

RESULTS (continued)

Follow-Up Analyses: Indirect Effects

Effects of Child-Teacher Attachment and Academic Self-Efficacy on Math and Science Identity

Figure 1. Simple mediation models illustrating effect of child-teacher attachment on math and science identity via academic self-efficacy



Note. Values represent standardized betas. *p < .05. **p < .01. ***p < .001

Table 3. Indirect Effects

Path	95% CI[a]
Child-teacher attachment → Self-efficacy → Math ID	[.03, .15]
Child-teacher attachment → Self-efficacy → Science ID	[.03, .14]

Note. [a]Confidence intervals for estimates with bootstrap samples of 1000.

CONCLUSIONS & IMPLICATIONS

- Adult role models, particularly teachers, play an important role in promoting the math and science identities in Latinx middle schoolers.
- The relationship between parent modeling, child-teacher attachment, and identity differed for math and science.
  - This study included a limited measure of parent- and teacher-student relationships. Other related measures could be more predictive of math identity. For example, Shifrer et al. (2023) found that adolescents who perceived their teachers as equitable had higher math identities.
  - Future research should further explore differences in factors promoting math identity and science identity.
- Follow-up analyses indicated that teachers may be able to promote Latinx adolescents' math/science identities through positive interactions that support students' academic self-efficacy. However, all measures were collected at the same time point.
  - Future research should examine child-teacher attachment, academic self-efficacy, and math/science identity in a longitudinal design.

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