Do Stereotypical vs. Counter-stereotypical Role Models Affect Teacher Candidates' Stereotypes and Attitudes toward Teaching Computer Science?

Lucas Vasconcelos[1]
Fatih Ari[1]
Ismahan Arslan-Ari[1]
Lily Lamb[1]

[1]University of South Carolina

DOI: https://doi.org/10.21585/ijcses.v6i2.174

Abstract

Computer Science (CS) stereotypes promote the mindset that nerdy White males who have a high IQ and are technology enthusiasts are the ones to succeed in the field, leading to gender and racial disparities. This quasi-experimental study investigated if exposing teacher candidates to a stereotypical vs. counter-stereotypical CS role model affects their stereotypes and attitudes toward teaching CS. Participants exposed to a counter-stereotypical role model reported a statistically significant decrease in stereotypes about social skills, and slightly weaker stereotypes about appearance, cognitive skills, and work preferences. Participants exposed to a stereotypical role model reported no changes in stereotypes. Participants in both groups showed increasingly positive attitudes toward teaching CS. Implications for CS teacher education are discussed.

Keywords: stereotypes, role models, computer science, teacher candidates, attitudes

1. Introduction

Computer Science (CS) is a field known for gender and racial disparities (Berg et al., 2018; Cheryan et al., 2015). Mostly White males are enrolled in CS higher education degrees (National Science Foundation, 2019) and make up the computing industry (Bureau of Labor Statistics, U.S. Department of Labor, 2021). A factor undermining participation of females and racial minorities is stereotypes, which promote the mindset that a nerdy White male who has a high IQ and is a technology enthusiast (Master et al., 2016; Pantic et al., 2018) will likely succeed in the field. These stereotypes can affect those who feel dissimilar by undermining their attitudes toward pursuing a CS degree or profession. Among female teacher candidates, stereotypes may promote negative attitudes toward teaching CS, and in turn can undermine integration of CS into the K-12 curriculum. It is important to examine teacher candidates' stereotypes and attitudes toward teaching CS so these can be addressed and challenged within teacher education programs. This might be helpful for teacher educators striving to prepare teacher candidates who can infuse CS into their future teaching in inclusive and equitable ways.

2. Related Literature

2.1 Stereotypes in CS

A stereotype is a standardized representation created to distinguish a group of individuals based on one or more specific characteristics (Kanahara, 2006; Sills, 1968; Taylor et al., 1994). In CS, stereotypes set apart individuals who are representative of the field, and therefore are considered to become successful professionals in the field. A computer scientist is stereotypically depicted as a White male who looks nerdy (e.g., wear glasses and tooth tracks), has limited social skills, prefers working with machines rather than people, possesses a high level of intelligence and IQ, and is passionate about technologies which results in countless hours working in front of a computer or with other computing devices (Ari et al, 2022; Cheryan et al., 2009, 2015; Cheryan, Meltzoff, et al., 2011; Cheryan, Plaut, et al., 2013; Pantic et al., 2018; Varma, 2020; Vasconcelos et al., 2022).

CS stereotypes can be biased and discriminatory because those who feel dissimilar from the stereotypical computer scientist may end up feeling at the margin. Particularly, females and other minorities may struggle to envision themselves as a CS professional (Cheryan et al., 2009; Cheryan, Meltzoff, et al., 2011; Master et al., 2016; Pantic et al., 2018), which then curtails their aspirations to pursue further education and jobs in the computing industry (Olsson & Martiny, 2018; Shapiro & Williams, 2012). Underrepresentation in CS raises issues about racial justice and socioeconomic equity because those minorities are unable to take on high-paying jobs in the computing industry (Beyer, 2014; Olsson & Martiny, 2018). At the personal level, this undercuts their income potential and limits quality of life. At the societal level, a CS pipeline that is neither inclusive nor diverse misses out on the creativity and innovativeness that come with promoting diversity of perspectives (Cheryan et al., 2015). Central to broadening the CS pipeline is identifying and debunking stereotypes to prevent minorities from feeling unwelcome in the field (Cheryan, Siy, et al., 2011).

2.2 Social Role Theory and Stereotypes

Social role theory posits that behavior is dependent upon the allocation of social roles for males and females within a society (Eagly et al., 2000; Wood & Eagly, 2012). Gender roles are formed through social interactions (Good et al., 2010), which in turn guides the behavior of men and women toward pursuing a certain type of labor (Eagly & Karau, 2002). For instance, men are predominantly assigned to full-time, paid leadership positions compared to women, who are more often expected to take on caregiving jobs.

Stereotypes are disseminated through the media (Cheryan, Drury, et al., 2012; Cheryan, Plaut, et al., 2013; Graham & Latulipe, 2003), in textbooks (Papadakis, 2018), and in interactions with other members in the community (Good et al., 2010). Using social role theory as a lens, we understand that social interactions that challenge, discredit, and provide alternative representations are critical to identify, debunk, and prevent stereotype formation. One way to achieve this is through social interactions with alternative and diverse role models.

2.3 CS Role Models

Exposure to alternative representations that discredit the default stereotypical representation of a computer scientist is critical to promote interest in CS among minorities. A study with undergraduate students found that females who briefly encountered and talked to a person representing a computer scientist and embodying counter-stereotypical traits (e.g., sports player, music listener, fan of American Beauty movie) displayed higher interest in a CS college major and felt a higher sense of belonging to the field compared to their counterparts exposed to a role model with stereotypical traits (e.g., video game player, programmer, fan of Star Wars movie) (Cheryan, Drury, et al., 2012). Another study conducted two similar experiments by exposing undergraduate students to a STEM stereotypical or counter-stereotypical role model. One experiment was in a face-to-face environment, and one in a virtual environment. Findings from both experiments showed that females in the counter-stereotypical group felt more similar to the role model and anticipated higher success in CS compared to their peers in the stereotypical group (Cheryan, Siy, et al., 2011).

A study with high school students enrolled in engineering classes in schools across the U.S. revealed that being taught by a female faculty over a year resulted in weaker stereotypes among boys who had reported strong stereotypical beliefs about STEM at the beginning of a year (Riegle-Crumb et al., 2017). The same study found that boys who had initially reported weak stereotypical beliefs experienced a decrease in stereotypes when exposed to a high number of female peers in the classroom (Riegle-Crumb et al., 2017). A counter-stereotypical role model also influences young girls. In Buckley et al.'s (2021) study, short stories about female scientists, which represented counter-stereotypical characters, were read to young girls aged 6-8 years old. Findings revealed that young girls who listened to those stories were more likely to recognize females as very smart individuals over males compared to other girls who were not exposed to those stories. Similarly, Gilbert (2015) found that asking women to reflect and write about biographies of female role models led to weaker STEM stereotypes and stronger associations between women and science, as well as increased sense of belonging in STEM compared to their peers not exposed to a female role model.

Previous research shows the impact of counter-stereotypical role models, but most studies have been conducted with secondary or college students. By the time this paper was submitted, no study had investigated the impact of stereotypical vs. counter-stereotypical CS role models on teacher candidates. Grounded on social role theory, we hypothesize that exposing female teacher candidates to a counter-stereotypical role model results in weaker CS stereotypes and increased positive attitudes toward teaching CS.

3. Purpose and Research Questions

The purpose of this study was to investigate if exposure to a stereotypical vs. counter-stereotypical role model affects teacher candidates' CS stereotypes and attitudes toward teaching CS. These questions guided the study:

RQ1: Does exposure to a counter-stereotypical role model affect teacher candidates' stereotypes about computer scientists?

RQ2: How does exposure to a counter-stereotypical role model affect teacher candidates' attitudes toward teaching computer science?

4. Methods

4.1 Research Design

This was a quasi-experimental study as it sought to determine the impact of an intervention on a target population that is not randomly assigned to experimental groups (Gopalan et al., 2020). Study participants were assigned to different groups based on course enrollment: participants in one group were exposed to a stereotypical role model and participants in another group were exposed to a counter-stereotypical role model. This study did not have a control group.

4.2 Setting and Participants

Participants were recruited from four sections of a teacher education course on early childhood mathematics teaching. The course was hybrid, i.e., it offered both online and face-to-face activities. Two sections of the course were offered in Fall 2020, and the same full-time female faculty taught them. The other two sections were offered in Fall 2021, and a male adjunct instructor taught both sections. Institutional Review Board approval was granted prior to the study. Informed consent was obtained. A total of 36 female senior teacher candidates agreed to join the study. Thirty-one were White, four were Latinx, and one was African American. Their average age was 21.81 years old (SD = 1.79). Participants were randomly assigned to either a counter-stereotypical (n = 15) or a stereotypical group (n = 21).

4.3 Instructional Material

Two versions of an online module were developed to correspond with the two role models, a counter-stereotypical and a stereotypical role model, in this study. The online module about STEM teaching and learning was designed and developed by the authors. This online module introduced participants to the idea of coding as a strategy to promote STEM learning, and they were prompted to reflect about integrating block-based code into their future STEM teaching. This module contained videos about STEM teaching and learning in early childhood, readings about the integration of coding into the classroom, and sample STEM activities (e.g., integrating coding into mathematics learning) for review. The role model was a computer scientist who guided teacher candidates through module activities and shared personal information throughout the module.

Group 1 was exposed to a counter-stereotypical role model, and group 2 to a stereotypical role model. The role models served as contextually-relevant pedagogical agents, which "are static or animated anthropomorphic interfaces employed in electronic learning environments to serve various instructional goals" (Veletsianos, 2010, p. 577). Role model avatars were designed with Bitmoji, a free avatar design tool. Bitmoji offers various scenarios in which the avatar displays emotions, preferences, and interactions.

To control stereotypicality, we designed role models based on five dimensions: race, gender, cognitive skills, social skills, and work preferences. These dimensions are often pointed out in the literature about CS stereotypes. First, we created the stereotypical role model: a White male who is highly intelligent, antisocial, and spends long hours working on the computer rather than around people. Other traits stereotypically associated with computer scientists were also featured such as glasses, preference for sci-fi movies (e.g., Star Wars) and video games. The counter-stereotypical role model was an African American female who did not mention having exceptional intelligence, but was sociable and enjoyed spending time with friends. Traits that are not stereotypically associated with computer scientists were also featured such as a feminine outfit, and appreciation for TV shows (e.g., Friends) and movies. In addition to the avatar image, each CS role model was presented with written descriptions that reinforced stereotypical and counter-stereotypical features for the five dimensions mentioned above. We understand that, in reality, it is possible to hold different combinations of stereotypical vs. counter-stereotypical perceptions of a computer scientist. However, it was our goal for this study to assess the impact of these two role models in their extremeness. Figures 1 and 2 present a comparison of the two CS role models used in the experiment.

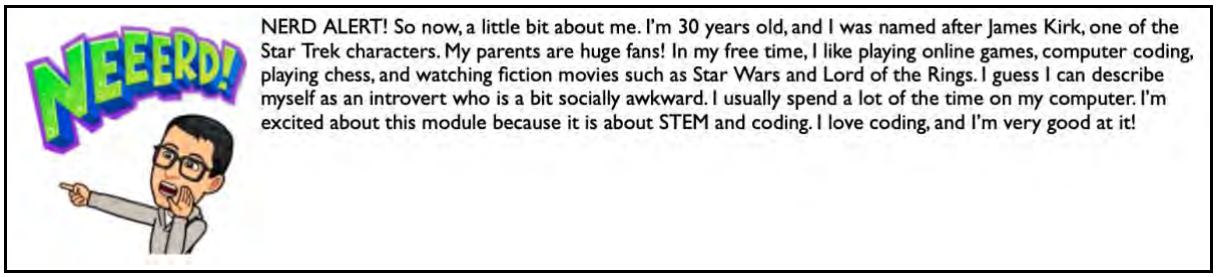

Figure 1. Stereotypical role model

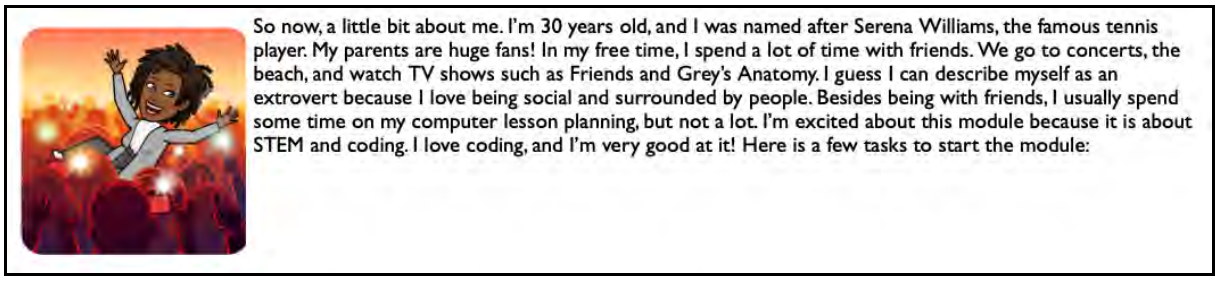

Figure 2. Counter-stereotypical role model

4.4 Data Sources and Analysis

To assess changes in teacher candidates' stereotypes, the CS Stereotypes Survey was administered before and after exposure to role models. This is an 18-item survey in which participants reported their perceptions of a computer scientist based on traits related to appearance, social skills, cognitive skills, and work preferences. This survey prompted participants to use a 5-point Likert-type scale to depict a computer scientist from (1) individualistic to (5) collaborative, or from (1) computer hacker to (5) amateur tech user. A rating value close to one indicates a stronger stereotypical belief about computer scientists, while a rating value close to five indicates a stronger counter-stereotypical belief. Survey data was analyzed with the nonparametric Mann-Whitney U test, which was suitable to examine if there were statistically significant differences between the two unrelated groups when the variable of interest is ordinal (Nolan & Heinzen, 2012; Siegel, 1956). This test is also appropriate for statistical analysis with relatively small samples, especially given the number of participants in group 1.

To assess changes in teacher candidates' attitudes toward teaching CS, an adapted version of Yadav et al.'s (2011) survey was implemented before and after exposure to role models. This Attitudes toward Teaching CS instrument was a 16-item survey that used a 4-point Likert type scale ranging from (1) strongly disagree to (4) strongly agree. Sample survey items include "I can do well in infusing coding and computing into teaching" and "Computer science and coding can be integrated into classroom

education in other fields." Descriptive statistics were used to analyze this data set. A measure of central tendency (mean) and a measure of dispersion (standard deviation) provided trends and patterns in collective data across participants (Field, 2017; Nolan & Heinzen, 2012) in their attitudes toward teaching CS.

Both surveys were piloted with teacher candidates prior to this study. Additionally, to assess the internal consistency of the CS Stereotypes Survey in this study, Cronbach's alpha coefficients were calculated for each subscale. The reliability scores were reported as .90 for social skills, .80 for appearance, .77 for cognitive skills, and .84 for work preferences, indicating good subscale reliability (Fraenkel & Wallen, 2009).

5. Findings

5.1 CS Stereotypes

Separate Mann-Whitney U tests were conducted to determine if exposure to a stereotypical vs. counter-stereotypical role model affects teacher candidates' stereotypical beliefs about computer scientists. In terms of computer scientists' social skills, teacher candidates in the counter-stereotypical role model group (Mdn = 0.60) reported a significantly higher decrease in their stereotypical beliefs compared to the teacher candidates in the stereotypical role model group (Mdn = 0), U = 78.50, $p < .01$, r = 0.43). Besides the social skills, teacher candidates in the counter-stereotypical role model group reported a decrease in their stereotypical beliefs about the appearance, cognitive skills, and work preferences of computer scientists. However, these changes were not statistically significantly different than the changes reported by participants from the stereotypical role model group in terms of appearance (U = 98.50, p = .05, r = 0.33), cognitive skills (U = 98.50, p = .22, r = 0.21), and work preferences (U = 116.00, p = .18, r = 0.23). Table 1 below presents the descriptive statistics for the change in teacher candidates' stereotypical beliefs about computer scientists in both groups.

Table 1. Descriptive statistics for the CS stereotypes (change score = post – pre)

	Counter-Stereotypical Role Model Group			Stereotypical Role Model Group		
	Mdn[a]	*M*	*SD*	*Mdn*[a]	*M*	*SD*
Social Skills	0.60	0.64	0.85	0	-0.08	0.57
Cognitive Skills	0.50	0.55	0.76	0.50	0.39	0.54
Appearance	0.50	0.50	0.97	0	0.06	0.36
Work Preferences	0.40	0.47	0.73	0	0.13	0.73

Note. [a]Higher values of *Mdn* indicate a decrease in stereotypical beliefs after completing the modules. Values close to zero indicate no change.

5.2 Attitudes toward Teaching CS

Participants in both groups showed increasingly positive attitudes toward CS and toward integrating CS into their teaching after the experiment. Regarding teacher candidates exposed to the stereotypical role model, notable increases were observed in their willingness to take CS courses (M = 2.87), the hope that their future career would require using coding and CS concepts (M = 2.67), the expectation to use coding in future education and professional career (M = 3.07), and their self-efficacy beliefs about infusing coding and computing into their teaching (M = 2.93). On the other hand, teacher candidates exposed to the counter-stereotypical role model experienced an increase in their expectation to use coding in their future education and professional career (M = 3.00), the perception that the challenge of teaching with coding is appealing (M = 2.81), their willingness to take CS courses (M = 2.81), and the perception that infusing coding and CS into teaching is interesting (M = 3.00). Table 2 below presents the descriptive statistics of teacher candidates' ratings for all items in the Attitudes toward CS Survey for both groups before and after the experiment.

Table 2. Descriptive statistics for attitudes toward teaching CS

Survey Item	Stereotypical Role Model Group		Counter-Stereotypical Role Model Group	
	Before *M* (*SD*)	After *M* (*SD*)	Before *M* (*SD*)	After *M* (*SD*)
1. Knowledge of coding will allow me to secure a better job as a teacher.	2.53 (0.52)	2.73 (0.88)	2.57 (0.68)	2.95 (0.74)
2. My teaching career goals do not require that I learn computing skills such as coding	2.73 (0.70)	2.40 (0.63)	2.67 (0.73)	2.29 (0.46)
3. I doubt that I can infuse coding or computing applications into my teaching.	2.13 (0.64)	1.93 (0.59)	2.10 (0.54)	1.81 (0.60)
4. I expect to use coding in my future educational and career work as a teacher.	2.33 (0.62)	3.07 (0.59)	2.33 (0.48)	3.00 (0.45)
5. I can do well in infusing coding and computing into teaching.	2.20 (0.68)	2.93 (0.80)	2.67 (0.66)	2.86 (0.57)
6. The challenge of teaching using computer science and coding appeals to me.	2.40 (0.63)	2.80 (0.86)	2.29 (0.64)	2.81 (0.60)
7. I expect to use coding and computer science for future teaching involving teamwork.	2.33 (0.62)	3.00 (0.65)	2.52 (0.60)	2.81 (0.51)
8. I can learn to teach coding and computing concepts.	2.80 (0.68)	3.13 (0.64)	3.00 (0.55)	3.19 (0.51)
9. I am not comfortable with teaching coding and computing concepts.	2.67 (0.82)	2.40 (0.74)	2.62 (1.02)	2.48 (0.68)
10. I expect to use coding and computing skills in my daily life as a teacher.	2.00 (0.66)	2.67 (0.90)	2.33 (0.66)	2.57 (0.60)
11. I hope that my future career as a teacher will require the use of coding and computing concepts.	1.80 (0.68)	2.67 (0.72)	2.43 (0.75)	2.76 (0.70)
12. I think that the idea of infusing coding and computer science into teaching is interesting.	2.47 (0.83)	3.07 (0.70)	2.57 (0.81)	3.00 (0.55)
13. I will voluntarily take computing courses if I were given the opportunity.	2.00 (0.76)	2.87 (0.64)	2.33 (0.86)	2.81 (0.51)
14. Computer science and coding can be integrated into classroom education in other fields.	3.00 (0.38)	3.20 (0.41)	2.86 (0.66)	3.19 (0.51)
15. Computer science and coding should be integrated into classroom education for other disciplines.	2.80 (0.56)	3.13 (0.52)	2.76 (0.54)	3.14 (0.48)
16. Having background knowledge and understanding of how to infuse computer science and coding into one's own teaching is valuable in and of itself.	3.13 (0.52)	3.33 (0.49)	3.00 (0.55)	3.19 (0.51)

6. Discussion and Future Research

The present study investigated if exposure to a stereotypical vs. counter-stereotypical role model

influenced teacher candidates' stereotypical beliefs about CS and their attitudes toward teaching CS. Our hypothesis was that exposure to counter-stereotypical role models would result in weaker CS stereotypes and increased positive attitudes toward teaching CS. Study findings revealed that there were no statistically significant changes in CS stereotypes among teacher candidates exposed to the stereotypical role model. In fact, descriptive statistics showed that there were virtually no changes before and after the experiment. Participants in the counter-stereotypical role model group reported a statistically significant decrease in stereotypical beliefs about a computer scientist's social skills, and a slight increase in other dimensions. This partially aligns with previous research, which shows positive effects of counter-stereotypical role models (Cheryan, Siy, et al., 2011; Cheryan, Drury, et al., 2012; Cheryan et al., 2015; Stout et al., 2011) and environmental cues (Cheryan et al., 2009; Master et al., 2016) on females.

Participants in the counter-stereotypical group described computer scientists as more sociable and outgoing after the experiment. The counter-stereotypical role model was a female, and females are often attributed gender-role stereotypes based on societal expectations that they are sociable and talkative (Block, 1973; Rosenkrantz et al., 1968). Using social role theory as the interpretive lens, it is possible that this gender-role stereotype overpowered the stereotype of a computer scientist being antisocial, resulting in teacher candidates' perception of a more sociable and extroverted female computer scientist. Studies about CS stereotypes among children have found that gender plays a role in CS steretoypes. Specifically, boys tend to show more interest in CS (Master et al., 2021), they are more commonly associated with the trait intelligence (Bian et al, 2017), they often display more positive attitudes toward CS (Vandenberg et al., 2021), and they are considered more capable in computer programming than girls (de Wit et al., 2022). This points to intersectionality in stereotypes as mental schemata that are influenced by various social constructs such as race, gender, sexuality, and more (Ireland et al., 2018; Rodriguez & Lehman, 2017; Trauth et al., 2016). While an intersectional analysis is beyond the scope of this study, we invite future research to adopt an intersectional theoretical framework to examine CS stereotypes.

Participants in the counter-stereotypical group externalized slightly weaker stereotypical beliefs about a computer scientist's appearance, cognitive skills, and work preferences though changes were not statistically significant. Participants in this study were overwhelmingly White, and the counter-stereotypical role model was African American. Perhaps participants did not "subjectively identify with" (Asgari et al., 2012, p. 371) the role model due to racial incongruence. This may partially explain the non-statistically significant difference about appearance in the counter-stereotypical group. Effective role models are most likely relatable (Asgari et al., 2012; Farrell et al., 2020; Shin et al., 2016) as they allow participants to build interpersonal connections and allow them to develop "a sense of perceived similarity to the role model" (Drury, Siy, & Cheryan, 2011, p. 267). Follow-up studies may include a number of counter-stereotypical role models that are contextually-relevant and demographically diverse in order to promote a sense of perceived similarity between teacher candidates and role models.

The experiment in this study was designed to represent the role model with images and text, which was expected to enhance content assimilation. According to the multimedia principle in Mayer's (2005) principles of multimedia learning, a combination of pictures and words leads to more effective learning rather than words alone. And yet, most changes were not statistically significant. We speculate that explicitly singling out and calling participants' attention to the five stereotype dimensions in the role models could have been more impactful. Specifically, we believe it would have been beneficial to combine the segmenting principle for multimedia learning (Mayer, 2005; Mayer & Pilegard, 2005) with cognitive scaffolding strategies (Belland et al., 2013) to explicitly challenge and offer alternatives to each one of the CS stereotype dimensions as well as offer opportunities for scaffolded reflection about each dimension. This recommendation can inform future studies.

From the perspective of social role theory (Wood & Eagly, 2012), stereotypes are formed through social interactions (Good et al., 2010), which are exchanges between individuals in a given social context. Research has found promising results from mediating brief social interactions, in person or virtually, with a human being who embodies a counter-stereotypical role model (Cheryan, Drury, et al., 2012; Riegle-Crumb et al., 2017). Further, an intervention that entailed reading stories about successful counter-stereotypical role models (e.g., successful females in STEM) to young girls (Gilbert, 2015) found positive results. Hindsight about the design of the present study shows that teacher candidates

read information about the role model, but they did not get to exchange information with the role model. We conjecture that participants may need more substantial and extended interactions with a counter-stereotypical role model to experience change in their long-ingrained stereotypical beliefs. These serve as recommendations for follow-up research. Additionally, future research can examine if different types of interaction with a counter-stereotypical role model (e.g., reading about role models, watching role models, or engaging in group vs. one-on-one conversation) have different effects on participants' CS stereotypes.

Findings from this study also revealed that participants in both stereotypical and counter-stereotypical groups reported more positive attitudes toward teaching CS after the experiment. The mean scores that resulted from exposing teacher candidates to a stereotypical vs. counter-stereotypical role model were very similar. Descriptive statistics showed that increases occurred across most survey items, particularly those about willingness to take future CS courses and expectation to use coding in their future education and career. It is possible that exposure to a role model, regardless of stereotypicality, raised teacher candidates' awareness to the importance of infusing coding skills into their future students' learning experiences. Another plausible explanation to these findings is that the content of the online module affected both groups. The module in which the experiment was embedded presented teacher candidates with a video and a practitioner's article about integrating STEM into K-12 education. It is likely that the content of these artifacts had a cumulative effect in positively influencing teacher candidates' attitudes toward infusing coding and CS into their future teaching. We invite follow-up research that includes a control group that is not exposed to a role model and/or to content about coding and STEM education.

7. Implications for CS Teacher Education

Investigating teacher candidates' stereotypes and attitudes toward teaching CS is critical because these factors can thwart opportunities for CS education in K-12 learning environments. Study findings point to a few implications for future practice within teacher education programs. First, the study showed that teacher candidates hold stereotypical beliefs about computer scientists. It is critical to address and debunk these stereotypes in order to prepare educators who can offer inclusive CS educational opportunities. Second, interventions on stereotypes should do more than expose teacher candidates to one counter-stereotypical role model. Promoting interactions with multiple and demographically diverse role models should enhance the effectiveness of future interventions. Third, sustained exposure to counter-stereotypical role models might prove to be more effective than one-shot encounters. While there is no consensus in the literature about a specific timeline, we hypothesize that extended interventions or interactions that span over multiple time points might yield statistically significant results. Fourth, interactions with role models should be followed by opportunities for scaffolded reflection so teacher candidates can have the time and space to externalize their perceptions and beliefs about each dimension that is relevant for CS stereotypes. And last but not least, future practice in teacher education programs should adopt an intersectional approach to illuminate the extent to which social expectations based on race and gender are reflected on CS stereotypes, and to show how teacher candidates can demystify these intersectional stereotypes in their future teaching.

8. Study Limitations

This study had four limitations. First, the number of participants in each group was unbalanced, but this was based on the number of participants who accepted to join the study and who completed both pre- and post-surveys. Second, one of the groups had a relatively small number of participants for statistical analysis, which informed our decision to use a nonparametric test. Third, it was not possible to identify if the difference in course instructors (full-time female professor vs. adjunct male professor) influenced the results. Fourth, the experiment was designed to be completed in one sitting, without interruptions. It was not possible to oversee participants' experiment completion. The experiment implementation had to occur online and asynchronously due to data collection restrictions imposed by the covid-19 pandemic.

Declaration of Interest Statement: The authors report there are no competing interests to declare.
Funding: This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

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