

**PRESERVICE TEACHERS' PERCEPTIONS OF DEPICTIONS OF MATHEMATICS  
TEACHING PRACTICE WHEN ENDURING INDIVIDUAL CHARACTERISTICS ARE  
INTRODUCED**

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*This study investigates the extent to which the introduction of enduring individual characteristics of students and teachers in depictions of teaching practice produces systematically different responses from preservice teachers. Enduring individual characteristics include characters' skin tones, names, and descriptions of the school and school community. Fifty-six preservice teachers were randomly assigned to one of two survey depiction formats: one including enduring individual characteristics of students and teachers. Teacher practices and student problem solving were held constant across both formats. Results indicate that, for several survey items, participants responded differently depending on the survey depiction format they were assigned. Interpretations of results suggest that enduring individual differences may be of critical importance to include in rich media resources utilized in mathematics teacher education.*

Keywords: Teacher Beliefs, Teaching Tools and Resources, Teacher Education - Preservice

### **Purpose of the Study & Guiding Framework**

Online, rich media platforms are transforming the ways individuals across a range of professions are prepared and practice. One such platform, *LessonSketch*<sup>1</sup>, allows mathematics teacher educators and preservice teachers to develop and engage with materials where users can create, share, and discuss scenarios that represent classroom interaction (Herbst & Chieu, 2011). Initial uses of LessonSketch deliberately provided depictions of teaching practices absent of individual characteristics. As Herbst et al. (2017) describe in prior work, *LessonSketch* characters were nondescript characters whose role was to depict practice rather than individuals. However, later updates to the platform began to incorporate contextual markers in teaching classrooms, such as skin tone, hairstyles, and body size. Furthermore, Herbst et al. (2017) describe the differences between the original, generalized depictions in earlier versions of LessonSketch as *enacted individual differences* (e.g. facial expressions, body orientation), and the updated contextual markers as *enduring individual differences* (e.g. body size, race, gender, or class).

The introduction of the option of incorporating enduring individual differences in depictions of instructional practice allows for the opportunity to explore the complex nature of the role of enduring individual differences in preservice teachers' perceptions of classroom interactions. While teachers may outwardly and consciously hold beliefs that all children can learn mathematics, a life immersed in the social discourse of gender, racial, and wealth hierarchies may lead them to rely on enduring individual differences in their interactions with students in ways that teachers may not be aware (Clark, Whitney, & Chazan, 2009). This study aims to explore the instability of the relationship between teacher resources, instructional practice, and student learning due to a host of normative, instrumental, and situational factors that influence a teacher's affective and cognitive resources in

<sup>1</sup> *LessonSketch* is designed and developed by Pat Herbst, Dan Chazan, and Vu-Minh Chieu with the GRIP lab, School of Education, University of Michigan. The development of this environment has been supported with funds from National Science Foundation grants ESI-0353285, DRL-0918425, DRL-1316241, and DRL-1420102. The graphics used in the creation of these storyboards are © 2015 The Regents of the University of Michigan, all rights reserved. Used with permission.

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varied and specific racial contexts and at particular moments in time (Chazan, Herbst, & Clark, 2016). Our research question for this exploratory study is: *Do preservice teachers systematically respond differently to rich media depictions of mathematics classrooms when enduring individual differences are introduced?*

## Methods

Our research question has important sub-questions. As we seek to investigate whether the introduction of enduring individual differences produces systematically different responses to depictions of teaching practice we also want to know, if so, where? And, which teacher practices produce different results? Further, we contend that enduring individual differences such as skin tone may contribute to systematic differences due to implicit bias (Greenwald & Krieger, 2006). It should be noted that this study is an exploratory one; the broader research questions we provide cannot be answered substantially through this study alone. Further work and refinement are necessary.

Participants were presented with scenarios of mathematics classroom interactions. The design of scenarios and survey questions was guided by several frameworks utilized in teacher education, mathematics teacher education, and mathematics education research (Hiebert, 1986; Martin, 2000; McKown & Weinstein, 2008; National Governors Association, 2010; TeachingWorks, 2020). Participants then answered 120 questions related to the scenarios. Participants were randomly assigned to view and respond to a format of the scenarios with one of two different degrees of individuality: *enacted only individual (henceforth enacted) difference* and *enacted and enduring (henceforth enduring) individual difference*. Enacted individual difference depictions (Figure 1) do not contain any visual or descriptive markers such as skin tone of students and teachers; enduring individual difference depictions (Figure 2) contain such markers. The depicted students' mathematical thinking and students' mathematical practices are held constant across both formats. The depicted teacher's instructional practices are also held constant across both formats. Twenty-eight preservice teachers responded to the enacted individual difference survey format and 28 preservice teachers responded to the enduring individual difference survey format.



Figure 1. Enacted Individual Difference



Figure 2. Enduring Individual Difference

The survey consisted of three sections: a division scenario, a multiplication scenario, and questions related to school and classroom context. The majority of survey questions were measured on a 6-point Likert scale (from strongly disagree to strongly agree).

## Results

Results are indicated in the tables below. The items contained in the tables refer to items where preservice teachers assigned to the enacted difference form responded significantly differently to the preservice teachers assigned to the enduring difference. In Tables 1 and 2, items are grouped by the extent to which they focus on teacher practice or student thinking.

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**Table 1. Division Scenario**

Scenario 1: Students are placed in pairs and assigned division problems. Student A uses a non-traditional algorithm and Student B is confused. The teacher interacts with the pair of students and encourages them to practice the traditional algorithm. Student B raises questions suggesting that he has some conceptual understanding of the nontraditional division algorithm.

Survey Format		Enacted difference (Blue skin tones)		Enduring difference (Brown skin tones)		Mann-Whitney U
		Mdn.	Mean	Mdn.	Mean	Sig.
Perceptions of Teacher Practice		Mdn.	Mean	Mdn.	Mean	Sig.
Q20	The teacher is effectively setting up and managing small group work.	3	2.75	2	2.18	0.038
Q30	The teacher is effectively checking for student A's procedural understanding of division.	3	3.04	2	2.25	0.015
Q31	The teacher is effectively checking for student B's conceptual understanding of division.	2	2.46	2	1.71	0.007
Q32	The teacher is effectively checking for student B's procedural understanding of division.	2	2.39	1	1.57	0.001
Perceptions of Student Thinking/Cognition		Mdn.	Mean	Mdn.	Mean	Sig.
Q26	Student B is likely to do well on the division problems on the chapter test.	2	2	3	2.82	0.003
Q41	For each student, indicate if they are most likely above level, on level, or below level-- Student B*	0	0.18	0.5	0.54	0.011

\* Q41 was measured on a 3-point scale, from below-level (0) to above-level (2)

**Table 2. Multiplication Scenario**

Scenario 2: Students are placed in pairs and assigned multiplication problems. Student D uses the traditional algorithm. Student C computes answers through use of the partial product method. The teacher acknowledges that partial product method but encourages both students to use the traditional algorithm for efficiency and accuracy on the test.

Survey Format		Enacted difference (Blue skin tones)		Enduring difference (Brown skin tones)		Mann-Whitney U
		Mdn.	Mean	Mdn.	Mean	Sig.
Perceptions of Teacher Practice		Mdn.	Mean	Mdn.	Mean	Sig.
Q53	The teacher is effectively managing small group work	3	3.29	2	2.68	0.030
Q70	The teacher should review the traditional algorithm to multiplication with all students.	5	4.71	4	4.21	0.036
Perceptions of Student Thinking/Cognition		Mdn.	Mean	Mdn.	Mean	Sig.
Q76	Student C was likely assigned as the helper in the group.	2	2.21	2.5	3	0.036

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**Table 3. School and Classroom Context**

School and classroom context: Participants are asked to respond to questions related to how they perceive aspects of the school and classroom.

Survey Format		Enacted Difference (Blue skin tones)		Enduring Difference (Brown skin tones)		Mann-Whitney U
		Mdn.	Mean	Mdn.	Mean	Sig.
Q86	Do you think this is most likely a 3rd, 4th, 5th, or 6th grade class?*	4	3.75	4	4.11	0.014
Q88	I would feel comfortable teaching this class.	5	4.71	4	4	0.003
Q89	I would feel comfortable teaching at this school.	5	4.54	4	3.64	0.001
Q90	I would want access to instructional support if I were teaching this class.	5	4.64	4	3.86	0.006
Q91	I would want access to instructional support if I were teaching at this school	5	4.75	4	3.79	0.000

\*Q86 was measured on a 4-point scale, from 3rd grade (3) to 6th grade (6).

### Discussion

The results of this study suggest that, for several survey items, preservice teachers' perceptions of depictions differ when the depiction formats vary by the inclusion or exclusion of enduring individual differences of depiction characters. In particular, preservice teachers perceived that teachers' practices associated with the management of small group work and checking for student understanding was less effective when brown skin color tones of characters were introduced to the depiction. Furthermore, preservice teachers were more likely to assign a higher grade level to characters with brown skin tones. Lastly, preservice teachers reported that they would be less comfortable teaching the class or in the school when brown skin tones were introduced. Overall, findings suggest that further exploration is needed to better understand if preservice teachers' perceptions are influenced by the introduction of enduring individual characteristics, and, further, if influenced by the introduction of specific racialized enduring individual characteristics such as brown skin tones.

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