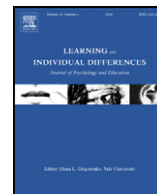




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Are teacher beliefs gender-related?

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ABSTRACT

Teacher beliefs influence student behaviour and learning outcomes. Little is known about the role of specific teacher characteristics (e.g., gender and teaching domain) in the formation of these beliefs. In the current study, three versions of the Implicit Association Test (IAT) were used to assess gender-related beliefs regarding career, aptitude for science and learning styles, respectively. The IAT-genderLearningStyles instrument was designed especially for the study. The beliefs of 107 participating teachers and student teachers in the Netherlands were investigated. Neither the gender nor the teaching domain of the teacher was associated with gender-related beliefs regarding student career choices. For male teachers, having a STEM background was associated with stronger gender-related beliefs regarding aptitude for science. The results of the IAT-genderLearningStyles reveal small gender-related scores (stronger male-independent learning association) for male teachers and STEM teachers, along with negligible gender-related scores for female teachers and non-STEM teachers.

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1. Introduction

The beliefs of teachers, whether implicit or explicit, are important because they impact on teachers' behaviour and the expectations of their students. Teachers' differential expectancy beliefs and behaviour, has been intensively studied (e.g., Brophy, 1985; Brophy & Good, 1970; Jussim, Eccles, & Madon, 1996; Jussim & Harber, 2005; Rosenthal & Jacobson, 1968; Tenenbaum & Ruck, 2007; Walkey, McClure, Meyer, & Weir, 2013; Watson et al., 2016). These beliefs and behaviour influence the learning outcomes of the students (Rubie-Davies, Flint, & McDonald, 2011; Urhahne, 2015; Van den Bergh, Denessen, Hornstra, Voeten, & Holland, 2010). Gender is one area in which this influence can be observed. Gender-related beliefs influence teacher behaviour in such areas as their expectations of students (Li, 1999), their ratings of written and verbal achievements (Murphy & Elwood, 1998) and their interactions with students (Andersson, 2010; Jones & Wheatley, 1990). Empirical evidence is therefore needed in order to provide insight into factors that could affect the formation and persistence of gender-related beliefs. The current study investigates associations between specific teacher characteristics (i.e., gender and teaching domain) and gender-related beliefs in teachers.

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Beliefs can be defined as “psychologically held understandings, premises or propositions about the world that are felt to be true, not necessarily logically structured” (Richardson, 2003, p.2). Such beliefs can have a stereotypical character when they involve customary assumptions about traits and behaviours that people in a particular category are thought to possess (Georgiou, 2008; Kite, Deaux, & Haines, 2008). Moreover, stereotypes are determined by culture (Hall, Lindzey, & Campbell, 1988) and accepted as fact (Ifegbesan, 2010). Beliefs may range from positive to negative evaluations of specific attributes (Asma, Walma van der Molen, & Van Aalderen-Smeets, 2011).

Gender-related beliefs concern the different characteristics, qualities or traits that are associated with girls/females or boys/males (Tiedemann, 2002; Upadyaya & Eccles, 2014). Given that the beliefs that teachers hold can affect their behaviour in the educational setting (Rubie-Davies et al., 2011), teachers' gender-related beliefs about the learning behaviour of boys and girls might sustain existing, possibly undesirable, situations with regard to the expectations and education of boys and girls. Thus, girls might be viewed as less competent in science, technology, engineering and mathematics (STEM). Teachers with gender-related beliefs concerning the mathematical abilities of boys and girls, for example, might advise their students differently regarding future study choices based on their gender, even if their learning outcomes are identical. Despite efforts to diminish inequity, and despite the increasing participation of girls in STEM fields the choices that students make might continue to be influenced by the gender-specific expectations that their teachers hold regarding the career roles of boys and girls (Booy, Jansen, Joukes, & Schaik, 2011).

Little is known about teacher-related factors that are associated with the development and persistence of such gender-related beliefs. Therefore, the focus of the current study is on teacher gender and teaching domain. There is some evidence that teacher gender may play a role, with female teachers tending to hold stereotypical gender views with less strength than their male colleagues (e.g., Cushman, 2010). Furthermore, research has suggested that female teachers tended to have stronger egalitarian views about gender roles than male teachers do, particularly with regard to employment roles (Almutawa, 2005; Tatar & Emmanuel, 2001) although this is not a consistent finding. Nosek, Greenwald, and Banaji (2002a), for example, reported no differences between males and females. Studies have also established the gender-specific character of certain subjects, with science, technology engineering and math (STEM) being particularly likely to evoke associations with gender (Vassilou, 2010). The focus on *teaching domain* is important because working in 'gender-specific' domains may be associated with having more pronounced gender-related beliefs about ability (Leslie, Cimpian, Meyer, & Freeland, 2015). This study suggested that practitioners in gender-specific domains were particularly likely to believe that raw, innate talent is the most important requirement for success and that the underrepresentation of women in such fields was related to the stereotypical view that women do not possess such talent. For this reason, the current study also considers teaching domain (i.e., STEM versus non-STEM).

The current study focuses on the beliefs of teachers in three areas: beliefs concerning *the aim* of learning in the long term (value orientation with respect to career versus family), *the alleged abilities* of specific students (capacities in STEM and non-STEM subjects) and *the ways in which* learning takes place (learning styles). The first area concerns the *career choices* that girls and boys make. Beliefs may influence these choices, regardless of how realistic preferences for the same career opportunities might be. Despite shifts in attitudes towards various career paths (CBS, 2012; Patten & Parker, 2012), stereotypical images of male and female roles and role expectations may continue to play a role in the choices that students make (Corell, 2001; Favara, 2012; Scantlebury, 2009; Schneeweis & Zweimuller, 2009).

The second area of beliefs concerns the *alleged abilities* of boys and girls. Some subjects tend to be characterised as gender-specific. Language, for example, is largely associated with the abilities of girls (Burman, Booth, & Bitan, 2008; Eriksson, Marschik, Tulviste, & Gallego, 2012; Rua, 2006), while the natural sciences and mathematics are largely associated with boys (Hill, Corbett, & St. Rose, 2010; Nosek, Banaji, Greenwald, 2002; Vassilou, 2010). Stereotypes concerning the mathematical abilities of women might be transmitted to girls by parents and teachers, thereby shaping the attitudes that girls have about mathematics and ultimately undermining their performance and interest in STEM fields, even for those who are positively inclined towards mathematics (Shapiro & Williams, 2012). Empirical evidence has demonstrated that negative stereotyping of the performance of girls in STEM subjects had a negative effect on their performance targets, results, interests and self-esteem (Steffens & Jelenec, 2011). Studies have further identified self-esteem as a crucial factor affecting study choices (Alting, 2003; Korpershoek, 2010; Van Langen & Vierke, 2009; Wigfield & Eccles, 2000; Zeldin & Pajares, 2000).

Finally, the current study examines beliefs related to possible *gender-related learning styles*. Much has been written about specific female and male characteristics relating to learning styles and strategies, including a tendency on the part of boys to be more competitive, hierarchical, less interactive and goal-orientated, while girls tended to be more cooperative (Bachman, Hebl, Martinez, & Rittmayer, 2009). As compared to girls, boys have been identified as learning in a more assertive (Feingold, 1994) and undirected (Severiens & Ten Dam, 1997) style, based on concrete experiences (Garland & Martin, 2005). Furthermore girls tended to want their teachers to be on their side (Tatar, 1998). In contrast, boys were less likely to ask for help (Pomerantz, Altermatt, & Saxon, 2002). Notions about possible differential learning styles of

boys and girls figure prominently in the more popular scientific literature (Gurian, Stevens, & King, 2008; Sax, 2005).

1.1. Social relevance of the study

The beliefs of teachers in the three areas mentioned could contribute to the continuation of gender inequality with regard to learning outcomes, interests, levels of beliefs in science abilities (OECD, 2011) and choices relating to study and career.

In both the scientific field and the more popular genres, many books and articles have been written with innuendoes regarding gender differences. One of these innuendoes has to do with the existence of distinct male and female brain patterns, thus justifying the recommendation that boys and girls should receive specialised education (e.g., Sax, 2006). One important problem with many texts is a tendency to dichotomise gender differences (Derks & Krabbendam, 2013; Kirschner & Van Merriënboer, 2013; Van Langen, Rekers-Mombarg, & Dekkers, 2006). While teachers who read popular science magazines achieved more general knowledge, they were also more likely to believe in neuromyths (Dekker, Lee, Howard-Jones, & Jolles, 2012). The findings reported by Dekker et al. (2012) suggested that teachers find it difficult to distinguish pseudoscience from scientific facts. Popular books and articles are easy to read, they sell well, and they are flooding the educational field.

Educational publishers are responsive to the interest in neuroscience in the classroom, with some focusing specifically on different teaching strategies for girls and boys (Gurian, Stevens & King, 2008). Such publications might influence the beliefs of teachers, possibly reinforcing the 'either-or' approach to such issues. Moreover, they have the potential to entrench stereotypical ideas within standard educational practice.

From a broader perspective, such dichotomised thinking could sustain inequality in economic status and reduce the future earning levels of women (OECD, 2011). With the current study, we aim to contribute to the body of knowledge regarding the presence or absence of gender differences. This information could help to develop a more balanced view regarding gender differences in teachers.

1.2. Explicit and implicit measurement

In studies on attitudes and beliefs, it is important to distinguish between explicit and implicit research techniques (Fazio & Olson, 2003; Pearson, Dovidio, & Gaertner, 2009; Van den Bergh et al., 2010; Wittenbrink & Schwarz, 2007). Explicit measurement techniques involve the use of interviews, self-reports and questionnaires in which participants are able to reflect on their responses. Although this approach is valuable, in that it taps into the beliefs that are knowingly endorsed, the information it generates may be subject to social desirability bias (Cunningham, Preacher, & Banaji, 2001; Hornstra, Denessen, Bakker, Van den Bergh, & Voeten, 2010). Implicit measurement techniques are based on measuring the automatic, unconscious associations made by participants. These techniques reduce the likelihood of social desirability bias (Greenwald, McGhee, & Schwartz, 1998).

A previous study on beliefs regarding career and science combined explicit and implicit techniques (Nosek, Greenwald and Banaji, 2002). The participants in that study exhibited a tendency to make implicit associations of male with career and female with family ($d = 0.72$), with the explicit measures revealing similar but slightly weaker links ($d = 0.50$). Although both men and women linked male gender to career and female gender to family, men exhibited relatively strong associations on both implicit and explicit measures (0.66 resp. 0.62), while the implicit measure revealed stronger effects for women than did the explicit measure (0.76 resp. 0.43). The participants showed similar associations of male gender with science and female with liberal arts according to both implicit ($d = 0.72$) and explicit ($d = 0.73$) measures.

The results of current studies on implicit techniques in social-psychological research suggest that their use within education research is

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