"Women's ways of knowing" among female Saudi student teachers: Implications for teaching and learning

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This exploratory quantitative research investigated how "women's ways of knowing" (WWK) apply to female Saudi student teachers, and aimed to provide a useful contribution for further prospective study about this subject. The study used the Attitudes to Thinking and Learning Survey (ATTLS) questionnaire to investigate two such ways of knowing: separate and connected knowing (forms of procedural knowledge). Participants were 190 female Saudi student teachers. Results showed that participants used predominately connected, not separate, ways of knowing. The study concludes that the use of connected versus separate ways of knowing may conform to the ideals of one's society rather than one's personal preference or learning style. Suggestions for education of Saudi female teachers are provided on this basis.

Introduction

Epistemology is concerned with one's own beliefs about the nature of knowledge. It asks the questions, "How do we know what we know? And, how do our beliefs about knowledge and knowing influence learning" (Burr & Hofer, 2002, p. 178). The research on students' epistemological development led by Perry (1970) showed that American college students shift in their way of making sense of their experiences, from being receivers to constructors of knowledge. Recently, students' critical thinking skills have been linked to their views about knowledge (e.g. Limon, 2006; Kuhn & Weinstock, 2002; King & Kitchener, 2004). In fact, personal epistemology of knowledge and ways of knowing are linked to academic learning as a cognitive process that involves using various skills, such as those of interpretation, validation, evaluation, and making judgments to acquire and process information (Hofer, 2001). However, college students' epistemological development has been investigated extensively. For instance, William Perry (1970) classified students' ways of knowing into four stages: dualism, multiplicity, relativism, and commitment; Belenky, Cinchy, Goldberger and Tarule (1986), who focused their research specifically on women's ways of knowing; and Baxter-Magolda (1992) who also studied ways of knowing in relation to gender. Moreover, Galotti, Drebus and Reimer (2001) extended the work of Belenky and her colleagues (1986) looking into whether or not students' ways of knowing represent individual learning preferences or gendered intellectual capacities within female and male students. Galotti and his colleagues investigated 192 students at a rural college in Minnesota. Galotti et al.'s (2001) work showed that women and men do in fact use different approaches to engage in the learning process. Women tend to prefer a connected way of knowing, which seeks to understand others' viewpoints before evaluation, whereas men prefer the separate way of knowing, which excludes emotions and feelings and focuses on developing a critique of others' viewpoints. Galotti et al. (2001) concluded that these preferences do not, however, predict academic performance for either gender.

The present study adopts the work of Belenky and her colleagues (1986) on women's ways of knowing (WWK) to examine how female Saudi student teachers approach learning. The focus was on connected and separate knowing, the two aspects of procedural knowing. Connected and separate approaches were the most studied approaches to ways of knowing, as they utilise advanced critical thinking skills such as interpretation, evaluation and judgment (Galotti, 1999). Extending the work of Perry (1970), Belenky, et al (1986) investigated women's epistemological beliefs. The authors classified women's ways of knowing into five: silence, received, subjective, procedural (broken down into separate and connected), and constructed knowing. Perry's original work on students' epistemology is considered to be the first theory that focuses on the influence of college academic experiences on students' beliefs about the source and the nature of knowledge — or their personal epistemology. The problem with Perry's theory, however, was the fact that sample was predominantly male. Belenky and her colleagues wanted to identify whether Perry's scheme of students' epistemology also reflected female students' epistemology.

In the field of teacher education, much research has been conducted on the impact of teachers' personal epistemologies on teaching and learning, for example, by Schommer (1990; 1994), Lyons (1990), Richardson, Anders, Tidwell and Lloyd (1991), McAnnich (1993), Sutton et al. (1996), Fang (1996), Stanton (1996), Hofer (2001), Hammer and Elby (2002), Brownlee (2004), Poerksen (2005), Hargreaves (2005), Mansour (2013), Asikainen, Viholainen and Hirvonen (2014), Löfström and Pursiainen (2015), and Cam (2015). The importance of epistemology in the field of teacher education lies in the fact that student teachers' ways of knowing plays an essential role in shaping their understanding and future practices, working "as a filter through which all education experiences are viewed" (Sutton et al., 1996, p. 414). This bears out the speculation of Hammer and Elby (2002) and Brownlee (2004) that if a teacher holds dualistic epistemological beliefs, he/she will most likely employ a passive way of teaching, while those who are relativists more likely use an active teaching approach. That is because dualist teachers would not expect students to question the information delivered, nor expect any input from them; whereas relativist teachers would encourage students to question and seek clarification from different resources.

Given the fact that the Saudi educational system has adopted a single-sex schooling model from K-12 and also through college, and that Saudi Arabia is widely considered an unusually homogenous society, the present study raises the question of whether or not the standard classification of women as predominately connected knowers is also true for female Saudi student teachers. Belenky and her colleagues pointed out that these ways of knowing vary across cultures, where some are valued more than others from culture to culture. In Saudi Arabia, silence, for example, is considered a sign of respect to elders, not a sign of weakness or hopelessness as in some other cultures. In addition, empathy, care and connectedness (which are traits of connected knowers) are used often by Saudi women to deal with their interpersonal relationships.

Few studies have investigated the effect of socio-cultural context on students' epistemological beliefs in Saudi Arabia, and no study has specifically investigated them

from the perspective of the theory of women's ways of knowing. Saudi scholars interested in epistemology have used the work of Schommer (1990), who suggested five epistemological dimensions to assess students' epistemological beliefs (e.g., Al-Galib, 2004; Al-Salhi, 2001; Ali &Ammar, 2005; Ismail & Abdel-Majeed, 2006). For example, Ali and Ismail (2005) examined gifted Saudi students' epistemological beliefs as predictors of cognitive engagement, perceived linguistic competence, and academic achievement. The study found that gifted students displayed more sophisticated epistemology than non-gifted students. The study also found that a high level of epistemology was a strong predictor of high engagement, achievement, and linguistic competence. However, only one study, by Khine and Hayes (2010) has investigated the theory of women's ways of knowing within an Arab context. The study investigated 176 female Emirati student teachers in their first year in the program, and found that most of the participants preferred connected ways of knowing. In Saudi Arabia, women's ways of knowing have received no attention in the field of teacher education.

The Ministry of Higher Education stated in 2013 that women represented 56.6% of Saudi university students, with an expectation of an increase in the future (Ministry of Higher Education, 2013). However, in order to understand women's ways of knowing, and why cultural and educational backgrounds of Saudi female prospective teachers may be unique, this study will begin by surveying in more detail the literature on epistemological beliefs, in preparation for an investigation of female Saudi student teachers' ways of knowing. It presents results gathered using the *Attitudes to Thinking and Learning Survey* (ATTLS), focusing on two ways of knowing — separate and connected knowing, the aspects of procedural knowing — and draws some implications, and concludes by providing some suggestions for Saudi teacher education.

Women's ways of knowing (WWK)

The theory of women's ways of knowing (1986) was influenced by the work of Perry (1970). Originally, Perry focused on understanding Harvard students' conceptions of knowledge, and how these conceptions changed over time. At the time of Perry's study, most college attendees were males.

Belenky and her colleagues believed that women had been largely ignored in previous educational psychology research. To understand woman's voices and ways of knowing, they interviewed 135 women from different ethnic and educational backgrounds, asking them about their self-perception, decision-making process, interpersonal relationships, and views of knowledge and truth. From these interviews, Belenky et al. (1986) developed a theory that represents five perspectives from which women construct their views of the world and knowledge. The five perspectives are silence, received knowledge, subjective knowledge, procedural knowledge, and constructed knowledge.

Regarding the first epistemological perspective, silence, according to Belenky et al. (1986) silent women live their lives in fear of a male figure, for example a father, husband, brother(s), or (other) figure of authority. These women have learned to be silent because

they have lived their lives afraid to use words to express their thoughts and ideas; or as Belenky et al. (1986) put it, words are viewed by these women and in these situations as a "weapon": if used by the women themselves, they will be punished, and when used by the authority figure, they give form and force to orders and rules that the "silent" or non-verbal women view themselves as unable to follow, understand, or remember; Therefore, these women have less confidence in "their abilities to learn from their own experience than they have in learning from the words that others use" (p. 26). They may believe that they are intellectually unable to understand, remember, or receive knowledge. However, women who have made it to college are more likely see themselves as capable of receiving, understanding, remembering, and passing information on to others (Belenky et al., 1986). Yet, women in that position of receiving knowing still often view (an) authority as the only source of knowledge, truth, and/or guidance. These women may feel themselves able to handle and transmit ideas, but still do not trust their inner voice to generate ideas or reflect on their experiences. They perceive knowledge as right or wrong, true or false, or white or black (p. 37). The meaning of learning is seen by them as receiving, retaining, and returning the words of authorities.

The third stage of women's ways of knowing is that of subjectivism. Subjective knowers are no longer attached to authorities as the source of knowledge, and instead are able to rely on their inner voices and experiences to achieve knowledge and "truth" (Belenky et al., 1986). The shift from being a receiver of knowledge to a subjective knower is one that is forced at some point in a woman's life, for example to deal with neglectful parents, an abusive father or husband, sexual harassment, or physical danger. They became suspicious of the information given by the authorities and come to rely on their "gut" to direct their actions. Truth and knowledge to them are intuitive and based upon feelings, not reason or logic (1986). Belenky and her colleagues noted that "subjectivism is dualistic in the sense that there is still the conviction that there are right answers" (p. 54). Subjective knowers do not accept knowledge derived from books, and scientific or empirical research, and believe that information, which derived from them, is secondary to that gathered directly from real-life situations.

Belenky and her colleagues (1986) indicated that the transition from received knowing to subjective knowing was caused by the academic challenges women faced during college. For received knowers, "[t]he demands of college were counter to the expectations of a received knower; these women either dropped or were pushed out or advanced cognitively" (Love & Guthrie, 1999, p, 20). Losing trust in male authority within the family, gaining confidence and trust in regard to their inner weaknesses or points of difficulty, and being exposed to different viewpoints and opinions all contributed to this shift. The further transition from being a subjective knower who relies on intuition to yield a personal truth to a knower with a more objective way of looking at truth and others' opinions happens as a result of engagement in challenging academic experiences (Belenky et al., 1986).

Procedural knowers, the fourth stage, approach truth and knowledge as conditions that can be learned and attained through a certain process. These women start to gain conversancy with the "voice of reason" as a result of encounters with authority figures

such as teachers who challenge their thinking and their views about truth and encourage them to understand and respect others' opinions (Belenky et al., 1986). Procedural knowers no longer see authority as a source of knowledge that they must suppress their own voices to take part in, but as a source of guidance to find answers through following the right procedures, that is, procedures that use critical and analytical thinking to evaluate and judge. At this point, the issue to be judged or determined in discussion is not the goal of the procedural knower but the methodology of knowing to be adopted. As they do so, they experience complicated issues and contradictory information that may conflict with their inner voice and require them to apply objective analysis (Belenky et al., 1986). They start to really listen to and observe the world around them, to better understand what processes people use to form their ideas and beliefs.

Belenky and her colleagues identified two types of procedural knowing: connected and separate knowing. Women who are procedural knowers use both of these to understand and analyse others' opinions. Separate knowers are oriented toward validating ideas. They play "the doubting game" (Elbow, 1973), wherein they look for mistakes or errors in an argument in order to (in)validate it. Knowledge is doubted until it is proven worthy of adopting (Belenky et al., 1986). Separate knowers develop the critical thinking skills of analysing and evaluating an argument, and become less aggressive and judgmental. What differentiates separate knowers from connected knowers is that "feeling and beliefs are rigorously excluded" (p. 109): their acquired critical thinking skills are not part of "who they are," but merely "how they know" or "their way of looking" (p. 97).

In contrast, connected procedural knowers try to understand others' opinions and actions. As with all procedural knowers, they become less judgmental, with more engagement and personal involvement. They play the "believing game" (Elbow, 1973) believing that other people's stories and experiences can be a valuable source of truth and knowledge. They are willing to "open up to receive another's experience into their own minds" (p. 122).For example, One of the women in Belenky et al.'s study talked about her way of understanding a book she was reading, saying, "I tend to try to read the mind of the author behind it and ask, why he wrote that? What happens to him when he wrote that" (Belenky et al., 1986, p. 113).

Belenky et al. (1986) stated that connected knowing is not gender related, "we all encounter men, in person and in print, who speak in this voice. Separate and connected knowing are not necessarily gender-specific; while the two modes may be gender-related" (Belenky et al., 1986, p. 102). Other scholars such as Baxter-Magolda (1992) reported that in moral dilemmas that required judgments, women more often than men based their decision on empathy, one of the characteristics of a connected knowing, that attempts to understand other people's experiences (Gallotti, 2001).

Lastly, women who move to a constructed way of knowing are those who integrate multiple sources of information and expand the possibilities for multiple answers, even to simple and obvious matters (Belenky et al., 1986, p. 138). They evaluate, reflect on, and re-examine their own and others' ways of thinking, and believe that there is no absolute answer or single and perfect argument that settles the problem, but instead that "[a]ll

questions vary depending on the context in which they asked and on the frame of references of the person doing the asking" (p. 138). When feeling conflicted in their thoughts, constructed knowers try to work out this conflict through conversation, and never let one side silence the other. This internal conversation proceeds constantly with logic, which requires them to be objective and follows critical thinking, and feelings. Constructed knowers are similar to subjective knowers in their belief that they have the power and ability to construct their own truth and knowledge, but they differ in the source(s) that they use in this quest for self. That is, subjective knowers construct truth from personal experiences only, whereas constructed knowers use many sources to settle on facts about truth and knowledge (e.g., the self, logic, context, authorities).

Connected and separate (procedural) approaches are the most frequently investigated approaches of knowing. They have been seen as modes of thinking in which the reasoner constructs or adopts one or more means of "obtaining, reflecting on, evaluating, and communicating knowledge" (Belenky, Clinchy, Goldberger & Tarule, 1985; Galotti, 1999, p. 19). Women who were identified as procedural knowers (in the Belenky et al. study) showed different thinking skills, involving analysis, understanding, and evaluation. Even though the authors of the WWK theory explicitly denied that these two approaches were gender related, several studies have found that the use of one of these or the other is gendered: the separate approach is more connected with men and the connected approach with women (Clinchy, 1990; Baxter-Magolda, 1996; Knight et al., 1995; Galotti et al., 1999; Galotti, Drebus & Reimer, 2001). Galotti et al. (1999) developed the *Attitudes to Thinking and Learning Survey* (ATTLS), a questionnaire containing 20 items that correspond to statements reflecting both separate and connected knowing experiences. Based on the results of the implementation of the questionnaire, Galotti et al. (1999) concluded not only that connected and separate knowing are gendered, but also that they illustrate learning preferences, but do not define students' cognitive abilities.

Since its emergence in the 1980s, the theory of women's ways of knowing has generated further research investigating different factors influencing students' epistemological development, studies of what teaching methods can support students' epistemological development, and studies that compare male and female students' ways of knowing (Philbin, Meier, Huffman & Boverie, 1995; Sternberg & Grigorenko, 1997; Chang, 2004; Kang, 2008; Buehl & Fives, 2009; Sandoval & Cam, 2011). The present study focuses on two ways of knowing, separate and connected, among female Saudi student teachers.

Objective of the study

Women constitute more than half of undergraduate students in Saudi Arabia, yet they are under-represented in research related to students' epistemologies and ways of knowing. As a result, the present exploratory study focuses on two ways of knowing as manifested by female Saudi student teachers. Saudi women study and develop their ways of knowing in segregated schools, apart from males (whether students or instructors). Further Saudi Arabia is a relatively homogenous society in terms of ethnicity, culture, religion, language, and values. The present study raises questions about the possible influence of Saudi

cultural and educational characteristics on female student teachers' ways of knowing. Specifically, the present study investigated the following questions:

1. What is the dominant way of knowing among female Saudi student teachers at Princess Nourah bint Abdulrahman University?
2. Is there a significant difference between the ways of knowing of student teachers majoring in English and in Arabic elementary education at Princess Nourah bint Abdulrahman University?
3. Is there a cultural difference between female Saudi students' ways of knowing and those set out in the original WWK theory (Belenky et al., 1986) and the results of similar studies within different contexts?

Methods

Participants' background

The cultural background of female Saudi students is unique. Saudi Arabia is located in Southwest Asia and has a population of approximately 30 million people. Saudi Arabia is a conservative society, governed by Islamic religious law that tries to maintain a conservative version of Islamic beliefs and values. Since the discovery of oil and the beginning of oil production in the 1940s, Saudi Arabia has experienced major economic, social, and political change. Along with greatly increased oil revenue in the 1970s and 1980s, Saudi Arabia experienced changes to society that affected people's lifestyles in various ways, including the expansion of education for women. Nevertheless, until 2002, women's education in Saudi Arabia was overseen by the Department of Religious Guidance "to ensure that women's education did not deviate from the original purpose of female education, which was to make women good wives and mothers, and to prepare them for 'acceptable' jobs, such as teaching or nursing, that were believed to suit their nature" (Hamdan, 2005, p. 44). Today, in contrast, higher education in Saudi Arabia for women as well as men is overseen by the Ministry of Education. The education system is centralised and relatively standardised across the country. Most female Saudi students graduate with degrees in education, humanities, social sciences, or religious studies, and most of these majors lead easily into employment in the education sector; in 2000, 73.3% of Saudi women employed in the public sector were in education (Calvert & Al-Shetaiwi, 2002). Today, women's roles and responsibilities in Saudi society are subject to various debates and controversies between conservatives and progressives (Hamdan, 2005).

Saudi Arabia is characterised by a high degree of cultural homogeneity, which is reflected in the country's political and cultural values. For historical and religious reasons, the numbers of foreigners from different ethnic and religious backgrounds is low compared to that of non-Saudi Muslim residents. Most non-Saudis in the country are Muslim immigrants from various Arab countries or Muslim countries who came to Saudi Arabia as pilgrims first and resided in the country (Ezzi, Teal & Izzo, 2014). Ezzi, Teal and Izzo (2014) pointed out that "The religiousness and ethnicity of Saudi Arabia's people has created an environment which makes it easier for the Saudi government to enforce a strict Islamic code of conduct among its people, from both political and social viewpoints" (p,

3). The family is the most important social institution, and individuals are expected to adhere to their families' values, which in turn are expected to exemplify the values of other families and the rest of Saudi society. The segregation of education by sex is an important characteristic of Saudi Arabia's education system, implemented in response to Islamic rules that discourage mixed-sex organizations. From elementary to postsecondary education, women attend separate schools and universities and are taught by female instructors only.

It is beyond the purpose of this study to examine Saudi women's issues in general or in relation to education in general, but keeping in mind these basic characteristics of Saudi society and education will help us consider how these cultural dimensions might influence female Saudi students' epistemological beliefs. Students' epistemological beliefs are created outside the self under guidance from an authority (Hofer, 2000) and in order for them to be able to construct their own knowledge and truth without reference to authorities or peers, students should be involved in academic experiences that promote epistemological development. Belenky et al. (1986) showed that women have various distinctive sources of knowledge that shape their beliefs about knowledge and truth and thus their ways of knowing. Given the above-mentioned characteristics of Saudi culture and the role of women therein, Saudi women may hold similarly distinctive beliefs about truth and knowledge. Further investigation of Saudi women's ways of knowing is needed to understand how different sources of knowledge have shaped them.

The participants in this study were 190 female Saudi student teachers in the last semester of their teacher-training program at Princess Nourah bint Abdulrahman University. The participants' ages ranged from 21 to 23. All were majoring in elementary education, as elementary language teachers of either English (111, 58.4%) or Arabic (79, 41.6%). All participants had conducted at least 120 hours of school observation for their general methods course and their special methods courses for teaching Arabic or English languages (respectively).

Instrument and procedure

These female Saudi student teachers' ways of knowing were investigated using the *Attitudes to Thinking and Learning Survey* (ATTLS), developed by Galotti, Drebus and Reimer in 2001 on the basis of the work of Belenky and her colleagues (1986). In 1999, Galotti, Clinchy, Lavin and Mansfield reflected the findings of the original interviews gathered by Belenky and her colleagues in an instrument with 50 items. Later in 2001, Galotti, Drebus and Reimer refined the 50 items into a valid, reliable 20-item instrument. The ATTLS contains 20 statements equally exemplifying both separate and connected knowing. Each item is answered on a seven-point Likert-type scale ranging from 1 (strongly disagree) to 7 (strongly agree). The ATTLS (2001) was used in the study titled *Investigating women's way of knowing: An exploratory study in the UAE* by Khine and Hayes (2010). Khine and Hayes sought the original authors' permission to use the ATTLS and translate it into the Arabic language; the Arabic version was tested for internal consistency using Cronbach's alpha, which yielded an acceptable reliability of 0.62 (Khine & Hayes,

2010). The current study sought Khine and Hayes's permission to use the Arabic version of the ATTLS with a group of female Saudi student teachers.

At the time of the distribution and collection of the ATTLS questionnaire, the participants were at the end of their practicum semester and were participating in a seminar course, reflecting on their practicum experiences. This requirement and the overall requirements for the elementary education major for both programs were similar; all courses were taken in Arabic except courses related to special teaching methods for the English language teaching and courses related to the English curriculum. The researcher used the last 30 minutes of the seminar periods to distribute the questionnaire where she introduced the research purpose and instructed the participants on how to answer the questionnaire. Upon receiving the ATTLS, students were given 15-20 minutes to complete the questionnaire and were encouraged to read the instructions and not think for long about the questions. Descriptive analysis was conducted on the responses using the statistical analysis software package, *SPSS*. The analysis included the calculation of mean scores and standard deviations for both groups as well as t-tests for comparison of results across groups.

Findings

First, the study analysed current ways of knowing among these female Saudi student teachers. As Table 1 shows, the mean score for connected knowing was 54.34, with 70 being the maximum score for connected knowing. The mean score for separate knowing was 39.92, with 62 being the maximum. This indicates that the participants prefer connected to separate ways of knowing. Individual scores ranged from 23 to 62 for separate knowing, and from 28 to 70 for connected knowing; standard deviations were approximately equal for both.

Table 1: Means and standard deviations for connected and separate knowing

Statistics	Mean	Std. dev.	Range	Minimum	Maximum
Separate knowing	39.926	8.10989	39.00	23.00	62.00
Connected knowing	54.347	8.16140	42.00	28.00	70.00

Table 2 presents the results of a t-test on these data, which showed them to be statistically significant. It can be concluded that respondents have significantly higher scores on the connected knowing subscale than on the separate knowing subscale ($t = -19.27$, $p = 0.000$).

Next, the study investigated whether there was a difference between elementary English student teachers' and elementary Arabic student teachers' ways of thinking. The analysis revealed that both groups scored high on their preference for using connected ways of knowing. Table 3 and Figure 1 summarise the scores for each group. For prospective English teachers, the mean score for connected knowing (55.00) was higher than the score for separate knowing (39.93); scores ranged from 23 to 61 for separate knowing and from 28 to 69 for connected knowing, and the standard deviations were approximately equal

for both. For prospective Arabic teachers, the mean score for connected knowing was 53.43, higher than the score for separate knowing (39.92); scores ranged from 23 to 62 for separate knowing and from 32 to 70 for connected knowing, and the standard deviations were approximately equal for both.

Table 2: Sample t-test

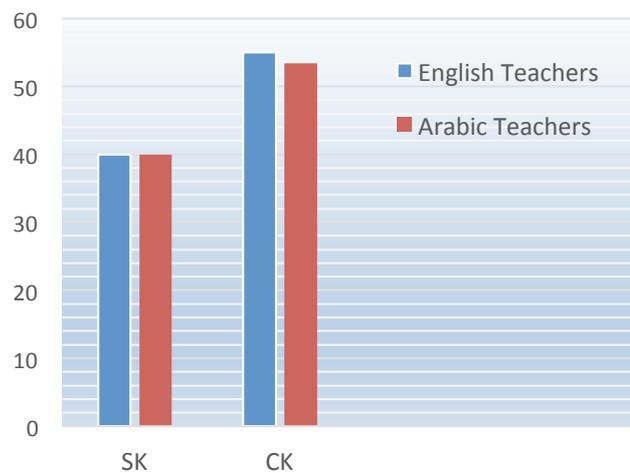|		Differences within pair							
		Mean	Std. dev.	Std. error of the mean	95% confidence interval of the difference		t	df	Sig. (2-tailed)
					Lower	Upper			
Pair 1	Separate knowing vs. Connected knowing	-14.1188	9.2684	0.7327	-15.566	-12.672	-19.27	159	0.000

Figure 1: Separate knowing (SK) and connected knowing (CK) mean scores

Table 3: Means and standard deviations for connected
and separate knowing across groups

Group		N	Mean	Std. dev.	Std. error mean
Separate knowing	Arabic teachers	72	39.9167	8.50642	1.00249
	English teachers	103	39.9320	7.86312	0.77478
Connected knowing	Arabic teachers	68	53.4265	8.85592	1.07394
	English teachers	96	55.0000	7.61163	0.77686

Last, to answer the question regarding the significance of the difference between elementary English teachers and elementary Arabic teachers with respect to ways of knowing, an independent-samples t-test was conducted. Levene's test for equality of variances was not significant for separate knowing, which means we do not have reason to

assume that variances are not equal (Table 4). However, for connected knowing, the test was significant at the 0.05 level, so equal variance could not be assumed. Table 5 presents paired-samples t-test results. The differences between the groups were not found to be significant. It can be concluded that there is no significant difference between the use of connected *vis-à-vis* separate ways of knowing between prospective English teachers and prospective Arabic teachers, according to their separate knowing scores (t(173) = -0.012, p = 0.990) and their connected knowing scores (t(130,301) = -1.187, p = 0.237).

Table 4: Levene's test for equality of variances

	F	Sig.
Separate knowing	.272	.603
Connected knowing	4.932	.028

Table 5: Paired-samples t-test

		t-test for equality of means						
		t	df	Sig. (2-tailed)	Mean difference	Std. error difference	95% confidence interval of the difference	
							Lower	Upper
Separate knowing	Equal variances assumed	-0.012	173	0.990	-0.01537	1.24940	-2.48140	2.45065
	Equal variances not assumed	-0.012	145, 111	0.990	-0.01537	1.26699	-2.51951	2.48877
Connected knowing	Equal variances assumed	-1.218	162	0.225	-1.57353	1.29167	-4.12422	0.97716
	Equal variances not assumed	-1.187	130, 301	0.237	-1.57353	1.32546	-4.19574	1.04868

Discussion

The results of the study show that connected (procedural) knowing was the predominant way of knowing among female Saudi student teachers majoring in elementary English and Arabic at Princess Nourah bint Abdulrahman University. The initial finding of the study is consistent with earlier findings of similar studies with samples from Western societies (Belenky et al., 1986; Baxter-Magolda, 1990; Sutton et al., 1996; Galotti et al., 2001; Schommer & Easter, 2006; Marrs & Benton, 2009).

The role of women in Saudi culture is to maintain the structure of the family by preserving Saudi customs and tradition (Vidyasagar & Rea, 2004). As part of this role, they are expected to value family cooperation; but this does not imply that women are not expected to actively participate in the development of their society, be ambitious, or be independent. Nevertheless, the culture of Saudi Arabia expects women to think within the context of being a mother, a wife, or a sister. Women in Saudi Arabia are expected to maintain connectedness to their family. Therefore, we speculated that procedural knowing as manifested by our participants would reflect Saudi cultural beliefs and expectations of women rather than or more than the women's own independent choice of cognitive

learning styles (see Galotti, 1999; 2001). One aspect of this is that their procedural knowing would be connected rather than separate.

The fact that most of the participants indeed proved to be connected procedural knowers may explain why these women chose to be teachers. In Saudi Arabia, teaching is considered a profession of the highest rank of honor, since teachers are responsible for educating future generations (Elyas & Picard, 2010). These beliefs about the teaching profession are rooted in the general culture and social beliefs of Saudi Arabia. The Prophet Muhammad is considered the first teacher of Muslims around the world, and his example and the honor given to teachers could explain why most Saudi female university graduates become teachers (Calvert & Al-Shetaiwi, 2002).

Furthermore, teachers are expected to be empathetic, and empathy is one of the characteristics of connected knowers (Belenky et al., 1986). Teachers use feeling and emotions to communicate with each other, with their professors, and later with their students. Clinchy (2000) pointed out that connected knowers spend more time sharing their feelings and stories with others. Emotions, connections, care, and sensitivity are the dominant parlance used by Saudi women at home, at school as students, and later as teachers (Khine & Hayes, 2010). With this cultural background in mind, we can see how connectedness could have become a habit of female Saudi student teachers.

In addition, Galotti (2001) and Schommer-Aikens and Easter (2006) have argued that students' orientation toward one way of knowing over another is affected by their teachers. Many studies speculate that teachers' ways of knowing affect their choice of what to teach and how to teach it. The current study considered a sample of (female) students taught only by Saudi female professors. In light of the discussion above, we may assume that Saudi female professors in the School of Education at Princess Nourah bint Abdulrahman University use teaching approaches that emphasise connection over separation and encourage collaboration rather than debate. Supporting this interpretation, Khine and Hayes (2010) argued that "matching" teaching methods with students' epistemological beliefs is a possible explanation for student teachers' ways of knowing. Comparison between student teachers' and their faculty members ways of knowing could explain student teachers' orientation toward one way over another.

It is important not to forget here that large numbers of the study sample were separate rather than connected knowers. This finding generates certain additional questions related to students' majors and the courses they took during their professional development years. For instance, the fact that English teachers preferred a separate knowing approach to a greater degree than Arabic teachers did could be related to the fact that students majoring in Arabic education are exposed more to courses related to Islamic studies and the Arabic language, while on the other hand, students majoring in English education have more exposure to content or topics related to Anglophone culture and global culture generally. All these speculations need direct testing, however. No research has been found that directly addresses the issue of whether or not student teachers' ways of knowing vary across different majors. Further investigation is required to illuminate this issue in teacher education.

Another point needing further exploration is rooted in the point made by Belenky et al. (1986) that women who have reached college and have succeeded in developing their own voice had been taught by a generation of male teachers. The case is the opposite for female Saudi students; they have been taught all their lives by female teachers only, and have had the opportunity to see more female professors make it in academia. So, how may this fact make a difference in their orientation towards learning? No very substantial speculation can be made due to the absence of research on these issues, especially comparing Saudi female and male ways of knowing. This study reflects openness to new ideas, willing to express ideas, and readiness to take risk within further research employing in-depth interviews providing a rich source of data on factors influencing Saudi students' ways of knowing. In addition, this study was intentionally broad and exploratory, and did not attempt to investigate the influence of Saudi social or religious life on female students' attitudes toward knowing. However, the findings of this study raise many questions that require further investigation. The next section presents some suggestions in that regard.

Suggestions for further research

The absence of research related to female Saudi students' epistemological beliefs in general and women's ways of knowing in particular indicates the necessity to acquire foundational information on this topic. The women's ways of knowing framework incorporates the understanding that these ways can be different for different people in different circumstances, for example with different religions, different cultures, or different professional contexts. Therefore, we make the following observation regarding research gaps and areas for further study.

1. More understanding is needed of the cultural beliefs of female Saudi student teachers and their influence on their ways of knowing.
2. Are male Saudi teachers different from female teachers with regard to ways of knowing?
3. Research is needed to investigate female teacher educators' awareness of women's ways of knowing and its influence on their ways of teaching.
4. Further investigation is needed to understand whether the current orientation toward one approach over the other (that is, connected over separate) influences female student teachers' perceptions of learning and future teaching.
5. A follow-up study is suggested to observe the teaching practices of the current study sample in their actual teaching practice, to see if they develop more sophisticated ways of knowing.

In addition, we derive a practical implication:

6. Student affairs personnel need to recognise how women's ways of knowing might influence women's voices and how the emphasis on one way of knowing over another might (dis)connect women from/to different opportunities.

Conclusion

According to Belenky and her colleagues (1986), women's ways of knowing should not be generalised, since they may differ across cultural backgrounds as well as within specific groups. Given the unique nature of Saudi culture, this study explored these issues within a sample of female Saudi student teachers. The study results showed that these women used predominantly connected as opposed to other ways of knowing, and also suggested that connected knowing may reflect Saudi cultural beliefs and expectations of women rather than the women's own choice of cognitive learning styles. The importance of understanding students' assumptions about knowledge and knowing lies in the fact that it influences students' cognitive process and decision-making and judgment (Hofer, 2001). It might affect their lifelong learning. Therefore, further understanding of these women's ways of knowing and better understanding of the role of epistemology(ies) in various aspects of Saudi teacher education are needed, as discussed in the previous section.

Limitations

This study is limited to a specific sample of 2015 student teacher graduates in elementary English and Arabic language education from the School of Education, Princess Nourah bint Abdulrahman University. Princess Nourah bint Abdulrahman University is the first and only women's university in Saudi Arabia that is managed and overseen by women only. In addition, the elementary education program is the first and only program offered at Princess Nourah University. Therefore, the extent to which the findings are applicable other contexts may be limited.

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