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A New Way of Assessing Ways of Knowing: The Attitudes Toward Thinking and Learning Survey (ATTLS)[1]

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In four studies, college students (both male and female, predominantly white) filled out a 50-item survey consisting of statements illustrating "separate" (critical, detached) and "connected" (empathic) ways of knowing (Belenky, Clinchy, Goldberger, & Tarule, 1986). The instrument showed acceptable internal reliability. Scores on the two scales were uncorrelated, supporting the view that the two epistemological positions are independent. Females consistently rated connected knowing (CK) statements higher than separate knowing (SK) statements, while males showed a slight, but non-significant difference favoring SK statements. When participants were divided into groups using a joint median split of the two rating scores, females were

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disproportionately likely to be placed in the High CK-Low SK group. CK and SK scores were unrelated to performance on a variety of cognitive tasks, but were related to some measures of preference, suggesting that ways of knowing may function more as approaches or styles rather than basic abilities.

A current "hot" topic in educational research is the identification and documentation of different learning or cognitive styles (Claxton & Murrell, 1987; Globerson & Zelnicker, 1989; Rayner & Riding, 1997; Riding, 1997; Sternberg & Grigorenko, 1997). At issue is whether or not there exist stable, predictable, individual differences in the way people acquire, structure, or process information, and approach or perform different learning or problem-solving tasks. Styles are thought to be distinct from abilities, and to involve preferences (not necessarily conscious) in the use of whatever abilities one has. Styles are also thought, at least by some, to vary across context and specific tasks as well as developmental period, and to be socialized by the predominant culture (Sternberg, 1997). Traditionally, cognitive styles have been linked to different personality and motivational factors (Kogan, 1983).

The relation between gender and cognitive or learning styles is a matter of some controversy (see Severiens & Ten Dam, 1997 for a review). In *Women's Ways of Knowing* Belenky, Clinchy, Goldberger, and Tarule (1986/1997) reported on their interviews with 135 women who were current students or recent alumnae at a variety of educational institutions, as well as what the authors term "invisible colleges," human service agencies dealing with clients seeking information on parenting. Women were asked to reflect on such issues as self-image, important relationships, education and learning, real-life decision-making, moral dilemmas, catalysts and impediments to change and growth, and visions of the future (Belenky et al., 1986, p. 11).

The authors described five different epistemological positions, leaving it an open question as to whether and when the different perspectives formed any kind of developmental sequence. The category that has received the most attention, and which will be the focus here, is that of *procedural* knowing, 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, p. 19). Belenky et al. (1985, 1986) identified two distinct types of procedural knowledge, which they named "separate" and "connected" knowing.

Separate knowing, often assumed (mistakenly, the authors claim) to be identical to "thinking," involves objective, analytical, detached evaluation of an argument or piece of work. It often takes on an adversarial tone, involving argument, debate, playing devil's advocate, "shooting holes" in another's position, or critical thinking (Clinchy, 1990). Separate knowers attempt to "rigorously exclude" their own feelings and beliefs when evaluating a proposal or idea (Belenky et al., 1986, p. 111).

Connected knowing, in contrast, involves "walking a mile in the shoes" of a position or piece of work that one may initially find alien. Connected knowers place themselves in alliance with another's position, even when they disagree with it initially. In contrast to separate knowers, "Instead of looking for what is wrong with the other person's ideas, [connected knowers] look for why it makes sense, how it might be right" (Clinchy, 1989, p. 651). Connected knowers try to look at things from the other's point of view, in the other's own terms, and try first to *understand* the other's point of view rather than evaluate it.

Although the authors of *Women's Ways of Knowing* explicitly disavowed the equation of "separate" with "male" and "connected" with "female," there is reason to expect at least some relationship between gender and one's predominant way of knowing. Perry (1970, 1981), who interviewed a largely male sample, failed to report any evidence of the connected stance toward knowledge and learning, whereas Belenky et al. (1986) reported that such a stance was common among the women they interviewed. Baxter Magolda (1992) reported a variety of different reasoning patterns in her longitudinal study of 101 male and female college students that she describes as "relate[d] to, but not dictated by, gender" (p. 369). Other scholars, studying women's experience and responses to moral dilemmas (Gilligan, 1982; Lyons, 1983) reported that women more often than men made moral judgments in terms of personal "care" rather than impersonal "justice," and more often described themselves as connected rather than autonomous in relationships.

Although separate and connected knowing were never proposed as polar opposites, many readers have misinterpreted them in this way (Clinchy, 1996). Clinchy (1998) argues against both reifying a non-existent dualism, and seeing one as a superior way of thinking to the other. Quite explicitly, she has stated that the two modes are *not* mutually exclusive, and "can and do coexist within the same individual" (1996, p. 207).

Belenky et al. (1986), Clinchy (1989, 1990, 1995), Clinchy, Belenky, Goldberger & Tarule (1985), Stanton (1996), and others believe that the existence of distinct ways of knowing requires some re-thinking in academic circles about pedagogy. True connected knowing, Clinchy (1996) argues, requires active work and goes beyond simplistic gut reactions. To view it simply as emoting, or "being nice," or drawing on one's first intuition, is to denigrate a way of relating to knowledge and learning that is a legitimate and effective approach and may be the predominant one for many students, especially women. Conversely, to view separate knowing as synonymous

with "thinking" and to prize it as the epitome of intellectual discourse may hinder the education of large segments of students.

The proposal that there exist gender-related ways of knowing raises a plethora of issues, both theoretical and applied. Assuming different ways of knowing can be demonstrated in other settings with other instruments (thus providing convergent validity for the ideas of Belenky et al.), how are they acquired and how do they operate? For example, do separate and connected knowing operate at the level of basic cognitive processes or components, such as encoding, or drawing inferences? Do different ways of knowing correlate with traditionally measured intellectual abilities? Or, are different ways of knowing more like attitudes, coloring the comfort with which knowers approach or immerse themselves in different tasks? In the studies to be reported below, we made a first pass at some of these important questions.

The *Ways of Knowing* research involved extensive two- to five-hour individual interviews, which were tape recorded and transcribed for coding. Interviews have many advantages, including allowing respondents to use their own categories of response and raise whatever issues they deem important, as opposed to having the data pre-structured by the investigator's hypotheses. On the other hand, interviews are costly, both for the respondent and the investigator, require extensive training to produce skilled interviewers, and demand many hours of labor in transcription and coding. Moreover, interviewer expectations may subtly guide respondents to either take up or gloss over particular issues. For these reasons, we attempted to design a reliable and valid survey measure of connected and separate knowing.

Our efforts in this direction are not the first. Bucynski (1993) developed a paper-and-pencil instrument to assess the full range of ways of knowing (i.e., not just the procedural knowing category focussed upon here), and tested it with 348 female undergraduates. Philibin, Meier, Huffman, and Boverie (1995) also designed a 12-item forced choice instrument to measure some educational dialectics discussed by Belenky et al. (1986) but it does not focus on separate and connected knowing.

Knight, Elfenbein, and Messina (1995), however, developed a written survey instrument to measure separate and connected knowing. This instrument consists of four items measuring separate knowing, nine measuring connected knowing, and 31 filler items (reflecting other epistemological categories described in *Women's Ways of Knowing*). These authors tested and validated the instrument on three samples, one of which included males, and found acceptable internal reliability for both scales (with coefficient alpha in the low .70's for each). Factor structures yielded two distinct components; separate knowing items loaded highly on the first, and connected knowing items loaded highly on the second. Test-retest coefficients for both scales over a 13-week period were in the low .70's.

Our instrument differs from the Knight et al. (1995) instrument in several ways. First, we began with 25 items each for separate and connected knowing, allowing for more precise comparison of the two scales. Second, we created these items from reading through the original papers on *Women's Ways of Knowing* (e.g., Belenky et al., 1986; Clinchy, 1989, 1990), and selecting parts of quotations or descriptions presented there. The first author drafted an instrument to be used for teaching purposes with her Cognitive Processes class; she asked the second author to review and help refine that draft and thus we created the *Attitudes Toward Thinking and Learning Scale* (ATTLS).

Sternberg and Grigorenko (1997) offer five criteria by which proposed cognitive styles can be evaluated. First, a proposal ought to be theoretically grounded. Second, any measure proposed to assess styles should be subjected to analyses of internal validity, including factor analysis, to demonstrate that the structure of the measure is as theoretically predicted. Third and fourth, there must be demonstrations of both convergent and divergent validity of the measures–the measures should show a pattern of correlation (and lack of correlation) given by the theory. Last, the theory should spawn further psychological research. Sternberg (1997) has also cautioned that styles must be distinguished from abilities. If no clear distinction can be drawn, he argues, then the concept of styles becomes redundant and superfluous. He also reminds researchers that people can vary in the strength of their stylistic preferences.

Our paper is divided into two parts. The first presents results on the psychometric testing of the ATTLS, including data on internal reliability and results from factor analyses. Additionally, an analysis of responses as a function of gender is described. The second part of the paper explores the question of whether CK and SK scores reflect styles or abilities, and whether they are related to students' educational activities, cognitive processing, and attitudes.

METHOD AND RESULTS, STUDIES 1–4

For ease of exposition, we present information on participants and the ATTLS instrument first, then review the relation of ATTLS scores to other measures used in each study.

Participants

All participants were drawn from the same midwestern liberal arts college. Specific racial and ethnicity data were not collected; however, the student body of the college is approximately 83% white, 8.5% Asian-

American, 5% Latino/Latina, 3% African-American, .5% Native American. Thus, it can be assumed that study participants were predominantly white. Students were drawn from all four class years in approximately equal proportions, and were not compensated for their time, which averaged about 30 minutes. Participants were recruited by student experimenters on a voluntary basis. Each participant participated in only one of the four studies. Studies 1 to 4 included, respectively, 64 women and 64 men, 57 women and 58 men, 39 women and 33 men, and 41 women and 27 men.

The Attitudes Toward Thinking and Learning Survey (ATTLS)

Participants in all four studies filled out very similar versions of this instrument,[3] and completed one or more other tasks. Order of tasks was counterbalanced across participants in Study 1; participants in Studies 2 through 4 completed the survey after they had completed the other tasks.

The instrument consists of 50 statements, 25 expressing statements exemplifying connected knowing (e.g., "I like to understand where other people are 'coming from,' what experiences have led them to feel the way they do," and "I'm more likely to try to understand someone else's opinion than to try to evaluate it)" and 25 items exemplifying separate knowing (e.g., "I like playing devil's advocate–arguing the opposite of what someone is saying," "In evaluating what someone says, I focus on the quality of their argument, not on the person who's presenting it"). The two types of statements were intermixed in the survey.

Participants were asked to rate their level of agreement with each statement on a 7-point Likert scale (1 = strongly disagree, 4 = neither agree nor disagree, 7 = strongly agree). They were asked not to dwell on statements as they responded to each one. Separate CK and SK scores were obtained by summing ratings of the 25 items exemplifying that type of knowing. The potential range of scores for each type of knowing was 25 to 175, with high scores indicating strong agreement with that style of knowing.

RESULTS AND DISCUSSION

Psychometric Assessment of the ATTLS

Internal reliabilities (computed with coefficient alpha) were calculated separately for Sample 1, who used a slightly different instrument from the

[3]The version of the instrument used in Studies 2–4 was a revision of that used in the first study, with wording on about twenty percent of the items changed to clarify the meaning of the items. Of the 50 items, 34 were identical on both versions of the instrument, and 11 others had minor rewordings in the two versions. Only five items appeared in the second version of the instrument that were not in the first.

other samples, who all used the same instrument and whose data were thus combined in one analysis. For Sample 1 (N = 128), the internal reliability was .83 for the SK scale and .76 for the CK. For the combined analysis of the data for Samples 2–4 (N = 248),[4] the internal reliability for the SK scale was .83, and .81 for the CK scale. These results establish acceptable levels of internal reliability for the instrument.

Correlations were also calculated between SK and CK scores, again separately for participants of Study 1 ($r = -.07$), and then for the combined data from participants of Studies 2–4 ($r = .01$). Neither correlation approached statistical significance. These results suggest that the two "ways of knowing" are in fact independent, as opposed to mutually exclusive.

Factor Analysis of the ATTLS

Individually, the four samples of participants were smaller than recommended for performing factor analyses (150–300; Tabachnick & Fidell, 1996). However, by combining the data from Samples 2–4 (who all used the same version of the instrument), we were able to perform a principal components factor analyses with varimax rotation, on a combined sample of 255. Our purpose was to examine whether or not separate SK and CK factors would emerge. We used a cutoff value of .45 for factor loadings, considered a "fair" magnitude, indicating 20% overlapping variance between a variable and the factor (Tabachnick & Fidell, 1996, p. 677).

Inspection of the scree plot suggested that only two factors should be extracted. The first factor, accounting for 12.4% of the variance, included thirteen CK variables, all loading positively above the .45 cutoff value. The second factor, accounting for 10.8% of the total variance, included 14 SK variables, all loading above the .45 cutoff value.

Gender Differences in SK and CK Scores

We first analyzed CK and SK scores as a function of gender and class year. Once again, we analyzed the results of the first sample separately, and the second through fourth samples together.

Figure 1 presents the mean scores, by way of knowing and gender, for both analyses. The two analyses showed a very similar pattern of results with a main effect of type of score, with CK scores higher than SK scores (for Sample 1, $F\,[1, 120] = 4.69$, $p < .05$, $MS\ error = 265.00$; for combined Samples 2–4, $F\,[1, 246] = 9.55$, $p < .002$, $MS\ error = 246.62$). Neither

[4]Data were excluded from all participants who failed to respond to one or more items.

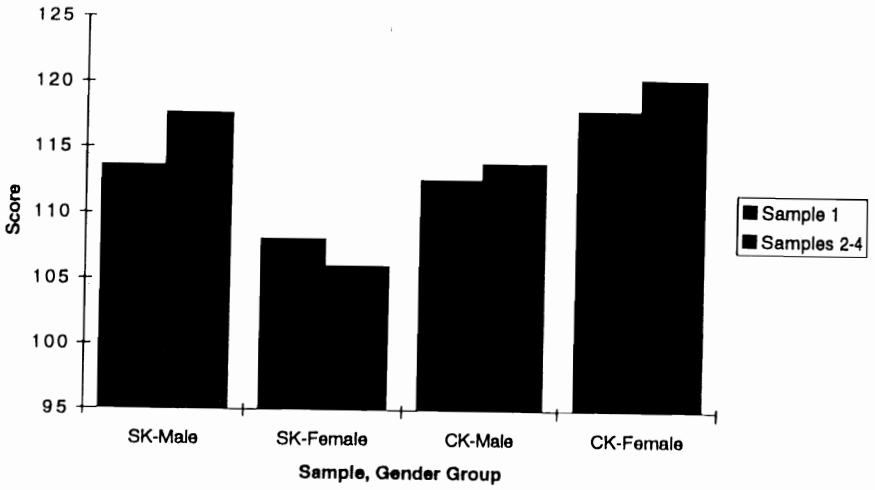

Fig. 1. Mean SK and CK scores by gender and sample.

analysis showed a significant main effect for gender or class year, but both analyses showed a significant interaction between score and gender (for Sample 1, F [1, 120] = 7.10, $p < .01$, *MS error* = 265.00, and for combined Samples 2–4, F [1, 246] = 38.18, $p < .001$, *MS error* = 246.62). Means for the interaction are presented in Fig. 1. Post-hoc Tukey tests indicated that the sample pattern held for both analyses ($p < .01$): Males had significantly higher SK scores than females, and females had significantly higher CK scores than males. Females' CK scores were significantly higher than their SK scores. Although males' SK scores were higher than their CK scores, the difference was not statistically significant.

Another way of looking at gender differences is to divide each sample up into groups, based on a joint median split of the CK and SK scores. Again, this analysis was performed separately for Sample 1 and then for the combined Samples 2–4. The median scores for both SK and CK scores were within one point of each other (for SK scores: 111 for Sample 1, 112 for Samples 2–4; for CK scores, 118 for Sample 1, 117 for Samples 2–4). Chi-square tests of contingency were run between gender and group, and both yielded significant effects (for Sample 1, with three degrees of freedom, the Pearson chi-square is 10.68, $p < .02$; for Sample 2, with three degrees of freedom, the Pearson chi-square is 29.09, $p < .001$). Figure 2 shows the results of these analyses. In both analyses, females were disproportionately likely to be assigned to the "High CK scores only" group, and males were disproportionately likely to be assigned to the "High SK scores only" group.

The length of the ATTLS required that most participants spend 30–45

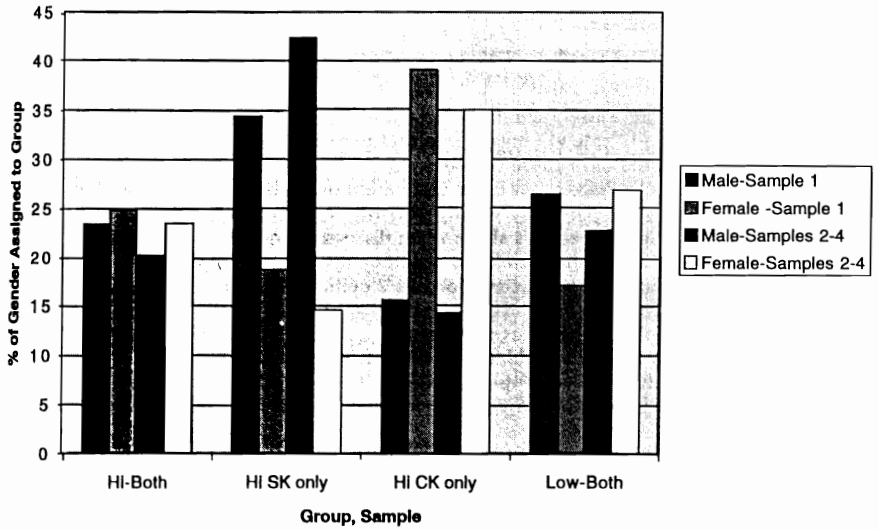

Fig. 2. Percentage of men and women assigned to four ways of knowing groups by sample.

minutes filling it out. We wondered whether we could shorten the instrument without a significant loss of psychometric power. Item analyses from the reliability results, together with factor loadings from the factor analysis, allowed us to construct a shorter version of the ATTLS. We selected 10 SK items and 10 CK items, those that showed the most consistently high loadings on the two factors extracted. Using the data from the combined Samples 2–4, we found that internal reliabilities for the CK and SK shortened scales was .83 for the CK scale and .77 for the SK scale. Scores on the shortened and full CK scales correlated significantly (r [255] = .88, $p < .001$), as did scores on the shortened and full SK scales (r [255] = .92, $p < .001$). Table I presents the shortened version of the ATTLS. It also displays item-total correlations for each item, calculated with the data of the combined Samples 2-4. The shortened scale shows slightly less internal reliability for the SK measure and slightly greater internal reliability for the CK measure than does the full instrument, and requires only 15–20 minutes to administer.

Thus far, we have demonstrated a set of results that fulfill three of the criteria put forward by Sternberg and Grigorenko (1997). That is, we have demonstrated a theoretically-derived measure with good internal reliability, as well as a coherent internal structure as demonstrated by the factor analyses. Moreover, the gender differences that emerge on the instrument are both consistent with previous findings and statistically significant.

What remains is to explore the nature of the underlying entities being

Table I. Items from the Shortened Version of the Attitudes Toward Thinking and Learning Scale (ATTLS)[a,b]

Connected Knowing Items	
When I encounter people whose opinions seem alien to me, I make a deliberate effort to "extend" myself into that person, to try to see how they could have those opinions.	it: .59, io: .02
I can obtain insight into opinions that differ from mine through empathy.	it: .41, io: −.04
I tend to put myself in other people's shoes when discussing controversial issues, to see why they think the way they do.	it: .63, io: .04
I'm more likely to try to understand someone else's opinion than to try to evaluate it.	it: .45, io: −.26
I try to think with people instead of against them.	it: .39, io: −.29
I feel that the best way for me to achieve my own identity is to interact with a variety of other people.	it: .37, io: .08
I always am interested in knowing why people say and believe the things they do.	it: .58, io: .11
I enjoy hearing the opinions of people who come from backgrounds different from mine—it helps me understand how the same things can be seen in such different ways.	it: .60, io: .09
The most important part of my education has been learning to understand people who are very different from me.	it: .55, io: .06
I like to understand where other people are "coming from," what experiences have led them to feel the way they do.	it: .68, io: .01
Separate Knowing Items	
I like playing devil's advocate—arguing the opposite of what someone is saying.	it: .39, io: .00
It's important for me to remain as objective as possible when I analyze something.	it: .25, io: .14
I try to listen to other people's positions with a critical eye.[c]	it: .48, io: −.13
I find that I can strengthen my own position through arguing with someone who disagrees with me.	it: .39, io: .01
One could call my way of analyzing things "putting them on trial," because of how careful I am to consider all of the evidence.	it: .34, io: .07
I often find myself arguing with the authors of books I read, trying to logically figure out why they're wrong.	it: .53, io: −.25
I have certain criteria I use in evaluating arguments.	it: .50, io: −.07
I try to point out weaknesses in other people's thinking to help them clarify their arguments.	it: .53, io: −.18
I value the use of logic and reason over the incorporation of my own concerns when solving problems.	it: .39, io: −.12
I spend time figuring out what's "wrong" with things; for example, I'll look for something in a literary interpretation that isn't argued well enough.	it: .54, io: −.22

[a]Subjects rated each statement on a seven-point Likert scale, with '1' indicating "Strongly disagree," '2' indicating "Somewhat diagree," '3' indicating "Slightly diagree," '4' indicating "Neither agree nor diagree," '5' indicating "Slightly agree," '6' indicating "Somewhat agree," and '7' indicating "Strongly agree."

[b]Numbers after each item represent the corrected item-total correlation (it) and the item-other scale correlation (io; e.g., for CK items, the correlation between that item and the SK scale).

[c]Upon further reflection, we suggest replacing this item with the following to improve clarity: "In evaluating what someone says, I focus on the quality of their argument, not on the person who's presenting it."

measured. In particular, we wanted to see whether SK and CK function as cognitive or attitudinal mechanisms. Thus, in Study 1, we explored the idea of whether SK and CK operate as *schemas,* memory structures that color, highlight, and distort the information retained (Anderson & Pichert 1978). In Study 2, we investigated this idea further, asking also whether SK and CK function as attitudes, affecting participants' assessment of the intelligence, clarity, typicality, and likability of students espousing different epistemological positions.

Studies 3 and 4 explored correlations between SK and CK scores and measures of ability. Ability was measured by performance on a short form of a non-verbal intelligence test in Study 3, and by performance on a deductive and inductive reasoning task in Study 4.

Study 1: Memories of College

We asked here whether participants' epistemological status predicted the type of autobiographical memories they were most likely to retrieve from an important transitional part of their lives. Participants (described previously as Sample 1) were asked to describe in writing a vivid memory of their freshman year of college, following Pillemer, Goldsmith, Panter, and White (1988). Written instructions indicated that their description could be as long or as short as they deemed necessary but as precise and detailed as possible.

Results. Three raters, blind to a participant's CK or SK score, coded each memory on a five-point scale for the degree to which it reflected separate or connected knowing. (Thus, each essay was coded twice by each rater, but the two ratings were done at different times and independently.) Raters were first given descriptions of major assumptions of both connected knowing (e.g., The emphasis on first-hand experience in trying to know or understand; One "steps into another's shoes" to try to gain understanding) and separate knowing (e.g., New ideas can be understood only through critical, dispassionate, rational analysis; Playing devil's advocate is a good way to examine issues.)[5]

The interrater reliabilities, computed using coefficient alpha over the three raters, were .62 for SK rating and .79 for CK rating. Next, essay ratings were correlated with CK and SK scores from the ATTLS. The mean CK rating of the memory was correlated slightly with the participant's CK score: (r = .20, $p < .05$), but the mean SK rating of the essay was not correlated with the SK score: (r = .03, n.s.). The mean CK rating of the memory and the mean SK rating of the memory were significantly and

[5]A complete description of coding instructions is available from the first author.

negatively correlated ($r = -.48$, $p < .0001$). This result may indicate that raters saw the SK and CK constructs as mutually exclusive, even though the psychometric data from the ATTLS indicates otherwise. No other correlations were significant.

Study 2: Recalling Passages and ATTLS Items

The purpose of this study was to investigate whether or not different ways of knowing draw attention toward and/or away from different statements. We wondered whether participants with relatively high SK or high CK scores would remember better dialogues written from an SK or CK perspective, or even whether participants would distort their memories of dialogues taking a different epistemological stance to make them better fit their own epistemological preference.

Participants were first shown two dialogues, each consisting of three exchanges between two students with androgynous names. Two of the dialogues discussed the interpretation of Shakespearean plays; two discussed scientific procedures in the field of chemistry. Two dialogues (one in English, one in chemistry) attempted to capture a prototypical connected knowing exchange; the other two, a separate knowing exchange. These materials are reproduced in Appendix A.

Immediately after reading each passage, participants were asked to rate the purported speakers in terms of the 10 different aspects listed in Table II. Next, they were presented with a sheet containing 57 adjectives assumed to illustrate a range of different teaching characteristics, (see Table III). They were instructed as follows: "First, take a moment to imagine the ideal college professor. What would that person be like; what kinds of adjectives might be used to describe that person? Next, read through the following list of adjectives. Circle any that you feel would characterize the ideal professor, and cross out any that you feel would be definitely uncharacteristic of that person. Circle or cross out as many or as few adjectives as you like."

Next, participants were presented with an unexpected recall task, in which they were instructed to write down as much as possible of the two dialogues shown earlier. Recall sheets contained the names of the two speakers, and a word or two about the topic of their discussion (e.g., "In the space below, please try to recall as much as you can of the dialogue between Leslie and Shawn on the size of an atom"). Participants were instructed that if they could not recall the dialogues word for word, they should record as ideas expressed in the dialogues as they could. Finally, participants filled out the ATTLS.

Table II. Correlations of Ratings of Passages with CK and SK Scores, Study 2[a]

Item Rated	CK Passages		SK Passages	
	CK Score	SK Score	CK Score	SK Score
How clearly do these students express their points of view?	.10	.02	**.31**[c]	−.18
How similar do these students' points of view seem to yours?	**.19**[b]	.09	.07	.07
How receptive do these students seem to other points of view?	.17	−.03	.15	.03
How logical a thinker do these students seem?	.15	.07	**.33**[c]	.04
How strong (e.g., academically able) do these students seem to be?	**.19**[b]	−.02	.04	−.03
How typical are the students' point of view among your classmates?	.15	−.00	.10	.12
How typical are the students' point of view among society as a whole?	.15	**.20**[b]	.02	.15
How much would you like to have a one-on-one conversation with these students?	.10	−.02	**.23**[b]	**.23**[b]
How much would you like to have these students in a discussion or seminar class with you?	.13	−.02	**.28**[c]	.17

[a]Statistically significant correlations are shown in bold.
[b]$p < .05$.
[c]$p < .001$.

Results. In the first analysis performed on the data, we correlated the Likert ratings of the students portrayed in the passages with CK and SK scores. CK scores correlated significantly with two of the ratings of CK passages, and four of the ratings of SK passages. SK scores correlated significantly with one of the ratings of CK passages, and one of the ratings of SK passages. For example, participants scoring higher in CK were more likely than those scoring lower to see the protagonists in the CK dialogues as similar to themselves and academically able, while rating protagonists in the SK dialogues as clear and logical. Participants scoring higher in SK differed from those scoring lower only in characterizing protagonists in the CK dialogue as typical students and, like the higher CK's, rating the protagonists in the SK dialogues as good conversationalists. All of the correlations are presented in Table II.

The second analysis concerned the recall of the dialogues. Seven or eight independent raters, blind to participants' gender, year in school, and CK and SK scores, coded typed versions of each recall sheet on a five-point scale for overall gist accuracy. Interrater reliabilities (computed with coefficient alpha) were .92 for the CK passage, and .87 for the SK passage. Other groups of seven or eight raters coded each recall sheet for the overall

Table III. Correlations of Adjectives of "Ideal Teacher" with CK and SK Scores, Study 2[a]

	CK	SK		CK	SK		CK	SK
In Control	**.20**[c]	.13	Patient	**.19**[c]	.13	Flexible	**.26**[d]	.06
Friendly	.08	−.00	Imaginative	.05	−.03	Aggressive	.03	.17
Accepting	**.33**[e]	−.05	Outgoing	.17	.04	Empathic	.12	−.09
Receptive	.15	−.05	Understanding	**.27**[d]	.04	Assertive	**.23**[c]	.14
Lively	.14	.02	Caring	.15	.06	Approachable	.16	.08
Interested	.15	.08	Open	**.26**[c]	−.05	Practical	.12	.09
Helpful	**.21**[c]	.07	Humorous	.17	−.14	Masculine	−.05	.16
Authoritative	−.07	**.21**[c]	Thoughtful	**.26**[c]	−.09	Enthusiastic	.17	**.25**[d]
Self-Confident	.08	.14	Demanding	−.13	**.37**[e]	Responsive	**.23**[c]	.03
Concerned with Details	.00	.15	Purposeful	**.21**[c]	.03	Organized	.09	.04
Outspoken	.15	.11	Systematic	.09	.18	Critical	.07	**.26**[d]
Respectable	.04	.10	Opinionated	−.11	−.03	Knowledgeable	.06	.14
Feminine	−.03	−.00	Observant	.16	.08	Respectful	.13	−.02
Facilitating	**.26**[d]	.00	Unconventional	.09	−.16	Serious	−.08	.06
Emotional	**.20**[c]	−.03	Persuadable	−.14	.09	Spontaneous	.16	**−.24**[c]
Tactful	.05	−.07	Young	−.14	−.00	Quiet	−.06	.03
Dramatic	.03	−.01	Reserved	**−.33**[e]	.13	Tolerant	**.30**[e]	**−.21**[c]
Experienced	.10	.14	Challenging	.04	.09	Technical	−.11	.16
Inquisitive	.09	.14	Easygoing	.11	−.08	Analytical	.01	**.26**[d]

[a]Statistically significant correlations are shown in bold.
[b]The most frequently circled adjectives were, in descending order of frequency of nomination: Approachable, Knowledgeable, Friendly, Helpful, Interested, Receptive, and Humorous. More detailed information is available from the first author.
[c]$p < .05$.
[d]$p < .01$.
[e]$p < .001$.

degree of distortion present in the recalled passages, on a five-point scale. Interrater reliabilities (computed with coefficient alpha) were .84 for the CK passage, and .67 for the SK passage. Mean accuracy ratings were 3.93 for the CK passage, and 4.28 for the SK passage. Mean distortion ratings were 3.77 for the CK passage, and 3.04 for the SK passage. Neither accuracy nor distortion ratings correlated significantly with either SK score or CK scores. Thus, there is no evidence that ways of knowing function as memory schemata. In other words, having a high SK (or CK) score does not improve accuracy for recall of SK (or CK) dialogues, nor does it make it more likely that recall of CK (or SK) dialogues will be distorted.

We next analyzed student descriptions of an ideal college professor. Student responses to the adjectives describing an ideal college professor were scored with a '1' if the adjective was circled (indicating that the adjective would characterize an ideal professor) '−1' if crossed out (indicating that the adjective would be definitely uncharacteristic of an ideal professor), and '0' if the adjective was neither circled or crossed out. Correlations with CK scores and SK scores were computed independently for each adjective. There were 15 significant correlations with CK scores, and six

significant correlations with SK scores (out of a possible 57). These correlations are also presented in Table III.

Overall, this study indicated that CK and SK scores predict different descriptions of an ideal teacher. Students with high CK scores describe an ideal teacher as in control, accepting, helpful, facilitating, emotional, patient, understanding, open, thoughtful, purposeful, flexible, assertive, responsive, and tolerant. In contrast, students with high SK scores describe an ideal college professor as demanding, enthusiastic, critical, analytical, and low in spontaneity and tolerance. However, neither type of score is strongly predictive of the way dialogues embodying connected or separate knowing are evaluated.

Study 3: Thinking Aloud with Ravens' Advanced Progressive Matrices

The focus of this study was on the relation of CK and SK scores to general measures of intellectual ability. Each participant was interviewed individually in a single, 20-30 minute session. The 36 problems from the Raven's Advanced Progressive Matrices Set II (Raven, Court, & Raven, 1985) were divided into three sets. Set A included every third item from the original set (thus, 1, 4, 7, 10,. . .34), Set B included every third item beginning with the second (i.e., 2, 5, 8,. . .35), and Set C the remaining items (i.e., 3, 6, 9,. . .36). Problems become more difficult throughout the set (i.e., the first problems are the easiest to solve, the last problems the hardest). Participants were assigned randomly to one set of problems, which they worked in ascending numerical order. Each problem shows a matrix of 9 elements arranged in three rows of three, with the bottom, right-hand element missing. The task is to select, from eight choices offered at the bottom of the page, the element that logically completes the matrix.

The Advanced Progressive Matrices are often taken to be a nonverbal intelligence test that measures the ability to "educe relationships and correlates," abilities Spearman (1927) took to be the hallmarks of intelligence. Authors of the test describe it as a means of assessing "a person's present ability to perceive and think clearly, irrespective of past experiences or present ability for verbal communication." (Raven, Court, & Raven, 1985, p. G3).

After choosing a response to an item, participants were asked to provide a confidence rating, on a five-point scale where a '5' represented certainty, and an '1' represented complete uncertainty.

Results. Internal reliabilities were computed separately for the three sets of problems. These were .75, .50, and .68 for Sets A, B, and C, respectively. For each participant, we computed the number correct on the 12

matrices he or she received, average latency or response time,[6] and average confidence. None of these measures correlated significantly with either CK and SK scores.

To investigate further whether there was any relationship at all between score on the shortened Raven's test and SK or CK score, we performed a one-way between-subjects ANOVA on Raven's score, assigning subjects to groups based on joint median splits of the CK and SK scores as the independent variables. Mean Raven's scores (out of a possible 12) were 8.06, 6.74, 8.00, and 6.65 for students in the High Both, High CK Only, High SK Only, and Low Both groups, respectively. Although the overall ANOVA was not statistically significant (F [3, 68] = 1.89, n.s.), examination of the means hints at the possibility that students with high SK scores may perform slightly better on this instrument.

Study 4: Deductive and Inductive Logic Problems

The purpose here was to see if ways of knowing status is related to reasoning skill. Each participant was interviewed individually for 10 to 15 minutes. Interview questions (originally developed by Galotti, Komatsu, and Voelz, 1997) were constructed from an initial set consisting of 32 items, each containing two premises and a question. Sixteen of the 32 items contained deductive inference questions; the other 16 contained inductive inference versions of those same items. Table IV presents examples of

Table IV. Examples of Logic Problems Used in Study 4

Deductive	Inductive
All poggops wear blue boots. Tombor is a poggop. Does Tombor wear blue boots?	Tombor is a poggop. Tombor wears blue boots. Do all poggops wear blue boots?
All daxlets are squishy. All squishy animals like to yell. Do all daxlets like to yell?	All squishy animals like to yell. All daxlets like to yell. Are all daxlets squishy?
No kwipsies wear mittens. Pilvie is a kwipsie. Does Pilvie wear mittens?	Pilvie is a kwipsie. Pilvie does not wear mittens. Do any kwipsies wear mittens?
All wugs have four toes. No four-toed animals like pink. Do all wugs like pink?	No four-toed animals like pink. No wugs like pink. Do all wugs have four toes?

[6]Because RT distributions are skewed, a logarithmic transformation was applied to all RTs before analysis.

these. Inductive items have no definite "correct" answer. Of the deductive items, half were constructed so that the correct answer was "yes," the other half, "no."

The 32 items in the initial set were divided into two sets of 16 questions, with the restriction that the deductive and inductive versions of the same problem content were assigned to different sets. Each student received one set of 16 questions. Thus, no student heard the same set of premises more than once. The presentation of question sets was counterbalanced across gender.

Participants were told that they would be shown 16 cards, each depicting an imaginary animal, would hear a few sentences about the animals, and would then answer questions about them. During the instructions, and again throughout the interview, participants were reminded that they would not be able to answer the questions just by looking at the pictures, but instead would have to listen very carefully to the sentences and questions. Participants were also told that after answering the questions, they would be asked how certain they felt about their answers to the questions, by providing a confidence rating on a five-point scale where a '5' represented certainty and a '1' represented complete uncertainty.

Results. Internal reliabilities were computed separately for the two sets of problems. These were .58 and .64, respectively. For each participant, we computed the number of inductive problems (out of 8) to which they gave a "yes" response,[7] the number of deductive problems they answered correctly,[8] the average latency or response time (RT),[9] and the average confidence rating. None of the correlations between these measures and CK or SK scores was statistically significant.

To investigate further whether there was any relationship at all between score on the reasoning task and SK or CK score, we performed a one-way between-subjects ANOVA on number of correct responses (out of 8) to the deductive problems, using the assignment to groups based on joint median splits of the CK and SK scores as the independent variables. Mean score (out of a possible 8) was 7.90, 7.89, 7.85, and 8.00 for students in the High Both, High CK Only, High SK Only, and Low Both groups. The overall ANOVA was not statistically significant (F [3, 64] = 0.28, n.s.). There is no indication here of any association between epistemological style and formal reasoning ability.

[7]Because inductive items had no correct answer, we could not use the number of correct responses as the DV. This allows us to see whether respondents had different overall patterns of drawing inductive inferences.
[8]Because deductive items had correct answers, we calculated this.
[9]Because RT distributions are skewed, a logarithmic transformation was applied to all RTs before analysis.

GENERAL DISCUSSION

We created a 50-item survey measure of separate and connected knowing, the ATTLS, that proved to have acceptable internal reliabilities for both subscales. Using this measure, we found no significant correlations CK and SK scores, reinforcing Clinchy's (1998) claim that these two ways of knowing are independent, rather than opposite ends of a single dimension. We did find consistent gender differences on the two types of scores. Males' CK and SK scores tended not to be significantly different, although SK scores were always higher than CK scores. Females consistently showed significantly higher CK than SK scores. Moreover, females had significantly higher CK scores than males, and males had significantly higher SK scores than females. This pattern of results supports the idea that men and women often differ in their attitudes toward learning, discussion, and knowledge.

When participants were divided into groups based on a joint median split of CK and SK scores, gender differences appeared even more striking. Men and women were equally represented in the High-CK/High SK and the Low-CK/Low SK groups. However, participants who had above average CK scores and below average SK scores were disproportionately likely to be female, and those who had above average SK scores and below average CK scores were disproportionately likely to be male.

Connected and separated knowing appear to represent different kinds of cognitive or learning styles, not intellectual abilities or capacities. Neither CK nor SK scores were significantly correlated with any cognitive measures of performance (recall memory, distortion of memory, reasoning, or nonverbal intelligence). However, there are hints in Study 3 that nonverbal intelligence scores may be slightly higher for students with high SK scores. Further work on this question must be done with the full Ravens' instrument and a larger sample of participants before a definite conclusion can be drawn.

In contrast to the lack of relationship between CK or SK scores and cognitive measures, we did discover a number of relationships between the scores and measures of preference. We found more significant correlations between CK scores than SK scores in ratings of protagonists in the dialogues, consistent with the idea that CK, unlike SK, involves sensitivity to individual knowers rather than simply the content of their knowledge. We also found more significant correlations between CK than SK sores in ratings of characteristics of ideal teachers. More important, perhaps, participants higher in SK tended to value attributes thought to be characteristic of separate knowers (e.g., authoritative, analytical, demanding, critical), while participants high in CK tended to value attributes thought to be characteristic of connected knowers (e.g., tolerant, understanding, flexible).

Because the 50-item ATTLS takes a long time to administer (45 minutes, on average), we constructed a shortened, 20-item instrument that is highly correlated with the longer version and nearly as reliable. We propose that the shortened instrument be used in future research. Such research might examine other correlates, both cognitive and stylistic, of different ways of knowing. For example, do CK and SK scores predict differential attention to different kinds of presentation of information? Do they affect the strategies with which students approach different learning assignments? Do they color students' comfort level with different types of academic experiences, assignments, domains? And if so, how large are these effects? Some work by Turkle and Papert (1990) suggests there exist gender-related (but not gender-exclusive) approaches to computer programming, and it would be important to see whether such approaches occur for different ways of knowing, and in different academic domains. It is hoped that the instrument developed and described here will aid in efforts to investigate such questions.

Appendix A. Connected and Separate Knowing Passages Used in Study 2

Separate Knowing Dialogue—Chemistry

Randy: Today in Chem. class the prof. was talking about Potassium-Argon dating as the most acurate method for measuring the passage of time. I thought it was really impressive how that technique works.

Shelby: Oh, yeah, that's when a volcano erupts and Potassium is present, but as the lava cools, it decays into argon. Because we know the half-life, we can tell how many years old a fossil is. But you know, that method has been shown to be pretty unreliable.

Randy: Yeah, the prof. explained that air can be trapped in the lava as it cools, and air contains a significant amount of argon, which can throw off the results. Still, though, you have to admit that it's a pretty nifty technique.

Shelby: Maybe at one time, but now that we have Carbon dating, there's no need to rely on something as unreliable.

Randy: I still think there may be some instances where the first method has more advantages than the second.

Shelby: Why in the world would anyone want to use a method that has contamination? Seems to me that Carbon dating is the far superior method, hands down.

Connected Knowing Dialogue—Chemistry

Leslie: Today in Chem. class we were talking about atoms. I'm still not sure I've got it completely. The prof. said that there's a definite limit to the size of an atom, because there can only be so great a distance between the protons and electrons, due to the attractive force that keeps them together.

Shawn: I've heard that, too. I don't quite understand the attractive force that keeps them together, though. Is it something like a magnet?

Leslie: Sort of, I think. Like a magnet keeping staples together. The farther away the magnet drifts, the less force it has to pick up the staples. Same thing with the protons and electrons.

Shawn: So the protons can only move so far away from the electrons to keep the atom's size?

Is it kinda like the proton doesn't want to drift too far away, and lose a connection with the electron?

Leslie: Something like that. I mean, research keeps investigating how far protons and electrons can be separated to keep some attractive force between the two. It's almost like pulling on gum until it breaks into two parts.

Shawn: So that makes it sound like the attractive force can be really minute. Just enough to keep the particles together?

Separate Knowing Dialogue—English

Avery: I just saw "William Shakespeare's Romeo and Juliet" with my English Lit I class. I thought it was a travesty. I can't believe anyone would take one of Shakespeare's greatest works and turn it into such a spectacle.

Pat: It was a spectacle, true, but I think it's important to put a modern twist on Shakespeare. Everyone always talks about how his writing endures; if this is true, the themes should be applied to life nowadays.

Avery: Okay, the themes endure. But taking Romeo and Juliet and turning it into some Generation-X flick is just wrong. The filmmakers were doing it to be spectacular, not to give credence to the perpetuity of his themes.

Pat: Wait a minute. If you think about it, Romeo and Juliet relates to life now. Teenagers still fall madly in love, there are still family pressures. Their eagerness to rebel against society and form their own world is, I think, very relevant to today.

Avery: But we should be able to glean from Romeo and Juliet a sense of Shakespeare's times—the plays are very enduring, but they are also meant to give a view into the Elizabethan period. Look at his histories. The movie compares the Montagues and Capulets to rival gangs. The analogy just doesn't hold.

Pat: I disagree. I think that in both situations the people involved in the conflict are outside the realm of the law. And falling in love with someone from a rival family then is as dangerous as it would be falling in love with someone from a rival gang nowadays. I thought the movie was a very effective interpretation!

Connected Knowing Dialogue—English

Jamie: We're studying Macbeth in my Shakespeare class. My prof. said some people believe that Macbeth was merely fulfilling a prophecy when he killed King Duncan, and had his best friend Banquo and others killed. But others think that he was acting out of his "vaulting ambition" and that he was completely aware of his actions.

Chris: I've heard that, too. I don't know how much I believe in fate or destiny. I realize it was an important aspect of ancient medieval literature. I always wondered if they really believed in prophecy back then.

Jamie: I don't really understand it. It seems like everything that Macbeth did—betraying his friends and allies—he performed out of his own free will. The way I interpret it, the witches planted the seed in Macbeth's mind, but he could've acted or not acted on this idea.

Chris: But how could he kill his best friend? And the king as well, who had just decorated him for valor in battle. I wonder what led him to do that?

Jamie: Maybe he was just overcome by his recent success, and his ambitious nature blinded him to the results of his actions. So, even if he knew that he was betraying his friend Banquo and King Duncan, he might have been unable to stop himself.

Chris: Yeah, that sounds possible. I can understand how a warrior just returned from battle with the ultimate goal of the throne before him could make such choices.

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The Psychological Impact of Reproductive Difficulties on Women's Lives[1]

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Little is known about the long-term impact of reproductive experiences on women's lives. This paper uses questionnaire data collected from 107 white female college graduates, when they were approximately 47 years old. More than half the sample had experienced at least one type of reproductive difficulty (abortion, miscarriage, or infertility). The stress and coping model of life difficulties (Lazarus &Folkman, 1984) was used to examine the relationship between the women's reproductive difficulties and emotional sequelae, politicization, and orientation to motherhood at midlife. As predicted, emotional responses to the reproductive difficulties varied according to the particular nature of each experience. In addition, women who had abortions and no other difficulties were more politicized at midlife than other women. Women whose reproductive experiences were especially likely to arouse feelings of not being in control of their life (those who had miscarriages or infertility) described a more agentic orientation to motherhood when compared with other women.

One consequence of the radically changing work and family patterns of the past forty years is that many social scientists have begun to examine previously unquestioned assumptions about gender roles and the importance of parenthood in American culture. Historically, Western culture has idealized women who become mothers. The expectation that a woman's most important and defining role is that of mother has been called the

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