Perceptions of knowledge and beliefs among undergraduate students in Italy and in the United States

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Abstract

This study investigated conceptions of knowledge and beliefs among 242 Italian and 231 American college students. Perceptions of the nature and interrelation of knowledge and beliefs, and prevalent characterizations and sources of these two constructs were explored by qualitative and quantitative methodologies. Differences emerged between Italian and American responses. Further, within the Italian sample, differences among students exposed to different high-school curricula were identified. Findings support and extend results of previous studies that suggested the influence of culture in general and schooling in particular in the development of epistemological beliefs. Implications for research and educational practice are discussed.

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1. Introduction

There is a word that appears with regularity in the current cognitive literature. It is the word beliefs. What is actually meant by the term beliefs? In 1992, Pajares lamented a lack of clarity and precision of expression in the literature, pointing to several words used in lieu of beliefs (e.g., attitudes, values, judgments, perceptions, opinions, conceptions, dispositions). He further posited that the distinction between knowledge and beliefs was very blurred and that diverse relations between these two constructs had been hypothesized. These varied relations were reflected in different operationalizations of the beliefs investigated, with obvious consequences for the comparability of results. However, the review of the available studies suggested a few reasonable assumptions that could be made with regard to beliefs structures, their formation and change, and their strong affective component (pp. 324–326).

The significant relations between beliefs and behaviors emerging in several studies encouraged researchers to further investigate beliefs. However, as Pajares (1992) noted, the study of beliefs has proven to be particularly challenging. For example, while at times individuals are cognizant of particular beliefs they hold, there are other times in which beliefs are buried or tacit, and unavailable for immediate personal reflection. Therefore, it became necessary to
develop indirect methods for assessing beliefs, inferring individual’s beliefs from various sources of evidence (e.g., statements, intentions to behave in a certain manner, observation of actual behavior, discussion of ill-structured problems).

1.1. Students’ beliefs and learning

Whether explicit or tacit, beliefs remain influential forces in students’ learning and development (Bandura, 1997; Caprara, Barbaranelli, Pastorelli, & Cervone, 2004; Dole & Sinatra, 1998; Dweck, 1990; Midgley, Kaplan, & Middleton, 2001; Murphy, 1998). In fact, there actually seems to be a reciprocal relation between students’ beliefs and schooling. On the one hand, beliefs have been shown to influence students’ learning and development. For example, beliefs that students hold about themselves as learners, such as their efficacy beliefs (i.e., their perceived capability to achieve a certain outcome) and their attributions for the successes or difficulties encountered, have been shown to correlate with effort, perseverance, cognitive strategy use, and task choice (Chemers, Hu, & Garcia, 2001; Pajares, 1996; Zimmerman, 2000).

Reciprocally, researchers have determined that formal education and various life experiences result in changes in students’ belief systems (Alexander, 2001; Perry, 1970). For example, the literature on conceptual change, centered primarily in science and mathematics, while documenting the persistence of misconceptions in the face of compelling evidence, has theorized that particular cognitive processes are required for knowledge restructuring (Chi, 1992; Chinn & Brewer, 1993, 1998; Strike & Posner, 1985; Vosniadou, 1994; Vosniadou & Brewer, 1992). The research on persuasion, extending such investigations to a much wider array of domains, has focused on changes in individuals’ attitudes and the conditions that seem to foster or hinder such attitudinal modification. Persuasion researchers have thus investigated relations of attitudinal change with learners’ characteristics, features of the message, environmental situation in which the communication takes place, and motives influencing the processing of information (Alexander, Buehl, & Sperl, 2001; Chaiken, 2000; Hynd, 2001; Mason, 2001; Murphy, 2001; Murphy, Long, & Esterly, 2003; Petty & Cacioppo, 1986; Pintrich, Marx, & Boyle, 1993; Woods & Murphy, 2001).

1.2. Students’ epistemological beliefs and learning

Finally, several studies have focused more specifically on beliefs about knowledge, exploring individuals’ beliefs about the nature and justification of knowledge, as well as beliefs about intelligence and learning (Hofer & Pintrich, 2002). The influence of epistemological beliefs on learning in a wide array of academic tasks, as well as on the reasoning and justification of preferred solutions to ill-structured problems, has been suggested by several studies, prompting the need for further investigation (Dole & Sinatra, 1998; Kardash & Scholes, 1995; King & Kitchener, 1994; Kuhn, 1991; Qian & Alvermann, 1995; Schommer, 1990).

Development and specificity of epistemological beliefs in the various academic fields have also been studied, endorsing the hypothesis that such beliefs tend to be both general and domain specific (Buehl, Alexander, & Murphy, 2002). Some of these researchers have studied the relation between teachers’ epistemological beliefs and teaching strategies (Brickhouse, 1990; Hashweh, 1996). Others have theorized the existence of a developmental trend in epistemological beliefs and suggested the need to aid students in moving from so-called naïve epistemologies to more complex epistemological beliefs resembling those typical of experts in the various fields (Lee & Ashby, 2000; VanSledright, 2002). Studies have also investigated the existence of multiple dimensions (e.g., certainty of knowledge, innate learning ability) in the construct of personal epistemology, suggesting the possibility that these dimensions do not actually develop at the same time or in the same direction (Jehng, Johnson, & Anderson, 1993; Schommer, Crouse, & Rhodes, 1992; Schraw, Dunkle, & Bendixen, 1995).

Finally, previous studies have indicated that culture plays a significant role in the conception and development of knowledge and beliefs in individuals (Alexander, Murphy, Guan, & Murphy, 1998; Yount, 2000), influencing the very notions of knowledge and beliefs prevailing within a given society. In particular, Alexander and Dochy (1995) asked college students, graduate students, and experts in the area of knowledge or beliefs in the United States and the Netherlands to share their views on the concepts of knowledge and beliefs. Some similarities emerged across different national communities (p. 419). However, patterns of cross-cultural differences also surfaced. For example, a view of knowledge and beliefs as two completely separated constructs emerged only among European participants (p. 421); more common among European respondents was also the view of knowledge as one component of beliefs...
In addition, religious references (p. 430) and links between conceptions of beliefs and personality traits (p. 437) were far more common within the American groups.

In the educational community, this growing body of research has fostered an increased awareness of the importance of beliefs in cognitive development (Hofer & Pintrich, 2002) and contributed to our understanding of the interaction between beliefs and knowledge. It has also underscored the evidence that beliefs, particularly epistemological beliefs, tend to remain tacit for the most part. Moreover, such beliefs, on the whole, appear as complex and multifaceted constructs, quite difficult to detect and analyze in empirical studies (Wood, Kitchener, & Jensen, 2002).

A complete review of the beliefs literature in general and of the epistemology literature in particular surpasses the purposes of this introduction. However, in trying to draw implications for learning from these studies, the issue of defining knowledge, beliefs, and their relation becomes essential. Given the extant research, this task faces several problems. Specifically, the very definition and operationalization of epistemological beliefs depend on the researchers’ epistemological stance, a stance that is not necessarily shared by individual participants. In other words, investigators tend to focus on beliefs about the nature of knowledge and their justification suggested by their theoretical framework, and assume that such characterization may aptly describe individual epistemologies. However, given our current knowledge of personal epistemologies, is this a justified assumption? The overall low variance captured by the most commonly used measures of epistemological beliefs made us pause (Wood & Kardash, 2002). Thus, we concluded that the field could still benefit from an in-depth, qualitative observation of students’ conceptions of knowledge, casting a net wide enough to capture nuances of students’ epistemic thinking. Therefore, rather than probing the existence of a priori dimensions of beliefs, the present study sought to foster their emergence, in an attempt to gain a richer portrait of the notions entertained by students and, possibly, to uncover facets of students’ beliefs that could guide further inquiry.

In the present study, which builds on the work of Alexander and Dochy (1995) and Alexander et al. (1998) on the relations between knowledge and beliefs, we asked participants in the United States and Italy to struggle with one of the problems that has been the object of much thought since the very origin of philosophy. More precisely, we asked students to tackle some of the issues which have been at the core of gnoseology, the branch of philosophy that investigates the question of the specificity of knowledge, and in particular its relation with opinion, beliefs, imagination, and faith. Probing student conceptions of the relation between knowledge and beliefs offered a promising avenue to elicit the emergence of student epistemological beliefs, whatever they may be. We also expected that the comparison of responses from students participating in different cultures and educational systems would facilitate the individuation of key dimensions of these beliefs.

1.3. The specificity of knowledge: the issues of truth and certainty

An interesting framework for thinking about this issue has been offered by Chimirri (1997). Chimirri identified two ways of examining one’s knowledge. The first regards the degree to which what we know approximates truth, a truth that is never conquered once and for all, but that is continuously rethought and deepened. In this respect, Chimirri also identified various paths toward truth, as well as different kind of truths, such as truths provided by evidence immediately available to the senses, logical truths, scientific truths, philosophical truths, and truths based on faith in someone else’s knowledge.

The second way to examine knowledge regards the psychological, subjective condition under which we perceive our knowledge (or specific elements of our knowledge). From this point of view, Chimirri distinguished among conditions of certainty, opinion, and doubt. A condition of certainty is experienced when one is personally sure about the truth of something. It implies, thus, a certain degree of stability in knowledge. On the other hand, opinion implies a conception of knowledge as probable, and even if the possibility of legitimate alternatives is acknowledged, the individual has sufficient reasons to choose a particular one among them. Finally, a condition of doubt is characterized by the awareness that mistakes are possible, since our very senses can evoke a false perception of reality. The conditions of doubt and opinion can characterize some part of our knowledge, but, according to Chimirri, they cannot describe the entirety of knowledge. This would imply a self-contradiction, since, in affirming that all knowledge is dubious or uncertain, one is also affirming, with absolute certainty, that only doubt (or opinion) can characterize it.

Cast in these terms, truth and certainty are not synonymous. In order for knowledge to be true, a comparison with reality is necessary; this comparison may validate knowledge, but it may also bring about the discovery of an error in
the current knowledge. On the other hand, certainty reflects the psychological perception that the individual has of his or her own knowledge, independently from the justification of such perception.

1.4. Rationale and design of the present study

Since only human beings “know that they know” (i.e., are able to reflect on their own status as knowers), we sought, with our study, to gain insight into the conceptions of knowledge and beliefs held by students educated in different cultures. The result of this endeavor is what these students shared with us, confirming that philosophical thought is not the exclusive province of professional philosophers, but rather a fundamental part of the human experience.

Five questions guided our exploration of undergraduates’ perceptions of knowledge and beliefs. One of the instruments used in this research asked students to choose among five different representations of the relation between knowledge and beliefs, with the additional option to draw their own. First, we wanted to identify which graphic representations chosen by the students were dominant within their respective countries. Second, we were interested in uncovering the reasoning behind those choices, exploring the justifications offered by participants for their decisions and looking for emergent patterns and commonalities across those justifications. We felt that these justifications would afford us clues to students’ perceptions about the nature and interrelations of knowledge and beliefs. A third question regarded the consistency between participants’ written explanations and the graphic representation of knowledge and beliefs they selected. We additionally sought to investigate which facets and characterizations of knowledge and beliefs were most often mentioned in participants’ responses. Finally, we wanted to explore the impact of formal schooling on the development of epistemological beliefs by comparing views of the relation between knowledge and beliefs for the Italian participants who attended different types of high schools and who were therefore exposed to different curricula (see Maggioni & Riconscente, 2003).

Since previous studies have concluded that culture and learning are associated with varied epistemological beliefs, we expected to find differences between the American and Italian respondents with regard to the justifications they offered. To our knowledge, studies investigating the influence of culture on epistemological beliefs have been primarily exploratory, and the correlation of particular cultural traits to the development of specific epistemological beliefs rarely has been attempted. The location and extent of expected differences were, therefore, difficult to predict. The epistemological beliefs of Italian students have been investigated by Mason and Castiglioni (2000) but, to our knowledge, no similar study has targeted Italian undergraduates. Further, we anticipated that the traits that emerged for Dutch undergraduates, as described in the Alexander and Dochy (1995) study, could not be broadly generalized to this study due to differences in the characteristics of the sample (e.g., age) and educational context. However, with particular reference to the Italian sample and to previous studies conducted by Mason and Castiglioni (2000), we did expect variations in epistemological beliefs among students choosing different educational paths during their high-school years.

2. Method

2.1. Participants

Participants were 463 college students. Approximately half of the participants were Italians attending a university in northern Italy, and the other half were American students enrolled in a large mid-Atlantic university. Our decision to focus on these Italian and American samples was based on several considerations. First, we needed to ensure that we were able to analyze open-ended responses provided by participants in their native languages, a task that required knowledge of the subtleties of both languages. The first and second authors are fluent in Italian and English and are directly knowledgeable about the educational systems in both Italy and the United States. Second, to allow for some basis of comparison, we targeted students with similar educational experiences. Thus, we selected students at comparable levels of tertiary education enrolled in psychology or psychology-related courses. Other attributes of these two samples are subsequently described.

Specifically, the Italian data were collected from 242 students, mostly freshman (83.9%). During the data collection, the students were enrolled in an introductory psychology course. Fifty participants were dropped from analysis either because they had not attended primary or secondary school in Italy or due to missing values on the majority of
items on one or more of the study measures. Consequently, analyses in the current study are based on responses from 190 Italian undergraduates. Of those 190, 17% were males and 83% were females.

The majority of Italian participants reported their ethnicity as European (99.2%) and all reported having attended at least 6 years of education in Italy prior to attending the university (median = 13 years). During their high-school years, 78% of participants had chosen to attend the liceo, 14% had chosen the istituto tecnico, 5% the istituto magistrale, and 3% the istituto professionale. Distinctions among these educational settings will be described later in this section.

In the United States, 231 undergraduate students participated in the study (see Woods, Fox, & Buehl, 2003). Student volunteers were solicited from several courses in educational psychology and human development over two academic semesters. Most volunteers received course credit for their participation. Among the American participants, 80.0% were female and 20.0% were male, a percentage representative of the students found in those courses. The students were freshmen (32.9%), sophomores (23.6%), juniors (23.6%), and seniors (20%) with an average age of 19.96 years.

The ethnic diversity of the participants was representative both of the university population and of American society as a whole (i.e., 68.0% Caucasian, 12.4% African American, 6.2% Hispanic, 5.3% Asian-American, 1.8% Middle Eastern, 1.3% Asian, and 4.9% Other). Responses from volunteers were included only if the students were undergraduates and had received at least 6 years of their elementary and secondary education in American public or private schools. Twelve participants did not complete all the tasks in the knowledge and beliefs instrument and three of the responses did not fit our classification. Therefore, analyses were based on the responses from 216 American college students.

2.2. Measures

The measures used in this research were administered as part of a larger international study of the interrelation of cognitive and motivational variables (Fives, 2003). What follows is a description of the specific measures used in the present study.

2.2.1. Knowledge and beliefs instrument

Participants’ conceptions of knowledge and beliefs were elicited by asking them to choose among various graphic representations of the relation between these two constructs (see Fig. 1). Alternatively, participants were free to draw their own representation of this perceived relation. They were also asked to explain and defend their choice in writing. This instrument was developed by Alexander and Dochy (1995) as part of a larger set of questions devised to explore

![Knowledge and beliefs graphic representations.](image-url)
and compare conceptions of knowledge and beliefs across varying cultural and educational communities. Because we were interested in understanding how our participants conceptualized the nature and relations of knowledge and beliefs, we did not want to provide them with any guiding definitions of these constructs; thus potentially coloring or constraining their responses. Instead, it was our intention to uncover what potential conceptions of knowledge and beliefs existed among our respondents. Therefore, we needed to select a measure that solicited such information rather than one that was built on any pre-existing conceptions.

We employed this particular instrument because prior studies have shown it to be a valid and reliable indicator of individuals’ perceptions of two very abstract and complex constructs, knowledge and beliefs (Alexander & Dochy, 1995; Alexander et al., 1998; Sinatra & Kardash, 2004). In addition, this measure has been used effectively with respondents of varying ages and from various countries including Singapore, the Netherlands, and the United States. The graphic representations central to this instrument allow respondents to weigh the potential relations between knowledge and beliefs without a heavy reliance on linguistic descriptions. Moreover, prior studies have determined that this measure serves to elicit responses about the nature and relation of knowledge and beliefs in an understandable and concrete manner that results in interesting and interpretable patterns.

The diagrams in Fig. 1 pose five graphic representations of the relation between knowledge and beliefs that correspond to relations discussed in the philosophical literature (Alexander & Dochy, 1995). The first option, referred to as the separate option, depicts knowledge and beliefs as two completely distinct, unconnected entities. In contrast, Option 4 (inseparable) shows knowledge and beliefs as completely overlapping and coinciding constructs. The second option (knowledge subsumption) shows knowledge as embedded in beliefs, while Option 3 (beliefs subsumption) depicts beliefs as a component of knowledge. Finally, Option 5 (overlapping) suggests a partial coincidence/integration between knowledge and beliefs, while allowing for the distinctiveness of some aspects of these two entities.

2.2.2. Background information

A demographic questionnaire asked participants to indicate their age, gender, ethnicity, parents’ highest educational level, and the number of years they attended public or private school in the target country (i.e., Italy or United States). In addition, the Italian students were asked to indicate the type of high school they attended (e.g., liceo). Two further questions asked how many mathematics and history classes participants were currently attending or had already completed at the university level. Further, since we expected that the formal study of philosophy might impact students’ way of thinking about the relation between knowledge and beliefs, the final item asked participants to indicate the number of philosophy classes they had taken. Because philosophy is a class usually offered in the Italian liceo, we also asked students to include in that response any philosophy classes taken in high school.

2.2.3. Translation

All measures were initially developed in English. To prepare the Italian version, several steps were taken. First, the first author, a native Italian speaker, translated the measures into Italian. The measures were then re-translated back into English by a bilingual native speaker blind to the study. Next, a second native English speaker unfamiliar with the study compared the two English versions (i.e., the initial and re-translated) to ensure their equivalence. Only minor differences were identified through the comparison and corrected. No translation of participants’ responses was necessary for the purposes of the analyses, since both the first and second authors are proficient in Italian and English.

2.2.4. Procedure

Under supervision of a graduate student, participants voluntarily completed the knowledge and beliefs measure and the demographic questionnaire (Fives, 2003). The administration of those measures followed the same protocol in Italy and in the United States. The demographic questionnaire was completed first, followed by the knowledge and beliefs instrument. The only difference in the administration in the two countries pertained to the number of students present at each administration. In the United States, the measures were administered to varying numbers of students in order to accommodate the needs of participants attending different classes. In Italy, all data were collected from two large groups.

2.2.5. Coding

Participants’ responses were initially content analyzed by the first author for words referencing knowledge, beliefs, or the relations between the two. From this analysis, nine relational categories emerged, each reflecting a particular
view of the association between knowledge and beliefs. A scheme for coding the data was generated after an initial reading of participants’ responses. The coding scheme included key words, characterizing each class of the relation between knowledge and beliefs, and summarized the most common traits reflected in the explanations. A detailed description of these categories with excerpts of participants’ responses is reported in the results section. The compatibility of the written justification with the graphic representation chosen or drawn by the participant was also evaluated and scored accordingly (i.e., incompatible/compatible).

A further analysis explored traits and sources of knowledge and beliefs mentioned by participants in their written responses. It should be noted that not all participants offered these further characterizations, since the instrument asked them to explain the relation between knowledge and beliefs and did not explicitly require them to describe the characteristics of these constructs. Nevertheless, we submit that the insights provided by these “volunteered” descriptors are particularly meaningful and may serve as portals into the conceptualizations held (and commonly used) by our participants. Key words used in association with knowledge and beliefs were noted and organized into four strands. The first strand gathers the emerged characteristics of beliefs, the second consists of the emerged characteristics of knowledge; the third strand comprises sources of beliefs, and the fourth strand addresses sources of knowledge. Descriptors of these strands were added to the coding scheme. References to religious or ethical issues were also noted.

After training in the use of the coding scheme, the two authors randomly selected approximately 10% of the participants’ responses from each country and scored them independently. Their interrater agreement was .91. We considered the high agreement a confirmation of the reliability of the classification developed and the remaining responses were scored by the first author.

3. Results and discussion

Results are organized in five sections following the questions posed in the introduction. Results for Question 1 are based solely on the graphic representation selected. For our Question 2, we identified general mutually exclusive categories which captured the essence of the justification. To respond to Question 3, we examined the consistency between the graphic representation chosen and the coded category of the associated written justification. Results for Question 4 are based on a lexical examination of the written justifications, highlighting participants’ choice of words as indications of their epistemologies regarding the source and character of knowledge and beliefs. For Question 5 we focus only on the Italian sample, to ascertain whether high school attended was associated with different response trends.

A much higher percentage of Italian students (18% compared with 5% in the American sample) did not complete the knowledge and beliefs instrument. It is possible that the administration of the measures to large groups might have favored this more disengaged behavior. It is also possible that the offer of extra credit to the participating students in the United States enhanced their sense of responsibility in completing the measure.

3.1. Question 1. Representing the relation of knowledge and beliefs

Which graphic representations of the relation between knowledge and beliefs were dominant within Italian and American students? To address this first question, we examined the selected diagram in the knowledge and beliefs instrument. Fig. 2 presents the percentages of students’ choices by country.

Sixty percent of the students in each country chose representation five (overlapping) as illustrative of their view of the relation between knowledge and beliefs. This supports previous findings (Alexander & Dochy, 1995) and may be explained in part by the greater latitude afforded by this representation. In fact, many of our participants underscored the moderate stance expressed by this representation, and we believe that this explains in part its broad appeal.

The distribution of the frequencies among the other options varies by cultural community. Among Italian students, Option 3 (beliefs subsumption) was the second most chosen (18%), followed by Option 2 (knowledge subsumption), which accounted for 9% of the responses. Less than 10% of the Italian participants chose one of the more extreme options (i.e., completely separate or inseparable).

Students in the United States (14%) also chose Option 3 (beliefs subsumption) second most frequently. Yet, in contrast with the Italian sample, an almost equal number of American students (13%) chose Option 4 (inseparable). Option 2 (knowledge subsumption) was selected by a similar percentage among American and Italian students (8%), and Option 5 (separate) accounted for a still lower percentage of selections (3%) in the United States.
The differences between the two populations on the visual task do not seem particularly striking at first glance, even though the chi-square goodness of fit test is statistically significant \( \chi^2(5) = 16.29, p \leq .01 \).

3.2. Question 2. The relation between knowledge and beliefs: written justifications

What was the reasoning behind the choice of a specific graphic representation? To tackle this question, we analyzed the written justifications offered by participants for their decisions and looked for emergent patterns and commonalities across those explanations. From this analysis, the first part of the coding scheme described in the Section 2 was developed and nine categories were created, each reflecting a particular view of the relation between knowledge and beliefs. Each category was described by a particular set of key words and common traits. The vast majority of replies (99%) could be classified according to this coding scheme, which was therefore considered adequate for this task.

Nevertheless, we do not claim that these categories neutrally emerged from the data, even if we sought to avoid superimposing an a priori schema. As our own epistemologies have surely played a role in shaping this grouping, this study, in a certain sense, has been as much an investigation of our own epistemological stances as those of respondents. We prefer therefore to describe these categories as the result of a dialogue in which both participants and we, the researchers, have taken part.

For the purpose of lending clarity to the communication of the results and to explore possible correlations among the findings, we have tentatively ordered the categories along a theoretical continuum stretching from a complete coincidence of knowledge and beliefs to a complete separation. In the sections that follow, the nine categories summarizing the relations between knowledge and beliefs are described along with samples of participants’ responses, reported in their original language. A translation of the Italian is provided in italics. Subsequently, distributions across the countries are compared.

3.2.1. Patterns of justifications: identifying categories

Category 1: Complete coincidence. Students whose responses fell into this category offered the justification that knowledge and beliefs completely coincided, since it is necessary to know why one believes. In the students’ written justifications, beliefs tended to be highlighted, but knowledge was what grounded and justified those beliefs. Knowledge and beliefs appeared thus to be critical and co-dependent. In a few instances, respondents referred to the uncertainty of knowledge in order to support the view that to know something coincided with believing in it.

Your beliefs are intertwined with how you view knowledge, and determine the potential knowledge you are capable of obtaining and using.
Conoscere qualcosa significa credere in essa. Nulla è certo e definitivo. L'unica forma di conoscenza è la credenza. To know something means to believe in it. Nothing is certain and final. The only form of knowledge is belief.

Category 2: Encompassing knowledge. Responses falling into this category portrayed knowledge as fundamental and totalistic. Students expressed a high regard for knowledge, which, in their view, subsumed beliefs and was actually the way through which beliefs could be grounded.

In order to have a belief about something you must be knowledgeable about the subject/topic/concept. Therefore the knowledge that we have must encompass our beliefs. We may not have beliefs about all the things we are knowledgeable about.

My knowledge is everything I know in the world from the most minute to the largest things. My beliefs stem from my knowledge.

Io credo che la conoscenza sia ciò che si sa per certo, ciò che mi da' sicurezza nell'affermarlo; le credenze fanno parte della conoscenza, ma si tratta solo di ciò che io credo e ritengo senza alcuna sicurezza. I believe that knowledge is what one knows for sure, what gives me certainty while I am affirming it; beliefs are part of knowledge, but it is only about what I believe and consider without any certainty.

Category 3: Overall integration. Participants’ responses grouped under this category highlighted the close interaction between knowledge and beliefs. Even when students acknowledged that the integration between the two could be less than complete, they stressed that both knowledge and beliefs are valuable and an agreement between the two afforded richer experiences. Some responses in this category underscored that it was precisely the interaction between knowledge and beliefs that allowed for either's application.

Perché la vera conoscenza nasce dall’interazione reciproca tra conoscenza acquisita e credenza in tal proposito e solo così’ puo’ avere una base solida ed essere dunque consolidata e puo’ poi essere applicata. Because true knowledge is born out of the reciprocal interaction between acquired knowledge and beliefs on that issue and only in this way it can be solidly grounded and be therefore consolidated to be later applied.

Because things you learn change your beliefs because you may have learned about an aspect you didn’t know of before so it changes. They are always intertwined also because sometimes the new things you learned and are interested in are based on your beliefs.

I believe that in order to be successful in what you are doing, you need to incorporate the knowledge you have gained through education as well as your own personal and cultural beliefs. By combining your own opinions with previous knowledge and theories will allow you to solve problems and make good decisions for various situations in life. Combining these two elements will also allow you to grow as an individual and let you view life in many different ways.

Category 4: Priority of knowledge. Justifications falling into this category expressed the view that it was necessary to know something in order to believe in it. Thus, for these students, knowledge had to come first and was often coupled with the assumption that beliefs were “verified” (made true) by knowledge.

Without having knowledge of certain materials or things in general, we couldn’t understand our beliefs. For example, without the knowledge we have/know about abortion and how it’s conducted, we wouldn’t know whether to be Pro-life or Pro-choice.

Ho scelto la numero 4 perché le mie credenze sono maturate in base alle conoscenze che mi sono state date e che ho immagazzinato: pertanto in base alle conoscenze ho poi sviluppato le mie credenze, se non conosco non posso credere in qualcosa o esprimere un’opinione. I have chosen number 4 because my beliefs have developed on the basis of the knowledge that I have been given and that I have stored; therefore on the basis of knowledge I have developed my beliefs, if I do not know I cannot believe in something or express an opinion.

Category 5: Beliefs as starting points. Responses assigned to this category conveyed the idea that beliefs came first in life and in the learning process, and prompted the development of knowledge. Further, beliefs tended to be seen as encompassing a wider range of objects than knowledge. Responses usually did not imply subordination between knowledge and beliefs. However, whenever such a subordination was envisioned, beliefs tended to be considered more important.
Prima di tutto devo credere nelle cose, in seguito cercherò di conoscercle meglio. I have to believe in things first, then I will try to know them better.

Una parte della conoscenza e’ inevitabilmente legata ad un certo tipo di credenza (e viceversa). L’ipotesi in quanto tale e’, per un certo senso, la più’ chiara delle credenze che spinge alla conoscenza. A part of knowledge is inevitably linked to a certain type of beliefs (and vice versa). The hypothesis as such is, in a certain sense, the clearest of beliefs that foster knowledge.

I feel that your beliefs act as a filter through which knowledge must squeeze. Information needs to “fit” your beliefs in order to get thru (although, sometimes, your beliefs can change to accept new information and have it become knowledge…like a rip in the screen filter).

“Because the beliefs that my parents have instilled are greater at this point, than my own knowledge and beliefs, because I am still young.”

Category 6: Beliefs as cognitive self-awareness. Students whose responses fell into this category referred almost exclusively to knowledge acquired in the educational/school environment and mentioned the act of believing only with reference to believing to know. These participants usually hinted at the influence of self-efficacy (i.e., beliefs in one’s capability to perform in a given domain or task) on the learning process and tended to express a non-hierarchical relation between knowledge and beliefs.

Sometimes because of your beliefs you may do worse on assignments because you have low self esteem and you won’t gain the knowledge you would have had you had positive beliefs about your abilities.

Perché’ non coincidono totalmente, a volte per troppa autostima a volte per mancanza di essa. Because they do not completely coincide, sometimes due to too much self-esteem sometimes to its absence.

Perché’ talvolta credo di poter riuscire a fare qualcosa quando poi effettivamente in alcuni casi non e’ così’. Because sometimes I think I can do something when in some cases it is not really like that.

Category 7: Partial coincidence. Responses grouped under this heading presented knowledge and beliefs as two partially intertwined constructs, which were not hierarchically related and which dealt with different issues or objects. A common justification for this occurrence was that knowledge and beliefs followed different paths or varied methods. Thus, these respondents generally acknowledged the possibility of conflict between knowledge and beliefs.

Ci sono cose che conosco e cose in cui credo. Il credere in qualcosa non ne implica la conoscenza ne’ vice-versa. Ci sono pure cose in cui credo che posso “conoscerci” con una certa sicurezza. Conoscere = capire attraverso un ragionamento mentale. Credere = “fidarsi” di qualcosa. There are things that I know and things in which I believe. Believing in something does not imply its knowledge and vice versa. There are also things in which I believe which I can “know” with some certainty. Knowing = understanding through a mental reasoning. Believing = “trusting” something.

Credo che ci siano cose in cui si puo’ credere anche senza conoscerle (ad esempio concetti come l’amore, l’amicizia, Dio…nessuno puo’ dire di conoscerli davvero perché’ non se ne puo’ dare una definizione, ma si puo’ comunque crederci. Ci sono altri concetti che invece si conoscono perfettamente (magari perché’ ci vengono insegnati a scuola), ma con cui si puo’ non essere d’accordo. Ci sono altri concetti in cui crediamo e di cui abbiamo anche una buona conoscenza. I believe there are things one can believe even without knowing (for example concepts like love, friendship, God…no one can say to really know them because it is impossible to give a definition, but one can believe in them. There are other concepts that on the contrary can be known perfectly (perhaps because they are taught to us in school), but with which one can disagree. There are other concepts in which we believe and of which we have a good knowledge.

Number 5 is a great representation of knowledge and beliefs. Some aspects of knowledge exist outside of what a person may or may not particularly believe, like a math problem for example. And similarly some beliefs like religion exist outside of knowledge. And there is an ultimate correlation between them at times.

Category 8: Knowledge as the only truth. Responses falling into this category expressed the conviction that knowledge was superior to beliefs, since it decided their truth. These students described beliefs as potentially untrue and, in
some cases, characterized beliefs as negative influences to be “kept in check”. By comparison, knowledge was often depicted as true, objective, grounded in reality, and, in their view, scientific. In essence, knowledge had the purpose to verify and sift beliefs, which tended to be more subjective or, alternatively, generated by the social milieu. In some cases, these respondents described beliefs as hypotheses or intuitions that were necessary in order to develop knowledge. Even in such cases, however, the role of knowledge as verifier was stressed.

Perché’ parte delle credenze che possediamo vengono rese veritieri dalle conoscenze che acquisiamo. Because part of the beliefs that we hold are made true by the knowledge that we acquire.

Delle credenze comuni possono realmente esser giuste, e quindi far parte delle conoscenze. Altre però’ non ci dicono nulla di vero e non si possono inglobare tra le conoscenze. Common beliefs can really be right, and therefore be part of knowledge. Others, though, don’t tell us anything true and cannot be included in the knowledge.

Le credenze sono una minima parte all’interno della conoscenza di un individuo. La conoscenza ci viene fornita dalla scuola e ha il preciso compito di contrastare il concetto di credenza che si basa invece sull’ambiente in cui un individuo si sviluppa. Nonostante la scuola però’ ognuno ha dentro di noi (sic) la sua parte soggettiva di credenze. Beliefs are a minor part within an individual’s knowledge. Knowledge is supplied to us by the school and it has the precise goal to contrast the concept of belief which is on the contrary based on the environment in which an individual develops. Schooling notwithstanding, though, each one of us has within herself her own subjective part of beliefs.

Category 9: Complete separation. Students whose justifications fell into this category perceived knowledge and beliefs as two completely separate entities, with different characteristics and different sources. In their responses, knowledge was often depicted as objective and grounded in an external reality, while beliefs were generally described as more subjective.

Per me le conoscenze e le credenze sono indipendenti le une dalle altre in quanto le prime sono oggettive mentre le seconde soggettive. For me knowledge and beliefs are independent from each other since the former is objective while the latter are subjective.

Knowledge and beliefs are two different things. Knowledge is what you gain, not only from work but from experience as well. Whereas beliefs are what you come to accept as the truth to yourself. Now, beliefs could be based from experiences but it is more likely to be a belief that is passed down from parents, religion faiths or internal decisions of one’s life.

Knowledge is separated from belief because what one acquires in everyday life may not be what they believe in. For example some people say that there is a higher being but they may not believe in it. They may have knowledge of it. I see belief in something that one may be extremely passionate about. God, rituals, certain items, clothes, etc. Knowledge carries you throughout the day. Knowledge is what makes one stand out and rise above others. Beliefs are normally internal. Beliefs are more or less emotional and sometimes psychological feeling that one has towards an idea, person, etc.

3.2.2. Emerging differences between Italian and American justifications

Fig. 3 depicts percent frequencies for each category by country. In Table 1 and Fig. 4, data are presented for the frequencies of responses coded according to these nine categories and their relation to the selected graphic representations. We will discuss the consistency between written explanations and students’ choice of graphic representations in the next section. Here we want to highlight the differences between the Italian and the American students in relation to the justifications offered for these chosen representations \[ \chi^2(8) = 74.64, p \leq .001 \].

The predominant category for both samples was Partial Coincidence (40% for Italian and 50% for American participants). Thus, a large number of participants apparently conceived of knowledge and beliefs as unique constructs, which follow different justification patterns, applied in various contexts (e.g., school or personal life) or to diverse matters (e.g., science or ethics). Certainly, the overlap between knowledge and beliefs was also acknowledged. However, the responses in this category still tended to stress their differences.
Interestingly, the Italian students, similarly to the Dutch participants in the Alexander and Dochy (1995) study, tended to contrast the scientific and certain nature of knowledge with the less logically defined, but more personally meaningful, traits of beliefs, as the following response illustrates:

Ho scelto la prima ipotesi perché credo che conoscenza e credenza siano separate. La credenza secondo me è un’idea personale mentre la conoscenza è qualcosa che si ha appreso scientificamente o comunque che abbia delle basi certe; anche se a volte questi due ambiti possono incontrarsi. I have chosen the first hypothesis because I believe that knowledge and beliefs are separated. Beliefs are in my opinion personal ideas while knowledge is something scientifically acquired or that has anyhow some firm foundations; even if sometimes these two areas can meet each other.

Further, Italian students were more apt to emphasize a difference in the source of knowledge and beliefs, with schooling, and more generally science, mentioned among the possible origins of knowledge, and social communities or the self as the main sources of beliefs.

Penso la 5 perché da un lato ci sono le credenze, di uso quotidiano e tramandate, dall’altro ci sono le conoscenze apprese a scuola e proprie delle scienze. Esse possono sovrapporsi in alcuni ambiti ma essere opposte

Table 1

<table>
<thead>
<tr>
<th>Categories of explanations</th>
<th>Option 1</th>
<th>Option 2</th>
<th>Option 3</th>
<th>Option 4</th>
<th>Option 5</th>
<th>Option 6</th>
<th>Total</th>
</tr>
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<td>0</td>
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<td>15</td>
</tr>
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<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
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<td>0</td>
<td>0</td>
<td>0</td>
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<tr>
<td>Knowledge as only truth</td>
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<td>7</td>
<td>17</td>
<td>17</td>
<td>34</td>
<td>30</td>
<td>114</td>
</tr>
</tbody>
</table>

Fig. 3. Percent frequencies of written categories, by country. CC: complete coincidence; EK: encompassing knowledge; OI: overall integration; PK: priority of knowledge; BSP: beliefs as starting points; BSA: beliefs as self-awareness; PC: partial coincidence; KOT: knowledge as only truth; CS: complete separation.
in altri. I think 5 because on one hand there are the beliefs, of daily use and handed down, and on the other hand there are the notions learned in school and typical of the sciences. They can overlap in some contexts but they can be conflicting in others.

The methods one follows to gain knowledge and beliefs were also perceived differently, as one of the previous examples illustrated:


Also, the students in the United States tended to emphasize the possibility of conflict between knowledge and beliefs about the same object, in some cases citing the controversy between creationism and Darwinism as an example.

There is some overlap between knowledge and beliefs, but some people know things they don’t believe (such as evolution vs. creation) or they believe things they don’t know (such as concepts like heaven).

Some of the American responses stressed the significance of beliefs while also stressing the factual base of knowledge, whereas beliefs “do not have to be backed up by facts and can be considered just as important nonetheless.” Some justifications also expressed a dynamic relation between the two, with knowledge used to defend one’s own beliefs, or sometimes additionally impacting and modifying beliefs about certain issues.

I feel that knowledge and beliefs often overlap and play into each other, but there are times when one might not have to do with the other. For example, your knowledge of a subject/issue may shape and change your belief about that issue. At times, if a person has knowledge about something, their beliefs could conflict with what they know because of upbringing, family, environment, etc.

As noted by Alexander and Dochy (1995), the mention of religious beliefs or ethical issues was much more common in the American responses (10%) than in the Italian ones (3%).

Because you can believe God exists without knowing. Your beliefs and knowledge combine to make you who you are and they don’t always overlap.

Moreover, there was a striking difference between Italian and American students with respect to the category Knowledge as only truth. While 16% of Italian responses were classified in this way, only two students (1%) from
the United States offered this type of justification. This result mirrors what Alexander and Dochy (1995) noted about Dutch respondents, who also tended to place knowledge as truth among their leading definitional categories in contrast to the American participants who tended to describe knowledge as information (p. 425). These differences might be read as signs of the different paths followed by the philosophical debate in Europe and in the United States, and in particular of the American pragmatic shift that substituted “data for objects” (Dewey, 1960, p. 99).

According to this view, ideas tended to be conceived primarily as instruments to solve problems in order to face a precarious existence and reality ceased to be conceived as the object of knowledge to be regarded as “subject-matter for further interpretation” (Dewey, 1960, p. 99). Thus, the interest in ideas became linked to their usefulness and relevance. Truth and falsehood became inadequate and perhaps even hindering attributes of a type of knowledge that was not perceived as a portal to the understanding of reality. As Chimirri (1997) observed, talk about the truth of knowledge necessitates a comparison with reality. When the reference to reality is blurred, it becomes meaningless to talk about true knowledge. In Dewey’s (1960, p. 102) words,

>> The notion that the findings of science are a disclosure of the inherent properties of the ultimate real, of existence at large, is the survival of the older metaphysics.... Thus is created the standing problem of modern philosophy: — the relation of science to the things we prize and love and which have authority in the direction of conduct.... Drop the conception that knowledge is knowledge only when it is a disclosure and definition of the properties of fixed and antecedent reality; interpret the aim and test of knowing by what happens in the actual procedures of scientific inquiry, and the supposed need and problem vanish.<<

This diversity between American and Italian notions was also evident in the different proportion of responses coded in the Priority of knowledge category (6% Italian responses versus 1% American responses), which also highlighted knowledge (of what exists) as the foundation for grounding and justifying beliefs. On the other hand, the Italian responses seemed to suggest the prevalence of a rationalistic trend, which accords the status of knowledge (a sort of absolute knowledge) only to the product of scientific inquiry.

Sebbene per me conoscenze e credenze siano distinte tra di loro, credo che quest’ultime nascano dalle conoscenze e per questo le inglobino. Cio’ che si conosce si basa su studi, esperienze, ecc...cio’ che si crede puo’ essere messo in discussione in ogni momento. Even if knowledge and beliefs are distinct for me, I believe that the latter are born out of knowledge and for this reason they are encompassed by it. What one knows is based on studies, experiences, etc. what one believes can be put under discussion in every moment.

American students were much more likely than Italian students to view knowledge and beliefs as completely coincident (13% versus 1%, respectively). Further, within this category, the personal importance of beliefs also surfaced in many responses, such that the importance of knowledge was conceived mainly as enabling individuals to support and justify their beliefs.

Knowledge and beliefs go hand in hand. Without our beliefs, knowledge is useless.

Beliefs must be based on knowledge, or else there is no way to defend your beliefs or thoughts. Beliefs also come from experiences which help you build knowledge.

In contrast to those justifications included under Partial coincidence, these respondents underscored the necessity and possibility of reconciling knowledge and beliefs. Similarly, the American responses (14%) classified under Encompassing knowledge tended to highlight the attempt to justify one’s own beliefs, emphasizing in this case the grounding value of knowledge.

Beliefs should not be blindly acquired. They should be formed by what you have learned. Your beliefs should be part of your knowledge as a whole.

This pattern was less evident in the Italian responses (11%), which tended to situate beliefs within knowledge, even if beliefs were nevertheless characterized as unproven and uncertain.

Associo la credenza as senso comune. Questo fa parte della nostra conoscenza anche se la sua veridicità’ e’ spesso opinabile. I associate beliefs to conventional knowledge. This is part of our knowledge even if its truth is often questionable.
L’ambito della conoscenza, molto ampio, ingloba quello delle credenze, vere o false che siano. The very broad area of knowledge contains the area of beliefs, true or false as they may be.

A slightly higher percentage of Italian students tended to stress the overall integration of knowledge and beliefs, while simultaneously acknowledging that these remain distinct constructs (10% versus 6% in the American sample). An almost equal percentage of students in Italy and in the United States (8% and 10%, respectively) justified their choice (usually Option 5 or Option 2) by referring to a perception of beliefs as starting points in the process of knowing. These respondents generally mentioned that a specific belief prompts and motivates individuals to know more about the issue and gives direction to their inquiry. These individuals also pointed out that beliefs tend to color the information that is acquired from the environment, influencing the sifting and interpreting of what is encountered.

The emergence of a characterization of beliefs as cognitive self-awareness (“I think I know”) may in part be due to the influence of the psychology class that the participants were attending at the time they participated in the study. It is possible that the issues addressed in the course evoked this association in respondents. Such a view was more prevalent among Italian students (7% versus 2% in the United States). Finally, a very low percentage of responses from either country supported the view of complete separation between knowledge and beliefs (1% from Italy and 3% from the United States).

3.3. Question 3. Consistency between written explanations and graphic representation of the relation between knowledge and beliefs

We used a comparison between participants’ written explanations and their selected representations as a way to corroborate the results and to substantiate the validity of the method used in our research. We were aware of the challenge inherent in expressing in writing, and in a relatively limited space, one’s own perceptions of knowledge and beliefs. While we assumed that participants’ writing skills sufficiently enabled them to express their views, we wanted to verify, as much as possible, that the responses they offered were, in fact, reflective of their conceptualization of the relation of knowledge and beliefs. Given the number of participants involved in the study and the impracticality of probing their thinking more deeply through interviews, we opted for a triangulation of the results to serve this purpose.

We found the resulting analysis encouraging. Eighty-seven percent of the Italian and 86% of the American responses were found to be consistent with the graphic option chosen. Moreover, the majority of discrepant responses reflected at least partial corroboration of the written explanation, since those responses usually accompanied Option 5 (overlapping), but failed to justify one of the two areas of independence (e.g., failing to justify how one can know something without believing in it, or how one can believe in something without knowing it, as in: “...you don’t necessarily need to have knowledge in order to believe in something”). Table 2 reports the frequencies and the percentages of written explanations by graphic options for each country.

3.4. Question 4. Investigating characterizations and sources of knowledge and beliefs

Which characterizations and sources of knowledge and beliefs were most often mentioned in participants’ written responses? While the previous categories described various relations between knowledge and beliefs generally found in participants’ responses, we wanted to conduct a finer-grained analysis. In particular, we wanted to examine patterns in the specific words or phrases used by participants to explain knowledge or beliefs. We noted that most of those words or phrases pertained to the character or the source of beliefs or of knowledge. Figs. 5—8 display frequencies of responses mentioning characteristics and sources of knowledge and beliefs; Tables 3—6 present these data disaggregated by category. Percent values were calculated based on the total number of analyzed responses for the respective samples.

3.4.1. Characteristics of beliefs

As shown in Table 3, eight characteristics of beliefs were repeatedly cited in participants’ responses. Some students mentioned that beliefs are not necessarily true (Potentially untrue) and that they play a negative role, hindering the development of knowledge and constraining one’s perspective on various issues (Hindering influence); others pointed to the positive role played by beliefs in orienting the construction of knowledge and their functioning as working hypotheses and sources of interpretation (Positive hypothesis). Some responses mentioned that people draw on beliefs
selectively, in particular fields, or with respect to certain matters (Selectively applicable). Some students referred to beliefs as self-awareness of one’s cognitive abilities, influencing the learning process, prompting engagement, or fostering withdrawal (Self-esteem booster). Finally, respondents characterized beliefs as something implying personal commitment and influencing a wide array of behaviors. Thus, beliefs involved a subjective choice that might prescind from knowledge (Subjective choice) until becoming independent from it (Knowledge unrelated) and from factual evidence (Facts unrelated).

3.4.2. Characteristics of knowledge

Four characteristics of knowledge were highlighted in participants’ responses (see Table 4). Knowledge was sometimes characterized as true, grounded in reality, scientific, and empirical (Scientific and true). Students also referred to knowledge as a wide and broad set of information (Set of information) and as something that can be practically applied (Applicable). Some responses noted that, by its very nature, knowledge is uncertain (Uncertain).

3.4.3. Sources of beliefs

Responses mentioned three main sources of beliefs (see Table 5). Some students stated that beliefs belong to the individual, and perceived them as innate or prompted by personal experience (Individual). Some respondents identified the social environment as the source of beliefs, mentioning that the transmission of beliefs usually happens through the various communities in which one takes part, from the society at large, or from one’s own family (Social environment). Finally, some participants mentioned that beliefs are based on knowledge or at least influenced by it (Knowledge).
3.4.4. Sources of knowledge

As shown in Table 6, seven sources of knowledge were identified in the responses. Certain students mentioned formal education, and explicitly referred to the role of school (Formal education). Other students stated that knowledge is gained or acquired from the external environment (Environment) or that it is learned through study and research (Learning). Other participants saw knowledge as a part of the self, who possesses it (Self). Some students underscored that knowledge is based on empirical data (Data) or that it comes from the experiences one has (Experience). Finally,
other students stated that knowledge is influenced by beliefs, sometimes to the point of being determined by them (Beliefs).

3.4.5. Cross-cultural response patterns

Among the cross-cultural response patterns about the characteristics of beliefs that surfaced was the almost exclusive and substantial emergence among the Italian students of a negative perception of beliefs. Nineteen percent of Italian respondents underscored the potentially untrue nature of beliefs, with 6% highlighting beliefs as hindering the process of knowing. At the same time, the view of beliefs as positive working hypotheses was expressed almost exclusively by Italian students (8%), suggesting the existence of very different epistemological positions among these students. Both traits were virtually absent in the American responses.

More widespread among American students than Italian students was the view of beliefs as unrelated to knowledge (24% versus 5%, respectively). Both groups characterized beliefs as subjective, personally relevant choices, often implying personal commitment (13% in Italy and 8% in the United States), but also selectively applicable according to the context and the issue at hand (14% in Italy and 10% in the United States).

Table 3
Frequencies of characteristics of beliefs by categories of written explanations

<table>
<thead>
<tr>
<th>Categories of explanations</th>
<th>Potentially untrue</th>
<th>Positive hypothesis</th>
<th>Selectively applicable</th>
<th>Hindering influence</th>
<th>Self-esteem booster</th>
<th>Subjective choice</th>
<th>Knowledge unrelated</th>
<th>Facts unrelated</th>
</tr>
</thead>
<tbody>
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<td>0</td>
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<td>0</td>
<td>0</td>
<td>0</td>
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<td>0</td>
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<td>0</td>
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<tr>
<td>(19%)</td>
<td>(1%)</td>
<td>(8%)</td>
<td>(1%)</td>
<td>(14%)</td>
<td>(10%)</td>
<td>(6%)</td>
<td>(1%)</td>
<td>(2%)</td>
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</table>

Fig. 8. Percent frequencies of sources of knowledge, by country.
The disaggregated data in Tables 3–6 suggest an association between the characterization of beliefs as potentially untrue and a view of the relation between knowledge and beliefs in which knowledge is perceived as the only source of truth (Category 8, *Knowledge as only truth*). In contrast, students who view knowledge and beliefs as only partially coincident constructs tended to characterize beliefs as subjective choices (particularly in the Italian sample), selectively applicable (in both samples), and usually unrelated to knowledge (particularly in the American sample).

Examining the characteristics of knowledge that emerged, the first observation regards the number of references to knowledge, which is much lower than the number of references to beliefs. While this was true in both samples, it was somewhat more evident among the American students who mentioned traits referring to beliefs 111 times, but referenced knowledge only 41 times. By comparison, Italian students referred to beliefs 147 times versus 88 times for knowledge. In other words, students tended to volunteer richer descriptions of beliefs than knowledge. We found this surprising, considering that the participants were undergraduate students spending a considerable portion of their daily lives in knowledge-related activities.

What role might educational systems play in fostering an apparent asymmetry in students’ perceptions? Is it possible that the prevalent commitment of formal schooling to the transmission of scientific knowledge, implicitly conveyed as neutrally objective and often countered with the beliefs received within one’s tradition, ultimately hindered students’ capacity to develop richer conceptions of the nature and meaning of knowledge? In other words, could it be that, in order to communicate the richness and significance of knowledge, it is necessary to start from the knowledge and beliefs that students bring to the classroom?

In his essay, *Towards a rational theory of tradition*, Popper (1962) compared the role that traditions play in social life to the function of theories in the development of science. As scientific theories, traditions also provide starting hypotheses to be tested. Therefore, as theories pave the way for the generation of new theories that can “bring some order into the chaos in which we live so as to make it rationally predictable,” so traditions give us “something that we can criticize and change” (p. 131). Attempting to “wiping off everything and starting from scratch, with

### Table 4
Frequencies of emerged characteristics of knowledge by categories of written explanations

<table>
<thead>
<tr>
<th>Categories of explanations</th>
<th>Scientific and true</th>
<th>Set of information</th>
<th>Applicable</th>
<th>Uncertain</th>
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<td></td>
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<td>U.S.</td>
<td>I</td>
<td>U.S.</td>
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<td>1</td>
<td>0</td>
<td>1</td>
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<td>Encompassing knowledge</td>
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<td>6</td>
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<td>0</td>
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<td>Priority of knowledge</td>
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<td>0</td>
<td>1</td>
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<td>1</td>
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<td>0</td>
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<td>Partial coincidence</td>
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<td>12</td>
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<tr>
<td>Knowledge as only truth</td>
<td>26</td>
<td>1</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Complete separation</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>57 (30%)</strong></td>
<td><strong>11 (5%)</strong></td>
<td><strong>22 (12%)</strong></td>
<td><strong>21 (10%)</strong></td>
</tr>
</tbody>
</table>

### Table 5
Frequencies of sources of beliefs by categories of written explanation

<table>
<thead>
<tr>
<th>Categories of explanation</th>
<th>Individual</th>
<th>Social environment</th>
<th>Knowledge</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>I</td>
<td>U.S.</td>
<td>I</td>
</tr>
<tr>
<td>Complete coincidence</td>
<td>0</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>Encompassing knowledge</td>
<td>2</td>
<td>6</td>
<td>1</td>
</tr>
<tr>
<td>Overall integration</td>
<td>1</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Priority of knowledge</td>
<td>8</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Beliefs as starting points</td>
<td>5</td>
<td>12</td>
<td>1</td>
</tr>
<tr>
<td>Beliefs as self-awareness</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Partial coincidence</td>
<td>23</td>
<td>19</td>
<td>7</td>
</tr>
<tr>
<td>Knowledge as only truth</td>
<td>12</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>Complete separation</td>
<td>1</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>53 (28%)</strong></td>
<td><strong>46 (21%)</strong></td>
<td><strong>47 (25%)</strong></td>
</tr>
</tbody>
</table>
a brand new rational world” (an attitude suggested by the stark dichotomy between schooled knowledge and traditional beliefs evidenced in some of the students’ responses) may well be inappropriate since, in doing so, the very ideas that fostered the generation of knowledge in the first place are swept away (pp. 131–132).

As previously discussed, one of the main differences between the Italian and American respondents was their perception of knowledge as scientific and true. Specifically, 30% of the Italian students characterized knowledge as such, compared to 5% of the Americans. This description tended to correlate with the view that knowledge and beliefs overlap only partially and that knowledge constitutes the only truth. The second most common trait to appear in the responses for both groups was the conception of knowledge as information (12% in Italy and 10% in the United States). Much less common was the characterization of knowledge as something that can be applied (4%). Practically no one referenced the uncertainty of knowledge (1%).

The perceptions of the sources of beliefs that appeared in responses for the Italian and the American samples afforded a contrasting picture. Italian students stressed the role of the social environment (25% versus 7% in the United States), while American students highlighted the influence of beliefs on knowledge (35% versus 9% for Italians). At the same time, we found that 24% of American students characterized beliefs as unrelated to knowledge. It is possible, however, that what would appear as a contradiction is another attempt to justify one’s beliefs by grounding them in knowledge, a view that often emerged in the American responses. Finally, a large number of students in both groups (28% in Italy and 21% in the United States) referred to beliefs as something owned by individuals who possess or generate them.

I define beliefs as my ethics and my faith.

You may have certain beliefs/values about the knowledge you gain in school or in day to day life.

In base alle conoscenze ho poi sviluppato le mie credenze. On the basis of knowledge I have then developed my beliefs.

Much more varied were the sources of knowledge mentioned by the students. The main differences between the two samples regarded perceptions of beliefs as sources of knowledge. Twenty-two percent of American students mentioned the influence of beliefs on knowledge, while only 5% of Italians did the same. The other sources of knowledge (e.g., environment or formal education) were mentioned by both groups to a similar degree.

3.5. Question 5. Educational paths and epistemological beliefs: the possible role of formal instruction

The analyses reported herein point to marked differences in the conceptualization of knowledge and beliefs held by students in Italy and in the United States. Given that the two samples were quite similar in many other respects (e.g., age, gender, or post-secondary major), we considered cultural variables as a potential root of such differences. In the
present study, we have chosen to explore one aspect of the culture that seems to us particularly prominent in the life of our participants, namely school. Does the structure of formal instruction impact epistemological beliefs? To answer this question, we focused on the Italian sample, disaggregating data by type of high school attended. Unfortunately, the same analysis could not be performed on the American data, since high schools there do not fit neatly into distinct categories (cf., Maggioni & Riconscente, 2003).

In this final section, we report some preliminary results informative for future research. Since four types of high school accounted for 80% of participants, we focused on the 152 Italian students who attended these high schools. Specifically, the schools considered were the liceo scientifico (32% of participants), the liceo classico (20%), the liceo psico-pedagogico (19%), and the istituto tecnico commerciale (9%). The liceo aims at providing students with a strong academic foundation, under the assumption that these students will pursue university studies. The core of the curriculum at the liceo consists of the traditional liberal arts (e.g., literature, philosophy, Latin, mathematics). In particular, the curriculum of the liceo scientifico emphasizes mathematics and the sciences, while the liceo classico stresses the fine arts and the study of Greek and Latin. Finally, the liceo psico-pedagogico focuses on disciplines typical of the social sciences, such as psychology, sociology, and pedagogy. The istituto tecnico commerciale aims at providing students with training for professions in business-related areas, with such curricula emphases as economics, accounting, law, foreign languages, and information technology.

We previously discussed the tendency of the Italian over American respondents to consider knowledge as only truth. However, disaggregating the data, we found that this view was not equally shared among students who attended different high schools. While 16% of Italian students responded in this manner, 23% of those who attended the liceo scientifico gave responses belonging to this category, versus 16% for the liceo classico, 6% for the liceo psico-pedagogico, and 12% for the istituto tecnico commerciale. Can this be explained in terms of the exposure to different curricula that promote the development of certain epistemological beliefs? Or rather, do certain epistemological beliefs, and in particular a more “absolutist” view of knowledge, tend to be more engrained not in the scientific subjects per se, but in the pedagogical approaches used to teach the scientific disciplines (Antiseri, 1974, 1977)?

Another indication that educational paths influence the development of epistemological beliefs emerged when disaggregating responses portraying the relation between knowledge and beliefs as only partially coinciding. Students who attended the liceo classico and the liceo scientifico tended in this case to reflect the distribution of the whole sample (38% and 43%, respectively, versus a 40% of the whole), but 56% of the students in the liceo psico-pedagogico and only 19% of the students in the istituto tecnico responded in this way.

On the other hand, it may be that individual’s beliefs influence the preference for specific curricula. The correlational nature of this study does not allow to discard this hypothesis, even if its results suggest a plurality of influences at work in the shaping of perceptions about knowledge and beliefs. Further research is needed to expand our understanding of these relations.

4. Conclusions and implications

Before turning to the main conclusions and implications, we would like to point out some potential limitations of this study. As discussed, the qualitative nature of this study afforded a rich description of the constructs investigated, and concomitantly introduced an explicit subjectivity to the analysis. Since other researchers may have identified alternative classifications based on participants’ responses, we have taken care to make our thinking visible, describing the categories we created as clearly as possible, using the words of participants whenever viable, and triangulating findings. Even given a substantial sample size, we do not claim that these findings generalize to the whole population of undergraduate students in the respective countries. Indeed, the very results of the present study strongly encourage attention to the plethora of factors influencing epistemological beliefs. Nevertheless, we maintain that these response patterns serve as a useful framework for the design and analysis of future research.

It is also possible that some participants constructed their responses based more on their perception of the prevalent conception of knowledge and beliefs than on their personal views. Even if this were the case, we contend that the overall response patterns nevertheless aid in discovering which traits of knowledge and beliefs may be considered particularly salient within specific cultures.

Keeping these limitations in mind, we present the main conclusions suggested by this study and discuss implications for research and educational practice.
4.1. International designs and development of research instruments

First of all, our analyses corroborate prior research findings regarding the complex and multidimensional nature of epistemological beliefs (Hofer & Pintrich, 1997; Jehng et al., 1993; Schommer, 2002). It would then be essential for researchers to employ instruments sensitive to the plurality of facets that shape epistemological beliefs, in order to capture as valid a portrait as possible of this construct. The different levels of analyses performed in this study illustrate how the choice of similar selected-response items can conceal quite different underlying conceptions of knowledge and beliefs. In other words, the research instruments applied are lenses capable of either focusing or blurring the object under investigation, consequently affecting the validity of the findings.

We further propose that the method of comparison afforded by an international framework fosters and sharpens the understanding of multidimensional constructs such as epistemological beliefs, calling attention to dimensions that may be less evident within a single culture. Nevertheless, this consideration also highlights the importance of considering the cultural sensitivity of the methods and instruments used. While the emergence of cultural differences cautions against uncritically importing frameworks developed in different contexts, it also encourages pursuits of new avenues of constructive international cooperation.

4.2. Cultural influences: schooling and tradition

From an educational point of view, it is additionally important to draw attention to the role that culture plays in the shaping of epistemological beliefs. In particular, the analysis of the Italian data disaggregated by type of high school attended supports the findings of previous research concerning the influence of schooling in the development of epistemological beliefs (Perry, 1970). This analysis also suggests that different curricula may foster the acquisition of different epistemological stances (Jehng et al., 1993; Paulsen & Wells, 1998).

On the other hand, it is also essential to recognize that students come to the classroom not as blank slates, but carrying a set of beliefs that need to be acknowledged as hypotheses that fuel and sustain the learning process. Especially in the United States, participants often stated that they can “know” (and perhaps even regurgitate) information, without having this “knowledge” impact what is actually meaningful for their lives. Perhaps this kind of learning may serve some purpose. However, we believe that education implies much more. In particular, we think that it should aim to introduce the person to reality in all its aspects, and that this endeavor cannot be fulfilled if the affirmation of the meaning of reality is disregarded (Giussani, 1995).

As a consequence of being born into a specific family and a particular culture, students are given a tradition that carries a whole structure of values and meanings. Some students highlighted this particular aspect in their responses, observing for example that “the beliefs that my parents have instilled are greater at this point than my own knowledge and beliefs, because I am still young,” or referring to the molding effect of “humanity’s 1.5 billion year existence.” Tradition serves thus as an explanatory hypothesis, and it becomes extremely important that education takes the tradition into which students are born seriously, since “there cannot be a discovery, step, or contact with reality that we initiate without some idea of possible meaning—an idea more or less profoundly reflected, and in any case present and active” (Giussani, 1995, p. 53).

In this study, some students acknowledged that sometimes, “their beliefs could conflict with what they know because of upbringing, family, environment.” In these cases, does education foster the acquisition of a method to deal constructively with such occurrences? The research on beliefs, providing numerous examples of the impact of beliefs on behavior and of their role in learning settings (Hofer & Pintrich, 2002; Pajares, 1992), further stresses the relevance of this issue.

The perception of a contraposition between schooling and tradition also emerged in some responses.

La conoscenza ci viene fornita dalla scuola e ha il preciso compito di contrastare il concetto di credenza che si basa invece sull’ambiente in cui un individuo si sviluppa.

Knowledge is supplied to us by school and it has the precise goal to contrast the concept of belief which is instead based on the environment in which an individual develops.

There was also a tendency among certain respondents to project dichotomous thinking in their depictions of knowledge and beliefs, a position that would make the reconciliation of knowledge and beliefs impossible to achieve.
We must have some knowledge on the subject in order to decide what we believe. Then there are some beliefs that do not agree with our knowledge, but we still believe them.

There are some things that I believe that are not supported by any type of knowledge. Also, I have learned things that don’t correspond with my beliefs.

There are many things which I know and believe in, however, there are also many things that I know of which I do not believe in.

There is an interaction between knowledge and beliefs, but there are independent events in which I must put my knowledge before my beliefs (chemistry class) or my beliefs before my knowledge (a morality discussion).

Far from being an advocacy for uncritical traditionalism, an educational approach that seriously takes a student’s tradition into account would actually encourage a personal verification of “the traditional contents being offered” (Giussani, 1995, p. 67). This verification in turn would foster the growth of an authentically critical and solid personality. Popper made a similar argument in his essay on a rational theory of tradition. He stated that, in front of tradition, there are only two main attitudes.

One is to accept a tradition uncritically, often without even being aware of it. In many cases we cannot escape this; for we often just do not realize that we are faced with a tradition. […] The other possibility is a critical attitude, which may result either in acceptance or rejection, or perhaps in compromise. Yet we have to know and to understand a tradition before we can criticize it, before we can say: ‘We reject this tradition on rational grounds.’ (Popper, 1962, p. 122)

Finally, the view of scientific knowledge as fixed and true per se, which emerged particularly in the Italian responses that dealt with the characterizations of knowledge, further highlights the importance of introducing students to the methods through which knowledge is generated in the various fields. We believe this would help students to recognize the powerful and unique role that both knowledge and beliefs play in the introduction to reality. In this way, the discovery of dissonances and gaps in the students’ personal knowledge or, more generally, the awareness of the limitation of knowledge, will not foster indifference or skepticism, but will become privileged occasions to deepen the search for truth. Being sensitive, as educators, to the beliefs that are fostered in the classroom and attentive to their manifestations is perhaps one of the first steps to take to assist the development of critical and mature thinkers.

References


