"Social Scientists Need to Be Nice and Empathetic": Exploring Students' Beliefs Related to Social Sciences and Humanities

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Abstract: The goal of this paper is to explore students' beliefs related to the social sciences and humanities and to investigate whether these beliefs differ between students who are highly interested in studying socials sciences after graduating from secondary school and students who are rather less interested. For this purpose, we conducted a study with 149 secondary school students. The analysis of students' answers to three open-ended questions revealed that most of the students have inaccurate and imprecise beliefs related to the workplaces, skills, and practices of scientists within the social sciences and humanities. An Epistemic Network Analysis demonstrated that these inaccurate beliefs are even stronger in students who reported to be interested in studying social sciences. Thus, our findings illustrate the need to foster students' development of realistic views of the social sciences and humanities.

Students' beliefs related to science

It is hypothesized that students' beliefs related to science and scientists are associated with their interest in and their attitudes towards science, and that this interaction, in turn, affects students' learning and their career choices (e.g., Christidou, 2011). We attempt to visualize these hypotheses in Figure 1.

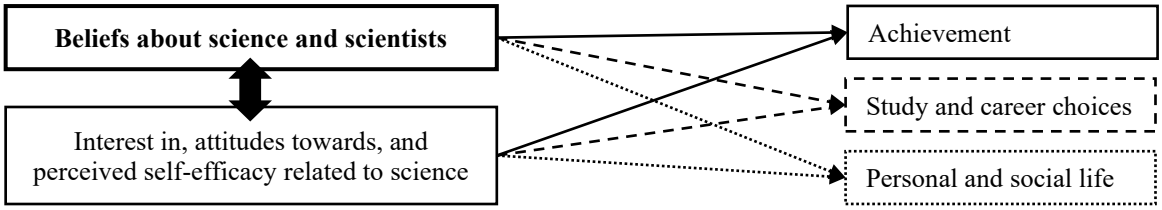

Figure 1. Model on the effects of students' beliefs about science and scientists.

Some scholars have begun to investigate the relationship between students' inaccurate beliefs about scientists (or science more generally) and their negative attitudes towards STEM (i.e., science, technology, engineering, and mathematics), their limited interest in STEM-related careers, and / or their low achievement in STEM domains (e.g., Lin-Siegler, Ahn, Chen, Fang, & Luna-Lucero, 2016). However, while ample research has been focused on examining students' beliefs related to science, especially the *natural sciences* (for a review, see Christidou, 2011), students' beliefs about *social sciences and humanities* as well as the relationship of these beliefs to, for instance, students' study choices have not yet been investigated. Pauly (2012) hypothesizes that students' choice to study social sciences (i.e., sociology, educational sciences, etc.) or humanities (i.e., philosophy, history, etc.) is probably often based on inadequate beliefs about these disciplines. This may then be the reason why the social sciences and especially the humanities – at least in Germany – suffer from a high drop-out rate of university students (Heublein & Schmelzer, 2018). Out-of-school labs (OLSs) try to address this issue in secondary school students (i.e., in students who have not yet made their study choices). Specifically, OSLs aim at fostering adequate beliefs about the natural or social sciences by enabling students to authentically experience scientific ways of thinking and working (Scharfenberg & Bogner, 2014). However, so far, empirical evidence on (1) students' beliefs related to the social sciences and humanities and (2) the relation between students' beliefs and their interest in studying social sciences is missing. We address this research gap in the present paper. Thereby, we aim at making a first step towards empirical investigation of the model depicted in Figure 1 in the context of the social sciences.

Method

To investigate our research questions, we conducted a survey of secondary school students, who visited an OSL for social sciences and humanities. To explore students' beliefs related to social sciences and humanities (Research Question 1), we coded and counted students' answers to three open-ended questions. To analyze the relation between these beliefs and students' interest in studying social sciences (Research Question 2), we used

epistemic network analysis (ENA: Shaffer, Collier, & Ruis, 2016). More specifically, we compared the coded student answers between students who reported a rather high interest (HI) in studying social sciences after graduating from secondary school and students with a rather low interest (LI). The resulting ENA model enables us to examine whether and to which extent HI and LI students differ in their patterns of beliefs.

Participants were 149 secondary school students (M_{age} = 15.99, SD = 1.17, 61% girls) from eight sociology or educational sciences classes. The study took place in an interdisciplinary OSL at a large German university. All participants attended an OSL project on social sciences research methods, namely on evaluating causal versus correlative evidence within the social sciences.

The data analyzed here are derived from a survey administered at the beginning of the OSL project. As students visited an OSL project on research methods within the social sciences and as they visited the project as part of their sociology or educational sciences course, we assessed students' interest in studying sociology or educational sciences after graduating from school. For this purpose, we asked them to rate the following item on a scale of 1 (*strongly disagree*) to 5 (*strongly agree*): "I would be interested in studying sociology / educational sciences". To measure students' beliefs related to social sciences and humanities, we used the following three open-ended questions: (1) Where do scientists within the social sciences and humanities work? (2) Which skills characterize a good scientist within the social sciences or humanities? (3) What does it mean to scientifically investigate something within the social sciences or humanities? Through a bottom-up process, we developed eleven codes to represent the key elements of students' answers (see Table 1). Two raters coded 50% of the data and their agreements (see Table 1) meet standards for Cohen's kappa (cf., Landis & Koch, 1977) for all codes.

Table 1: Coding scheme and inter-rater reliability statistics

	Code name	**Description** (for examples see Table 2)	**κ**
Question 1	Research locations	Students name locations that are related to research (e.g., university, university of applied sciences, laboratory).	0.80
	Locations of practice	Students name locations that are related to different pedagogical (e.g., school), medical (e.g., hospital) and / or social (e.g., nursing home) areas of practice.	0.87
	Other locations	Students name workplaces other than the research locations or locations of practice (e.g., ministries, office, church).	0.81
Question 2	Cognitive skills	Students name cognitive skills and characteristics (e.g., intelligence, memory capacity).	0.90
	Metacognition & norms	Students describe metacognitive skills (e.g., self-reflection) or research norms (e.g., objectivity).	0.73
	Motivation	Students describe motivation-related reasons (e.g., fun, interest) for doing research.	0.90
	Social skills	Students name social and / or interpersonal skills (e.g., empathy, team-minded).	0.90
Question 3	Research methods	Students describe ways for empirically (e.g., observation) investigating something.	0.81
	Investigating humans	Students describe research as an attempt to understand, explain, investigate the human mind and / or behavior.	0.75
	Investigating something	Students describe that scientists within the social sciences and humanities think about, analyze, criticize, or investigate something (not humans, often society).	0.80
	Other activities	Students name activities other than using research methods, investigating humans, or investigating something (e.g., teaching, to help people).	0.91

Results

Table 2 shows the frequencies of students' answers to the three open-ended questions sorted by the eleven codes. With respect to the first question, the results show that the majority of the participants (i.e., n = 93) associate locations of practice with workplaces of scientists within the social sciences and humanities. We further coded students' answers within the category "locations of practice". This coding of all statements (in total N = 139) given by the 93 participants reveals that 80 statements refer to pedagogical areas of practice (i.e., school and / or

kindergarten), 34 statements relate to medical workplaces, and 24 statements refer to social organizations. Regarding the second question, the results show that most students (n = 118) attribute social skills to scientists within the social sciences and humanities. Regarding the third question, the results show that most of the students describe that investigations within the social sciences and humanities either aim at examining and explaining human behavior and thinking (n = 59) or at investigating "something" else, such as the society (n = 50). While these descriptions include no or few details on the methods that are used to investigate humans or some other topic of interest, the answers of 37 students within the category "research methods" are fairly specific with respect to the methods (e.g., observation or survey) that scientists within the social sciences and humanities may use.

Table 2: Frequencies of students' answers to the open-ended questions

	Codes	**Frequency**	**Examples** (translated from English to German)
Question 1	Locations of practice	93	"at schools, with people"; "hospitals, organizations that help people, schools"; "psychiatry, hospital, school, kindergarten"
	Research locations	87	"at an institute of a university or in a laboratory for social sciences and humanities"; "universities"; "laboratories"; "research institutes"
	Other locations	65	"in an office"; "in public facilities"; "politics"; "in companies"
	No location stated	14	"I have no idea"
Question 2	Social skills	118	"one needs to know people, needs to empathize with people, and has to interact well with people"; "patience, has to be confidential, needs to be a good listener"
	Cognitive skills	83	"logical thinking, recognition and deep analysis of structures"; "grasp"; "one has to know how to analyze studies"
	Motivation	31	"long-lasting interest in society-related topics"; "curiosity"
	Metacognition & norms	27	"objective and unbiased"; "organized working behavior (precise documentation), self-reflection"
	No skills stated	4	"the same as every other scientist"; "I have no idea"
Question 3	Investigating humans	59	"to understand and explain the thinking or behavior of a person"; "to investigate the behavior of a human or a group of humans"
	Investigating something	50	"to investigate and analyze different situations"; "to investigate how something affects, for instance, the society"
	Research methods	37	"one has to analyze a bunch of surveys"; "to discover something by testing people"; "to pose hypotheses and test these by conducting studies, experiments"
	Other activities	27	"to help people or the society more generally"; "to share information"
	No activities named	13	"I have no idea"

Figure 2 illustrates the ENA results, namely HI and LI students' patterns of beliefs. To identify HI and LI students, we used the average score of their interest in studying sociology or educational sciences after graduating from secondary school (M = 2.78, SD = 1.25) and identified 85 HI students (i.e., interest > 2.78) and 64 LI students (i.e., interest < 2.78). The left Figure shows each student's network location along with the means and 95% confidence intervals of LI (red) and HI (blue) students. A t-test reveals a statistically significant difference between HI and LI students on the first dimension with a large effect (M_{HI} = 0.18, M_{LI} = -0.24; t = -5.19, p < 0.01, Cohen's d = 0.84). To identify why there is a significant difference between the two groups, we subtracted one network from the other. As the right Figure shows, HI students (blue) made more links between SOCIAL SKILLS and LOCATIONS OF PRACTICE, while LI students (red) make more links from COGNITIVE SKILLS to RESEARCH LOCATIONS and SOCIAL SKILLS as well as (although less stronger) to LOCATIONS OF PRACTICE, RESEARCH METHODS, and INVESTIGATING HUMANS.

Discussion

Our findings suggest that students have rather inaccurate and imprecise beliefs about the workplaces, the skills, and the practices of scientists within the social sciences and humanities. More specifically, most of our participants stated that scientists within the social sciences and humanities work in pedagogical, medical, and / or social areas of practice, need social skills, such as empathy, and that they try to somehow investigate and understand humans

and / or the society. Our ENA results demonstrate that the inaccurate beliefs about the workplaces and required skills of scientists within the social sciences and humanities are even stronger in students who are rather interested in studying sociology or educational sciences after graduating from secondary school than in students who are less interested in studying these disciplines. Thus, many students who intend to study social sciences seem to have inaccurate beliefs about these disciplines. Hence, our findings illustrate the need to foster students' development of more realistic views of the social sciences and humanities. Moreover, our findings are a first step towards investigating the model depicted in Figure 1 in the context of the social sciences.

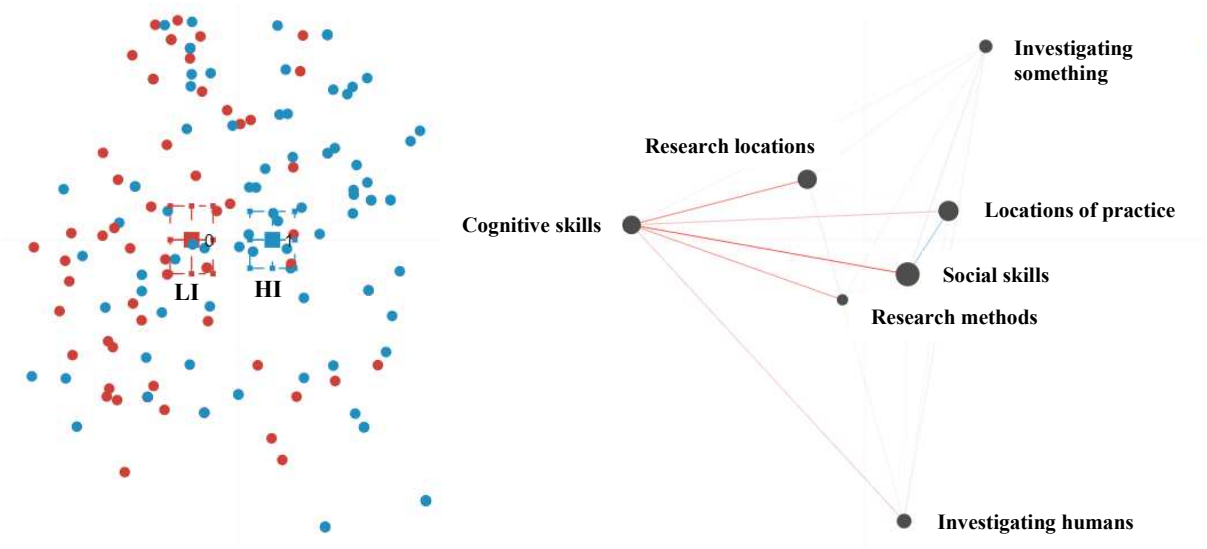

Figure 2. LEFT FIGURE: ENA scatter plot showing LI (red) and HI (blue) students. RIGHT FIGURE: ENA difference graph for LI (red) and HI (blue) students' coded answers. Due to visualization reasons, four codes that do not account for the differences between HI and LI students are not displayed in the right figure.

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