

Justification for knowing in a digitalised landscape: An empirical exploration

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Abstract

Epistemic beliefs are described as the way individuals regard the nature of knowledge and knowing. The nature of knowledge can be explored as dimensions describing the certainty and the structure of knowledge, whereas the nature of knowing can be explored as dimensions describing the source of knowledge and the justification for knowing. Recent research suggests justification for knowing as consisting of three strategies for justifying knowing: 1) justification by authority, 2) justification by multiple sources, and 3) personal justification.

Knowledge is considered to originate from various sources, where testimony is regarded as the most important. Many online interactions are about conveying information to others and thus, testimonial in nature. The information we receive in various testimonies requires justification using the appropriate justification method. Therefore, source of testimony is central when justifying knowing.

In a pilot study among first-year students we explored how the source of testimony and the type of information affect the choice of justification method. The use of justification methods was measured using the Internet-Specific Epistemic Justification Inventory (ISEJ). The results indicate that the source of testimony has a stronger impact than type of information on the choice of justification method.

Keywords: epistemic beliefs, justification, knowledge, internet, epistemic injustice, testimonial injustice, social media

1. Introduction

Since the introduction of the internet, traditional media (books, journals, newspapers, radio, television) are increasingly being used in digital formats alongside their analogue precursors. In addition, the digitalised media landscape is characterised by a multitude of social media platforms where, unlike

traditional media, a large part of the content is user generated. All the various types of media convey to us information from both known sources and from sources whose identity is covert or fictitious.

To a large extent we construct our knowledge upon information that is often conveyed to us as testimonies via the media. Considering that testimonies are regarded as the main source of information, the question arises: how do users in this new media landscape choose and justify information to be part of their knowledge?

How people regard knowledge can be explored using the concept of epistemic beliefs, which has attracted increasing interest during the past decades. This also applies to the concept of epistemic injustice, which includes the concept of testimonial injustice. Thus, testimony is a common component for these concepts.

In the following, I present brief introductions to the concepts of epistemic beliefs (including justification for knowing as a key element when assessing testimonies), testimony, and epistemic and testimonial injustice, while connecting them to the digitalised landscape.

2. Epistemic beliefs

Each science or discipline has its own epistemology, that describes what is considered knowledge, how knowledge is created within the discipline, and what is possible to know. Similarly, individuals have their personal – often unconscious – epistemic beliefs about the nature of knowledge, and how to create personal knowledge based on the information they receive. One's epistemic beliefs influence how one assesses information, and how one creates one's own knowledge. In educational settings, the epistemic beliefs are reflected partly in how students learn, partly in how teachers set up their teaching and learning activities.

2.1 Epistemic beliefs as a set of dimensions

Research around epistemic beliefs already has a 50-year history that includes extensive research. The foundations of the concept of epistemic beliefs were laid already in the 1970s, and an important milestone for one line of research was the Epistemic Questionnaire (EQ) introduced by Marlene Schommer (1990). This line of research is based on the idea that our epistemic beliefs can be seen as a multidimensional construct where the dimensions develop independently of each other. In the beginning, dimensions that also described learning views were included. Hofer & Pintrich (1997) among others suggested that epistemic beliefs should, however, describe only views of knowledge and knowing. Hofer & Pintrich structured the epistemic dimensions according to 1) the nature of knowledge including the dimensions 1.a) *certainty of knowledge* and 1.b) *structure of knowledge*, and 2) the nature of knowing with the dimensions 2.a) *source of knowledge* and 2.b) *justification for knowing*.

- 1.a. *Certain(ty of)*¹ *knowledge* expresses² a view of knowledge as certain, absolute and not changing or developing.
- 1.b. *Simple (structure of) knowledge* expresses a view that knowledge is mainly hierarchically structured and consists of simple, unambiguous, isolated pieces instead of complex or coherent concepts.
- 2.a. *Omniscient authority / Source of knowledge* expresses a view where one sees an omniscient authority as the primary source of knowledge.
- 2.b. *Justification for knowing* was presented as a dimension by Hofer & Pintrich (1997) but interestingly, rarely operationalised in the various instruments presented during the following

¹ Throughout the years, the dimension labels have varied to some extent.

² The dimensions are here expressed according to what Schommer, and several successors described as a "naïve orientation", which assumes that one's epistemic beliefs develop from naïve to sophisticated.

decades, with exception for the Internet-Specific Epistemological Questionnaire (Bråten et al., 2005).

In the line of research initiated by Schommer (1990), epistemic beliefs have been measured using questionnaires, where respondents respond to statements that constitute operationalizations of the epistemic dimensions. The statements have been answered on anchored attitude scales with the poles "totally disagree" and "fully agree", although the number of steps have varied. The answers have often been analysed using exploratory factor analysis to extract the anticipated dimensions. However, replication has often failed because the factor analyses yielded unanticipated factors, the factors were based on too few variables, and/or the resulting scales showed poor reliability. DeBacker (2008) and Schraw (2013) present informative descriptions of these challenges.

Hofer & Pintrich (1997) described source of knowledge (omniscient authority) and justification for knowing as dimensions describing the nature of knowing, but in more recent models, the dimension of justification for knowing has been expanded and clarified. For instance, Ferguson et al. (2013), Strømsø & Kammerer (2016) and Bråten et al. (2019) have suggested that justification for knowing should itself be seen as a trichotomous belief framework. For this purpose, Ferguson et al. and Bråten et al. have suggested three sub-dimensions for justification: 1) justification by authority, 2) justification by multiple sources, and 3) personal justification. The operationalisation of these dimensions in the validated Internet-Specific Epistemic Justification Inventory (ISEJ, Bråten et al., 2019; Appendix A) illustrates that they can be seen as methods or resolution strategies to overcome epistemic doubt and justify one's knowing.

2.2 Epistemic beliefs in various contexts

In Schommer's (1990) model, it was assumed that an individual's epistemic beliefs develop from a naïve to a sophisticated level. Contrary to the naïve stance, a sophisticated (mature) belief entails that one sees knowledge as changing and developing, consisting of complex constructs, and that one can derive knowledge through personal reasoning. Among others, Elby & Hammer (2001, 2010, p. 431) have pointed out that the naïve–sophisticated axis is not appropriate, since it is more important to identify whether the individual's beliefs in the various dimensions are productive, that is, if they promote learning and development.

Another discussion, building on the one above, is that the measurement of epistemic beliefs should be linked to a specific context (see, e.g., Bråten et al., 2019; Elby & Hammer, 2001, 2010, p. 431; Grossnickle Peterson et al., 2017, pp. 257–258; Muis et al., 2006, 2016). Let us exemplify with the information that water (given a certain salinity, atmospheric pressure, altitude etc.) freezes into ice at 0°C. Taking a naïve stance, that is, regarding that information as certain and immutable, is productive. An opposite example could be about whether the global ambitions for reduced greenhouse gas emissions are insufficient or excessive to slow down the alleged climate change. In the first example, there is abundant empirical evidence, and it is appropriate to treat the information naïvely and regard it as unchanging. In the second example, there is evidence that climate change is a complex issue, and as new findings are constantly emerging, it would be unproductive to take a naïve stance on that issue and believe that we have arrived at the ultimate truth.

There are examples of studies where measurement has been linked to context and domain, although there is some variety in how context and domain have been conceptualised. For instance, Muis, Bendixen, & Haerle (2006) propose distinguishing between three contexts, that is, the socio-cultural, the academic and the instructional context. The two latter can hold domain-specific beliefs, whereas the socio-cultural context holds general epistemic beliefs. In a later study, Muis et al. (2016) compared epistemic beliefs by linking them to the domains of mathematics and psychology, and also included everyday knowledge as a kind of general domain. Grossnickle Peterson et al. (2017) regard the internet as a context and suggest task as an aspect of the context. Bråten et al. (2019) focus on what individuals believe about knowledge on the internet and how they come to know on the internet. When phrasing the statements on the Internet-

Specific Epistemic Justification Inventory (ISEJ), Bråten et al. (2019) regarded teacher education as the domain and the internet as the context. As the examples show, context has been used like an umbrella term that can include, for instance, domain, discipline, task, or the online setting on the internet. Thus, context can include basically any circumstances surrounding the situation where an individual exerts epistemic agency.

Chinn et al. (2011) criticise epistemic beliefs research for measuring on a general level that is too coarse. Consequently, paying more attention to the contexts by framing measurement in a limited set of circumstances surrounding the situation would enable more fine-grained measurement. Hereafter, when measuring epistemic beliefs, I will use the term “contextual elements” (cf. Grossnickle Peterson et al., 2017, p. 257) to denote this “set of circumstances surrounding the situation where an individual exerts epistemic agency”.

2.3 Epistemic competence

According to Grossnickle Peterson et al. (2017, pp. 257, 262), the insight that knowing should be justified is of central importance to what they call epistemic competence. They define epistemic competence as the ability to use contextual elements (in the situation) to decide how knowing is to be justified. According to my interpretation, epistemic competence could also include the ability to strategically and flexibly vary one's epistemic beliefs – or epistemic frameworks as Elby & Hammer (2010) put it – while taking into account the relevant contextual elements at hand.

Regardless of whether we're talking about primary school or university studies, pupils and students need to learn about different subjects and phenomena. As the examples of freezing point and climate change show, we need to be able to adopt an appropriate view of knowledge and justification method depending on what we are to learn. Regarding a phenomenon that actually requires a sophisticated attitude, a naïve attitude can, however, be expedient and productive in the beginning, when the insights into the phenomenon are still superficial (cf. Elby & Hammer, 2001). As the insights deepen, the beliefs can develop towards sophistication – we can sense a parallel to Bloom's taxonomy, from knowing to evaluating and creating (see, e.g., Krathwohl, 2002).

Thus, in some cases, a naïve epistemic belief is productive, in other cases a sophisticated epistemic belief is more appropriate. The epistemic beliefs can thus be seen as building blocks of one's epistemic competence, and also as part of one's learning competencies.

Bromme et al. (2008, p. 431) address the importance of understanding how different sources (or testimonies) may require different methods for justification. Bromme et al. further describe epistemic sophistication as the ability to flexibly adapt one's epistemological judgments to the context, which is rather close to the definition by Grossnickle Peterson et al. (2017, p. 257).

3. Testimony

3.1 Testimony as information source

Our knowledge is considered to originate from four or five different sources. Simon (2010) and Gelfert (2014, p. 55) describe them as perception, inference, memory, and testimony, whereas for instance in The Stanford Encyclopedia of Philosophy (Steup & Neta, 2020) they are described in slightly other terms as perception, introspection, memory, reason, and testimony. There seems to be broad agreement that testimony is the dominating source for a major part of the information we receive, be it verbally, visually, or in writing, or as a mixture of these (Chinn et al., 2011; Lackey, 2006, p. 1).

The process from testimony to knowledge can be conceptualised as in Figure 1.

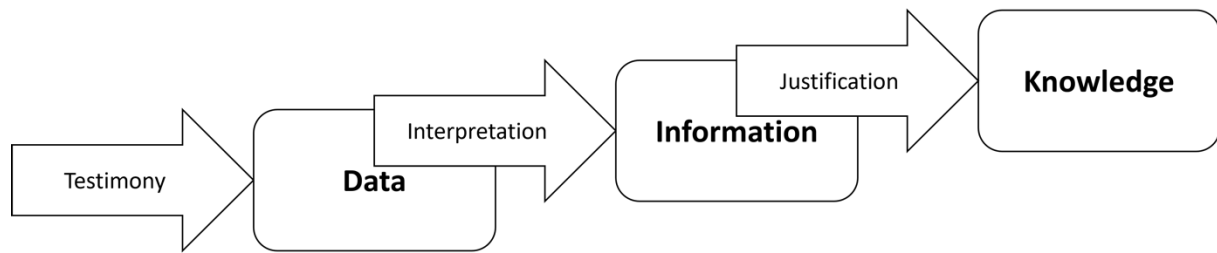


Figure 1. From testimony to knowledge.

Strictly speaking, what we receive by testimony is always mere data that we then give a meaning through our interpretation and can thereby understand as information. The interpretation depends heavily on our previous knowledge (but also attitudes and preconceptions), so that for instance “F4” can be interpreted by one person as the 4th floor in the F wing of a building, or by another, mathematically oriented person, as the hexadecimal format of the decimal value 244. The information – or actually the data – that the hearer receives stems from a speaker, traditionally a known or unknown person. We are exposed to more testimony than we have time to process but still, for the information we receive we must decide how we relate to it, and how we justify it to make it (or discard it) part of our personal knowledge (here I choose to ignore the cognitive levels (cf. Krathwohl, 2002) that are also part of knowledge building).

Chinn et al. (2011) note that all knowledge derives from multiple sources simultaneously³. Although testimony can be regarded as the major source of information, Chinn et al. point out that all the sources interact, that is, one’s knowledge of a topic will rest jointly on one’s perceptual experiences, the testimonies of others, one’s memory containing past knowledge-acquisition episodes, and finally one’s own reasoning, weighing and connecting everything together.

3.2 Testimonies in internet-related contexts

Gelfert (2014, p. 15) suggests that, in a broad epistemological sense, we may think of testimony as simply a way of conveying information and generally, testimony is understood as an act of (synchronous or asynchronous) communication where a speaker conveys information to a hearer. The medium can be verbal but also written, recordings, gestures etc. (Gelfert, 2014, p. 27). Gelfert (2014, p. 95) connects testimony with justification when pointing out that a theory of testimony should also be concerned with what justification there is for either accepting or rejecting an instance of testimony. If we ignore justification, we will have no way to rule out illegitimate cases of rejection or cases of credulous acceptance of testimony.

New technologies induce new practices so that in today’s digitalised media environment, the speaker of a testimony can also be a bot, a troll or perhaps a search algorithm, and quite often, both type and identity of the speaker remain hidden from the hearer. Tollefsen (2009) notes that in more liberal definitions, testimony can be defined as “tellings in general” without restrictions regarding the context, thus also including the internet. Origgi & Ciranna (2017, p. 310) note that since many online interactions are about conveying information to others, they are testimonial in nature.

In some epistemic beliefs studies (e.g., Bråten et al., 2019), the internet has been used as the context. However, for most people and especially the young generations, the internet is nowadays such a natural part of daily life (see, e.g., Andersson, 2017; Sundin et al., 2017) that it is hardly relevant to refer to the internet as a specific context. Further, if we were to regard the internet as a single context, we would ignore that the internet in itself contains infinite sub-contexts where a multitude of – known and anonymous – epistemic agents convey their testimonies.

³ Basically, also information from all the other sources should be justified but due to space restrictions, this paper is delimited to discussing the justification of testimony-based information.

Since the introduction of the internet, and especially since smart phones became commonplace in the 2010s, people increasingly get their information as what we might call “internet-based testimonies”. This applies especially to the younger generations and among them, social media plays an increasing role. A study in the US shows that 77% of the teenagers get their news and headlines from social media, and 75% of the respondents feel that traditional news media mostly have no idea about the lives of young people (Robb, 2020, pp. 8, 26). The latest European Youth Barometer reports social media and news websites as top sources of information on political and social issues, both mentioned by 41% of the respondents aged 16 – 30, and also here, the youngest group used social media to a larger extent than the more mature respondents (European Parliament, 2021, pp. 41, 44). Similarly, a Finnish study shows that young people trust social media and influencers to a larger extent than previous generations (PING Helsinki, 2019, p. 17).

Dahlgren (2018) claims that, partly due to the vast information online, the concept of democracy is today facing a growing epistemic crisis. This problem of knowledge and trust, that Dahlgren regards as key dimensions in what he calls civic cultures, is of importance for democratic participation. MacKenzie et al. (2021) draw our attention to the fact that the vast amount of information available on the internet should make us consider whom and which testimonies we can trust. In the internet contexts it is, however, increasingly difficult to know, who is the actual speaker behind the testimony. This complicates our efforts to assess the speaker’s credibility, perhaps to such an extent that we pass critical assessment and justification in the background.

A recent example of the multitude of “speakers” in the internet context is the chatbot ChatGPT (OpenAI, 2023) that was released for open access in December 2022. To a question from the user, ChatGPT is supposed to be able to compile an answer based on texts available to the bot. ChatGPT is supposed to learn from feedback provided by the users and thereby, the ChatGPT-generated texts are expected to continuously improve to give an authentic, human-generated, knowledgeable impression. In the future, ChatGPT and other AI applications will probably be increasingly used for generating texts, both in an automated manner and at the request of a user. However, if the source texts contain mis-/disinformation, it will inevitably accumulate. It has also been discovered that when the necessary information is lacking, ChatGPT will simply fabricate an answer that may be quite irrational and contain references to e.g., conferences and articles that do not exist (see, e.g., Pollesello & Papp, 2023; van Dis et al., 2023).

4. Epistemic and testimonial injustice

Miranda Fricker has introduced the concept of epistemic injustice and since her seminal work (Fricker, 2007) was published, the concept has received increasing attention (see, e.g., Davis, 2016; Gelfert, 2014; Kidd et al., 2017; Medina, 2011; Tollefsen, 2009). Fricker regards the overall aim of the concept as exploring two kinds of dysfunction in the epistemic practices between people: testimonial injustice and hermeneutic injustice. According to Fricker (2007, p. 17), testimonial injustice occurs when prejudice relating to social identity causes a hearer to afford a speaker’s testimony an incorrect level of credibility. This prejudicial dysfunction can result in two kinds of testimonial injustice where the speaker is wronged: in the first case, the (often disadvantaged) speaker may receive less credibility, and in the other case more credibility than deserved (Fricker, 2007, pp. 20–21). I will delimit this presentation to the concept of testimonial injustice and in addition, I intend to make an attempt to extend the concept that, according to Fricker is limited to 1) individually based prejudice relating to social identity, 2) credibility deficit, 3) speakers as humans, and 4) harm to the speaker.

Fricker’s original concept delimits testimonial injustice to something that results from prejudice (Fricker, 2007, pp. 17, 22, 2017, p. 53) but regarding this aspect, it might be interesting to zoom out: every encounter with another speaker is affected by our preconceptions, which can be of various kinds. If the preconception is negative, we can label it as prejudice, usually causing us to afford the speaker’s

testimony an inflated level of credibility. Our preconception can also be neutrally unprejudiced and open-minded, and if our preconception is (overly) positive and admiring, it can cause us to afford the speaker a high or even excessive level of credibility.

Fricker states that testimonial injustice is about credibility deficit but on the other hand, she does not rule out the possibility of credibility excess and that it can also be harmful to the speaker in a way “...that merits the label testimonial injustice” (Fricker, 2007, p. 20). There is some disagreement as to whether credibility excess should be included in the concept but still, some later researchers (see, e.g., Davis, 2016; Medina, 2011) have addressed the importance of acknowledging credibility excess, that they maintain can harm both privileged and disadvantaged speakers. As MacKenzie et al. (2021) note, “we have a tendency to be passive before overwhelming information or when informants we trust, respect or admire speak; we often grant too much credibility to the speaker or the source”. Thus, from the education and information literacy perspectives, testimonial injustice in terms of credibility excess is a most interesting aspect of epistemic injustice, especially in various internet contexts where, for instance, a search situation may involve both credibility deficit and credibility excess.

During the past decades, educational and information literacy researchers have expressed their concern about internet users sometimes relying too easily on the information they find on the internet (e.g., Biddix et al., 2011; Hämäläinen et al., 2021; Huvila, 2013). This may occur in two ways, that is, 1) the user relies on the hit list presented by the search engine, trusting that the top of the list is what there is to know about the topic at hand, and 2) the user relies on a web source (perhaps from the hit list), trusting what it says, without appropriately assessing the quality and credibility of the source. Both the hitlist itself and the picked source are here regarded as testimonies. This phenomenon suggests that people have increasingly come to rely on search engines that can be regarded as so-called algorithmic authorities. Further, there are signs indicating that a reliance on internet-based information may go hand in hand with naïve views of knowledge as certain and unchanging, as consisting of isolated bits and as being handed down by authority (cf. Ståhl et al., 2021). In those situations, we have the opposite case: the reputation of the search engine (perhaps based on popularity, ease of use, often successful in finding the “right” information etc., cf. Alasuutari, 2018)⁴ may work in favour of the search engine, and the user may 1) make an inflated judgement of its credibility, and 2) elevate its capacity as a “knower”.

The proposals above go beyond Fricker’s (2007, pp. 27–28) notion of the speaker as a person and raises the question whether search engines (or any anonymous online source) could be regarded as speakers, conveying tellings in general (cf. Origgi & Ciranna, 2017; Tollefsen, 2009). Taking a less dogmatic stand we could perceive the internet (in a broad sense) as a kind of speaker and, with reference to Medina (2011), regard the internet as a “class all to itself”. Basically, there is nothing internet-specific in this notion since over decades, people have used testimonies from non-human speakers such as institutional, governmental or religious authorities, political parties etc. and assessed the credibility of these speakers depending on their preconception; for instance, believing everything party X expresses and distrusting party Y.

Finally, Fricker originally assumed that it is always the speaker who is being harmed. The above examples from the internet context support the suggestion by Medina (2011) that the possibility of testimonial injustice causing harm to the hearer should also be considered. This is especially important to acknowledge in educational contexts.

To conclude, for the purpose of discussing the results of this study from the perspective of testimonial injustice, I have extended Fricker’s original concept of testimonial injustice to include 1) general preconceptions regarding the speaker, 2) credibility excess, 3) non-human speakers, and 4) harm to the hearer.

⁴ Alasuutari describes four types of authorities (capacity-based, ontological, moral, and charismatic) that are only indirectly applicable to the perceived authority of search engines.

5. Research questions

Summarising the previous sections, we can note that:

- Current research shows that epistemic beliefs should be measured on a more fine-grained level and in relation to specific contextual elements.
- Epistemic competence requires an ability to flexibly adapt one's epistemic beliefs and justification methods depending on contextual elements such as, for instance, source of testimony and type of information.
- Everything we read, see, and hear on the internet is testimonial in nature, although we are often unable to identify the speaker.
- Testimonies, tellings in general, are the main source of information.
- Any information conveyed over testimony requires justification in order to become part of one's personal knowledge.
- Internet reliance suggests that the reader may be overly reliant on the source and may afford the (unknown) speaker's testimony an inflated level of credibility.

Taken together, it is highly relevant to explore how a recipient's management of the information is influenced by 1) the source of the testimony, and 2) the content of the testimony. Thus, acknowledging Chinn et al. (2011), calling for more fine-grained measurement, the present study will focus on what methods users apply to justify various types of information stemming from various sources. To be more explicit:

1. How do the justification methods differ depending on the speaker behind the testimony?
2. How do the justification methods differ depending on the type of information in the testimony?

In addition to the actual research questions above, this study also aims at testing the functionality of the ISEJ inventory, as suggested by Bråten et al. (2019) when applied in other contexts and, as in this study, when applied to testimony.

6. Method

6.1 Participants

The data collection was carried out among a cohort of first-year students attending bachelor-level study programmes at a Finnish university of applied sciences at the start of the semester in August 2021 (N = 618). In the data collection phase, the participants were known and background data about them (e-mail, gender, year of birth, school background, education) was obtained from the university's student registry. Participants were invited to take part in the survey through personal e-mail messages that contained – in addition to general information and a link to the Privacy Notice for Scientific Research – a link to each respondent's individual survey form. The Privacy Notice for Scientific Research contained the information that the informant should be given in accordance with articles 12 – 14 of the EU General Data Protection Regulation (GDPR, 2016). After data collection, the data were pseudonymised to enable a later cumulation of the data for measuring changes over time.

6.2 Data collection

When constructing the instrument, experiences from previous international studies (mainly Bråten et al., 2019; Ferguson et al., 2013; Muis et al., 2016) were used. The web-based survey was set up in the survey service LimeSurvey (LimeSurvey GmbH, 2020) which was administered by the university. The focus was on the subject area of justification for knowing and in addition, the survey collected data regarding three other subject areas, namely motivation for studying, general epistemic beliefs, and critical thinking.

The statements measuring justification for knowing were presented using a modified ISEJ inventory (Bråten et al., 2019). The ISEJ inventory contains twelve unidirectionally oriented statements about

justification for knowing, covering the three sub-dimensions justification by authority, justification by multiple sources, and personal justification, each of which is measured with four items. The statements were presented on a 6-point anchored scale, where only the extreme values “totally disagree (1)” and “fully agree (6)” were labelled. The modified ISEJ inventory was presented in two rounds so that the survey started with the subject area of motivation, followed by the first round of the ISEJ inventory. The survey continued with the subject areas of general epistemic beliefs and critical thinking and ended with the second round of the ISEJ inventory.

In their validation study, Bråten et al. (2019) framed the ISEJ inventory statements 1) in the domain of teacher education and 2) in the internet context. In the current study, the intention was to let the material illustrate how the contextual elements 1) type of information and 2) source of testimony may influence how one justifies knowledge. Thus, framing the statements in type of information was illustrated with two extremes, that is, factual information versus tentative information. Testimony, in turn, was illustrated with a known, public authority and the opposite, an unknown source on social media. The examples of contextual elements were taken from the on-going Covid-19 pandemic, which was chosen since it was easy to understand, it was assumed to be generally familiar and each of the four combinations appeared natural and realistic (cf. Bråten et al., 2009).

The variation of information and testimony allowed for four different framings or scenarios. The heading on each questionnaire page started with the prompt "Please state to what extent you agree to the following statements regarding...", followed by a more detailed description of the contextual elements in that scenario: "diagnosed Covid-19 cases in Finland at a specified date", "regarding the protective effect of wearing a face mask against the Covid-19 disease", "published by the Finnish institute for health and welfare, a governmental authority", and "published on social media by some user unknown to you". This allowed presenting the items in a slightly shorter format so that, for instance, where an original ISEJ statement (expressing justification by authority) would read:

“When I read something about an educational topic on the Internet, I evaluate whether this information is written by an expert” (see Appendix A, item 3)⁵.

In the scenarios presented to groups 3 and 4 (Table 2), the corresponding statement was phrased as:

“When I read something on social media about the effect of using a face mask, I evaluate whether this information is written by an expert”.

Table 1. Framing the statements in the contextual elements of information and testimony.

	Testimony	Known public authority	Unknown actor on social media
Information			
Factual information		[the specific number of Covid-19 cases] [from the governmental authorities]	[the specific number of Covid-19 cases] [on social media]
Tentative information		[the effect of using a face mask] [from the governmental authorities]	[the effect of using a face mask] [on social media]

The ISEJ-based statements were presented in four different scenarios, and each respondent completed the modified ISEJ inventory in two different scenarios, one at the beginning of the survey, and another at the end of the survey. For this purpose, the respondents were randomly divided into four groups (Table 2), and the respondent’s group affiliation was included as a background variable to control how the survey service presented the statements for each respondent. Presenting the different scenarios was set up so that in each group, one aspect was controlled for while the other aspect was varied.

⁵ In appendix A, the contextual elements in the original ISEJ are marked with [square brackets]. In the current study, the content inside the brackets was replaced with some of the contextual elements as described in Table 1.

Table 2. Overview demonstrating how information and testimony were controlled and varied, respectively, for each group of respondents.

Group	Controlling for		Varying	
	Testimony	Information	Testimony	Information
1		Factual information	Known authority ↔ Unknown actor	
2	Known authority			Factual information ↔
3	Unknown actor			Tentative information
4		Tentative information	Known authority ↔ Unknown actor	

The respondents were introduced to the claims regarding justification for knowing using information as suggested by Bråten et al. (2009). The respondents were asked to reflect upon what knowledge is and how they build their own knowledge. The introduction underlined that the statements are linked to Covid-19, which only serves the purpose of example and illustration. Further, the respondents were encouraged to read the statements carefully and pay attention to who is claiming something and what type of information the claim is about. Before the second round of the modified ISEJ questionnaire, it was brought to the respondents’ attention that the following pages contain similar statements as in the beginning of the survey, and that they should again pay attention to statement content.

7. Results

7.1 Data descriptives

After discarding 9 cases that were completely or almost empty, and one case where all questions had been answered with the same response, the collected material contained 449 responses. Thus, the response rate amounted to 72.7% and in the sample, all study programmes were represented in a similar proportion as they occurred in the sampling frame. The same applied to gender distribution and origin. Out of the respondents, 86.6% were domestic and 13.4% international students, representing 19 countries. In the sample, the four groups contained between 110 and 114 respondents each and were thus equally represented. Due to the four groups answering the modified ISEJ inventory in two rounds, the material contained just over 200 responses to each of the four scenarios. Given that data were collected using an anchored attitude scale, that is, an ordinal scale, a discussion of the normal distribution of the single items is irrelevant (cf. Carifio & Perla, 2007).

The ISEJ-based items were used for creating subscales for each of the three dimensions in each of the four scenarios. The individual subscale scores were calculated using the mean.x() function (SPSS, 2021), thereby ensuring that a subscale score was calculated only if the respondent had entered a valid response to at least three of the four statements associated to each dimension.

7.2 Analysis results

The focus of this study was to compare how the students’ methods for justifying knowing differ depending on type of information and testimony. For this purpose, the three subscale scores were compared in each of the four scenarios.

A comparison of the internal consistencies of the subscale scores showed that the Cronbach alpha values were in the same range (0.848 – 0.941) as those reported by Bråten et al. (2019). The item-scale correlations (0.558 – 0.793) were even above the correlations reported by Bråten et al. (0.56 – 0.67)

although the coefficients varied slightly depending on the scenario. The subscale scores were found to be mainly normally distributed.

It should be noted that the subscale scores in this study cannot be directly compared with the results Bråten et al. presented, partly because Bråten et al. used the response scale 1 – 10, partly because in this study, each statement appeared in four different variants, due to the scenarios.

The comparisons of the subscale scores in the four scenarios suggest that when the information is tentative, students tend to use some of the methods to justify knowing to a greater extent than when it is about factual information. Similarly, when the testimony came from an unknown source, students used justification to a greater extent than when the testimony stemmed from a known authority. In Table 3, the first column contains the four student groups for which one aspect was controlled for. Therefore, each scenario occurs in two instances with slightly different mean values since they are based on different subsets of cases.

Table 3. Comparison of the mean values of the subscale scores in the various scenarios, where one aspect was controlled for, and the other aspect was varied.

Controlled aspect (group)	Varied aspect	Justification by personal reasoning		Justification based on authority		Justification based on multiple sources	
Type of information	Testimony →	Unknown source	Known authority	Unknown source	Known authority	Unknown source	Known authority
Factual (1)		4,23	3,03	4,23	2,76	4,06	2,64
Tentative (4)		4,37	3,36	4,38	3,29	4,29	2,97
Testimony	Type of Information →	Factual	Tentative	Factual	Tentative	Factual	Tentative
Known authority (2)		2,88	3,49	2,99	3,38	2,80	3,34
Unknown source (3)		3,94	4,31	4,27	4,55	4,11	4,28

Each group was exposed to two scenarios and thus, the difference when varying one of the aspects was measurable on individual level. At a more detailed level, the results show the following, presented below for each of the four groups, in the same order as in Table 3.

Controlling for type of information

Group 1 When dealing with **factual information**, students used all justification methods extensively ($\bar{x} = 4.06 - 4.23$) when the testimony came from an unknown user on social media. When the testimony stemmed from a known authority, the various methods were used the least ($\bar{x} = 2.64 - 3.03$). Thus, the differences in the use of the various methods of justification were largest in this pair of scenarios (see Figures 2 and 3). Consistently, the differences⁶ were most significant (t-values between 9.80 and 10.60; $p < .001$) in this pair of scenarios.

Group 4 When dealing with **tentative information**, the students again used the various methods of justification more extensively when the testimony came from an unknown user on social media ($\bar{x} = 4.29 - 4.38$). When the testimony stemmed from a known authority, the justification methods were activated to a considerably lower degree ($\bar{x} = 2.97 - 3.36$). The differences between this pair of scenarios were significant (t-values between 6.96 and 9.74; $p < .001$).

⁶ The differences were tested separately for each of the three justification methods.

Controlling for source of testimony

Group 2 When the testimony stemmed from a **known authority**, the students tended to use all methods of justification significantly less on a general level. When the statement concerned factual information, the justification methods were used least of all ($\bar{x} = 2.80 - 2.99$), and also in the case of tentative information, justification methods were used moderately ($\bar{x} = 3.34 - 3.49$). However, the differences between this pair of scenarios were still significant (t-values were between 2.64 and 4.79, $p < .01$).

Group 3 When the testimony stemmed from an **unknown user** on social media, the students tended to use all methods for justification extensively, and most of all when the information was tentative ($\bar{x} = 4.28 - 4.55$). Also, in the case of factual information, justification methods were used to a high degree ($\bar{x} = 3.94 - 4.27$) so that in this pair of scenarios, the differences were barely or not at all significant.

Analysing the responses on the individual items also indicates that when the testimony stemmed from a known authority, roughly 9 – 16% of the respondents refrained from activating any of the justification methods. When the testimony stemmed from an unknown user on social media, the majority of the respondents applied some of the justification methods and the portion of those who did not activate any of the justification methods remained below 3%. These numbers are based on calculating the maximum score for each respondent in each of the scenarios.

The difference between the various scenarios is presented visually in the sample graphs below, both describing the method of justification by authority as it occurred in group 1. Here the largest and most significant difference ($t(101) = 10.60$; $p < .001$) occurred between the scenarios factual information conveyed by a known authority vs. factual information conveyed by an unknown user on social media.

To sum up, the results indicate that the source of testimony has the strongest impact on how the various methods of justification are activated. The type of information also has an effect, although slightly weaker.

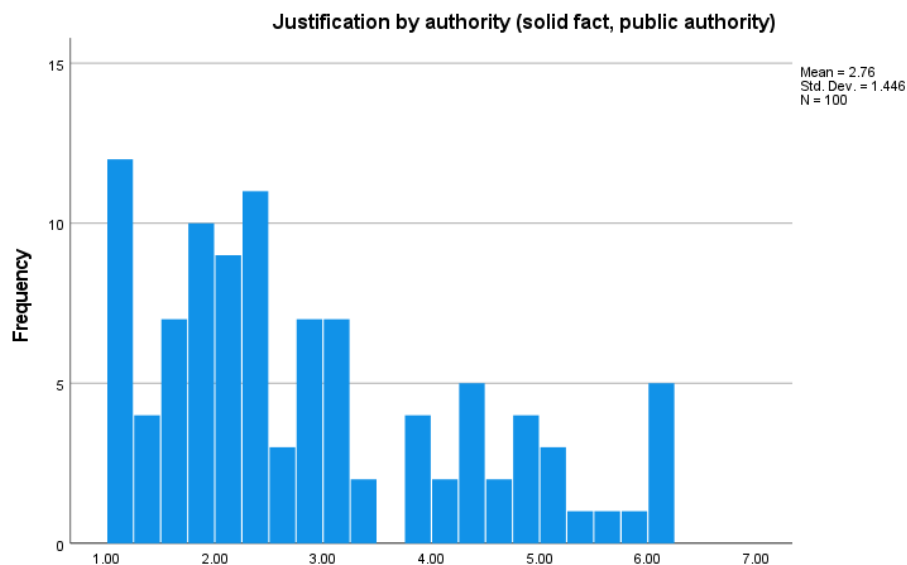


Figure 2. Distribution of the subscale score for justification by authority in the scenario "factual information conveyed by a known authority" (group 1).

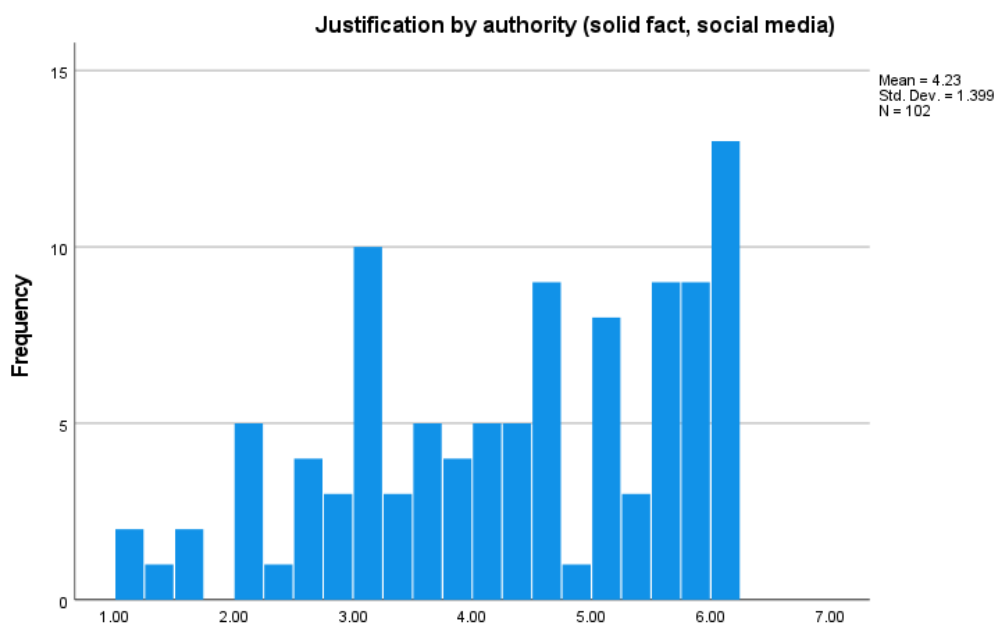


Figure 3. Distribution of the subscale score for justification by authority in the scenario "factual information conveyed by an unknown social media user" (group 1).

8. Discussion

8.1 Justification for knowing

8.1.1 The ISEJ inventory, replicability and adaptability

In their validation study, Bråten et al. (2019) stated that the ISEJ inventory measured what it was intended to measure, that is, how respondents handle information through activating the three methods for justification of knowing to various levels. On that point, this study corroborates these previous results.

The results in this study show that the original statements in the ISEJ inventory can be adapted – as Bråten et al. (2019) suggested – and successfully applied to other contexts. The study also shows that the type of information and the source of testimony both can be used as contextual elements to frame measurement. Despite a different framing than the one Bråten et al. used, we can talk about successful replication of the instrument. Further, the high alpha values and item-scale correlations indicate that the measurement becomes more accurate when the framing is expressed more fine-grained (cf. Chinn et al., 2011) and with such concrete elements that the respondents can relate to.

The choice to use type of information and testimony as contextual elements proved to work well, and varying the contextual elements induced clear differences in how respondents activated the three justification methods.

8.1.2 Methodological issues

In this study, the students were exposed to the ISEJ statements in two rounds, and between them to a number of other statements expressing general epistemic beliefs and critical thinking. This setup made the questionnaire rather lengthy and therefore it posed a risk for respondents dropping out. The setup proved, however, to work, since most students answered the questionnaire right to the end.

The setup with students answering the ISEJ inventory in two rounds allowed one aspect to be controlled while the other was varied, which generated a valuable material. Through the use of four groups, each

group thus came to contain just over a hundred cases, and based on the reliabilities of the scales, it can be concluded that the sample was sufficient for the purposes of the study.

In their validation study, Bråten et al. (2019) connected the statements of the ISEJ inventory to the domain of education and to the internet context. In this study, it would have been close at hand to connect the statements to the domain of the students' respective study programmes. This can, however, be questioned for at least two reasons: 1) The individual study programmes (especially in a university of applied sciences) do not represent distinct domains based on a single knowledge base but instead, they are highly multidisciplinary. 2) Since the participating students were just starting their studies, they cannot be expected to have a clear picture of the study programme's knowledge base. Connecting the statements to a domain that was unfamiliar to the respondents would thus have led to losing the idea of framing the statements.

When targeting a survey to new students at a university of applied sciences with fourteen different study programmes, it is challenging to find a framing that is familiar to everyone. For framing the statements, phenomena connected to the Covid-19 pandemic were chosen since it was expected that this framing should be familiar to everyone (cf. Bråten et al., 2009). In addition, the framing should also work for the international students with varying backgrounds. Given that, at the point of data collection, the pandemic had been going on for more than a year and a half, it was reasonable to assume that all the information and all the discussions surrounding the pandemic could hardly have passed anyone by. We can make the conclusion that the framing worked, although some comments by the students suggested that a small number of them got too caught up in the Covid-19 phenomenon.

8.2 Potential for educational practice

Dahlgren (2018) notes that the current epistemic crisis of democracy includes an attack on basic enlightenment principles so that currently, scientific evidence is increasingly seen as just another subjective opinion and equated with one's own subjective emotions. This trend can be illustrated with the adjective "post-truth", described as "...circumstances in which objective facts are less influential ... than appeals to emotion and personal belief" (OED Online, 2022). The trend is worrying in terms of democracy on a societal level, but just as much in terms of knowledge building on individual level, especially considering the (increasing?) problem of science denial (cf. Sinatra & Hofer, 2021).

MacKenzie et al. (2021) argue that in order to cultivate our understanding (our 'Bildung'), "we need to learn the grounds of our opinions and be able to defend them against common objections", that is, we need to learn to justify our knowing and be aware of how we justify knowing and on which grounds we choose a specific justification method. Thus, on the individual level, this indicates a connection to the concept of epistemic competence as described by Grossnickle et al. (2017, p. 257).

We can also see a connection to testimonial injustice; if we are unaware of our preconceptions (prejudice or over-reliance) and on what grounds we choose a specific justification method (if any), then we are more likely to exert testimonial injustice, that is, affording a testimony an incorrect level of credibility. In Fricker's terms, illiteracy may cause the hearer to miss the obligation to "match the level of credibility she attributes to her interlocutor to the evidence that he is offering the truth" (Fricker, 2007, p. 19). In the bigger picture, it is about the interplay between learning competencies, epistemic competence, and information literacy, all of which are important to prevent information disorders and to safeguard trust, truth and integrity, and thereby our democracies (cf. MacKenzie et al., 2021). These literacies need to be supported on all levels of education.

The instrument applied in this study may not be useful for direct measurement of students' epistemic competence, but it can be applied as a component to initiate the students' own process of reflecting on their ways of learning and justifying knowing. The results show that the students did apply different justification methods depending on both the type of information and the source of testimony. This altering of justification methods can be seen as an expression of epistemic competence (cf. Grossnickle Peterson

et al., 2017, p. 257). Further, the results provide comfort and hope in the sense that most of the respondents were sceptical towards an unknown speaker, and more cautious regarding tentative information. Still, we should feel some concern about the minority of students that lacked scepticism, but it is, however, impossible to verify if they truly ignored justifying unreliable information, or if they just clicked their responses randomly, causing a “noise” in the data set.

The results suggest that the instrument contains potential for being used in the future to support the development of students’ information literacies and learning competencies. The ISEJ inventory can be modified and framed in a way that is appropriate for the target group, and then be used to initiate the students’ reflection processes. The survey should then be followed up by presenting the results and using them as a take-off for discussions, that should preferably take place within a reasonable time after the survey.

8.3 Aspects of testimonial injustice

In the section regarding epistemic and testimonial injustice I proposed extending Fricker’s original concept to include 1) non-human speakers, 2) general preconceptions regarding the speaker, 3) credibility excess, and 4) harm to the hearer. The extended concept was not used as a theoretical framework for the data collection but still, parts of the results of the study indicate that the proposed extension is in no way far-fetched.

As mentioned earlier, content on the internet is increasingly being generated by non-human (epistemic?) agents. In the survey, the scenarios depicted testimonies either from an unknown actor on social media or from a known authority. The results showed that the respondents were able to discern the difference and to apply different justification methods depending on the speaker, that is, the source of the testimony. Based on this material it is, however, not possible to draw conclusions regarding credibility excess or deficit.

The extent to which the respondents used justification in the various scenarios indicates that the preconception regarding the speaker can be positive or negative. The results indicate that the respondents afforded the testimonies from the national health authorities a high level of credibility which, in turn, showed in the material as a lesser need to apply additional justification methods. Consistently, the testimonies from an unknown user were afforded a low level of credibility and entailed a greater need to seek justification elsewhere.

Based on this material it is not possible to draw conclusions regarding harm to the hearer, but there are researchers (e.g., Davis, 2016; Medina, 2011) speaking in favour of acknowledging that inappropriate credibility assessment can harm also the hearer. Further, the contextual elements used in this study – information regarding preventing Covid-19 – can serve as an example where being overly reliant on dubious speakers on the internet can cause the hearer to choose inappropriate actions that will ultimately harm her. Ultimately, the notion that the hearer is at risk of harm is a key element linking testimonial injustice with education.

Gelfert (2014, p. 145) notes that “If the listener’s knowledge (that p) mirrors that of the speaker, it seems natural to speak of the speaker having passed on her knowledge to the listener”. Given this, will we assume that, for instance, ChatGPT (OpenAI, 2023) has knowledge? Will the listener/user know the source of this testimony? As mentioned earlier, a testimony needs to be justified in order to become part of one’s personal knowledge. Considering the multitude of testimonies in the digitalised landscape – some of them generated by AI, some by anonymous or fictitious users – how will the user be able to conclude who is behind the testimony and based on that, decide how to justify the testimony?

8.3 Conclusions and future research

An interesting area for future exploration is how the measurement of the original EQ dimensions *certainty of knowledge* and *structure of knowledge* could be developed more fine-grained by framing them in type

of information and perhaps also other contextual elements. In previous studies (e.g., Ståhl et al., 2021), the subscales for these two dimensions have shown weak reliability and/or low item-total correlations, which could possibly be due to the respondents finding it difficult to take a stand on statements that are not connected to relevant contextual elements.

A further research area would be to measure the original EQ dimensions (Schommer, 1990) together with the three ISEJ-based sub-dimensions (Bråten et al., 2019) of justification for knowing to explore how the EQ dimension *omniscient authority* relates to the sub-dimension *justification by authority*.

The current study shows that the concept of epistemic beliefs can contribute to exploring epistemic injustice over empirical research regarding specifically testimonial injustice and the epistemic dimension of justification. Testimonial (in)justice is essentially preceded by the hearer's assessment of a speaker's testimony. The result of this assessment depends on which methods the hearer uses to justify the testimony, which, in turn, is influenced by the hearer's previous knowledge, attitudes, and (positive or negative) preconceptions regarding the speaker. As the current study shows, the justification methods can be measured but using this kind of measurement does not, however, provide information about the preconceptions and reasoning behind the choice of justification methods. Therefore, in future research, the quantitative self-report approach should be supplemented with some qualitative method suitable for providing an insight into the respondent's reasoning.

References

- Alasuutari, P. (2018). Authority as epistemic capital. *Journal of Political Power*, 11(2), 165–190. <https://doi.org/10.1080/2158379X.2018.1468151>
- Andersson, C. (2017). “Google is not fun”: An investigation of how Swedish teenagers frame online searching. *Journal of Documentation*, 73(6), 1244–1260. <https://doi.org/10.1108/JD-03-2017-0048>
- Biddix, J. P., Chung, C. J., & Park, H. W. (2011). Convenience or credibility? A study of college student online research behaviors. *The Internet and Higher Education*, 14(3), 175–182. <https://doi.org/10.1016/j.iheduc.2011.01.003>
- Bråten, I., Brandmo, C., & Kammerer, Y. (2019). A Validation Study of the Internet-Specific Epistemic Justification Inventory with Norwegian Preservice Teachers. *Journal of Educational Computing Research*, 57(4), 877–900. <https://doi.org/10.1177/0735633118769438>
- Bråten, I., Gil, L., Strømsø, H. I., & Vidal-Abarca, E. (2009). Personal epistemology across cultures: Exploring Norwegian and Spanish university students’ epistemic beliefs about climate change. *Social Psychology of Education*, 12(4), 529–560. <https://doi.org/10.1007/s11218-009-9097-z>
- Bråten, I., Strømsø, H. I., & Samuelstuen, M. S. (2005). The Relationship between Internet-Specific Epistemological Beliefs and Learning within Internet Technologies. *Journal of Educational Computing Research*, 33(2), 141–171. <https://doi.org/10.2190/E763-X0LN-6NMF-CB86>
- Bromme, R., Kienhues, D., & Stahl, E. (2008). Knowledge and Epistemological Beliefs: An Intimate but Complicate Relationship. In M. S. Khine (Ed.), *Knowing, Knowledge and Beliefs: Epistemological Studies across Diverse Cultures* (1–20, pp. 423–441). Springer. https://doi.org/10.1007/978-1-4020-6596-5_20
- Carifio, J., & Perla, R. J. (2007). Ten Common Misunderstandings, Misconceptions, Persistent Myths and Urban Legends about Likert Scales and Likert Response Formats and their Antidotes. *Journal of Social Sciences*, 3(3), 106–116. <https://doi.org/10.3844/jssp.2007.106.116>
- Chinn, C. A., Buckland, L. A., & Samarapungavan, A. (2011). Expanding the Dimensions of Epistemic Cognition: Arguments From Philosophy and Psychology. *Educational Psychologist*, 46(3), 141–167. <https://doi.org/10.1080/00461520.2011.587722>
- Dahlgren, P. (2018). Media, Knowledge and Trust: The Deepening Epistemic Crisis of Democracy. *Javnost - The Public*, 25(1–2), 20–27. <https://doi.org/10.1080/13183222.2018.1418819>
- Davis, E. (2016). Typecasts, Tokens, and Spokespersons: A Case for Credibility Excess as Testimonial Injustice. *Hypatia*, 31(3), 485–501. <https://doi.org/10.1111/hypa.12251>
- DeBacker, T. K., Crowson, H. M., Beesley, A. D., Thoma, S. J., & Hestevold, N. L. (2008). The Challenge of Measuring Epistemic Beliefs: An Analysis of Three Self-Report Instruments. *Journal of Experimental Education*, 76(3), 281–312. <https://doi.org/10.3200/jexe.76.3.281-314>
- Elby, A., & Hammer, D. (2001). On the substance of a sophisticated epistemology. *Science Education (Salem, Mass.)*, 85(5), 554–567. <https://doi.org/10.1002/sce.1023>
- Elby, A., & Hammer, D. (2010). Epistemological resources and framing: A cognitive framework for helping teachers interpret and respond to their students’ epistemologies. In F. C. Feucht & L. D. Bendixen (Eds.), *Personal Epistemology in the Classroom: Theory, Research, and Implications for Practice* (pp. 409–434). Cambridge University Press. <https://doi.org/10.1017/CBO9780511691904.013>
- European Parliament. (2021). *European Parliament Youth Survey 2021*. European Parliament, Directorate-General for Communication. <https://doi.org/10.2861/60428>
- Ferguson, L. E., Bråten, I., Strømsø, H. I., & Anmarkrud, Ø. (2013). Epistemic beliefs and comprehension in the context of reading multiple documents: Examining the role of conflict. *International Journal of Educational Research*, 62, 100–114. <https://doi.org/10.1016/j.ijer.2013.07.001>
- Fricker, M. (2007). *Epistemic Injustice: Power and the Ethics of Knowing*. Oxford University Press. <https://doi.org/10.1093/acprof:oso/9780198237907.001.0001>
- Fricker, M. (2017). Evolving Concepts of Epistemic Injustice. In I. J. Kidd, J. Medina, & G. Pohlhaus (Eds.), *The Routledge Handbook of Epistemic Injustice* (pp. 53–60). Routledge. <https://doi.org/10.4324/9781315212043>
- GDPR, Pub. L. No. 2016/679, General Data Protection Regulation (2016). <https://eur-lex.europa.eu/eli/reg/2016/679/oj>
- Gelfert, A. (2014). *A Critical Introduction to Testimony*. Bloomsbury Academic; Bloomsbury Collections. <https://doi.org/10.5040/9781472594082>
- Grossnickle Peterson, E., Alexander, P. A., & List, A. (2017). The argument for epistemic competence. In A. Bernholt, H. Gruber, & B. Moschner (Eds.), *Wissen und Lernen. Wie epistemische Überzeugungen Schule, Universität und Arbeitswelt beeinflussen [Knowing and learning. The influence of epistemic beliefs on schools, universities and working life]* (pp. 255–270). Waxmann Verlag. <https://search.ebscohost.com/>
- Hämäläinen, E. K., Kiili, C., Räikkönen, E., & Marttunen, M. (2021). Students’ abilities to evaluate the credibility of online texts: The role of internet-specific epistemic justifications. *Journal of Computer Assisted Learning*, 37(5), 1409–1422. <https://doi.org/10.1111/jcal.12580>
- Hofer, B. K., & Pintrich, P. R. (1997). The Development of Epistemological Theories: Beliefs about Knowledge and Knowing and Their Relation to Learning. *Review of Educational Research*, 67(1), 88–140. <https://doi.org/10.2307/1170620>

- Huvila, I. (2013). In Web search we trust? Articulation of the cognitive authorities of Web searching. *Information Research*, 18(1). <http://informationr.net/ir/18-1/paper567.html>
- Kidd, I. J., Medina, J., & Pohlhaus, G. (Eds.). (2017). *The Routledge Handbook of Epistemic Injustice*. Routledge. <https://doi.org/10.4324/9781315212043>
- Krathwohl, D. R. (2002). A revision of Bloom's taxonomy: An overview. *Theory into Practice*, 41(4), 212–218. https://doi.org/10.1207/s15430421tip4104_2
- Lackey, J. (2006). Introduction. In J. Lackey & E. Sosa (Eds.), *The Epistemology of Testimony* (pp. 1–21). Oxford University Press, Inc. <http://ebookcentral.proquest.com>
- LimeSurvey GmbH. (2020). *LimeSurvey* (3.22) [Computer software]. <https://www.limesurvey.org/>
- MacKenzie, A., Rose, J., & Bhatt, I. (2021). Dupery by Design: The Epistemology of Deceit in a Postdigital Era. *Postdigital Science and Education*, 3(3), 693–699. <https://doi.org/10.1007/s42438-020-00114-7>
- Medina, J. (2011). The Relevance of Credibility Excess in a Proportional View of Epistemic Injustice: Differential Epistemic Authority and the Social Imaginary. *Social Epistemology*, 25(1), 15–35. <https://doi.org/10.1080/02691728.2010.534568>
- Muis, K. R., Bendixen, L. D., & Haerle, F. C. (2006). Domain-Generality and Domain-Specificity in Personal Epistemology Research: Philosophical and Empirical Reflections in the Development of a Theoretical Framework. *Educational Psychology Review*, 18(1), 3–54. <https://doi.org/10.1007/s10648-006-9003-6>
- Muis, K. R., Trevors, G., Duffy, M., Ranellucci, J., & Foy, M. J. (2016). Testing the TIDE: Examining the Nature of Students' Epistemic Beliefs Using a Multiple Methods Approach. *The Journal of Experimental Education*, 84(2), 264–288. <https://doi.org/10.1080/00220973.2015.1048843>
- OED Online. (2022). 'post-truth, adj.'. In *Oxford English Dictionary*. Oxford University Press. <https://www.oed.com/view/Entry/58609044>
- OpenAI. (2023). *ChatGPT*. <https://chat.openai.com/>
- Origi, G., & Ciranna, S. (2017). Epistemic injustice—The case of digital environments. In I. J. Kidd, J. Medina, & G. Pohlhaus (Eds.), *The Routledge Handbook of Epistemic Injustice* (pp. 303–312). Routledge. <https://doi.org/10.4324/9781315212043>
- PING Helsinki. (2019, May). *Miten somevaikuttaja vaikuttaa? Somevaikuttajien luotettavuus ja vaikuttavuus yleisöjen näkökulmasta [What is the influence of social media influencers? The reliability and effectiveness from the audience's point of view]*. <https://pinghelsinki.fi/informaatiovaikuttaminen-merkittava-ongelma/>
- Pollesello, P., & Papp, Z. (2023). Integrating an artificial intelligence chatbot in scientific communication: Do's and don'ts. *European Science Editing*, 49(e112023). <https://doi.org/10.3897/ese.2023.e112023>
- Robb, M. B. (2020). *Teens and the News: The Influencers, Celebrities, and Platforms They Say Matter Most, 2020*. Common Sense Media. <https://www.common Sense Media.org/research/teens-and-the-news-the-influencers-celebrities-and-platforms-they-say-matter-most-2020>
- Schommer, M. (1990). Effects of Beliefs About the Nature of Knowledge on Comprehension. *Journal of Educational Psychology*, 82(3), 498–504. <https://doi.org/10.1037/0022-0663.82.3.498>
- Schraw, G. (2013). Conceptual Integration and Measurement of Epistemological and Ontological Beliefs in Educational Research. *ISRN Education, Journal Article*, 1–19. <https://doi.org/10.1155/2013/327680>
- Simon, J. (2010). The entanglement of trust and knowledge on the Web. *Ethics and Information Technology*, 12(4), 343–355. <https://doi.org/10.1007/s10676-010-9243-5>
- Sinatra, G., & Hofer, B. (2021). *Science Denial: Why It Happens and What to Do about It*. Oxford University Press. <https://doi.org/10.1093/oso/9780190944681.001.0001>
- SPSS. (2021). *SPSS 27.0* (27.0.0) [Computer software]. SPSS Inc., IBM Corporation.
- Steup, M., & Neta, R. (2020). Epistemology. In E. N. Zalta (Ed.), *The Stanford Encyclopedia of Philosophy* (Fall 2020). Metaphysics Research Lab, Stanford University. <https://plato.stanford.edu/archives/fall2020/entries/epistemology/>
- Stähl, T., Sormunen, E., & Mäkinen, M. (2021). Epistemic beliefs and internet reliance – is algorithmic authority part of the picture? *Information and Learning Sciences*, 122(11/12), 726–748. <https://doi.org/10.1108/ILS-01-2021-0004>
- Strømso, H. I., & Kammerer, Y. (2016). Epistemic Cognition and Reading for Understanding in the Internet Age. In J. A. Greene, W. A. Sandoval, & I. Bråten (Eds.), *Handbook of Epistemic Cognition* (pp. 230–246). Routledge. <https://doi.org/10.4324/9781315795225>
- Sundin, O., Haider, J., Andersson, C., Carlsson, H., & Kjellberg, S. (2017). The search-ification of everyday life and the mundane-ification of search. *Journal of Documentation*, 73(2), 224–243. <https://doi.org/10.1108/jd-06-2016-0081>
- Tollefsen, D. P. (2009). Wikipedia and the Epistemology of Testimony. *Episteme*, 6(1), 8–24. <https://doi.org/10.3366/E1742360008000518>
- van Dis, E. A. M., Bollen, J., Zuidema, W., van Rooij, R., & Bockting, C. L. (2023). ChatGPT: Five priorities for research. *Nature*, 614(7947), 224–226. <https://doi.org/10.1038/d41586-023-00288-7>

Appendix A

Items on the Internet-Specific Epistemic Justification Inventory (Bråten et al., 2019).

Item # Item wording

Personal justification

1. When I find information about [an educational topic]⁷ [on the Internet], I evaluate whether this information is consistent with my own of the topic.
4. To check whether information about [an educational topic] I find [on the Internet] is reliable, I evaluate it in relation to my own knowledge of this topic.
7. I evaluate whether information I find about [an educational topic] [on the Internet] seems logical.
10. When I read about [an educational topic] [on the Internet], I evaluate whether this information is consistent with what I already know about this topic.

Justification by multiple sources

2. I evaluate claims I find about [an educational topic] [on the Internet] by checking several information sources on the same topic.
5. When I read something about [an educational topic] [on the Internet], I compare several websites that deal with this topic.
8. To evaluate whether information I find [on the Internet] about [an educational topic] is reliable, I check whether it is consistent with information on other websites.
11. To determine whether information I find about [an educational topic] [on the Internet] is trustworthy, I compare information from multiple sources.

Justification by authority

3. When I read something about [an educational topic] [on the Internet], I evaluate whether this information is written by an expert.
6. To determine whether information I find about [an educational topic] [on the Internet] is trustworthy, I evaluate whether the author has sufficient knowledge of the topic.
9. When I find information about [an educational topic] [on the Internet], I check whether it comes from an expert source.
12. To evaluate whether information I find about [an educational topic] [on the Internet] is reliable, I try to determine whether it is written by a person with a high level of competence in the area.

⁷ In the current study, the content inside the brackets was replaced with other contextual elements.