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RENEWING THE CURRICULUM TO PROMOTE EPISTEMIC COGNITION IN THE KNOWLEDGE SOCIETY: SOME PROCEDURAL PRINCIPLES

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Abstract

In our Knowledge Society, the division of cognitive labor, the specialization of knowledge and the brisk growth of new information and communication technologies provide a complex challenge for those tasked with selecting what is worth teaching and how to do it. The ease of access to information due to advanced and user-friendly technologies often gives us the illusion to know more than we actually do. This "epistemic disease" is a danger to both democracy and public health. The educational system must therefore encourage good epistemic habits consistent with responsible citizenship. From a didactic perspective, this requires updating the curriculum in the light of the educational challenge of the 21st century: making students aware of what knowledge is and what knowing means by fostering their epistemic cognition. Since epistemic cognition is concerned with the acquisition of a habitus, that is, a durable disposition to act in a certain way under certain circumstances (second-level curriculum objective), curriculum updating should not be reduced to a mere quantitative increase in the knowledge to be taught. On the contrary, this revision should address, on a qualitative level, how the selected disciplinary content is didactically transpose. In this contribution, we intend to propose some procedural principles – conceived as pragmatic patterns of behavior – that can help teachers design instructional activities consistent with the goal of promoting students' epistemic cognition. These procedural principles will be formulated based on a conception of discipline as a correlated system of epistemic products and expert practices of knowledge construction, validation, evaluation and justification.

Keywords: *Epistemic cognition, procedural principles, curriculum design, didactic transposition, disciplinary epistemic practices.*

1. The knowledge illusion as epistemic disease

The division of cognitive labor (Kitcher, 1990) underpinning the hyperspecialization that characterizes today's Knowledge Society, combined with the brisk growth of new information and communication technologies (e.g., the internet, mobile telephony, social media) provide a complex challenge for those tasked with selecting what is worth teaching and how to do it. The ease of access to information (at least in some Countries) enabled by increasingly advanced and user-friendly technological devices has not, as Tom Nichols (2017) points out, led to a new and more democratic "enlightenment". On the contrary, it has ushered in "the age of incompetence", where a narcissistic and uninformed egalitarianism opposes expert knowledge, thus undermining democracy. Information overload contributes to instilling in us the reassuring but dangerous belief that we master authentic knowledge, even though this is not the case. In short, we often suffer from knowledge illusion - i.e., we think we know more than we actually do (Sloman & Fernbach, 2017) - an "epistemic disease" fueled by increasing digitization, which may hinder the development of 21st century citizenship skills, as well as the achievement of the Sustainable Development Goals (SDGs) set by the United Nations 2030 Agenda. Indeed, the ongoing Covid-19 infodemic clearly shows how the presumption of knowledge combined with "information disorder" can undermine people's ability to make decisions.

The World Health Organization (WHO) labelled as "infodemic" the overabundance of information "including false or misleading information in digital and physical environments during a disease outbreak" that makes it difficult to find one's way around a given topic because of the difficulty of identifying reliable sources. The damage to public health that this information pathology can cause by prompting people to distrust scientific experts and health authorities can be further amplified by the *filter bubble effect*. This expression was coined by the American scholar Eli Pariser (2011) to refer to personalized information ecosystems generated by algorithms, as, for example, Google's personalized

search and Facebook's personalized news. These algorithms, based on the preferences previously granted by the user, tend to propose contents similar to what the user likes. As a result, naïve epistemic subjects (but not only), being excluded from information that contradicts their own standpoint, end up being isolated in their epistemic bubble or echo chamber. The knowledge illusion generated by the consensus of one's own group makes them more polarized and prone to conflict (Sunstein, 2009). In other words, interacting with a homogeneous network of like-minded friends makes people more likely to radicalize their positions, regardless of whether they have well-founded reasons to support them. This natural tendency of the human mind is further reinforced by the many types of cognitive bias (systematic cognitive errors) that influence our judgement and decision-making (e.g., Piattelli Palmarini, 1994; Kahneman, 2011). Especially relevant to the problem at hand is the confirmation bias, i.e., our spontaneous inclination to search for, accept and interpret evidence in a way that supports what we are already convinced of. Confirmation bias hampers public evaluation of opinions and arguments, promotes social conformity, devaluation of expert views, and polarization and manipulation of opinions. Although philosophers of science, following Karl Popper (2014), suggest us challenging a hypothesis by trying to disprove it, we (and very often scientists as well) are always looking for data that are consistent with our current beliefs (Kahneman, 2011). Thus, complying with the rules of scientific rationality requires a great cognitive effort from people as they need to get used to inhibiting their intuitions.

2. Promoting epistemic cognition in the curriculum

In the light of the above, whether information sharing can be the key resource of our society compared to those of the past also depends on the extent to which citizens are likely to enact knowledge-friendly behaviors while seeking new information and taking decisions. The education system needs, therefore, to encourage good epistemic habits consistent with responsible citizenship, by providing students with the conceptual, critical and epistemic tools to effectively select, evaluate, integrate and make sense of different sources of information. From a didactic perspective, this entails updating the curriculum – conceived as a theoretical and methodological device that allows knowledge, practices and skills to be articulated coherently (Martini, 2019) – to meet the educational challenge of the 21st century: making students aware of what knowledge is and what knowing means by fostering their engagement in sophisticated epistemic cognition (Greene, Sandoval & Bråten, 2016). In short, I argue that epistemic cognition, i.e., the ability to produce, evaluate, justify and use knowledge in formal and informal contexts, should be included among the life skills of the 21st century. On par with the others established by WHO, it is indeed necessary for enacting adaptive and positive behaviors "that enable individuals to deal effectively with the demands and challenges of everyday life". Like critical thinking - to which for some scholars (Greene & Yu, 2016) it is closely related -, epistemic cognition concerns the acquisition of a *habitus* (Dewey, 1922; Bourdieu, 1977; Baldacci, 2012), that is, the formation of stable, long-lasting dispositions to think and act in a certain way under certain conditions. This is the reason why curriculum updating should not be reduced to a mere quantitative increase in the knowledge to be taught. On the contrary, this revision should address, on a qualitative level, how the selected disciplinary content is didactically transposed (Schubauer-Leoni, 2008). To clarify what I mean, I introduce the distinction between first-level and second-level curriculum proposed by Baldacci (2006), which is linked to Bateson's hierarchical theory of learning (2000).

According to Baldacci, the curriculum structure can be organized on two levels, which correspond to the first two distinct logical types of learning identified by Bateson. First-level curriculum aims to promote proto-learning (learning I), i.e., the acquisition of disciplinary knowledge and abilities (declarative and procedural knowledge). On the other hand, second-level curriculum is concerned with deutero-learning, that is the development of habits of thought and actions, personal attitudes and interests, *formae mentis*, particular ways of seeing and thinking (including those of disciplinary experts). Proto-learning is direct, explicit and gives results in the short-to-medium term, whereas deutero-learning is collateral – as it only takes place in parallel and in connection with learning I –, mostly implicit and gives results in the medium-to-long term. It follows that the promotion of students' epistemic cognition is a second-level curriculum objective insofar as it involves the development of a core of habits and attitudes characterizing a virtuous epistemic agent (Elgin, 2013).

In general terms, by virtuous epistemic agent I mean an individual who is both capable and inclined to pursue valued epistemic goals by engaging in reliable epistemic practices - included correct forms of reasoning - and to use sound epistemic standards to evaluate epistemic products and practices as well as to justify these evaluations. At the operational level, the second-level curricular objective of promoting the habitus (of thought and action) of the virtuous epistemic agent can be pursued through procedural principles that can help teachers design effective instructional activities in this regard. In other words, the various disciplines must provide the context in which students learn to repeatedly enact

knowledge-friendly behaviors that can collaterally promote the development of good epistemic habits and attitudes. My proposal is to formulate these procedural principles – conceived as pragmatic patterns of behavior (Stenhouse, 1977) - by applying a three-step methodological scheme initially devised for a previous research project on color education (Martini, D'Ugo, & Tombolato, 2021). In the next paragraph, I describe the three phases of this methodological scheme, which has been properly modified to fit the current research context and purpose and provide some examples of procedural principles.

3. Towards the identification of procedural principles

The *first phase* of the research consists of identifying some general epistemological categories that help characterize the habitus of the virtuous epistemic agent. According to the definition proposed above based on a review of the philosophical and educational literature (e.g., Goldman, 1999; Chinn & Rinehart, 2016; Kelly, 2008; Sandoval, 2005), these general epistemological categories are: epistemic goals directed at epistemic products, reliable epistemic practices, epistemic standards/criteria. However, since these categories are very broad, independent of a specific knowledge domain, they fail to provide precise guidance to teachers, most of whom are not accustomed to fostering students' epistemic cognition during the didactic transposition of their disciplines. Therefore, in order to formulate procedural principles useful for supporting teachers' practices, we need to sharpen these general categories by identifying, for each of them, *operationalized subcategories* in the form of epistemically virtuous behaviors to be related to the procedural principles aimed at their development (*second phase*). My working hypothesis is indeed that by consistently applying these procedural principles, teachers will be more likely to encourage students' knowledge-friendly behaviors to be taken as indicative of the habitus of the virtuous epistemic agent. The behaviors at issue can be identified on two levels of specificity: a first a-disciplinary level, i.e., independent of any specific discipline; a second strictly disciplinary level, i.e., dependent on the specific characteristics of each discipline. This follows from the fact that, as some scholars (e.g., Knorr Cetina 1999; Sandoval, 2016) pointed out, different epistemic communities enact different epistemic practices, have different perspectives on objectivity and use different standards/criteria to justify their discipline knowledge claims, or to establish what counts as evidence.

My current research focuses on carrying out a *first-level operationalization* of the meaning of general epistemological categories in order to formulate some a-disciplinary procedural principles. For this purpose, it is necessary to explore the literature on epistemology (including social epistemology), education and epistemic cognition and to analyze the set of competences that constitute the construct of information literacy. *Second-level operationalization*, on the other hand, will be the target of future research, as it requires in-depth empirical investigation based on observation of the actual practice of disciplinary experts. With regard to *epistemic goals directed at epistemic products*, some examples of first-level operationalization are provided by the following knowledge-friendly behaviors: seeking objective knowledge, achieving disciplinary understanding, creating meaning from information, gathering reliable information, gathering sound evidence, forming true belief within a discipline, constructing different kind of explanations, providing sound epistemic justification of a knowledge claim and so on. Under the category of *epistemic practices* (Kelly, 2008; Tombolato, 2020) fall the variety of practices related to how knowledge is constructed, validated, evaluated, justified, used effectively to solve problems and make decisions within a scientific community. These practices can be formal, empirical, experimental, simulation-based, argumentation-based and include all forms of reasoning (inductive, deductive, abductive, model-based, probabilistic, statistical, counterfactual, by analogy, by trial and error, by falsification, by counterexamples, etc.). Finally, *epistemic standards* cover the specific criteria used to evaluate and justify products and practices: e.g. checking the soundness of an argument, identifying trustworthy sources of information, separating evidence/facts from opinions/fiction, checking the adequacy of an epistemic representation, assessing the credibility of an expert in relation to the subject matter, identifying biased procedures and reasoning, distinguishing good from bad explanations, distinguishing fruitful analogies from false or misleading ones, and so on.

Once the subcategories have been identified and operationalized in the form of knowledge-friendly behavior, the *third phase* is to construct some *procedural principles* that can guide teachers' professional action. As Table 1 shows, each operationalized subcategory can correspond to numerous procedural principles, which translate these subcategories into actions that the teacher must perform in order to promote in learners those behaviors considered indicative of the habitus of the virtuous epistemic agent. It is worth noting that epistemological categories and, consequently, procedural principles have been conceptually isolated, but it does not mean that they can be actually isolated. Insofar as they are closely interconnected, almost every teaching activity exemplifies many of them. For the epistemic goal aimed at an epistemic product presupposes both an epistemic practice of which that product is the result and epistemic criteria on which to rely to evaluate practices and products.

Table 1. Some examples of procedural principles referred to each general epistemological category characterizing the habitus of the virtuous epistemic agent.

General epistemological categories	*Operationalized subcategories (Epistemically virtuous behaviors)*	*Procedural Principles*
Epistemic goals directed at epistemic products	*Providing sound epistemic justification of a knowledge claim*	*Learners are more likely to develop the habitus of the virtuous epistemic agent if they are engaged in activities a) that require them to consistently justify their knowledge claims; b) that allow them to recognize if others' knowledge claims are justified or not c) that allow them to distinguish epistemic from non-epistemic (e.g., pragmatic) justifications; d) that allow them to become acquainted with different types of epistemic justifications, both reliable and unreliable and so on.*
	Forming true belief within a discipline	*Learners are more likely to develop the habitus of the virtuous epistemic agent if they are engaged in activities a) that allow them to distinguish believes formed through reliable disciplinary practices from naïve believes; b) that prompt them to prove the truth of a knowledge claim within a discipline by referring to disciplinary modes of inquiry and knowledge-finding tools; c) that elicit them to reflect on how each discipline constructs, critiques, revises knowledge and proves the truth of its statements; d) that allow them to compare different disciplinary conception of what counts as evidence/proof, etc.*
	Constructing different kind of explanations	*Learners are more likely to develop the habitus of the virtuous epistemic agent if they are engaged in activities a) that allow them to distinguish an explanation from a description within distinct disciplines; b) that require them to provide disciplinary explanations about a fact, a phenomenon, a mathematical formula; c) that expose them to different types of explanations (e.g., nomological-deductive, inductive-probabilistic, simulation-based) in relation to different disciplines and so on.*
Epistemic practices	*Constructing disciplinary forms of knowledge*	*Learners are more likely to develop the habitus of the virtuous epistemic agent if they are engaged in activities that allow them a) to become acquainted with disciplinary rules and constraints which bound scientific community members when constructing knowledge; b) to compare different forms of reasoning in relation to the achievement of disciplinary epistemic goals; c) to choose which epistemic practices (formal, empirical, experimental, etc.) are to be employed to address a given disciplinary or interdisciplinary problem and so on.*
	Justifying knowledge, practices, forms of reasoning	*Learners are more likely to develop the habitus of the virtuous epistemic agent if they are engaged in activities that allow them a) to become acquainted with how experts evaluate and justify the practices enacted to construct knowledge in their domain of expertise; b) to compare disciplinary and naive forms of reasoning and so on.*
Epistemic standards	*Distinguishing good from bad explanations*	*Learners are more likely to develop the habitus of the virtuous epistemic agent if they are engaged in activities that elicit them to compare good and bad explanations on the basis of the following criteria: fit the facts to be explained, be falsifiable, not conflict with other facts, rely on valid inferences, avoid inferring causal relations from statistical correlations, distinguish relevant from irrelevant variables/facts, allow for new predictions (at least in some disciplines) and so on.*
	Checking the soundness of epistemic justification	*Learners are more likely to develop the habitus of the virtuous epistemic agent if they are engaged in activities that require them to evaluate an argument on the basis of good epistemic criteria such as: coming from expert testimony, logical consistency (no contradiction), soundness of evidence, coherence with previous data (no counterevidence), etc.*
	Identifying biased procedures and reasoning	*Learners are more likely to develop the habitus of the virtuous epistemic agent if they are engaged in activities that elicit them a) to evaluate the soundness of an inductive generalization by ascertaining whether there is a sufficient number of cases to draw a conclusion, whether the breadth of the conclusion is supported by the evidence, etc.; b) that prompt them to distinguish valid inference rules from common fallacies and so on.*

4. Conclusion and future prospects

In this paper, I have attempted to turn the epistemological concept of *virtuous epistemic agent* into a didactically fertile construct through an operational definition of both the knowledge-friendly

behaviors that he/she habitually engages in (operationalized subcategories), and the instructional actions that the teacher can implement to promote these same behaviors in students (procedural principles). Encouraging students to repeatedly enact these behaviors through appropriately designed teaching situations can indeed foster a stable, long-lasting disposition to act epistemically responsible when dealing with personal and professional issues and when exercising their citizenship rights. Within this framework, there are two future challenges for educational research: to construct additional procedural principles that help teachers carry out a didactic transposition of their discipline aimed at promoting students' epistemic cognition. To train prospective and in-service teachers so that they are able to incorporate the results of didactic research into their instructional practice in order to meet the educational needs of the citizens of the information and knowledge society.

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