Chapter 20

The Trajectory of Argumentation and its Multifaceted Functions

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Abstract. The manner, goal, and function of argumentation shift over the course of development. We suggest that early learners engage in proto-argumentation in a non-competitive "learning mode". The knowledge asymmetries in their social environment prompt argumentation to be used as a means of accumulating knowledge about the world. As early learners develop more sophisticated reasoning abilities, argumentation shifts to an "argue-to-win" style, which aims solely to promote one's own point of view and discredit others. The simplest form of this mode of argument is *ad hominem*-style attacks, which ignore the actual structure of the argument. Once the structure of the argument has been internalized, it is then possible to re-enter the learning mode equipped with more powerful tools for discovery. Though these modes at most times may be incompatible, certain strategies like "considering the opposite" (Lord, Lepper, & Preston, 1984) can be effective ways to leverage the features of reasoning to enable productive exchanges of ideas. Argumentation in this form can serve to expose gaps in understanding and probe the understanding of others.

1. The Trajectory of Argumentation and its Multifaceted Functions

Arguments pervade a wide range of social interactions. They take place everywhere from classrooms (Chi, 2009) to courtrooms (Warren, Kuhn, & Weinstock, 2010) and occur across domains such as moral reasoning (Bloom, 2010; Haidt & Bjorklund, 2007) and scientific advancement (Latour & Woolgar, 1986; Osborne, 2010). Despite serving many important functions, there is no clear consensus on how to best characterize the concept of argumentation (Voss & Dyke, 2001). Argumentation has been described as containing multiple continua such as product-process, internal-external, and rhetoric-dialogical, where each instance of an argument can hold a different position on each dimension (Garcia-Mila & Andersen, 2007). Here, we suggest an additional dimension of argumentation that has not received attention. Arguments can be deployed with various goals and purposes and these characteristics create distinct modes of argument.

This chapter argues for distinguishable modes of argument that shift both across contexts and across the course of development. While philosophical and theoretical models of argumentation (i.e. Toulmin, 1958) are certainly important, those approaches may not describe the informal ways in which arguments are used by laypeople. Here, we focus on how arguments are construed psychologically. More specifically, we explore the possibility

that arguments take on distinct and even incommensurable sets of characteristics depending on the context and period of development.

1.1. Modes of Argument

While there are many nuanced ways in which people argue in daily discourse, most broadly, two of the most common uses are winning and learning. Consider, for example, how a judge and a defense lawyer deploy arguments differently based on their role in the courtroom (Nickerson, 1991). The ideal judge aims to discern the truth of a matter and uses argumentation to evaluate evidence and probe for useful information. A defense lawyer, however, must carefully construct evidence to build a case supporting one particular outcome. These roles in the courtroom illustrate two distinct modes of argument. The judge exemplifies an argue-to-learn mindset — she freely follows the evidence and is ultimately concerned with finding the truth. The defense attorney exemplifies an argue-to-win mindset — he has a pre-determined position and is ultimately concerned with undermining the opposition and coming out on top. Note that both roles must use evidence to construct an argument to justify an assertion so that others see it as true (i.e. a suspect's innocence). The sense of argument that we trace in this chapter has this quality: it is truth-oriented in that the ultimate goal is to assert or evaluate a truth claim about a particular matter. Though the distinction is admittedly difficult to draw, this definition of argumentation excludes mere disputes, where the justifications offered are purely instrumental: people fighting to change a certain state of affairs to reach a desired end.

What is the evidence for these separate modes of argument? Experimental evidence suggests that these two approaches to argumentation constitute two distinct and potentially incommensurable mindsets. Social context is one factor that has been identified which can shift people into one mindset or the other (Fisher & Keil, under review). Specifically, when others are watching, winning becomes the goal of the argument, when others are not watching, the goal is to learn. In these studies, several indicators suggest that the cognitive construal of argumentation changes across social setting. First, participants chose to argue with those who are less knowledgeable about the topic of the argument when in a public setting, revealing their desire to outperform the opposition in the exchange. Second, the content of the arguments became more winning-oriented (as rated by independent judges) when in public. Finally, people produce lower quality arguments (again, as rated by independent raters) when they believe they are arguing in front of others. In a separate series of studies, when arguing cooperatively, people were more likely to hold a relativist understanding of truth, illustrating the downstream cognitive consequences of adopting a particular argumentative mindset (Fisher, Knobe, Strickland & Keil, under review). Thus, when people are arguing with the goal of learning, they shift their understanding of the underlying truth of the matter and see the truth as more subjective. These pieces of evidence support the notion that arguments can serve very different purposes at different times and in different contexts.

Although research has begun to unpack the different factors that influence the informal uses of argumentation, there remain many open questions. A developmental perspective offers a promising approach to better understanding argumentation by highlighting different components and precursors of how we argue. With much empirical work yet to be done, we offer a developmental roadmap for the various modes of argumentation. Given the novelty of the learn vs. win distinction, much of the available evidence is only indirectly related to our core distinction. Here, we organize the relevant evidence to sketch a plausible account for how argumentation develops. By examining the topic through this lens, we can isolate

the cognitive underpinnings of learning and winning-oriented argumentation, better understand how they emerge, and see how they function.

1.2. Developing Modes of Argument

We propose that the ability to deploy arguments towards a specific goal develops in three distinct phases. In this chapter, we use this three-phase framework to organize the existing literature and suggest how observed patterns of argumentation relate to the modes of argument 1) As information seekers, children first exhibit a cooperative stance towards their interactions with others and use argumentation to promote learning. 2) As the ability to reason matures, trying to win becomes a major goal of argumentation as well. This mindset primarily manifests itself in one of two ways: people either discredit the source of argument through ad-hominem-style attacks or they deploy biased and self-serving reasoning mechanisms to construe the content of the argument in their favor. 3) Finally, the mechanisms used to win can be reoriented and leveraged to gain new insights from alternative perspectives through argumentation. When this final phase does occur, it allows the openness of Phase 1 to combine with the rigor of Phase 2 to create a powerful approach to learning.

2. Phase 1: Learning

2.1. Early Prosociality

The openness with which children learn from others may arise from the early emerging bias to cooperate. Converging evidence from a variety of fields of study suggests that human prosociality is intuitive (Rand, Greene, Nowak, 2012; Zaki, & Mitchell, 2013). While traditional models commonly assumed human cooperation requires deliberation and the control of selfish impulses, recent work suggests that in fact, cooperation is intuitive because it often creates benefits in social interaction. This theory is supported by the finding that 6-month-old infants exhibit prosociality, preferring helping agents to those who hinder another's action (Hamlin, Wynn, & Bloom, 2007). By 18-months, children engage in spontaneous helping behavior such as opening a cabinet or offering useful information without any expectation for a reward or repayment (Warneken & Tomasello, 2009). Only with increasing executive control can these intuitive responses consistently be overridden (Garon, Bryson, & Smith, 2008). These most basic forms of prosocial preferences and action help explain why children so willingly learn from others.

2.2. Trust in Testimony

Relying on the testimony of others is central to cognitive development (Wellman & Gelman, 1992). Children face vast knowledge asymmetries in relation to other human agents and need to rapidly absorb information from those who know more. Large swaths of human understanding require knowledge that the learner has never directly observed. Knowledge of this sort is often transmitted via testimony. Children are often willing to believe in the existence of unobserved causal agents, like those posited by science and religion (Harris, Pasquini, Duke, Asscher, & Pons, 2006). They will even override immediate sensory information in favor of another's testimony. Children with an understanding that appearance is not always reality accept an informant's incorrect labels for ordinary objects (i.e. calling a lemon a rattle; Lane, Harris, Gelman, & Wellman, 2014). In general, children display

openness to acquiring information from the testimony of those around them. While part of this acceptance may reflect less cognitive capability to carefully scrutinize information, children are still able to utilize several heuristics as filters.

Children do not blindly accept any information from anyone; instead, early developing tendencies allow infants to identify trustworthy sources. These strategies may lay the foundation for the later development of the argue-to-win mentality. Eight-month-olds use the observed reliability of agents to inform future behavior (Tummeltshammer, Wu, Sobel, & Kirkham, 2014). Young children continue to track the performance of informants to select accurate sources (Koenig, & Harris, 2005; Koenig & Woodward, 2010). In these cases, children are using characteristics of the source to judge the trustworthiness of the message. Similar inferences characterize the argue-to-win mindset. Dismissing information based solely on the source may be a beneficial as children learn about the world, but may become less productive when externalized in the form of *ad hominem* attacks during argumentation.

In addition to evaluating sources, children also show early signs of scrutinizing the information they receive. Children who have difficulty with the appearance vs. reality distinction are surprised when adults make a claim that contradicts the child's perception (Pea, 1982) and will reject unexpected information (Harris, Pasquini, Duke, Asscher, & Pons, 2006; Robinson, Mitchell, & Nye, 1995). In these cases, children show a rudimentary ability to analyze the reliability of information based on the content, not merely the source. This capacity is far from adult-like competitive argumentation, but may be an important step in the development of the argue-to-win mindset. Despite children's selectivity, the formidable gaps in their knowledge require children to largely adopt a cooperative stance in knowledge acquisition.

2.3. Question Asking

It is no surprise that very young children ask questions. It is however, impressive how purpose driven their questioning can be. Even young preschoolers often ask questions with a clear goal of gaining explanatory insight. Thus children expect, and often receive, explanatory responses from adults. They can persist in asking questions and further adjusting them until they get explanations in response to their questions instead of mere facts or platitudes. (Callanan & Oakes, 1992; Chouinard, Harris, & Maratsos, 2007; Frazier, Gelman & Wellman, 2009). They are clearly capable of evaluating responses to their questions in terms of the explanatory insights they provide. They show pleasure and satisfaction with explanatory answers and often build on them; but they show impatience and dissatisfaction with scripted responses that offer no insight and often repeat the same why question or simply disagree with the non-explanatory answer (Frazier et. al., 2009). This is not the same as argumentation, but it does reveal an early ability to seek out information in a transactional manner and to evaluate the quality of the information received in real time and adjust one's queries accordingly.

2.4. Arguing to Learn: Acquiring Argumentation Skills

Children are cooperative and open to learning, but are they competent arguers? Children's argumentative skills may first develop out of interaction with family members (Stein & Albro, 2001). Children often engage in arguments and model the skill of offering justification for their positions after their parents (Dunn & Munn, 1987). The safety of the home environment offers children ample opportunity to practice producing and evaluating arguments as they resolve conflicts. Early in life, children display quite sophisticated skills in their arguments, demonstrating argumentative capabilities even before they enter the

school setting. In disagreements between children at a nursery, 3 and 4-year-olds rarely end disputes in a simple refusal, but rather offer justifications for their position and ideally come to mutual understanding (Eisenberg & Garvey, 1981). Observations of children's interactions show that children use oral arguments to negotiate with others (Stein, Bernas, & Calicchia, 1997). These conflicts will focus on topics such as manners, possessions, and independence. Children will offer justification for their claims by appealing to sources such as their feelings, social rules and material consequences (Dunn & Munn, 1987). In one observational study, 18-month-olds would show signs of distress and anger when disputes arose over basic rights. By 24 months, children would respond similarly for conflicts regarding conventions. At 36 months however, children shifted strategies and began to offer justifications for their positions in these situations rather than simply expressing their discontent (Ibid). These were the same topics in which mothers were most likely to offer justification as well, suggesting children readily pick up the skills of argumentation through observing their parents. Children show sensitivity to fallacious arguments: in appropriately simplified formats, 3-year-olds prefer non-circular arguments to circular arguments (Corriveau & Kurkul, 2014; Mercier, Bernard, & Clément, 2014). By 4 years of age, children are able to produce all of the essential components of an argument (Eisenberg, 1992) and show competence in understanding verbal structures like *modus tollens*, often used in formal arguments (Scholnick & Wing, 1991). Furthermore, children justify their assertions in arguments and understand that all views can be supported or challenged (Perlman & Ross, 2005).

Early in development, children's goals will conflict with others. For young children, the ultimate goal of deploying these sorts of arguments may be to act willfully on a set of beliefs (Dunn and Munn, 1987). In these situations, children will try to achieve their own goals and win the exchange. Children also offer justifications after breaking a norm or following a disputed or surprising assertion (Orsolini, 1993). Arguments like these can help children avoid embarrassment by providing justification for their actions. Children may display winning-oriented behavior, but in these cases they are not processing evidence in a truth-oriented argument; instead they are justifying impulses. We classify this behavior as a dispute rather than a genuine argument because children are not abstracting away from a particular topic and arguing for a specific view of the truth, but rather excusing their own behavior or attempting to overcome a personal obstacle. Though even in the case of disputes, children become less conciliatory over time (Tesla & Dunn, 1992).

2.5. Arguing to Learn: In Practice

The use of arguments in educational settings demonstrates the effectiveness of argumentation as a learning tool. Argumentation in the classroom can enable students to shift perspectives and change their initial thoughts through teacher-led classroom discussions (Leitão, 2000). They often utilize arguments to improve reasoning through group collaborations. When children are paired with someone who has a different perspective on a problem, they then improve when tested individually (Perret-Clermont, 1980). In general, these sorts of group interactions demonstrate the "two wrongs make a right" effect (Ames & Murray, 1982): the performance by group members often exceeds that of the group's top individual performers. Arguments amongst members of a group facilitate this improvement in performance (Schwarz, Neuman, & Biezuner, 2000).

When children in educational environments engage in collaboration they outperform children in the control groups. These benefits have been found across multiple disciplines (Webb & Palinscar, 1996). A recent meta-analysis shows the benefits of interactive learning are superior to other methods like constructive activities or passive learning (Chi, 2009). Student groups do not produce higher quality scientific arguments than individuals, but those

who generate arguments in a group setting show greater mastery over the material (Sampson & Clark, 2009). By high school, students are able to explicitly identify a wide variety of fallacies in arguments (Weinstock, Neuman, & Glassner, 2006; Weinstock, Neuman, & Tabak, 2004), suggesting that while young children are capable arguers, the ability to do so continues to develop throughout the school-age years.

The improvements observed in the group settings are due to genuine conceptual improvements, not simply increased motivation or being rewarded for group interactions. The encouragement students receive from family members and teachers does not increase academic performance; in fact, external rewards can sometimes hurt performance (Deci, Koestner, & Ryan, 2001). These considerations suggest group reasoning itself, and perhaps argumentation in particular, may be responsible for these positive effects of collaboration.

3. Phase 2: Winning

As the cognitive mechanisms required for adult-like reasoning coalesce, people's goals in arguments may often shift to winning. Working memory may play a key role in the shift to an argue-to-win mindset. This mode of argument requires a certain level of metacognitive awareness: instead of being embedded in a dispute, like young children, the arguer must have the ability to abstract out and view language as an object to which reasoning can be applied—connecting new arguments to the previous components of the exchange. Even into the high school years, students often fail to offer arguments relevant to the other elements of the argument (Jiménez-Aleixandre *et al.*, 2000). Abstracting in this way while simultaneously using reasoning to produce and evaluate arguments is cognitively taxing, requiring a certain amount of working memory to function. It is part of a much larger pattern of increasing metacognitive awareness during the school years (Whitebread, Bingham, Grau, Pino Pasternak, & Sangster, 2007).

It may be that the biases found in human reasoning arise not for the function of achieving perfect rationality, but for winning arguments (Mercier & Sperber, 2011). Communication plays a vital role in human life and reasoning, construed as argumentative, would be adaptive in that it makes an individual less susceptible to misinformation. It is a way of ensuring epistemic vigilance (Sperber, Clément, Heintz, Mascaro, Mercier, Origgi, & Wilson, 2010). This approach helps explain why the argue-to-win mindset would only emerge once reasoning has more fully developed and can be applied to truth statements, as opposed to mere disputes.

Once the mechanisms of reasoning have matured, even if reasoning is for arguing, it does not entail that people's initial arguments will be particularly convincing. In fact, people often do not spontaneously produce sophisticated arguments (Kuhn, 1991). This deficit could be because arguers need the feedback of a live interaction to force them to find better arguments. Indeed, in argumentative contexts, people are found to be quite skilled arguers (for review see: Mercier, 2011).

We posit that in a competitive setting, such as a live interaction between two people who disagree about a topic important to them, people easily enter the argue-to-win mindset. This mindset can manifest itself in two distinct ways. These two types of arguing-to-win approximate the distinction between the analytical and heuristic routes to persuasion (Eagly & Chaiken, 1993; Petty & Cacioppo, 1984). The first argue-to-win strategy focuses only on the characteristics of the other arguer. The personal, *ad hominem* style attacks used in this mindset have no bearing on the actual content on the argument. The second, and more cognitively demanding argue-to-win strategy, addresses the substance of the argument, but in a biased, unconstructive manner. When engaged in this version of the winning mindset,

people produce and evaluate information in a way that supports a previously determined position. Interactions of this sort are typically unproductive and end in a stalemate but do at least sharpen a sense of one's own position. It is a clear indication that one of these winning mindsets is active when people resist attempts at persuasion and become even more confident in their original point of view (Tormala & Petty, 2002). In the following sections, we examine the evidence for these two types of the argue-to-win mindset.

3.1. Discrediting the Source

Just as children adjust their trust in testimony based on information about the source, adults use information about a source as a heuristic for processing information from that source. In many cases, inferring the quality of information from the source may be an effective approach. For example, informants who are seen as trustworthy (Mills & Jellison, 1967) or as experts (Rhine & Severance, 1970) more effectively persuade others. In general, the degree to which a source garners credibility, the more like their message will be received (Petty & Wegener, 1998). In these cases, people use generally reliable cues about the source.

People also rely on less rational cues to determine their trust in a source. For example, people consider members of the in-group as more reliable informant than members of the out-group (Clark & Maass, 1988). When recipients perceive similarities with the source, the information they receive leads to more changes in behavior and attitudes (Feldman, 1984). Physical attractiveness is also used to evaluate sources of information— purchasing intentions increase as a function of attractiveness of the endorser (Kahle & Homer, 1985). These sorts of cues used to interpret information from a source, can be utilized to try and discredit an opponent in an argument.

From a logical perspective, the *ad hominem* argument is a logical fallacy (Walton, 1995; Woods, Irvine, & Walton, 2004). The characteristics of the arguer do not necessarily have any bearing on the actual argument. Despite recognizing clear cases of *ad hominem* as unreasonable in experimental settings, overt *ad hominem* it is still used in argumentative discourse, often going undetected by those involved in the argument (van Eemeren, Garssen, & Meuffels, 2012). In the argue-to-win mindset, *ad hominem* arguments are used as attempts to overpower the opponent and forcibly assert an alternative view. This approach is obviously unfruitful for making progress in any discussion, but it may be a way in which one person can exert dominance over another in front of a relevant social group. This may help explain why people are more likely to enter the argue-to-win mindset when in public (Fisher & Keil, under review).

3.2. Discrediting the Message

The second variety of arguing to win, focuses on the actual information presented in an argument. As arguers produce and evaluate arguments, they must deploy a set of reasoning mechanisms to process that information. The biases that have been found to be prevalent in human reasoning are consistently self-serving — they do not consider evidence in an optimally rational way. In the same vein as the argumentative theory of reasoning (Mercier & Sperber, 2011), we suggest that the function of reasoning can be to win arguments. That is, reasoning may be adaptive in that it helps protect against misinformation by producing and evaluating arguments.

If the function of human reasoning is to achieve pure rationality, one of its most puzzling features would be the confirmation bias: the tendency to find and interpret evidence in a manner that supports previously held beliefs (Nickerson, 1998). This phenomenon is nicely illustrated by the Wason selection task (Wason, 1966). People are presented with 4 two-sided

cards: a 4, 7, E, and K are visible. They then must choose which two cards to turn over to determine if the following rule is true: if there is a vowel on one side then there is an even number of the other. People intuitively seek to confirm the rule and choose the cards mentioned in the rule (the 4 and E). The rarely chosen correct answer (the 7 and E card), is not made salient by the rule and thus reasoning does not generate justifications for why those cards would be the correct response (Evans, 1996). Relatedly, people find arguments that support a position they already hold as more convincing than opposing arguments (Lord, Ross, & Lepper, 1979). Accumulating evidence only to support one side will not be conducive to determining the actual truth of the matter. It is, however, an effective strategy if winning is the goal of the interaction. Constantly amassing evidence that one's own points of view are accurate makes those positions much easier to defend if ever challenged in an argument.

People also exhibit motivated reasoning: the tendency to arrive at desired conclusions by generating justifications (Kunda, 1990). Motivated reasoning pervades many aspects of thought, but features especially prominently in moral cognition. The intuitionist model of morality posits that moral justifications emerge after reasoning has been applied to intuitive moral judgments and generated rationalizations for why the intuitions are objectively true (Haidt, 2001). This habit of thought is exposed through a phenomenon called "moral dumbfounding". People consider moral dilemmas in which they unable to generate justifications for their intuition that an action is immoral (e.g. eating one's already dead dog). Even after failing to provide a cogent rationalization for their moral judgment, people refuse to change their initial judgment (Bjorklund, Haidt, & Murphy, 2000). In an argumentative setting, motivated reasoning makes even the most convincing evidence unpersuasive to those in the winning mindset. This strategy would not lead to true conclusions, but would be very helpful in winning an argument. It is difficult to lose an argument if one is unable to be convinced that their own view is mistaken.

Consider the ways in which reasoning leads to suboptimal decision making. People make decisions, not in a rational way, but in way that is easy to justify. For example, people tend to avoid changing a course of action once they already have committed time, energy, and resources (Arkes & Blumer, 1985). However, people avoid the sunk-cost fallacy when reasons are available to them to justify the waste created by switching (Soman & Cheema, 2001). Reasoning may explain the strength of framing effects as well: more effortful processing leads to a stronger effect of framing (Igou & Bless, 2007). Alternative frames may prompt people to generate reasons to justify decisions in those contexts. Making decisions can lead people to be overly active in searching for reasons to justify their choices, resulting in reliance on irrelevant reasons. In some instances, the same reason will be used to both accept and reject an item (Brown & Carpenter, 2000). In an argument, the tendency to make easy-to-justify choices, leads arguers to make arguments that will help them avoid losing, but may not ultimately lead to the truth.

These features suggest that a major function of reasoning is winning arguments. Here, we have reviewed only a small sample of the evidence to support this view (see Mercier & Sperber, 2011 for a comprehensive treatment). The development of reasoning enables the argue-to-win mindset, leading arguers to become biased as they process information. Activated by particular factors, such as social setting (Fisher & Keil, under review) the argue-to-win mindset is a counterproductive approach when exchanging ideas with others.

4. Phase 3: Using Winning to Learn

While the argue-to-win mindset presents a rather grim view of argumentation, the mechanisms supporting it can also be used for much more productive ends. Under certain conditions, the open and cooperative approach seen in early development can reemerge in adults. Several requirements must be met before one can successfully argue to learn as an adult. Cognitively, one must be able to engage in an additional level of abstraction. In the argue-to-win mindset arguments are applied to topics, but in the argue-to-learn mindset arguments are applied to arguments. In the argue-to-win mindset, one might say, "That position is wrong because of this evidence", but in the argue-to-learn mindset, one might say, "The argument from that evidence does not lead to that conclusion." At this level of abstraction, reasoning can scrutinize itself, leading to less biased conclusions. Additionally, to adopt the argue-to-learn mindset, one must be willing to "lose" the argument. If both arguers refuse to adjust their beliefs, no progress can take place. However, if they are willing to update their views as the argument develops, learning can be achieved. In this mode, arguers are like scientists testing hypotheses, willing to revise their theories as they encounter new evidence. The truth may not present itself immediately, but through the iterative testing of ideas, better answers will emerge. When the stakes of the argument are too high, this approach is unlikely to be used. In cases where there is less personal investment in the issue at hand, the argue-to-learn mindset is more likely.

4.1. Group Reasoning

Collaborative group reasoning, especially when there is a demonstrably correct answer, can help counteract individuals' biased reasoning and lead to learning. When groups reason about the Wason selection task, for example, no member holds a strong commitment to a particular solution. Group members are free to question others' intuitions and justifications. This leads to the construction of more sophisticated arguments than those generated by participants in isolation, leading groups to find the solution to the problem 75% of the time, while individuals find it only 9% of the time (Moshman & Geil, 1998). The transcripts of these sorts of group interactions verify that individuals must be convinced that the solution they initially proposed is incorrect before considering alternative solutions from other group members (Trognon, 1993). When group participation is high, more dissent within the group leads to more innovative solutions (De Dreu & West, 2001). The various points of view within a group help challenge assumptions that may have otherwise been taken for granted and could have been preventing progress towards the solution to a problem. Group diversity is more likely to cause emotional conflict, but if steps are taken to avoid such problems, diverse groups make better decisions (Priem, Harrison, & Muir, 1995; Williams, & O'Reilly, 1998). When groups reason together, using arguments to uncover alternative approaches, the correct solution tends to emerge (Laughlin & Ellis, 1986). When arguing in a competitive fashion, marked by a total unwillingness to change positions, the benefits of group reasoning are lost. However, when people are willing to be proven wrong, they end up arriving at better solutions collectively. This sort of collaborative reasoning promotes innovation and progress in society, including in science (Dunbar, 1997).

4.2. Considering the Opposite

During group reasoning, the others in the group counter the biases of individual reasoning. Similar benefits occur when individuals pit their own reasoning biases against themselves. Considering the opposite, a strategy similar to "playing devil's advocate", entails seeing the

other side of an issue (Lord, Lepper, & Preston, 1984). In this mode of thinking, the biases of reasoning, such as the confirmation bias, are counteracted. An individual generates the strongest arguments in favor of one position, and then, ideally, also generates the best possible arguments for the opposing position. The individual is then able to fairly consider both perspectives and can then identify the best argument. This approach helps eliminate bias and create a more objective approach to the available evidence. For example, when people are deeply emotionally invested in topics, they tend to overestimate how well they can justify the underlying arguments. But by first considering opposing points of view, they are able counteract the influence of emotional investment and assess themselves more accurately (Fisher & Keil, 2014). Merely considering any other alternative, not just the opposite, can lead to similar debiasing effects (Hirt & Markman, 1995). This strategy is highly effective for individuals reasoning alone, but can also be beneficial when used in group settings (Schwenk & Valacich, 1994). Even if an interlocutor does not adopt the argue-to-learn mindset, one can still reap the benefits of a learning mentality by using the consider-the-opposite strategy.

5. Conclusion

Arguing with others and considering the opposite improves reasoning, but the situations in which these strategies work may be limited. The previous findings most often emerge in cases where no one in the group enters the interaction with a firmly held set of beliefs. In daily discourse, arguments often occur when this is not the case. Further research is needed to determine how to best promote learning-oriented arguments for firmly held topics, but there exist some promising preliminary solutions. Recent evidence suggests that the context in which arguments take place shifts the mindset of the arguers. When arguing in a public setting people tend to adopt a winning mindset, while in private they adopt a learning mindset (Fisher & Keil, under review). Several other factors, such as the stakes involved or priming of argument styles may also influence which goal is adopted in an argument, but the simple physical context of an argument, whether it is in public or private, can be surprisingly influential. Future work is needed to identify the conditions under which people willingly use arguments to learn and how they might resist influences that push them towards argue to wind mindsets.

The development of argumentation may closely track the development of epistemological understanding (Kuhn, Cheney, & Weinstock, 2000). Throughout development, the understanding of truth shifts. Initially children have a "realist" view, where reality directly corresponds with statements made about it. This stance towards truth may contribute to children's openness to learning. As they seek to better understand reality, the assertions made by those around them can serve as effective guides to discovery. The argue-to-win mindset is likely to be related to the "absolutist" understanding of truth. In this phase, people have a binary view of truth: an assertion is either completely true or completely false. This view of truth helps set the stage for arguments to be viewed as battlegrounds where there will be a definite winner and a definite loser. In this context, arguers will do whatever it takes to outperform the opposition. Finally, the "evaluativist" conception of truth, where knowledge is uncertain and assertions and arguments must be evaluated, supports the argue-to-learn mindset in adults. In this phase, thinking critically about multiple positions generates the best possible understanding of the truth of the matter. Like arguing to learn, relatively few adults reach an evaluativist epistemic understanding.

Arguments are important throughout the lifespan, yet the role they play in a particular context can vary to a large degree. The development of argumentation follows a trajectory

whereby people first engage in collaborative learning, then deploy the mechanisms of reasoning to win, and finally apply reasoning to arguments themselves in order to learn. These three phases of development clarify how arguments are used in everyday discourse and how the goal of an argument can shift dramatically. The developmental approach highlights the role of working memory, meta-representations, and reasoning in shifting from one phase of argumentation to the next. It may also be that primitive versions of all three phases can appear very early. For example, younger children can have greater metacognitive awareness in domains where they have massive expertise, such as child dinosaur experts (Gobbo, & Chi, 1986) and it is possible then, when operating in such domains that they may also be better able to not only argue to win but even to argue to learn in the most sophisticated sense. This raises the possibility that, with appropriate interventions and training, it might be possible to foster the growth of even the most productive forms of argumentation even in young children. Arguments have the potential to lead to gridlock, demonstrating the worst of human reasoning, but they also have the potential to lead to powerful new insights.

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