INTELLECTUAL HUMILITY, MINDSET, AND LEARNING

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Abstract

Intellectual humility is regarded as highly important by leaders in business, education, public service, and other fields. Yet, despite its apparent importance, there is little empirical research on intellectual humility. Seven studies in this dissertation investigated the nature of intellectual humility and its consequences for disagreements, and for learning in school. In Studies 1 and 2, a new self-report intellectual humility scale demonstrated good convergent and discriminant validity. Moreover, in these studies college students higher in intellectual humility were more open to the opposing view in disagreements about school material (Study 1), and adults were more open to the opposing view in disagreements about actual socio-political issues (e.g., increasing taxes to fund public education, and passing laws to limit greenhouse gas emissions) (Study 2).

Studies 3 and 4 tested the associations between intellectual humility and two behavioral measures of openness. Adults who were higher in intellectual humility read more reasons justifying a socio-political position that opposed theirs (Study 3). Participants who were higher in intellectual humility also felt that they had learned more by reading others' reasons, and remained more interested in continuing to learn about the issues relative to those who were lower in intellectual humility. Participants who were higher in intellectual humility were also marginally more likely to articulate more reasons justifying a socio-political view that opposed theirs, but this association was not statistically significant (Study 4).

In Study 5, beliefs about the malleability of intelligence were examined as a possible source of intellectual humility. It was predicted that a *growth mindset of intelligence* – belief that intelligence is a malleable trait that can be developed – would

enhance intellectual humility because operating in a growth mindset may make it easier to acknowledge what one does not know. It was also predicted that a *fixed mindset of intelligence* – belief that intelligence is a static trait - would dampen intellectual humility because having a fixed mindset may foster the perception that some people have superior intellectual abilities compared to others.

To test these hypotheses, an experimental procedure was used to induce either a growth or a fixed mindset of intelligence in Study 5. As predicted, participants in the growth mindset condition had significantly higher intellectual humility and were significantly more open to the opposing view relative to those in the fixed mindset condition. Moreover, the mindset induction significantly affected participants' intellectual humility, which, in turn, shaped participants' responses to disagreement. That is, the growth mindset induction boosted participants' intellectual humility, which, in turn, made them more open to the opposing view relative to those in the fixed mindset condition. This study also found that the relations between mindset, intellectual humility and responses to disagreement were robust to participants' experiences of intellectual success and failure.

Studies 6 and 7 investigated the relation between intellectual humility and outcomes that are relevant for learning in school. College and high school students higher in intellectual humility had a stronger motivation to learn, used a number of adaptive study strategies, and reported being more collaborative when working in groups relative to those lower in intellectual humility. These results suggest that intellectual humility might foster an adaptive achievement motivation that is focused on learning rather than on trying to demonstrate one's intelligence.

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CHAPTER 1: INTRODUCTION

Intellectual humility – acknowledging the partial nature of one's understanding and valuing others' intelligence – is important. Harvard professor Jeffery Miron attributed the recent financial crisis to a lack of intellectual humility, reflecting "whatever we think we 'know' is far less certain than most textbooks and policy pronouncements presume," (Miron, 2012). Jim Collins argued that intellectually humble leadership set the most successful CEOs apart from others in his study of over 1,400 companies (Collins, 2001). Laszlo Bock, Google's head of hiring, named intellectual humility one of the company's five essential employee attributes, reflecting that without intellectual humility "you are unable to learn" (Freidman, 2014).

Yet, although many see it as valuable, intellectual humility (IH) seems to be a rare quality. When asked about impediments to scientific progress, Nobel Prize winning astrophysicist Subramanyan Chandrasekhar noticed that scientists often developed "a certain arrogance toward nature," believing that they "must be right" because of their "special way of looking at science" (Hammond, 1984). Fred Hargadon, dean of admissions at an Ivy League school, has encountered few students who were "comfortable admitting what they [didn't] know" and many who strove to continually impress others with their knowledge and accomplishments (Paul, 1995).

Given the apparent importance of IH, what does psychology tell us about its nature, causes, and consequences? So far, not much. There are few psychological studies of IH and limited empirical research linking it to outcomes like openness to the opposing view, and learning. We do not know what causes IH and, consequently, we do not know how to (or if we should) increase it.

This dissertation describes seven studies that explore intellectual humility and its consequences. Specifically, the present research tests how intellectual humility, as assessed by a novel self-report scale developed for this research, shapes people's self-report and behavioral responses to disagreements. It also examines how intellectual humility relates to learning-relevant outcomes among college and high school students. For example, it tests the associations between IH, achievement goals, learning strategies, grades, and growth in achievement over time. In addition to exploring the consequences of intellectual humility, this research also investigates a possible source of IH: people's beliefs about intelligence. It tests whether shaping beliefs about intelligence may be one way to enhance IH and associated outcomes.

Throughout this dissertation, study-relevant background information is given at the beginning of each chapter. The remainder of this introduction provides a description of how I conceptualize intellectual humility, a review of the possible benefits of intellectual humility, an introduction of why beliefs about intelligence might affect intellectual humility, and a summary of the research contained in subsequent chapters.

Intellectual humility

Jeffrey Skilling, Enron's most powerful executive, was described by colleagues as being "incandescently brilliant" and "the smartest person I ever met," (McLean and Elkind, 2003; p. 28). He could synthesize large amounts of information incredibly quickly. He could simplify complex problems into "sparkling, compelling images," (McLean and Elkind, 2003, p. 28). Skilling's intelligence helped make Enron one of America's most successful companies – at least for a while.

Skilling is in many ways an archetype of intellectual arrogance. He was "unwilling to recognize when reality didn't match [his] theory," (Mclean & Elkind, 2003, p. 28). He "became so sure that he was the smartest guy in the room that anyone who disagreed with him was summarily dismissed as just not bright enough to 'get it'," (Mclean & Elkind, 2003, p. 28). According to Mclean and Elkind (2003), Skilling's certainty in the power of his mind created blind spots that contributed to the destruction of Enron.

If Skilling personifies intellectual arrogance, what does it look like for someone to be intellectually humble? We may notice intellectual humility from time to time, for example in a professor who admits to being wrong about a theory she has worked years to develop, or in a bipartisan meeting where members from both parties genuinely try to understand the other. However, IH also seems a bit more difficult to pin down, less obvious and perhaps less visible than intellectual arrogance.

Scholars have also struggled to describe exactly what intellectual humility is. Some have argued that IH is simply the opposite intellectual arrogance (Roberts & Wood, 2003; Gregg & Mahadevan, 2014), but others contend that IH may be more (Samuelson et al., 2012). Thus, in order to study IH, I first sought to clarify the construct.

Because research on IH is only just emerging, it was necessary to survey the general humility, which has an older and more developed conceptual literature in psychology. General humility has been described as a multifaceted construct (Tangney, 2000) that involves having an accurate view of one's abilities (Richards, 1992; Emmons, 1999) and recognition of others' value (Emmons, 1999; Tangney, 2000). Given a more accurate perspective, to have humility means that one is neither too self-aggrandizing nor

too self-deprecating. And that one prefers to focus on larger goals rather than on oneself (Tangney, 2000). As Halling, Kuntz and Rowe's research demonstrated, "Humility…[comes] insofar as [people] let go of their defensiveness and experience relief from the burden of self-preoccupation and secrecy," (Halling, Kuntz & Rowe, 1994, p. 121; see also Tangney, 2000).

Intellectual humility, then, is a related but more specific humility construct focused on the intellectual domain (Gregg & Mahadevan, 2014; Davis & Hook, 2014; Hopkin, Hoyle & Toner, 2014). It has been described as the "disinclination to regard a belief as true just because it's one's own," (Gregg & Mahavedan, 2014, p. 8), as having an unusually low concern with intellectual status (Roberts & Wood, 2003), as "the mindset and actions associated with treating one's own views (i.e., beliefs, opinions, positions) as fallible and an openness to changing or reinterpreting those views when faced with superior information," (Hopkin, Hoyle, Toner, 2014, p. 51), and as "a virtuous mean lying somewhere between the vice of intellectual arrogance (claiming to know more than is merited) and intellectual diffidence (claiming to know less than is merited)," (Samuelson et al., 2014, p. 1). All of these definitions share a recognition that the intellectually humble are aware of the fallibility of their intellect.

However, these definitions of IH also contain conceptual murkiness. For example, is intellectual humility just a state of mind or does it subsume a set of behaviors as well, as the Hopkin et al. conceptualization suggests? Is intellectual humility *synonymous* with openness, or does it *predict* openness? Is there an interpersonal component to intellectual humility? Is intellectual humility a multi-dimensional construct, or does it have one essential center?

In an effort to clarify conceptual issues and to identify what I came to see as a core of IH, in this research I define IH as recognizing the partial nature of one's knowledge and valuing others' intelligence. This definition is compatible with others' conceptualizations, but it has certain features that are important to the research described in this dissertation. Primarily, I predict that IH, as conceptualized here, will be associated with various outcomes (e.g., openness to the opposing view, eagerness to learn), but that IH itself is distinct from the behaviors and outcomes that it may predict. Second, in my view IH contains a self-directed component about one's own knowledge, and an other-directed component about others' knowledge. This conceptualization is consistent with a large body of research suggesting that most researchers conceptualize general humility as involving both inter and intra personal components (Davis & Hook, 2014).

Is intellectual humility beneficial? People tend to view intellectual humility in a positive light (Samuelson et al., 2014), and many philosophers consider it a virtue (e.g., Baehr, 2012; Roberts & Wood, 2003). But empirical research on the possible benefits or drawbacks of intellectual humility is still in an early stage. Some work suggests that intellectual humility is associated with greater tolerance for the opposing perspective. For example, wise reasoning—a composite of intellectual humility and dialectic thinking— was associated with partisan undergraduates' interest in joining a bipartisan political group (Kross & Grossman, 2012). By contrast, having lower religious intellectual humility (in the form of less respect for others' beliefs) predicted less tolerance of different religious views (Hopkin, Hoyle, & Toner, 2014). In a leadership context, followers' ratings of a religious leader's intellectual humility were associated with higher trust and forgiveness of that leader following a betrayal (McElroy et al., 2014).

A larger literature suggests the benefits of general humility. Trait humility has been associated with greater forgiveness (Davis et al., 2012), generosity (Exline & Hill, 2012), physical health (Krause, 2010), helpfulness (LaBouff, Rowatt, Johnon, Tsang, & Wilerton, 2012), academic achievement (Rowatt et al., 2006), and effective leadership in business (Owens, Johnson, & Mitchell, 2013; Ou et al., 2014). Evidence from two experiments and a diary study has suggested that gratitude boosts humility, and that humility also increases gratitude (Kruse, Chancellor, Ruberton and Lyubomirsky, 2014). Relatedly, in one experiment, completing a humility workbook intervention significantly increased participants' humility, forgiveness, and patience (Lavelock et al., 2014).

A key hypothesis tested in this dissertation is that intellectual humility will be associated with similarly adaptive outcomes in the contexts of intellectual disagreements and school. For example, I hypothesize that those higher in intellectual humility will be more likely to listen and try to learn from the opposing view in a disagreement, and that students higher in intellectual humility will be more motivated to learn.

Beliefs about intelligence as a source of IH? If intellectual humility does relate to adaptive outcomes, how might we foster it? Considerable research suggests that beliefs about intelligence might be one potent source of IH and its consequences. An incremental belief about intelligence (i.e., a growth mindset)—the belief that one can change and develop one's intelligence—fosters many qualities thought to be associated with intellectual humility, including greater motivation to learn (e.g., Blackwell, Trzesniewski, & Dweck, 2007), less defensiveness (e.g., Nussbaum & Dweck, 2008) and a more accurate awareness of one's knowledge and abilities (Ehrlinger & Dweck, under review).

By contrast, an entity belief (i.e., a fixed mindset)—the belief that intelligence is a fixed trait—might sabotage intellectual humility by increasing people's self-focus and defensiveness in intellectual contexts (e.g., Mueller & Dweck, 1998; Nussbaum & Dweck, 2008). I predict that having a more of a growth mindset will foster intellectual humility primarily because it makes it easier to admit what one doesn't know.

Overview of Chapters

One of the goals of the present research was to develop a way to assess intellectual humility.   My path to measurement of IH was iterative – it involved visiting and revisiting the humility literature, writing and revising scale items, and testing the psychometric properties and validity of the scale in various incarnations. I describe this process in Chapter 2.

In Chapter 2 I also describe the results of two studies that tested the relation between IH and openness to the opposing view. In two studies, I tested the very straightforward prediction that people higher in IH – given their awareness of the partiality of their knowledge and their recognition of others' intelligence - would be more open to those who did not share their views. To test this prediction, I asked participants to imagine themselves in a disagreement with a peer about school work (Study 1) and about actual political issues (Study 2). Participants rated attributions for why someone might disagree with them (e.g., "because they are not intelligent" vs. "because the topic is complex and warrants different opinions"), and they also rated how they would respond in a discussion with their adversary (e.g., "I would listen to what they had to say" vs. "I

would ignore everything they had to say"). I tested the associations between intellectual humility and how respectful and open participants were to the opposition.

In Chapter 3 I describe two additional studies that investigated the association between IH and adults' openness to the opposing view. Here, I tested whether IH, as assessed by self-report, predicted behavioral measures of participants' openness. Specifically, in Study 3, I measured participants' IH and then asked them to indicate their position on a socio-political issue (e.g., affirmative action, capital punishment). I then gave them an opportunity to read reasons for why someone had the same or the opposite view to theirs, counting how many opposing-view reasons they read. In Study 4 I followed a similar protocol, but instead of having participants read reasons, I asked them to write reasons for why they had their position and why someone might have the opposite view. I tested the associations between IH and the number of reasons that participants read and wrote, predicting that those higher in IH would read and write more reasons for the opposing view relative to participants lower in IH.

In Chapter 4, I examined a possible source of intellectual humility: people's beliefs about intelligence. Here I describe the results of an experiment that tested the causal relationship between beliefs about intelligence and IH. Based on a large body of research on people's beliefs about intelligence, I predicted that those temporarily led to endorse a fixed theory of intelligence – the belief that each person has a certain amount of intelligence – would have lower intellectual humility relative to those led to endorse an incremental theory of intelligence – the belief that intelligence can grow and develop.

In Chapter 5 I report results from two studies that examined IH in one of the most interesting contexts for learning: school. In these studies, one with college and one with

high school participants, I tested whether intellectual humility predicted adaptive

academic outcomes such as motivation to learn, learning strategies, achievement, growth

in achievement, peer nominations, and teacher-reported engagement in school.

CHAPTER 2: MEASURING INTELLECTUAL HUMILITY & TESTING ASSOCIATIONS BETWEEN IH AND RESPONSES TO DISAGREEMENT

Because research on intellectual humility is only just emerging, there are not any validated, self-report survey instruments that assess the construct. Thus, one goal of my research was to develop a way to measure IH. In this chapter I describe the steps that I took to develop an intellectual humility scale. In this chapter I also describe the results of two studies that tested the relation between IH and people's responses to disagreement.

Measuring Intellectual Humility

Measurement of General Humility

In order to learn more about how to measure intellectual humility, it was necessary to review the more extensive measurement literature on general humility.

In trying to develop ways to assess general humility, researchers have encountered a number of challenges (Davis et al., 2011; Tangney, 2000). They have struggled to define humility and, consequently, to operationalize it (Davis & Hook, 2014). Scholars have also worried humility measures might erroneously tap low self-concept, self-deprecation, or low confidence instead of true humility (Tangney, 2000). Moreover, many scholars have questioned whether self-report measures of humility could ever be valid because "describing oneself as 'very humble' seems akin to bragging," (Davis & Hook, 2014, p. 113), and because humble people may be modest and under-report their humility (Davis et al., 2010; Tangney, 2000).

Despite challenges, as research on humility has expanded in the last 15 years, an assortment of humility measures have cropped up. There is considerable overlap in how

humility has been operationalized across studies, with most scholars assessing both inter-

and intrapersonal features of humility (Davis & Hook, 2014). Different measures have

attempted to address self-report bias in different ways. For example, some researchers

have asked others to rate a target's humility (e.g., Owens, Johnson, & Mitchell, 2012;

Davis et al., 2011). Others have assessed humility with an implicit association test

(Rowatt et al., 2006). Others have assessed humility behaviorally (e.g., Kruse et al.,

2014; Van Tongeren et al., 2014). And some scholars, apparently less concerned about

self-report bias, have assessed humility with standard self-report questionnaires (e.g.,

Bollinger, 2010; Brown, Chopra, & Schiraldi, 2013; Landrum, 2011[1]). Researchers have

noted that each approach to measurement has strengths and limitations (Chancellor &

Lyubomirsky, 2013). But different forms of measurement were rarely compared in the

same study, thus there is still no scholarly consensus on the best way to measure humility

(Davis & Hook, 2014).

However, the proliferation of measurement work has provided more information

about the prevalence of self-report bias of humility. Currently there is no evidence that

individuals over or underreport their own humility. On the contrary – most of the

research suggests that people's self-reports are pretty well-calibrated with other types of

assessments. For example, Rowatt and colleagues (2006) found that implicit and self-

report measures of humility in large part agreed. They also found that informants tended

to rate targets' humility higher than the target themselves, but that informant-rated

humility and self-report humility were generally positively correlated, indicating fairly

good agreement between assessments. By contrast, Davis and colleagues (2012) found

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[1] Landrum's measure is self-report, but it asks participants to rate how much they like others who possess humble traits (e.g., "I like people who can admit their mistakes", Landrum, 2011) – this measure assumes a participant's rating of someone she likes is a good approximation of her own humility (Landrum, 2011).

that informant-rated humility was negatively correlated with self-reported humility, but

the authors attributed this finding to a ceiling effect in reporting. Researchers found no

evidence that self-enhancement of reported humility was related to narcissism (predicted

positive association), or agreeableness (predicted negative association), and concluded

that "perhaps self-reports are not as problematic as originally thought" (Davis et al.,

2012, p. 16).

Intellectual humility scale

Informed by the measurement research on general humility, I concluded that one

way to assess intellectual humility was to develop a self-report scale. Thus, I began a

process of developing scale items.

The item-development process had several stages. Initially, a 23-item scale was

developed by adapting some scale items from validated measures of general humility

(e.g., Bollinger, 2010; Owens et al., 2012) and writing some items that were unique to

this research. The 23 items tapped an awareness of the limitations of one's knowledge

(e.g., "I am willing to admit it if I don't know something), valuing others' intelligence

(e.g., "I sometimes marvel at the intelligence of others"), intellectual openness (e.g., "I

am open to revising my beliefs and ideas"), intellectual superiority (e.g., "I am often

aware of the intellectual stupidity of others"), and preoccupation with intellectual status

(e.g., "I care more about expanding my knowledge than being rewarded by others for my

intelligence"). See Appendix A for the full 23-item scale.

I tested the factor structure of the 23-item scale using exploratory factor analysis

with promax rotation, on a sample of 188 adults recruited from Amazon Mechanical

Turk. The scale had a messy factor structure. Items loaded on five factors with the first

two explaining approximately 42% of the construct's variance. The first two rotated

factors included items about acknowledging the limitations of one's knowledge, valuing

others' intelligence, intellectual openness, and preoccupation with intellectual status. The

superiority items cross-loaded on different factors in no discernable pattern. Thus, I

retained the 16 items that had factor loadings greater than .5 on the first two factors, and

dropped the superiority items.

The next phase of scale refinement involved honing the construct validity of the

IH scale. In the process of learning about IH as a construct, I came to see the core of IH

as acknowledging the partial nature of one's understanding and valuing others'

intelligence. Thus, it was necessary to ensure that the scale only contained items that

tapped that core. I also wanted to ensure that the IH scale was a separate construct from

the outcomes that I thought it might predict. Accordingly, items about being open to

learning and about preoccupation with intellectual status were dropped from the scale,

leaving a scale of 9 items that tapped the core of IH. In the studies that follow, I report

the results from this 9-item IH scale. The 9 items are reported in Table 1.

To examine the factor structure of the 9-item scale, I conducted an exploratory

factor analysis with promax rotation. The dataset that I used for this analysis combined

data from all 7 studies in this dissertation ($N = 850$). The factor analysis suggested that

there might be a two-factor structure to the IH scale, with reverse-coded items loading on

a separate factor than the other items[2]. However, because the second factor had only

reverse-coded items, it's possible that this factor structure reflected a methodological

artifact instead of a truly distinct construct. Thus, for the sake of simplicity, I retained the

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[2] Another possibility was that items tapping views of self and views of others may have loaded on separate factors. However, this did not seem to be the case. The positive indicators of IH that tapped views of self and views of others had factor loadings > .49 in the combined dataset.

1-factor scale. When I forced the items to load on one factor, all items had factor loadings > .46, except for the reverse coded items, which had loadings from .1 to .19. The internal reliability of the scale across studies ranged from α = .80 to .55. The internal consistency of the scale in the combined data set was α = .65[3].

In further examination of the scale, I sought to understand whether the scale items were loading equally across the studies in this dissertation. After completing all studies, I tested whether constraining each item to be equal across the studies altered the overall model fit of the scale in a confirmatory factor analysis. If the model fit changed when an item was constrained to load equally, it suggested that the item was not loading equally across the studies. I found that 5 of the 9 items when constrained to load equally altered the model fit. Of the 5 items, 3 of them loaded unequally in more than five unique study comparisons[4]. These items are reported in Table 1. Thus, I omitted these three items and created a 6-item scale[5], re-testing the results across studies with this shorter scale. In the studies that follow, I report when the results from the 6-item and the 9-item composites differ.

Testing the Intellectual Humility scale: Convergent and Discriminant Validity

Once the scale items were written and found to have the psychometric properties described above, I sought to test the scale's validity. Specifically, I tested whether IH, as measured by the scale, related to other constructs in predicted ways, and whether IH was empirically distinct from other constructs. I also sought to ensure that the IH scale was

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[3] This alpha-level increases to .68 when one item, "If someone doesn't understand my idea it's probably because they're not smart enough to get it."

[4] Item 1, "I am willing to admit it if I don't know something," loaded unequally in Study 7 relative to all of the other studies. This suggests that item 1 was loading equally in all of the adult samples, but not in the high school sample. Thus, this item was retained.

[5] The alpha-level of the 6-item scale in the combined data set is α = .63.

not tapping low self-esteem, or low confidence in intelligence. The results of this validity testing are reported in Studies 1 and 2. In the remainder of this section I outline the validity measures that I chose to test, and my rationale for selecting them.

Selection of validity measures. In their white paper on intellectual humility, Samuelson and colleagues (2012) identified several well-established psychological constructs that they predicted would relate to IH. For example, they hypothesized that a person high in IH would probably also have a high need for cognition, i.e., a tendency to engage in and enjoy thinking (Cacioppo & Petty, 1982), and be low in Narcissism, the tendency to view oneself as superior to others (Emmons, 1987). They predicted those high in IH would have a low Need for Cognitive Closure, a person's desire for a firm answer to questions despite ambiguity (Webster & Kruglanski, 1994), and high Modesty, not drawing too much attention to oneself (Park, Peterson, & Seligman, 2004). They predicted the Big Five Personality Inventory, particularly Openness to Experience - the tendency to be curious and to seek out novelty (John, Donahue, & Kentle, 1991), would be positively related to IH. Beyond the constructs identified by Samuelson et al., I predicted that IH would be positively associated with General Humility (Bollinger, 2010), and Epistemic Curiosity, the drive to know (Litman & Spielberger, 2003) (see Table 2 for a summary of validity constructs, their definitions, their predicted associations to IH, and key their difference from IH).

In addition, to investigate the possibility that the IH scale might be erroneously tapping a low view of one's self, or low confidence in one's intellectual abilities, I assessed the relations between IH, self-esteem and confidence in one's intelligence. Also, because I intended to test beliefs about intelligence as a possible source of intellectual

humility in subsequent studies, I assessed the relation between IH and beliefs about intelligence.

Intellectual humility and responses to disagreement

In addition to examining the validity of the IH scale, in Studies 1 and 2 I tested whether IH predicted people's responses to disagreement in a hypothetical classroom disagreement scenario (Study 1), and in a hypothetical disagreement scenarios about an actual political issue (Study 2). Research suggests that disagreements are most fruitful when each person tries to understand the other's position (e.g., de Wied, Branje, & Meeus, 2006; Kahn & Lawhorne, 2003). Indeed, experts in conflict resolution often instruct people to learn about the opposing view by asking questions, listening, and validating the other's perspective (e.g., Stone, Patton and Heen, 2010). I predicted that people higher in intellectual humility would be more likely to engage in these adaptive responses during disagreements.

Why might IH allow individuals to manage disagreements more constructively? To have IH is to recognize that one's knowledge and understanding are always incomplete and, therefore, that one always has more to learn. At the same time, it involves recognizing that, although everyone's knowledge is incomplete, each person potentially has unique knowledge and valuable information to contribute. As such, intellectual humility may foster a way of seeing the world that leads to consistent curiosity and interest in learning from others' views across multiple issues and situations, including during disagreements. If so, those higher in intellectual humility may seek to understand their opposition's perspective more fervently and be less likely to derogate or personally attack the opposition.

Although my prediction is theoretical, it is bolstered by philosophical work suggesting that IH should foster more constructive epistemic disagreements (e.g., Samuelson et al., 2012), and by past empirical research showing that people higher in IH tend to be more tolerant of views that conflict with theirs (Kross & Grossman, 2012; Hopkin, Hoyle, & Toner, 2014).

Summary

In Studies 1 and 2 I tested the convergent and discriminant validity of the IH scale among a sample of college students (Study 1), and a sample of community adults (Study 2). I also tested whether intellectual humility related to people's responses to hypothetical disagreements in a school setting (Study 1), and about political issues (Study 2).

Study 1

Method

Participants. 178 students attending a community college in Northern California were recruited (M_{age} = 23.61, SD = 7.71, Range = 18 to 51; 130 women, 49 men, 2 participants who did not specify their gender). Regarding ethnicity, forty-eight percent of participants were Asian, 24% were White, 14% were Hispanic, 7% were mixed race, 3% were Pacific Islander , 2% were Black, , and 2% were other race.

Procedure and measures.

Intellectual Humility. In one online session, participants completed the Intellectual Humility scale. The scale contained items that tapped participants' recognition of the partial nature of their understanding (e.g., "I am willing to admit if I don't know something,") and items about valuing of others' intelligence (e.g., "I like to compliment others on their intellectual strengths"). Participants indicated their agreement

with each item on a 7-point scale (1 = *strongly disagree,* 7 = *strongly agree*). For a list of all of the items, see Table 1. Three items were reverse-scored and averaged with the remaining 6 positive indicators of IH to create a measure of intellectual humility, with higher scores representing greater intellectual humility. The scale had a reliability of α = .67[6].

Validity measures. In addition, participants completed measures to assess the convergent and discriminant validity of the IH scale. All measures were assessed though Likert scales anchored at 1 = *strongly disagree*, and 7 = *strongly agree*.

Validity measures were a 15-item index of Need for Closure (e.g., "I dislike questions that could be answered in many different ways"; α = .85; Roets & Van Hiel, 2011), a 16-item measure of Narcissism (e.g., "I can make anybody believe anything I want them to"; α = .80; adapted from Ames, Rose, & Anderson, 2006[7]), an 18-item measure of Need for Cognition (e.g., "thinking is not my idea of fun" (R); α = .91; Cacioppo, Petty, & Kao, 1984), the Big Five Personality Inventory (John, Donahue, & Kentle, 1991), which assessed Openness to Experience (e.g., "I am curious about many different things"; 4 items; α = .61), Conscientiousness (e.g., "I am a reliable worker"; 4 items; α = .66), Extraversion (e.g., "I am outgoing, sociable"; 4 items; α = .84), Agreeableness (e.g., "I can be cold and aloof" (R); 4 items; α = .50), and Emotional Stability (e.g., "I remain calm in tense situations"; 4 items; α = .80).

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[6] The internal consistency of this scale increases α = .69 when one item, "I feel uncomfortable when someone points out one of my intellectual shortcomings" is dropped from the scale.

[7] For Study 1 I adapted Ames, Rose and Anderson's (2006) forced-choice, short-form Narcissistic Personality Inventory into a Likert response scale. Research suggests that Likert response adaptations of valid narcissism scales are themselves valid, are highly correlated with forced-choice scales (e.g., r = .97) (Barelds & Dijkstra, 2010), and have stronger psychometric properties than forced-choice alternatives (Gentile, 2013).

I also assessed Epistemic Curiosity (e.g., "I am interested in discovering how things work"; 10 items; α = .89; Litman & Spielberger, 2003), and General Humility, (e.g., "In the broader scheme of things, what I will accomplish in the world is small"; 25 items; α = .68; Bollinger et al., 2006). As well as Self-Esteem ("I have high self-esteem"; 1-item; Robins, Hendin and Trzesniewski, 2001), Confidence in One's Intelligence ("I am confident in my intelligence"; item written for this research), and Beliefs about Intelligence (e.g., "To be honest, you can't really change how intelligent you are (R)"; 8-items; α = .94, Levy & Dweck, 1997), with higher scores indicating a stronger belief in the malleability of intelligence.

  Responses to disagreement. Participants then completed measures assessing their responses to disagreement. For this measure, participants read three scenarios depicting classroom disagreements (e.g., disagreeing with a peer about a class reading, a presentation and an essay). For example:

> For a psychology class, you have to write an essay about major psychological theories for your final project. You do a lot of research and write a well-informed essay. The professor pairs you up with another student in the class and asks you to swap essays with this person and comment on each other's work. The student who reads your essay says that they disagree with many of the points that you made.

  For each scenario, participants rated five attributions for why their classmate would disagree with them, two of which were respectful (e.g., "because the essay topic is complex and warrants different opinions about it"), and three of which were disrespectful (e.g., "because they are not as intelligent as I am"); 1 = not at all the reason, 7 = definitely the reason. The disrespectful attributions were reverse-scored and averaged with the

respectful attributions to create an index of respectful attributions for disagreement, α = .90.

Participants then imagined that they encountered the person who disagreed with them outside of class, and that the person engaged them in a discussion about the disagreement. Participants rated 9 items based on how likely they would be to respond to this person with open-mindedness (e.g., "I would try to understand their perspective about the material"; "I would start an argument with them (R)"; 1 = extremely unlikely, 7 = extremely likely). Negatively-worded items were reverse-scored and averaged with open-minded items to create an open-minded response composite, α =.89.

After indicating their responses to disagreement, participants answered a brief demographic questionnaire. Finally, participants were debriefed about the purposes of the study and thanked for their participation.

Results

Men and women did not significantly differ in their average levels of IH[8]. Although the sample of participants was racially diverse, there was not enough variation across different racial groups to make meaningful comparisons. There was a small positive correlation between age and intellectual humility, indicating that older participants tended to have higher IH, $r = .16$, $p = .045$. However, controlling for age in the analyses did not alter the results.

Intellectual humility and validation measures. All correlations, scale means and standard deviations of validation measures are reported in Table 3. As predicted, intellectual humility was positively associated with Need for Cognition, Openness to

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[8] Women were marginally higher in IH than men, $t(177) = 1.76$, $p = .08$. However, this marginal finding was weakened when using the 6-item IH composite that had more equal loadings across studies, $t(177) = 1.12$, $p = .26$.

Experience, Agreeableness, Conscientiousness, General Humility, and Epistemic Curiosity. Contrary to prediction, intellectual humility was not related to Need for Cognitive Closure or to Narcissism.

Intellectual humility was not associated with Self-Esteem[9], but it was positively associated with Confidence in Intelligence. These results suggest that the intellectual humility scale was not tapping an unhealthy self-concept or low intellectual confidence. In addition, as predicted, intellectual humility was associated with believing that intelligence is malleable.

Did intellectual humility predict participants' responses to disagreement?
Next, I tested whether intellectual humility predicted participants' responses to disagreement. As hypothesized, intellectual humility was significantly associated with reporting more respectful attributions for disagreement, $r = .44$, $p < .001$, and more open-minded responses during a disagreement, $r = .50$, $p < .001$. These associations remained significant controlling for all of the demographic and validation measures included in the study, all ps $< .01$.

Overview of Findings

To summarize, Study 1 provided some evidence for the validity of the intellectual humility scale. IH was positively associated with several theoretically related constructs including Need for Cognition, Openness to Experience and Epistemic Curiosity. Moreover, the magnitude of the correlations between IH and the validation measures suggested that IH was empirically distinct from the other constructs.

The intellectual humility scale did not tap a low self-concept or low confidence in one's intelligence. On the contrary, those higher in IH tended to have more confidence in

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[9] The 6-item IH composite was positively associated with self-esteem, $r = .17$, $p = .02$.

their intelligence. In addition, intellectual humility was positively associated with believing that intelligence is malleable. This finding provides initial support for the hypothesis that beliefs about the malleability of intelligence might be one source of intellectual humility.

However, Study 1 also raised questions about the IH scale's validity. Intellectual humility did not relate to Narcisissm or Need for Closure. Although associations between IH and these constructs were moving in the predicted (negative) direction, the correlations were small and not statistically significant. It may be that IH as assessed in this study (i.e., without intellectual openness and superiority items), did not have the sensitivity to pick up on associations with these constructs. However, given theoretical work suggesting that IH (even as conceptualized in this study) and the validation constructs should relate, further research is needed to explore whether these findings may be attributed to the IH scale or to some other factor.

Results regarding participants' responses to disagreement were also promising. As predicted, intellectual humility was positively associated with participants' openness to the opposing view. Those higher in intellectual humility were more respectful in the attributions they made for why someone would disagree with them. They were also more willing to listen and to try to understand their opposition's position. Notably, the associations between IH and responses to disagreement were robust. Associations remained statistically significant controlling for all of the demographic and validation measures in the study.

Given the validation questions raised by Study 1, in Study 2 I reexamined the validity of the IH scale among a population of community adults. In Study 2 I also tested

whether IH related to participants' responses to disagreements about real-world sociopolitical issues.

Study 2

Method

Participants. 187American adults (M_{age} = 32.84, SD = 11.65, Range = 18 - 61; 109 women and 78 men) from the online commercial panel Amazon Mechanical Turk participated in the study (for information on Mechanical Turk see Burhmester, Kwang, & Gosling, 2011; Paolacci & Chandler, 2014; Paolacci, Chandler, & Ipeirotis, 2010). Seventy-seven percent of participants were White, 8% were Black, 8% were Asian, 4% were Hispanic, and 3% did not specify their race. Ninety-nine percent of participants had a high school diploma, 48% had a college degree. Participants were compensated 50 cents for their participation.

Procedure and measures.

IH and validation measures. In one online session, participants completed the intellectual humility questionnaire (α = .74), and the validation measures. Of the validation measures, Need for Closure (α = .85), Need for Cognition (α = .93), The Big Five Personality Inventory (Extraversion, α = .85; Emotional Stability, α = .79; Agreeableness, α = .68; Openness to Experience, α = .77), and Beliefs about Intelligence (α = .92) were assessed in the same way that they were assessed in Study 1.

However, in Study 2 a 10-item measure (instead of a 1-item measure) assessed Self-Esteem (e.g., "I feel that I have a number of good qualities"; α = .91; Rosenberg, 1965). A three-item measure (instead of a 1-item measure) assessed confidence in

intelligence. For this measure, participants read 3 pairs of statements and chose the statement that was most true of them (e.g., "I wonder if I'm intelligent" or "I usually think I'm intelligent"; α = .77; Dweck, Chiu, & Hong, 1995). A 16-item measure assessed narcissism. For this measure, participants chose the description that best described them from two options (e.g., "I prefer to blend in with the crowd" or "I like to be the center of attention"; α = .77; Ames, Rose, & Anderson, 2006), instead of rating each item on a Likert-type scale. Modesty was assessed in Study 2 (e.g., "I don't brag about my accomplishments"; 10 of items; α = .79; Park, Peterson, & Seligman, 2004), but to mitigate potential survey fatigue, General Humility and Epistemic Curiosity were not assessed in Study 2.

Responses to disagreement. Next, participants completed measures assessing their responses to disagreement. For this measure, participants read about five contentious issues (gun control, use of animals in research, gay marriage, regulating businesses' carbon emissions, increasing taxes to fund education). For each issue, participants selected the side of the issue that they endorsed. For example:

> There has been a lot of discussion about education in the United States. There are people who think that taxes should be raised to increase funding for public schools and colleges. Other people think that taxes should not be raised to increase funding for public schools and colleges. What do you think? Would you favor or oppose tax increases that would provide extra funding for public schools and colleges?

After choosing a position, participants rated four[10] attributions (1 = *definitely not the reason,* 7 = *definitely the reason*) for why someone might disagree with them about

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[10] One attribution ("because they are a bully") that was used in the first study was not included in this study because it was less appropriate in the sociopolitical disagreement context relative to the school context.

that issue. Attributions were the same as those rated in Study 1, with slight differences to make the attributions relevant to sociopolitical issues (e.g., "The issue is complex and warrants different opinions about it"). Attributions across issues were combined to create a respectful attribution composite, $\alpha = .81$. Participants also rated how important each issue was to them personally (1 = *not at all important, 7 = extremely important*), and how certain they were about their opinion on each issue (1 = *not at all certain, 7 = extremely certain*).

Next, participants chose the one issue out of five that was most important to them. They were asked to imagine discussing that issue with a person who disagreed with them. Participants rated 8-items[11] about how likely they would be to respond to a dissenter with open-mindedness (e.g., "I would try to understand their perspective on this issue"; "I would ignore what they have to say about this issue (R)"; 1 = *extremely unlikely, 7 = extremely likely*). A composite was created with higher scores indicating greater open-minded responding, $\alpha = .64$[12].

After registering their responses to disagreement, participants answered questions about their demographic information. They were then debriefed about the purposes of the study and thanked for their participation.

Results

There were no differences in intellectual humility by participant gender, yearly income, marital status or level of education, all ps > .35. There was not sufficient variation across racial groups to make meaningful comparisons. As in Study 1, there was

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[11] One response to disagreement used in Study 1 ("I would try to learn from them") was accidentally omitted.

[12] When one item was dropped, "I would try to convince them to change their opinion to match my own," internal consistency of these items increased to .69, but dropping this item from the open-minded responding composite did not change results so all 8 items were retained.

a small positive correlation between intellectual humility and age, $r = .16$, $p = .03$, but controlling for age in analyses did not alter the results.

IH and validation measures. See Table 4 for correlations, scale means and standard deviations. As predicted, IH was positively associated with Need for Cognition, Openness to Experience, Agreeableness, Conscientiousness and Modesty. Unlike in in Study 1, but consistent with prediction, IH was negatively associated with Need for Closure, and Narcissism.

Intellectual humility was also positively associated with Self-Esteem, but was not associated with Confidence in Intelligence[13]. Consistent with Study 1, IH was associated with believing that intelligence is a malleable trait.

Did IH predict responses to disagreement about sociopolitical issues? Regarding responses to disagreement, IH was associated with more respectful attributions for disagreements, $r = .28$, $p < .001$, and with more open-minded responses to disagreements, $r = .30$, $p < .001$. These associations remained significant controlling for ratings of issue importance, certainty of opinion, and all of the demographic and validation measures assessed in the study, all ps $< .05$. IH was also positively associated with participants' certainty about their views on their most personally important issue, $r = .16$, $p = .03$, suggesting that one can be intellectually humble while holding strong convictions about an issue.

Overview of findings

Study 2 provided additional support for the validity of the IH scale. IH was associated with all of the validity measures assessed in this study, and with beliefs about intelligence in the predicted directions. IH was also empirically distinct from the other

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[13] The IH composite with 6 items is positively associated with confidence in intelligence, $r = .15$, $p = .04$.

constructs measured in this study. In addition, as in Study 1, the IH scale did not tap low confidence in intelligence, or low self-esteem.

Intellectual humility also predicted participants' responses to disagreements about important socio-political issues. Participants higher in IH made more respectful attributions for why others did not share their sociopolitical views. They were also more open to listening to those with the opposing perspective – even about an issue that was personally important to them. The associations between responses to disagreement and IH remained significant controlling for all validity and demographic variables assessed in the study, suggesting the results were quite robust.

Discussion of Studies 1 and 2

Studies 1 and 2 found that the IH scale had adequate convergent and discriminant validity. Overall, the IH scale predicted a number of theoretically related constructs in the expected direction, including need for cognition, epistemic curiosity, and modesty. In Study 2, IH was also negatively related to narcissism and need for cognitive closure. The size of the correlations between IH and the validity measures suggested that IH was empirically distinct from other constructs, including general humility. There was consistent evidence across two studies (of two distinct populations) that the IH scale did not tap low confidence in intelligence or low self-esteem.

However, there were a few inconsistent validity findings between Studies 1 and 2. In the first study intellectual humility was not related to narcissism or to need for closure, and in the second study it was. Self-esteem and confidence in intelligence were also inconsistently related to IH. In the first study, but not the second, IH was positively

related to confidence in intelligence. And in the second study, but not the first, IH was positively related to self-esteem.

One contributor to discrepant findings may have been differences in the way constructs were assessed across studies. The number and types of items used to assess narcissism, self-esteem, and confidence in intelligence differed in Study 1 and Study 2. In Study 1, continuous measures of narcissism and confidence were used, and in Study 2 a dichotomous, forced-choice method of assessment was used. Similarly, in Study 1 a 1-item measure of self-esteem was used, and in Study 2, a 10-item measure was used. It is worth noting that although correlation magnitude and statistical significance differed, in both studies all correlations were moving in the same direction.

Intellectual humility and responses to disagreement

Intellectual humility also consistently predicted participants' responses to disagreements. In both studies, IH was related to responses to disagreement over and above the effects of many other factors (e.g., gender, age, race, and all of the validity measures assessed in the studies). IH also predicted college students' openness during school disagreements (Study 1), and adults' openness during disagreements about actual social issues (Study 2).

Overall, Studies 1 and 2 demonstrated that a person high in intellectual humility was more likely to be respectful, and open to learning about another's perspective during an intellectual disagreement.

To more fully understand how intellectual humility might shape responses to disagreements, in the next chapter I describe the results from two studies that tested

whether IH related to two behavioral measures of participants' openness to the opposing

view.

CHAPTER 3: INTELLECTUAL HUMILITY AND BEHAVIORAL RESPONSES TO DISAGREEMENT

In Studies 1 and 2, IH was associated with participants' self-reported responses to disagreements. Because self-report responses may be vulnerable to reporting bias, in Studies 3 and 4 I tested whether IH predicted two behavioral measures of participants' openness to the opposing view. Specifically, I examined the associations between IH and the number of reasons participants read for why someone had a view that was opposite theirs (Study 3). I also tested the association between IH and the number of reasons participants generated for why someone might have the opposing sociopolitical view (Study 4).

I expected those higher in IH to be more open-minded and eager to learn, and thus more willing to expose themselves to perspectives that differed from their own. As such, I predicted that participants higher in intellectual humility would read more reasons justifying the sociopolitical view that opposed theirs. I also expected that participants higher in IH would be able to generate more reasons for why someone might have the view opposite to theirs.

Although the primary focus of Studies 3 and 4 was to test whether IH predicted behavioral responses to disagreement, in the following studies I also assessed whether IH was associated with beliefs about intelligence, as well as individuals' overall motivation to learn.

Study 3

Methods

Participants. 160 American adults were recruited from Amazon Mechanical Turk (M_{age} = 33.28, SD = 11.76; 73 women, 85 men, and two participants who did not report gender). Sixty-nine percent of participants were White, 13% were Black, 10% were Asian, 4% were Hispanic, 3% were other race, and 1% was mixed race. Seventy-nine percent had some college and 42% had a college degree. On average, participants' political ideology was moderate, M = 3.66, SD = 1.71 (1 = extremely liberal; 7 = extremely conservative). Participants were compensated $1.00 for their participation.

Procedures and measures*.* In one online session, participants completed measures of Intellectual Humility, α = .74, Beliefs about Intelligence (4 items; α = .93), and Learning Goals (e.g., "I am always seeking opportunities to develop new skills and acquire new knowledge"; 3 items; α = .93; Grant and Dweck, 2003).

Participants were then randomly assigned to read about one of two issues: gun control or capital punishment. Random assignment to issues allowed me to test whether one or the other issue was driving the results. It also ensured that the results weren't biased by liberals or conservatives taking only a "pro" or "anti" position on an issue (i.e, in the gun control condition, the "pro" position is traditionally a more liberal stance, while in the capital punishment condition, the "pro" view is traditionally a more conservative stance).

Issue passages presented two positions on an issue and participants chose a side (e.g., "pro" or "anti" capital punishment). On a 100-point sliding scale, participants rated how much they favored capital punishment or more gun control (0 = *completely oppose;*

100 = *completely favor*); this item was recoded to provide a measure of attitude strength

regardless of issue position, with higher values indicating stronger attitudes. Participants

also indicated how much they knew about the issue (0 = *nothing;* 100 = *everything*).

Next, participants were given the chance to read reasons that justified the

matching or the opposing view. Participants read the following instructions:

> We'd like to give you a chance to hear other
> people's take on gun control/capital punishment. In
> a previous study, we asked a sample of US citizens
> to provide reasons for their views on this issue. We
> put together some of their reasons and have listed
> them here. To read the reasons that participants
> provided, click on the bubbles below. If you would
> rather move on, click the "move on" bubble. **You
> may read as many reasons as you want**. All of the
> links will display <u>unique</u> reasons for the positions
> these participants have - there aren't any repeated
> reasons represented in the links.

On one webpage, fourteen links were presented, seven links per "anti" and "pro"

position. The links were equally visible and accessible, listed under "pro" and "anti"

headings (e.g., "pro gun control 1"; "anti gun control 1"). The presentation of "pro" and

"anti" positions was counterbalanced so that half of participants saw "pro" links on top of

the list and the other half saw "anti" links on top. A "move on" link was at the bottom of

the list of links.

When participants clicked a reason link, they saw a reason for a particular issue

position. Each reason had a bold, underlined title that captured the gist of the reason, and

one or two sentences explaining the position. For example, one "pro" gun control reason

read:

> "**<u>Solving Crimes</u>**. I'm in favor of stronger gun control.
> People should register their guns with law enforcement

because registered guns are easier to trace and can help
police solve crimes more quickly."

Reasons were based on texts found on issue-related websites, were written by our

research team to respectfully represent each position, and were matched for length.

After reading a reason, participants could move on to the next part of the study, or

read more reasons. Participants were only advanced to the next part of the study when

they chose to move on, or when all 14 reasons had been read.

Next, participants rated whether they would be interested in learning more about

the issue (0 = not at all true of me; 100 = extremely true of me). They also rated their

attitude strength, and how much they knew about the issue for a second time.

At the end of the study, participants reported their level of political engagement (3

items; e.g., "How important are politics and political issues to you?"; "How closely do

you usually follow politics in your day-to-day life? (e.g., newspapers, websites,

magazines, television); 1 = not at all, 7 = extremely; α = .91), and answered demographic

questions. Participants were then fully debriefed about the purposes of the research and

thanked for their participation.

Results

There were no differences in intellectual humility by participant gender, yearly

income, age, political ideology, or level of education, all ps > .27. There was not

sufficient variation across racial groups to make meaningful comparisons.

Did IH relate to beliefs about intelligence and learning goals? See Table 5 for

correlations, means and standard deviations. As in past studies intellectual humility was

positively associated with believing intelligence is malleable, r = .16, p = .049.

Intellectual humility was also associated with having stronger learning goals, $r = .53$, p

$<.001$.

Were the issues comparable? Before testing the associations between IH and the

number of reasons participant read, it was important to ensure that gun control and capital

punishment were comparable issues.

There were no differences between issues in attitude strength, $t(141) = 1.00$, $p =$

.32, issue knowledge, $t(142) = 1.53$, $p = .35$, or in the number of matching or opposing

reasons read by participants, $t(142) = .44$, $p = .66$, and $t(142) = 1.04$, $p = .30$,

respectively. Thus, I concluded that the issues were comparable and combined responses

across issues for all analyses.

Baseline attitude strength and knowledge. Participants held strong positions

about gun control and capital punishment, $M_{attitude\_strength} = 81.90$, $SD = 19.68$.

Participants also reported having a moderate amount of baseline knowledge about the

issues, $M_{baseline\_knowledge} = 60.12$, $SD = 23.53$.

IH was not related to baseline issue knowledge, $r = .13$, $p = .11$, but it was

associated with baseline attitude strength, $r = .18$, $p = .02$. This finding suggests that

those high in intellectual humility can have strong convictions about issues.

Did intellectual humility predict number of reasons read? In the results that

follow I refer to reasons that match participants' views as matching reasons (e.g.,

someone who was "pro" gun control reading a "pro" gun control reason), and those that

represent the opposite view as opposing reasons (e.g., someone who selected "pro" gun

control reading an "anti" gun control reason).

On average, participants read 1.28 (SD = 2.07) matching reasons and 1.5 (SD = 2.34) opposing reasons. As predicted, intellectual humility was positively associated with the number of opposing reasons read, r = .17, p = .03[14]. IH was also associated with the number of matching reasons read, r = .18, p = .02.

The association between intellectual humility and the number of opposing reasons remained significant when controlling for level of education, political ideology, and baseline issue knowledge, all ps < .05. However, the association was no longer significant when controlling for gender (r = .13, p = .10).

The association between IH and matching reasons remained significant controlling for level of education, beliefs about intelligence, attitude strength, political ideology, level of political engagement, and baseline issue knowledge, all ps < .05, but was not significant when controlling for gender (r = .15, p = .07).

Gender did not moderate the associations between IH and opposing or matching reasons, ps > .37, suggesting that gender was not driving the association between IH and these outcomes.

Were there other predictors of reasons? There were no associations between the number of reasons read and beliefs about intelligence, learning goals, political ideology, political engagement, attitude extremity, issue knowledge, age, income or level of education. Relative to men, women read more matching, t(140) = 3.35, p = .001, and more opposing reasons, t(140) = 3.32, p = .001.

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[14] The IH composite with 6 items did not relate to the number of opposing reasons, r = .03, p = .68 or to the number of matching reasons read, r = -.05, p = .52.

Were there changes in attitude strength or issue knowledge during the

study? There were no average changes in attitude strength, $t(141) = .79$, $p = .43$, or in

reported issue knowledge, $t(142) = .10$, $p = .92$, over the course of the study.

However, IH was associated with change in issue knowledge. Those higher in IH

reported knowing more about the issue after participating in the study, $r = .16$, $p = .049$.

Those higher in IH were also more likely to report that they learned something by

participating in the study, $r = .24$, $p < .01$. Moreover, high IH participants' desire to keep

learning about the issue was not extinguished by participating in the study. At the end of

the study, those higher in intellectual humility remained more interested in learning more

about the issue, $r = .30$, $p < .001$.

Overview of findings

Overall, findings from Study 3 supported the hypothesis that intellectual humility

predicts participants' openness to the opposing view. On average, participants higher in

IH read more reasons justifying the opposition's perspective relative to those lower in IH.

Notably, high IH participants were more apt to read opposing reasons even though they

felt strongly about the issues presented in this study. Thus, despite strong issue attitudes,

intellectually humble participants did not construct ideological echo chambers for

themselves, only exposing themselves to views that aligned with their own. In addition,

intellectual humility was the only construct, other than gender, that significantly

predicted the number of reasons read in this study. Other theoretically related variables

(e.g., learning goals) did not significantly predict reasons.

In Study 3 I also found that those higher in IH were more likely to read reasons

that supported their own view. Thus, those higher in IH read more justifications for

positions on both sides of the issue. Although not necessarily anticipated, this finding is consistent with the view that intellectually humble individuals are avid learners. It's plausible that high IH participants were generally more curious and interested in adding to their knowledge about the issue, and did so by reading reasons from both sides.

Accordingly, those higher in IH were more likely to report that they learned something about the issues during the study. They also felt that they knew more about the issue after participating in the study. Intellectually humble participants were also more likely to remain interested in learning more about the issue upon completing the study. These findings comport with the notion that intellectual humility undergirds persistent motivation to learn.

Although participants' average attitude strength and knowledge did not change over the course of the study, this is not unusual given participants' strong a-priori issue attitudes (Erber, Hodges, & Wilson, 1995). We might have even expected participants' attitudes to become stronger after reading reasons that opposed their position and possibly became more entrentched in their own views (Taber and Lodge, 2006; Lord, Lepper and Ross, 1989), but we did not observe such a change in this study. Further, although we unexpectedly found that women exposed themselves to more reasons than men (both for their own and for the opposite view), we did not find any gender differences in intellectual humility, nor did gender and intellectual humility interact to predict the number of reasons read. Gender therefore does not appear to be responsible for the association between IH and the number of reasons participants chose to read.

Study 4

Given that those higher in IH were more apt to expose themselves to the opposing perspective in Study 3, I predicted that participants with higher IH would also be able to generate more reasons for a sociopolitical position that differed from theirs.

In Study 4, I tested the association between intellectual humility and the number of reasons that participants articulated for an issue-position that was contrary to their own. In addition, to examine the possibility that issue importance might shape the association between IH and the number of reasons written, in Study 4 I also assessed how important issues were to participants (in addition to their general attitude strength, and their issue knowledge).

Method

Participants. 82 adults were recruited from Amazon Mechanical Turk ($M_{age} = 33.82$, $SD = 10.95$; 44 women, 38 men). Eighty-one percent of participants were White, 6% were Black, 6% were Asian, 4% were mixed race, and 3% were Hispanic. Eighty-three percent had some college and 43% had a college degree. On average, participants' political ideology was moderate, $M = 3.50$ $SD = 1.76$ (1 = extremely liberal; 7 = extremely conservative).Participants were compensated $1.00 for their participation.

Procedure and measures. In one online session, participants completed measures of intellectual humility (α = .80), beliefs about intelligence (α = .94), and learning goals (α = .92).[15]

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[15] Participants also completed several other scales related to political attitudes and behavior, including Social Dominance Orientation (Pratto, Sidanius, Stallworth, and Malle, 1994), and three shortened subscales from the National Attachment Scale (American National Identity, Constructive Patriotism, Uncritical Patriotism; Huddy & Khatib, 2007). Controlling for Constructive Patriotism weakened the association between IH and opposing reasons ($r = .17$, $p = .15$), but no other interesting effects of these variables emerged.

The following procedure was repeated with three issues in the following order: immigration reform, affirmative action in college admission, and imposing economic sanctions on Russia.

Participants read a brief passage about the issue. The passage was similar to those used in previous studies. Participants indicated their position on the issue (e.g., "pro" or "anti" immigration reform), and then rated how much they favored or opposed the issue (0 = *oppose strongly*; 100 = *favor strongly*) – this item was recoded to provide a measure of attitude strength. Next, participants rated how much they knew about the issue (1 = *I know almost nothing about this issue*; 7 = *I know very much about this issue*), how important the issue was to them (1 = *not at all important;* 7 = *extremely important*), and how interested they were in learning more about the issue (1 = *not at all interested*; 7 = *extremely interested*).

Next, participants were asked to write as many reasons as they could think of (up to 10) for their own position on immigration reform (matching reasons), and as many reasons (up to 10) for why someone might have the opposite position (opposing reasons). Next, participants rated their engagement in politics ($\alpha = .94$), and answered demographic questions. Participants were then fully debriefed about the purposes of the research and thanked for their participation.

Coding reasons. Two researchers who were blind to participants' intellectual humility counted the number of matching reasons generated, and coded and counted the number of opposing reasons generated. Among opposing reasons, only those coded as valid were counted. To be coded as valid, a reason needed to be distinct from the other reasons given by that participant (redundant reasons were only counted once), intelligible

(a few reasons did not make sense and were not counted), and legitimate (the reason needed to be something that a person from the opposing view might actually give).

To determine which reasons were legitimate, researchers created lists of matching reasons (e.g., a list of reasons for why participants were pro affirmative action). These lists provided empirical guidance about justifications that people actually gave to rationalize their positions. In several cases, participants gave valid opposing reasons that fit the other criteria but had not been mentioned by other participants in this study. These reasons were coded as valid as well. Illegitimate opposing reasons were typically derogatory in nature (e.g., a participant who was pro immigration reform writing that people were anti immigration reform because they are racist).

Researchers coded reasons independently. When there were disagreements, a third researcher who was also blind to participants' IH, provided a tie-breaking code to help resolve the disagreement. Coding reliability across the issues was adequate, with an overall Kappa of .76, and a correlation of $r = .91$.

Results

There were no differences in intellectual humility by participant gender, yearly income, age, political ideology, or level of education, all ps > .10. There was not enough variation across racial groups to make meaningful comparisons.

Did IH predict beliefs about intelligence and learning goals? See Table 6 for correlations, means and standard deviations. As in Study 3, intellectual humility was positively associated with believing that intelligence is a malleable trait, $r = .30, p <.01$. Intellectual humility was also positively related to learning goals, $r = .58, p <.01$.

Were issues comparable? As in Study 3, I began by testing whether the issues assessed in Study 4 were comparable. Attitude strength of immigration reform and affirmative action did not differ, $t(78) = .36$, $p = .72$. There were also no differences between immigration reform and affirmative action in terms of issue knowledge, $t(78) = 1.06$, $p = .29$., or ratings of issue importance $t(78) = .42$, $p = .68$.

By contrast, participants knew significantly less about imposing sanctions against Russia than they did about immigration reform, $t(78) = -5.77$, $p < .001$, and affirmative action, $t(78) = 5.46$, $p < .001$. Participants also rated sanctions against Russia as significantly less important to them than immigration, $t(76) = -4.75$, $p < .001$, and affirmative action, $t(76) = 3.48$, $p = .001$. Participants' attitude strength about Russian sanctions ($M = 68.41$, $SD = 23.10$) was also significantly lower than it was for immigration, $t(78) = 2.92$, $p < .01$, and for affirmative action, $t(78) = 2.24$, $p = .03$.

Relatedly, participants gave significantly fewer reasons for their own view about sanctions against Russia than they gave for their view on immigration reform, $t(75) = 8.44$, $p < .001$, and affirmative action, $t(74) = 3.34$, $p = .001$. I therefore concluded that the Russian sanctions issue was substantially different than the other issues and excluded it from further analyses[16]. I combined responses across the two other issues.

Baseline attitude strength, issue importance and issue knowledge. Participants held moderately strong attitudes about immigration reform and affirmative action, $M_{attitude\_strength} = 75.88$, $SD = 16.47$. Participants also reported having a moderate amount of baseline knowledge about the issues, $M_{baseline\_knowledge} = 4.45$, $SD = 1.28$, and considered the issues to be moderately important, $M_{issue\_importance} = 4.46$, $SD = 1.34$.

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[16] Intellectual humility was not associated with the number of reasons people gave for their own view about Russian sanctions ($M = 2.00$, $SD = 1.21$; $r = .01$, $p = .93$), and was not associated with reasons that they gave for the opposite view ($M = 1.69$, $SD = 1.08$; $r = .05$, $p = .67$).

IH was positively associated with attitude strength, $r = .35$, $p < .01$, again suggesting that those high in IH can have strong convictions about issues. Unlike in Study 3, IH was also associated with baseline issue knowledge, $r = .33$, $p < .01$[17], and ratings of issue importance, $r = .32$, $p < .01$.

Did intellectual humility predict number of reasons read? On average, participants generated 3.37 ($SD = 1.71$) reasons for their own view (*matching reasons*), and 2.16 ($SD = 1.08$) reasons for the opposing view (*opposing reasons*). Intellectual humility was marginally associated with the number of opposing reasons generated, $r = .22$, $p = .055$[18]. IH was not associated with the number of matching reasons generated, $r = .14$, $p = .21$.

Were there other predictors of reasons? There were no associations between the number of reasons generated and beliefs about intelligence, political ideology, issue knowledge, gender, age, or income, all ps > .24.

Opposing reasons were association with learning goals, $r = .25$, $p = .03$, political engagement, $r = .26$, $p = .02$, ratings of issue importance, $r = .24$, $p = .04$, and level of education, $r = .27$, $p = .02$. Matching reasons were associated with learning goals, $r = .29$, $p < .01$, attitude strength, $r = .23$, $p = .04$, and level of education, $r = .23$, $p = .04$.

Did intellectual humility predict interest in learning more? Consistent with Study 3, intellectual humility was associated with participants' interest in learning more about the issues, $r = .27$, $p = .01$.

Overview of findings

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[17] In Study 3, IH was not associated with baseline issue knowledge. Differences in the scales used to assess knowledge (a 100 point scale in Study 3 vs. a 7 point scale in Study 4) may have contributed to the discrepant finding.

[18] The IH composite with 6 items did not relate to the number of opposing reasons, $r = .10$, $p = .38$ or to the number of matching reasons read, $r = .07$, $p = .53$.

Although suggestive, Study 4 did not provide conclusive evidence that intellectual humility is associated with participants' ability to generate reasons justifying the opposing view. There was a trending positive association between intellectual humility opposing reasons, but the correlation was not statistically significant. Intellectual humility was also not related to the number of matching reasons that participants generated. However, IH was associated with participants' interest in learning more about immigration reform and affirmative action.

Discussion of Studies 3 and 4

Overall, IH predicted participants' openness to the opposing view, i.e., the number of opposing reasons participants read (Study 3), but it did not significantly relate to the number of reasons that participants generated to justify the opposing view (Study 4). One possible explanation for the discrepant findings between Studies 3 and 4 may be key differences between the behavioral variables assessed across the studies. In Study 4, generating reasons allowed participants to demonstrate the learning they had already done about an issue. Conversely, in Study 3, reading reasons offered participants an opportunity to learn more about the issue. Given intellectually humble participants' heightened interest in learning (as opposed to demonstrating their knowledge), we might have expected IH to have a more robust association with reading reasons than with writing them.

Moreover, the number of reasons participants generated was associated with many factors other than IH, including level of education, and level of political engagement. By contrast, gender was the only factor other than IH associated with the number of reasons participants read. It is therefore plausible that external factors such as

level of education and political involvement advantaged certain participants when it came to articulating reasons.

It is also worth noting that Study 4 had about half as many participants as Study 3. Had there been more participants in Study 4, the association between IH and opposing reasons might have been statistically significant. On the other hand, a number of other factors significantly predicted reasons in Study 4 suggesting that the study was adequately powered to detect several statistically significant results.

Review of studies 1-4

Overall, Studies 1 through 4 provided consistent evidence that intellectual humility is associated with people's openness to the opposing view. In Studies 1 and 2, those higher in IH were more respectful and more likely to listen to the opposition in two hypothetical disagreement scenarios. Intellectual humility predicted college students' and adults' openness to the opposition even after accounting for many other demographic and psychological factors in these studies.

Study 3 demonstrated that IH also predicted participants' willingness to expose themselves to the opposing perspective. When given the opportunity to read others' views about gun control and capital punishment, intellectually humble participants read more reasons supporting the position that opposed theirs. Participants higher in IH felt that they learned by participating in the study, and their desire to keep learning about the issues remained strong.

In Study 4, there was a marginal association between IH and the number of opposing reasons that participants generated to justify the opposing view. However,

ability to generate opposing reasons may not have been as indicative of openness to the opposition as it was of participants' level of education and political involvement.

One limitation of Studies 1 – 4 was that all of the findings were correlational. As such, the results did not demonstrate a causal link between IH and openness to the opposing view. Thus, in Study 5, I conducted an experiment to test the causal relationship between IH and responses to disagreement. In addition, in Studies 1-4, IH has consistently associated with beliefs about intelligence. Thus, In Study 5, I also investigated people's beliefs about intelligence as one source of intellectual humility.

CHAPTER 4: BELIEFS ABOUT INTELLIGENCE: A CAUSE OF INTELLECTUAL HUMILITY?

Studies 1-4 shed light on one possible consequence of IH: it may increase people's openness to the opposing view during disagreements. However, these studies did not provide causal evidence that IH leads to more adaptive responses. Thus, one goal of Study 5 was to investigate the possible causal link between IH and responses to disagreement.

In order to examine the causal link between IH and responses to disagreement, it was necessary to find a way shape IH. Although the sources of IH are not well understood, considerable research suggests that people's beliefs about the malleability of intelligence might exert an important influence on intellectual humility and its consequences. Studies 1 – 4 provided correlational evidence that intellectual humility is associated with beliefs about intelligence. Thus, in Study 5, I tested whether shaping people's beliefs about intelligence affected IH and whether IH, in turn, affected responses to disagreement.

Beliefs about intelligence and IH

In the past 25 years, a large body of research has developed on beliefs about intelligence. People who believe intelligence is a fixed trait that cannot be changed (*fixed mindset*) differ substantially from those who believe intelligence is a malleable trait that can be developed (*growth mindset*). These beliefs affect motivation, learning, and achievement. Having an incremental belief about intelligence predicts many positive attitudes and behaviors including mastery goals, persistence after failure, and greater

academic success (Dweck, 1999). I propose that beliefs about intelligence predict another important attribute: people's level of intellectual humility.

Having more of a growth mindset predicts many IH-relevant outcomes like eagerness to learn (Blackwell et al., 2007; Hong, Chiu, Dweck, Lin, & Wan, 1999; Mueller & Dweck, 1998), interest in remediation and less defensiveness (Nussbaum & Dweck, 2008), and more accurate awareness of one's knowledge (Ehrlinger & Dweck, under review). Thus, I predicted that having more of a growth mindset would enhance IH. Correlational evidence from Studies 1-4, showing that those higher in IH tended to have more of a growth mindset, provided initial support for this hypothesis.

By contrast, I predicted that a fixed mindset of intelligence would dampen intellectual humility. Research has shown that those with a fixed mindset construct a world where some people are intellectually superior to others (Dweck, 1999). Intellectual success can make them arrogant because it indicates that their fixed intelligence is better than other people's; conversely, not knowing the right answer threatens to brand them as losers in the intelligence lottery. Consequently, they may go to great lengths to boost their image in their own and others' eyes. For example, they will inflate their reported test scores (Mueller & Dweck, 1998) and seek to compare themselves to people who performed worse than they did (Nussbaum & Dweck, 2008). These defensive strategies are designed to keep their sense of intelligence intact and are not conducive to IH, which requires individuals to acknowledge what they don't know.

In Study 5, I tested the predictions that intellectual humility fosters openness to the opposing view, and that a growth mindset fosters intellectual humility. My proposed causal model is depicted in Figure 1. Specifically, I hypothesized that having more of a

growth mindset would allow a person to be more comfortable acknowledging what they do not know, thereby fostering intellectual humility. I predicted that intellectual humility, in turn, would cultivate openness to the opposing view.

In addition to establishing a general relationship between beliefs about intelligence and IH, Study 5 also explored how this relationship might change as individuals experience intellectual successes and failures.

On the one hand, one might think that those with a fixed mindset would show greater intellectual humility after failure, since failure may call their fixed ability into question. On the other hand, those with a fixed mindset might continue to show low intellectual humility after a failure given their need to restore their intellectual status. I explored both possibilities by exposing participants to either a success or failure experience before assessing their intellectual humility and responses to disagreement.

Study 5

Methods

  Participants. 104 community college students (54 women, 50 men) were recruited to participate in this study. Three participants were excluded from analyses: one because of suspicion about the experimental manipulation, and two because they submitted identical survey responses except for ID numbers and may have been working together on the survey. This left 101 participants (53 women, 48 men). Forty-seven percent of participants were Asian, 25% were White, 12% were mixed ethnicity, 7% were Hispanic, 5% were other ethnicity, and 4% were Black. Because of a glitch in online data collection, I did not have access to participants' ages.

Design and procedure. In one online session, participants were randomly assigned to a fixed or growth mindset condition that involved reading a scientific article with evidence for either a growth or fixed view of intelligence, and to a success or failure condition that involved completing a difficult set of spatial reasoning problems and receiving pre-determined success or failure feedback on them.

Mindset conditions. The growth and fixed mindset articles were ostensibly published in a well-known magazine, were matched for length and content, and were adapted from articles used in past studies (e.g., Nussbaum & Dweck, 2008). The key message of the growth mindset article was that intelligence can be developed (e.g., "Dr. Stanley and her team of researchers developed an extensive body of scholarship about intelligence. One of their key discoveries was that, essentially, each person's intelligence can grow and develop over time") and the key message of the fixed mindset article was that intelligence is a static trait (e.g., "Dr. Stanley and her team of researchers developed an extensive body of scholarship about intelligence. One of their key discoveries was that, essentially, each person has a certain amount of intelligence, and that amount remains pretty stable over time"). To check participants' understanding of the articles, I asked them to report the article's main idea.

Success and failure conditions. After completing questions about the article, participants began a seemingly separate study on spatial reasoning ability, beliefs, and attitudes. Participants were instructed to complete seven difficult spatial reasoning problems as quickly and accurately as possible. Problems were selected from practice dental school admissions tests, as past research has shown that it is difficult to know

whether one has answered these problems correctly or incorrectly, making both success and failure feedback equally plausible (Nussbaum & Dweck, 2008).

Once participants submitted their answers, the computer provided either predetermined success feedback ("You scored 31/35 [86th percentile]. A typical score is in the range of 19-28. If you scored over 28, you are very strong at spatial reasoning. A score under 19 indicates that you find spatial reasoning difficult"), or failure feedback, ("You scored 16/35 [46th percentile],…") followed by the same score interpretation offered in the success condition.

Questionnaires. Next, participants completed measures of IH ($\alpha = .79$), self-esteem (10 items, $\alpha = .86$, Rosenberg, 1965), confidence in intelligence (3 items, $\alpha = .69$, Dweck, Chiu, & Hong, 1995) and the same responses to disagreement in a classroom context that were assessed in Study 1, including respectful attributions, ($\alpha = .88$) and open-minded responding, ($\alpha = .89$). At the end of the session, participants were fully debriefed about the nature of the articles that they read and the feedback that they received. They received course credit and were thanked for their participation in the research.

<center>**Results and discussion**.</center>

There were no significant differences in IH by gender, $p = .37$. The experimental conditions were also balanced for gender, $\chi^2 < 1$, ps $> .50$. There was not significant variation across racial groups to make meaningful comparisons.

Intellectual humility was not associated with confidence in intelligence, $r = .02$, *ns*, and was marginally associated with self-esteem, .18, $p = .07$.

Manipulation check. All participants except four correctly reported the main idea of the mindset article. The four participants who failed to do so reported either not reading the article, or not understanding it. Analyses were conducted including and excluding these participants, and results were not affected. To give a conservative estimate of the effects of the experiment, these four participants were included in the analyses.

Did beliefs about intelligence affect IH? As predicted, participants in the growth mindset condition had significantly higher IH ($M = 5.09$, $SD = .71$) than those in the fixed mindset condition ($M = 4.77$, $SD = .75$), $t(99) = 2.32$, $p = .03$, $d = .44$ (see Figure 2). The effect of mindset condition on IH remained significant when controlling for gender, self-esteem and confidence in intelligence, ps $< .05$.

Did beliefs about intelligence affect responses to disagreement? Responses to disagreement were also affected by the beliefs about intelligence manipulation. Participants in the growth mindset condition made more respectful attributions ($M = 5.65$, $SD = .87$) than those in the fixed mindset condition did ($M = 5.30$, $SD = .86$), $t(99) = 2.06$, $p = .04$, $d = .40$ (see Figure 2).

Participants in the growth mindset condition also reported being more open-minded in their responses to disagreement ($M = 5.13$, $SD = .73$) than did those in the fixed mindset condition ($M = 4.84$, $SD = .69$), $t(99) = 2.10$, $p = .04$, $d = .41$ (see Figure 2). Again, controlling for self-esteem, gender and confidence in intelligence did not alter the results, ps $< .05$.

Did intellectual humility affect responses to disagreement? Next, I examined whether an increase in intellectual humility was the key factor that affected responses to

disagreement. That is, I tested whether beliefs about intelligence boosted IH, which, in turn, boosted openness during disagreement.

For respectful attributions, when intellectual humility was entered as a predictor in the regression model, the association between IH and attributions was significant, $B = .55$ ($SE = .10$), $t(98) = 5.25$, $p < .001$, but the effect of mindset condition on respectful attributions was not, $B = .17$ ($SE = .16$), $t(98) = 1.11$, $p = .27$ (see Figure 3). A bias-corrected bootstrap mediation model with 5000 bootstrap re-samples and 95% confidence interval supported the role of IH in mediating the effect of mindset condition on respectful attributions, $B = .18$; $CI = .02$ to $.39$.

Similarly, for open-minded responses, when both mindset condition and IH were included as predictors in the model, IH remained a significant predictor, $B = .52$ ($SE = .08$), $t(98) = 6.35$, $p < .001$, but mindset condition was not, $B = .13$ ($SE = .12$), $t(98) = 1.03$, $p = .30$ (see Figure 4). A bootstrapping analysis supported the mediating role of IH in the effect of mindset condition on open-minded responses, $B = .17$; CI $= .02$ to $.36$.

Did experiences of success and failure affect the results? I also tested whether experiencing academic success or failure affected IH. Overall, there were no differences in IH between participants in the success and failure conditions, $t(99) = .70$, $p = .49$. There were also no differences in responses to disagreement between participants in the success and failure conditions, all $ps > .24$. Moreover, interactions between the success and failure and mindset conditions did not significantly predict IH or the disagreement outcomes, all $ps > .24$. Thus, experiencing success or failure in this experiment did not

affect the relationship between IH, beliefs about intelligence and responses to disagreement.

Overview of Findings

Overall, Study 5 demonstrated that beliefs about intelligence affected intellectual humility and that intellectual humility affected responses to disagreement. Those in the growth mindset condition had significantly higher intellectual humility than those in the fixed mindset condition. Moreover, IH successfully mediated the effect of the growth mindset condition on participants' responses to disagreement.

Study 5 also showed that the effect of beliefs about intelligence on intellectual humility was robust to experiences of intellectual success and failure. It was possible that those in the fixed mindset condition, having just read that people have a fixed intellectual capacity, would have felt humbled after failing at an intellectual task. It was also possible that those in the fixed mindset condition may have felt extremely intellectually arrogant, relative to those in the failure condition, after experiencing intellectual success. However, neither of these possibilities was supported by the results. Instead, those in the fixed mindset condition remained less intellectually humble than those in the growth mindset condition regardless of experiencing intellectual success or failure.

Discussion of studies 1-5

Philosophers have argued that intellectual humility is an important intellectual virtue, and that it makes epistemic disagreements more fruitful (Roberts & Wood, 2003; Samuelson et al., 2012). However, until recently, there hasn't been a way to empirically test philosophers' claims given struggles to conceptualize and measure IH. The present work sought to advance research on IH by developing a way to measure it. It also empirically tested the associations between intellectually humility and people's self-

reported and behavioral responses to disagreement. Results from five studies supported philosophers' assertion that IH benefits disagreements. Specifically, those higher in intellectual were consistently more respectful and open to the opposing view, even during disagreements about important political issues.

The finding that IH may increase openness to the opposing socio-political view is particularly relevant given the current political climate in the United States. American politics is marked by polarization and incivility. Disagreements have led to gridlock in the legislature, cutting the number of substantial bills passed by Congress in half (DeSilver, 2014). According to some analysts, partisan animosity among citizens has also become more severe in recent years (e.g., McAdam & Kloos, 2014; Iyengar & Westwood, 2014). The research presented here suggests that promoting intellectual humility may offer a way to curb the destruction that can result from disagreements about political issues. However, findings also suggest that those high in IH are not politically apathetic. On the contrary, they, on average, tend to have stronger socio-political positions. Accordingly, IH may foster individuals' desire to engage in respectful dialogue around important issues, and help to create the kinds of civil and constructive disagreements that are important to democracy (Gutmann & Thompson, 2004).

Beliefs about intelligence as a source of IH. The present research also identified beliefs about intelligence as one source of intellectual humility. Correlational evidence from 4 studies showed that IH was associated with more of a growth mindset of intelligence. Experimental evidence from Study 5 supported the causal link between mindset and IH.

Identifying mindset as one source of IH may offer a relatively simple and inexpensive way to increase intellectual humility. Past research has shown that beliefs about intelligence can be changed and that this change can affect important outcomes. In one real-world study designed to change beliefs about intelligence, Blackwell and colleagues (2007) administered incremental belief training to adolescent students. Students were taught that they could grow their intelligence by working hard and creating new connections in their brains. Other students from the same school received a workshop about memory skills and general academic issues. Teachers, blind to students' condition, reported that those in the incremental group demonstrated increased motivation and responded more profitably to feedback. These students' grades also improved relative to their baseline grades and to the grades of students in the other workshop. Identifying beliefs about intelligence as one source of IH presents opportunities for similar interventions to increase IH and associated positive behaviors.

Intellectual humility, self-esteem and confidence. Scholars have noted that some dictionaries define humility as entailing a very low view of self (Tangney, 2000), and have also been concerned that attempts to assess intellectual humility might tap self-deprecation. Findings from 5 studies demonstrated that intellectual humility was not associated with low self-esteem, or with low confidence. On the contrary, though the findings were inconsistent across studies, IH was occasionally positively associated with self-esteem and confidence, suggesting that IH might even be easier to find among those with a more healthy self-concept and higher intellectual confidence.

Intellectual humility and demographic differences. Across 5 studies, IH did not differ significantly by gender. We might have expected women to show higher

intellectual humility than men, considering that Narcissism (in clinical and non-clinical forms) is more prevalent among men (Stinson et al., 2008; Grijalva et al., 2015). However, a gender difference was not supported by the data.

There was also no evidence that intellectual humility varied by participants' socio-economic status as assessed by annual income or level of education. However, results from two studies suggested that IH might increase with age. In Studies 1 and 2, in which participants ranged in age from 18 to approximately 60 years old, there was a small positive correlation between IH and age. It may be that as individuals mature, they grow more comfortable admitting the limitations of their knowledge. However, the association between IH and age was not found in two other studies and age data were not available in the remaining study. The inconsistency raises questions about the reliability of this finding.

Limitations and future directions. The present research had several limitations. Although the IH scale had quite consistent convergent and divergent validity across studies, it had an uncertain factor structure, with the reverse-coded items loading on a different factor than the positive indicators of IH. The factor structure of IH may reflect a superficial method factor instead of a true two-factor construct. However, the factor structure of the IH scale remains unclear. Moreover, in some studies, the internal reliability of the IH scale hovered just below the $\alpha = .70$ threshold, suggesting that items may not have held together well in certain studies. The across-study scale reliability was also limited, given that several scale items loaded unequally across studies. Overall, more research is needed to refine the intellectual humility scale, although the present research provides a foundation from which to build.

Second, the individuals who participated in this research were from two populations: American adults generally, and community college students from California. It is not clear if the results would replicate among participants outside of these groups. Future research could examine the relation between IH and various outcomes to see if results differed among different populations.

Regarding Study 5, I did not assess participants' baseline intellectual humility before the mindset induction. Thus, I cannot test whether the mindset effect differed by participants' baseline levels of IH. For example, it's possible that the mindset message was most effective for those who entered the study with high IH. Future research should probe the moderating effect of baseline IH on interventions or experimental inductions designed to increase it.

Future research should also investigate the relation between IH and participants' responses to real-world, naturally occurring disagreements. For example, a diary method could be used to examine how high and low IH participants respond to disagreements that occur in their everyday lives. In addition to providing more information on how IH shapes disagreements generally, this type of investigation might also reveal how situational factors may interact with IH to shape participants' openness to the opposing view.

Relatedly, it is not clear from the present research the extent to which individuals' IH may differ across contexts or situations. Although individuals may have a general tendency to be more or less humble regardless of circumstances, there may also be certain features of the environment that foster or dampen IH. Both state (more situationally driven) and trait (conceptualized as being more stable across situations)

approaches to studying general humility have emerged (e.g., Kruse et al., 2014). The study of intellectual humility might also benefit from exploring the state and trait facets of IH as well.

CHAPTER 5: INTELLECTUAL HUMILITY AND LEARNING IN SCHOOL

Studies 1-5 examined IH and people's openness to the opposing view. In Studies 6 and 7, I examined IH in the context of school. Specifically, I tested whether intellectual humility related to learning relevant outcomes such as motivation to learn, learning strategies and attitudes about group work among college and high school students. As a context for the current work, I begin by reviewing the literature relevant to IH and education.

Background

Being a good learner, critical thinker, and collaborator are increasingly recognized as important for success in college and beyond (Stecher & Hamilton, 2014; NRC, 2012; Levy & Murnane 2004). Although these so-called 21st century skills[19] have always been valuable, characteristics of today's economy make them particularly prized (NRC, 2012; Levy & Murnane, 2004). Increases in computer technology and outsourcing have decreased the number of available blue-collar and clerical positions: less than 40% of U.S. adults work in these types of jobs today, compared with over 50% of the workforce having such jobs in the 1970s (Levy & Murnane, 2004).

At the same time, high-skilled jobs in engineering, management, medicine, technology, and other fields have increased (Levy & Murnane, 2004). There is widespread recognition these more readily available jobs require advanced skills in learning and collaboration (Stecher & Hamilton, 2014; NRC, 2012; Levy & Murnane, 2004).

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[19] The high-level skills in problem solving, critical thinking and collaboration have a number of designations including 21st century skills (NRC, 2012), 21st century competencies (Soland et al., 2013), deep learning skills (NRC, 2012), and expert thinking skills (Levy and Murnane, 2004).

In view of the changing economy, educators have taken some steps to prepare students to succeed in it. The Common Core State Standards (currently adopted by 46 states) strive to equip students with "deep learning skills" needed to flourish in college and beyond (Soland, Stecher, and Hamilton, 2013). Yet, questions remain about how to best support students in developing the kinds of competencies needed for success in today's job market.

Here I ask: what psychological dispositions can orient students towards being good learners and collaborators? I propose that intellectual humility is one such disposition. Students high in intellectual humility – who are aware of the partiality of their knowledge – may be consistently motivated to learn, and more persistent in using a number of learning strategies to expand their knowledge. They might also be more open to learning from peers and, thus, more effective when working in groups. By contrast, those low in intellectual humility may lack awareness of their ignorance, be harmfully overconfident in what they know, and resist new information in a way that hinders learning.

The following chapter contains two studies that tested my predictions about intellectual humility and learning in school. Study 6 examined the link between intellectual humility, motivation to learn, learning strategies, and attitudes about group work among college undergraduates. Study 7 replicated and expanded Study 6 by examining how intellectual humility related to peer nominations, teacher-reported engagement in school, math achievement and growth in achievement over time among high school students.

Why might intellectual humility matter for learning in school?

Although there are no empirical studies that test the link between intellectual humility and learning[20], philosophical and educational research hints at its importance.

Most philosophers who write about intellectual humility consider it an intellectual virtue[21] – a characteristic of a good learner (e.g., see Baehr, 2012; Paul, 2000; Roberts and Wood, 2003; Spiegel, 2012). Philosophical scholarship suggests that intellectual humility might contribute to learning in several ways. For one, IH may support motivation to learn. Specifically, the recognition that one's knowledge is partial might inspire interest, curiosity and a desire to increase knowledge (Baehr, 2012). Along the same lines, IH may free one to focus on learning, instead of on striving to look smart (Roberts and Wood, 2003). If so, we might expect intellectual humility to predict intrinsic motivation and achievement goals – two measurable motivational constructs known to have powerful effects on student behavior in academic settings (e.g., see Ryan & Deci, 2003; Grant & Dweck, 2003).

Intellectual humility may also foster study habits recognized by education scholars as promoting learning. For example, it may encourage metacognitive reflection - monitoring of one's knowledge and understanding (Richert, 2002; King & Kitchener, 2004). Students low in intellectual humility may not use metacognition reflection much during the learning process because they may feel their current knowledge is sufficient. If they do reflect on their understanding, they may draw inaccurate conclusions assuming that they know more than they actually do. By contrast, students high in intellectual

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[20] Rowatt et al., 2006 found that general humility relative to arrogance, assessed by an implicit association test, was positively associated with participants' introductory psychology course grade.

[21] It is worth noting that although the vast majority of philosophers consider intellectual humility a virtue, not all philosophers agree. For example Nietzsche considered humility a trait promoted by the mediocre to keep superior individuals from realizing their potential (Damon & Colby, 2015).

humility may reflect on their knowledge and understanding more often. They may also gain more from the reflection process given their willingness to acknowledge what they don't know.

Intellectual humility might also predict more persistent and effortful engagement in school. An intellectually arrogant student might disengage from a class if she feels she already knows all that is being taught, or if the class challenges her knowledge or intellectual status too much. By contrast an intellectually humble student, who is aware that there is always more to learn, might be more persistently effortful in engaging in school and trying to learn more.

Finally, intellectual humility may support effective group work. A large body of research suggests that students can benefit from working with others (see Barron & Darling-Hammond, 2008). However, there are disparities in group work quality, and low quality experiences do not produce the same learning gains as high quality ones (Barron, 2003). Barron (2003) found that groups whose members were more responsive and respectful of one another learned more working together. By contrast, groups whose members often ignored or rejected the suggestions of other group members did not learn as much. Intellectually humble students may be more effective at working in groups because they value others' intelligence and may, thus, be more likely to collaborate, listen to and respond to their peers' suggestions. They may also value group work more as a way to learn.

Overview of Studies

In Study 6, I tested the associations between IH and constructs known to be important for success in school – achievement goals, learning strategies, and group work attitudes and collaborative style.

In Study 7, I examined IH longitudinally among high school students. In addition to replicating the tests conducted in Study 6 with a sample of high school students, I expanded Study 7 in several ways. First, I examined the stability of IH in an adolescent sample over a 3-month period. Second, I tested the relation between IH and teacher-reported intellectual humility and engagement in school. Third, I examined how IH related to students' perceptions of other students. Fourth, I tested the relation between IH and students' math grades, and their achievement trajectories over time.

Study 6

Methods

Participants. Sixty-six students attending Stanford University were recruited through the psychology department credit pool (18-32 years old, $M_{age} = 19.25$ $SD = 2.07$). Forty-two percent of participants were male, 41% were white, 6% were Black, 21% were Asian, 10% were Hispanic, 3% were Native American, 14% were mixed ethnicity and 5% were other race.

Procedures and measures. Participants completed an online survey in a location that was convenient for them. The survey took approximately 30 minutes and participants received course credit for their participation. For the following measures, all items were rated on Likert scales, 1 = *strongly disagree*, 7 = *strongly agree*.

Intellectual humility. The survey assessed Intellectual Humility (9 items, α = .67). Intellectual humility scale had items that tapped participants' willingness to

acknowledge the partial nature of their own knowledge (e.g., "I am willing to admit it if I

don't know something"; "I acknowledge when someone knows more than me about a

certain subject"; "I actively seek feedback on my ideas, even if it is critical") and their

recognition of others' intelligence (e.g., "I sometimes marvel at the intellectual abilities

of other people"; "I like to compliment others on their intellectual strengths").

Achievement goals. The survey also assessed achievement goals with the

Achievement Goal Inventory (Grant & Dweck, 2003). The Achievement Goal Inventory

assessed four goal subtypes: learning goals[22] (6 items, α = .91, "In my classes I focus on

developing my abilities and acquiring new ones"), normative ability goals (3 items, α =

.92, "It is very important to me to prove that I am more intelligent than other students."),

normative outcomes goals[23] (3 items, α = .89, "It is very important to me to do well in

my courses compared to others."), and ability goals (3 items, α = .85, "It is important to

me to confirm my intelligence through my school work").

Motivation and learning strategies. Motivation and learning strategies were

assessed with a subset of the Motivated Strategies for Learning Questionnaire (MSLQ)

(Duncan & McKeachie, 2010; see also Artino, 2005). The MSLQ is a well-established

questionnaire that can be used in part, or in full, and whose subscales have predicted

school achievement in past research (see Artino, 2005 for a review). The MSLQ has

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[22] As in Grant and Dweck (2003), learning goals is a composite of learning and challenge goal items. In this study these six items could not be distinguished in a factor analysis and the scree plot indicated a one-factor solution. All item loadings > .72.

[23] Grant and Dweck (2003) made a composite of all normative goal items. In this study, the factor structure of the normative goals was less clear. Scree plot indicated a two-factor structure. Normative outcome and normative ability goals loaded on two separate factors using principal axis factoring analysis with varimax rotation (factor loadings > .7, non-construct items factor loading < .3 except for one cross loading item which loaded at .50 on the non-construct factor). Outcome and ability goals were less distinct in a factor analysis using promax rotation (the lowest loading for a non-construct item was .49, but construct items loaded very highly (all loadings > .82). Here, I separate normative outcome and normative ability goals. However, conducting analysis with a comprehensive composite of all normative goal items does not change results – the correlation between IH and comprehensive composite of normative goals $r = -.27$, $p < .05$.

motivation and learning strategies sub-scales that each have between three and 12 items. A subset of items was chosen to assess five motivational constructs and learning strategies.

The motivation sub-scales assessed were Intrinsic Goal Orientation (3-items, α = .77, "In my classes, I prefer course material that really challenges me so I can learn new things", and Test Anxiety (3 items, α = .61, "I have an uneasy, upset feeling when I take an exam").

The learning strategies assessed were Metacognitive Self-regulation (8-items, α = .73, "I ask myself questions to make sure I understand the material I have been studying in my classes"), Effort Regulation (4-items, α = .78, "I work hard to do well in my classes even if I don't like what we are doing"), and Help Seeking (3 items, α = .13). Due to the low internal consistency of the help seeking items, these were analyzed separately. The items were: "I ask the instructor to clarify concepts I don't understand well"; "Even if I have trouble learning new material in my classes, I try to do the work on my own, without help from anyone" and, "When I can't understand the material in my classes, I ask another student in the class for help."

Self-esteem and Confidence in Intelligence. As in past studies, I also assessed Confidence in Intelligence (1-item, "I am confident in my intelligence," written for this research), and Self Esteem (Robins, Hendin, Trzesniewski, 2001, 1 item, "I have high self-esteem,") to make sure that the intellectual humility scale was not tapping a low self-concept, or low confidence in intelligence among students.

Group work. I developed items assessing attitudes and behavior relevant to group work. Six items assessed attitudes about the value of group work (α = .88, "Some of the

best projects come from working in groups"), and six items assessed how collaborative participants were when working with others (α = .74, "When I work in groups, I need to be the star of the team," reverse-coded). All items were rated on a Likert scale, 1 = *strongly disagree*, 7 = *strongly agree*.

Results

There were no differences in IH by gender, or age, (all ps > .05). There was not enough variation across racial groups to make meaningful comparisons. IH was not associated with Confidence in Intelligence or Self-Esteem, ps > .10.

Did IH predict Achievement Goals? See Table 7 for all correlations, means and standard deviations[24]. One goal of Study 7 was to examine the association between intellectual humility and achievement goals. As predicted, participants higher in intellectual humility had higher learning goals, $r = .42, p <.001$. In addition, those with higher intellectual humility had lower normative ability goals, $r = - .43, p <.001$. IH was not associated with ability goals or normative outcome goals.

Did IH predict motivated learning strategies? Next, I tested whether IH related to other motivational constructs and to learning strategies. IH was associated with Intrinsic Goal Orientation, $r = .27, p = .03$[25] and was not associated with Test Anxiety. Regarding learning strategies, IH was associated with Metacognitive Self-Regulation, $r = .34, p <.01$, and Effort Regulation, $r = .24, p = .05$[26], and was not associated with any of the help-seeking items, all ps > .26.

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[24] The individual help-seeking items are not reported in the table, but results are reported in text.
[25] Using the 6-item version of the IH scale that had more equally-loading items, the association between IH and intrinsic goal orientation was not significant, $r = .17, p = .18$.
[26] With the 6-item version of the IH scale, the association between IH and effort regulation was not significant, $r = .15, p = .22$.

Did IH predict valuing group work and collaboration? Finally, I tested whether intellectual humility related to participants' attitudes about group work. Participants higher in intellectual humility did not significantly value group work more than those lower in intellectual humility, $r = .24$, $p = .057$, but high IH participants reported being more collaborative in group work, $r = .47$, $p < .001$.

To investigate the robustness of the correlations reported here, I re-ran the analyses controlling for demographic variables. All of the associations remained significant except the association between IH and effort regulation, which became marginally significant controlling for gender, $p = .053$. However, gender did not moderate the association between IH and effort regulation, $p = .34$, suggesting that it was not driving the relation between these constructs.

Summary of findings

On the whole, results from Study 6 suggest that intellectual humility is related to learning-relevant outcomes among the college students sampled here. As predicted, students higher in intellectual humility were more motivated to learn in school, and less motived by trying to look smarter than their peers. Students who had higher intellectual humility were also more likely to use their "understanding about their own understanding and knowledge" to guide their studying. Students higher in IH also reported being more effortful in school, however the association between intellectual humility and effort regulation was weakened when controlling for gender. This suggests that the association between IH and effort regulation was not as robust as the other associations observed in this study, all of which remained significant controlling for demographic factors.

However, gender did not moderate the association between IH and effort regulation suggesting that it was not driving the relation between these constructs.

As predicted, students higher in intellectual humility reported being more collaborative when they worked with others in groups. That is, the intellectually humble students were more likely to identify as team players, and less interested in "being the star of the team."

Contrary to prediction, those higher in IH were not significantly more likely to value group work as a way to learn. It could be that the generality of the group work items, which asked students how much they valued working with others on school projects globally, made these items a bit ambiguous and thus open to multiple interpretations. In all levels of school, the variety of experiences "working together with others" is broad, and students may have had very different types of group projects in mind when responding to these items. Nevertheless, there was a trend in the expected direction such that as students increased in intellectual humility, they were often more likely to consider working with others a worthwhile way to learn.

Study 7

Study 6 provided some evidence that intellectual humility is relevant to learning in college.

Thus, one goal of Study 7 was to examine whether the findings from Study 6 would replicate among a high school sample. Each of the motivational, learning strategy and group work constructs assessed in Study 6 was also assessed in Study 7. In addition, one

motivational construct (effort beliefs) was added because past research on adolescent

achievement has demonstrated its importance (e.g., see Blackwell et al., 2007).

I also expanded Study 7 in several ways. First, I tested whether intellectual

humility related to peer and teacher perceptions of students. Regarding peer nominations,

positive relationships with peers can help bolster students' success during high school

(Reyes, Gillock, Kobus & Sanchez, 2000). Thus, one goal of this research was to test

whether intellectual humility would relate to students' views of their peers. It could be

that intellectually humble students (if they can be found in high school) simply go

unnoticed by peers – particularly if they are over-shadowed by more arrogant classmates.

However, I predicted that students high in IH would be respected and admired by their

peers[27]. If so, this finding would suggest that intellectual humility may have benefits

beyond individual learning outcomes – it may also help boost students' interpersonal

outcomes.

Regarding teacher reports, the present study tested the extent to which the

teacher's ratings of students' intellectual humility agreed with the students' ratings of

their own IH. It also tested whether students' self-report humility related to the teacher's

perception of how engaged students were in learning.

In addition, Study 7 tested whether intellectual humility was associated with

students' achievement, and their growth in achievement over time. I predicted students

higher in intellectual humility, with their enhanced motivation to learn and greater use of

adaptive study strategies, would earn higher overall grades, and have greater growth in

achievement over time.

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[27] This prediction is somewhat supported by research showing that general humility can strengthen social ties (e.g., see Davis et al., 2012)

To summarize, the goals of Study 7 were:

1. To examine whether the findings from Study 6 would replicate among a sample of high school students.

2. To test the relation between intellectual humility and others' perceptions, specifically, peer nominations and teacher-reported IH and engagement in learning.

3. To investigate the association between intellectual humility and achievement, both overall achievement and growth in achievement over time.

Method

Participants. 88 students attending a public high school in the greater Kansas City area were recruited for this study (14 – 16 years old, $M = 14.52$, $SD = .57$). Students were freshmen (89%) and sophomores taking Algebra II or Integrated Math I from the same teacher. Forty-three percent of participants were male, 86% were white, 8 % were Hispanic, 3% were Black, 2% were Asian and 1% was other race. Seventy percent of participants' parents had a college degree.

The students attended a high performing high school, with 99% of students scoring at or above the Kansas state mathematics standard in 2013 (80% of students state-wide met or exceeded this standard). The high school had a fairly homogenous racial composition, with 86% White students. About 10% of students in the school were classified by the state as economically disadvantaged.

Students who signed an assent form and whose parents signed a parental consent form were eligible to participate. Of the 139 students eligible to participate, 88 participated in the study (63% response rate)[28].

Procedures and measures. Students were surveyed in December of 2013, and again in March of 2014 in their math class. Surveys took approximately 15 minutes to complete. I administered both surveys, explaining that the purpose of this research was to learn from them (the students) how to improve high school math classes. I assured students that their survey responses would be kept confidential and anonymous, and that they were free to discontinue participation at any time. Students who weren't eligible to participate in the study worked independently on their homework while others took the surveys. All self-report survey items were rated on 7-point Likert-type scales from 1 (*strongly disagree*) to 7 (*strongly agree*).

Intellectual humility. Surveys at both time points assessed Intellectual Humility (9-items, α= .55 for T1 and α= .56 for T2). Given the lower reliability of the IH scale in this study compared to past studies, I retested the scale's factor structure. Although the factor structure of this scale was not entirely clear, as in the previous tests, there was some indication that the scale had two factors – one composed of positive indicators of IH, and one composed of negative indicator items (all items had factor loadings > .23 on one of these factors). No other discernable patterns emerged in analyses of the scale's factor structure[29]. There was somewhat better reliability within the positive indicators

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[28] The response rate may have been reduced by the extremely icy, snowy weather on the first day of data collection.

[29] It was also possible that the views about self and views about others items would load on separate factors. However, this did not seem to be the case in this study. The two views about others items loaded relatively well with the other views about self items (all loadings > .38)

factor (6 items, α = .63). However, the factor of negative indicators did not have an improved internal reliability, (3 items, α = .55)[30].

Thus, the psychometric properties of the IH scale did not clearly indicate whether the scale was operating as a single or a two-factor instrument in this study. As such, the primary results in this study are reported with the 9-item IH scale. Supplementary analyses of the results with a two-factor IH scale are also reported and discussed in Appendix B.

The test-retest reliability of the 9-item IH scale over a 3-month period was $r =$ .52, $p <$.001. On average, participants had slightly higher intellectual humility at time 2 ($M_{time2} = 4.72$) relative to Time 1 ($M_{time 1} = 4.56$); the mean difference was statistically significant, $t(80) = 1.99$, $p = .05$.

Achievement goals. To investigate whether the achievement goal findings from Study 6 would replicate among high school students, the same achievement goals were assessed in Study 7. However, to shorten the survey, a subset of two items per goal subtype was used[31]. The four goal subtypes were: learning goals[32] (4-items, α = .85, "I seek out classes that I will find challenging."), normative ability goals (2-items, α = .91, "It is very important to me to prove that I am more intelligent than other students."), normative outcomes goals[33] (2-items, α = .83, "It is very important to me to do well in my courses compared to others."), and ability goals (2-items, α = .78, "It is important to me to confirm my intelligence through my school work.").

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[30] Alpha increases to .66 ($r = .49$, $p <$.001), when one of the three items, "If someone doesn't understand my idea it's probably because they're not smart enough to get it", is dropped.
[31] I selected the items that had the highest factor loadings in Grant & Dweck, 2003.
[32] As in Grant and Dweck (2003), and Study 6, learning goals is a composite of learning and challenge goal items. These six items could not be distinguished in a factor analysis and the scree plot indicated a one-factor solution. All item loadings > .77.
[33] As in Study 6, normative goals are kept as separate composites.

Motivation and learning strategies. The motivation and learning strategies assessed in Study 6 were also assessed in Study 7. Motivation constructs were Intrinsic Motivation in math[34] (e.g., "I'm not very interested in this class," reverse-coded; 2 items; $\alpha = .74$; items written for this research), and Test Anxiety ("When I take a test I think about items on other parts of the test that I can't answer'; "when I take a test I think of the consequences of failing," 2 items, Artino, 2005). Due to low internal consistency of the test anxiety items ($r = .19$, $p = .09$), they were analyze separately. Three items assessed effort beliefs (e.g., "If you're not good at a subject working hard won't make you good at it," reverse coded; $\alpha = .76$, Blackwell et al., 2007), with higher scores indicating more positive views of effort.

For learning strategies, I assessed meta-cognitive self-regulated learning (e.g., "when studying for my classes I try to determine which concepts I don't understand well,"; 5 items; $\alpha = .69$; Artino, 2005), effort regulation (e.g., "I work hard to do well in my classes even if I don't like what we are doing,"; 3 items; $\alpha = .72$; Artino, 2005), and help-seeking (e.g., "I seek help from my teachers if I don't understand something," $\alpha = .61$; Artino, 2005).

Group work. I used a subset of the items from Study 6 to assess attitudes about group work and cooperative style. Three items assessed attitudes about group work (e.g., "I find value in working on school projects with others"; $\alpha = .87$), and three items assessed cooperative group work style (e.g., "When I work in groups I need to be the star of the team", reverse-coded; $\alpha = .77$).

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[34] For these items, I chose to assess intrinsic motivation for math class (rather than intrinsic motivation for school generally).

Self-esteem and Confidence in Intelligence. As in Study 6, to make sure that the IH scale was not tapping low self-esteem, or low confidence, I assessed Self-esteem (1 item, "I have high self-esteem"), and Confidence in Intelligence (written for this research) (1 item, "I am confidence in my intelligence").

Peer nominations. To examine whether IH related to students' perceptions of their classmates, I collected peer nominations. Nomination procedures were adapted from Graham, Taylor and Hudley, 1998. Nominations were collected in students' math classes in December, after students had several months to get to know one another. The six class sizes ranged from 11 to 32, with the median class size being 25. Although the class sizes varied, there were no differences in the average IH between classes, $F(5) = 1.12$, $p = .36$.

Students were given an alphabetical list of names of the students in their class. They were asked to write up to three peers in their class whom they 1. Admired, 2. Respected, and 3. Wanted to be like. They were also asked write up to three peers in their class who 4. Is smart, 5. Bullies others, and 6. Gets picked on. Each nomination was written as a separate statement, and after each statement three lines were provided for listing names. Students were told that they could nominate the same student in more than one category, but that they could not nominate themselves.

If a student's name was nominated by a peer for a certain category, that student received one "point" for that category. Nomination scores were tabulated for each category. Exploratory factor analysis of nominations with promax rotation showed that one factor explained 35% of the variance in responses. Nominations for peers who were admired, respected, smart and who others wanted to be like loaded on the first factor, all loadings > .45. Thus, these nominations were combined into one composite of positive

peer nominations (α = .62). Nominations for "Bullies others" and "Gets picked on" were kept as separate variables.

Teacher reports. To understand more about the teacher's perceptions of her students' IH, I collected teacher-report measures about each student. One measure assessed the teacher's perception of students' IH, using items adapted directly from the intellectual humility scale[35] (e.g., "This student is willing to admit it if they don't know something,"; 4 items; α = .76; 7 = *extremely true of this student*, 1 = *not at all true of this student*). In addition, I assessed the teacher's perception of students' engagement with learning (e.g., "This student is eager to learn"; 2 items; r = .89, p <.001). The teacher completed these measures during the last month of the school year.

Student achievement. Several measures assessed students' achievement in math. First, as a measure of overall achievement, I computed an average of fall and spring semester grades (r = .87, M_{grades} = 84.60, SD = 10.78, range = 53.77 − 100.58,). The semester grades accounted for students' test scores, homework, and class participation. To investigate changes in achievement over time, I used students' 11 unit test scores in math, which were administered at fairly regular intervals of time over the school year.

Although I did not have access to official reports of students' grades in other classes, to conduct a preliminary test of whether intellectual humility might relate to achievement in subjects outside of math, in the Time 2 survey I collected students' self-report of their fall-semester English grade, and of their fall grade point average (GPA).

Results
Intellectual humility was not associated with gender, age, class in school, or year in school (all ps > .05). There was not sufficient variation across racial groups to make

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[35] The items for this measure were taken directly from the IH scale except for one item, which was written for the teacher measure. That item was "This student is intellectually arrogant", reverse-scored.

meaningful comparisons. Intellectual humility was positively associated with parent education, $r = .23$, $p = .04$. IH was also positively associated with self-esteem $r = .38$, $p <.001$, and confidence in intelligence, $r = .30$, $p <.01$[36].

Did the results from Study 6 replicate? Correlations, scale means and standard deviations are reported in Table 8[37]. Correlations with the 2-factor IH scale are also reported in Appendix B.

One objective of Study 7 was to investigate whether the results from Study 6 would replicate among a high school sample. Many of the achievement goal findings replicated across studies. Specifically, IH was positively associated with learning goals, $r = .36$, $p <.001$ and negatively associated with normative ability goals, $r = - .23$, $p = .04$. IH was not associated with normative outcome goals. However, unlike in Study 7, intellectual humility was positively associated with ability goals, $r = .26$, $p = .02$[38].

Regarding motivation and learning strategies, as in Study 6 intellectual humility was positively associated with intrinsic motivation, $r = .25$, $p = .02$[39], metacognitive self-regulation, $r = .47$, $p <.001$, and effort regulation, $r = .34$, $p = .001$. IH was not associated with either of the test anxiety items, ps from .09 - .11. Unlike Study 6, IH was positively associated with help seeking $r = .29$, $p <.01$. In addition, IH was positively associated with positive effort beliefs, $r = .30$, $p <.01$.

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[36] The correlations between IH and self-esteem and confidence in intelligence are higher than has been observed in past studies. One possible explanation is that the self-esteem and confidence items were grouped together with, and included at the very bottom of the list of intellectual humility items. Research has shown that the later an item appears in a group of items, the more strongly the item tends to correlate with the previous items. This is because respondents tend to interpret the grouped-together items as measuring a construct, and they have a better sense of what the construct is after they have responded to all of the items (Krosnick & Presser, 2010). Thus, the ordering and grouping of survey items may have artificially inflated the correlations between IH and these constructs.

[37] Results for the test anxiety items are not included in this table, but are reported in the text.

[38] The 6-item IH scale of equally loading items was not associated ability goals, $r = .14$, $p = .21$.

[39] The 6-item IH scale of equally loading items was marginally associated with intrinsic motivation, $r = .19$, $p = .08$

The findings related to group work also replicated in Study 7. IH was not significantly related to valuing group work, $r = .12$ $p = .26$, but it was positively associated with being more collaborative in groups, $r = .41$, $p < .001$.

All of the correlations remained significant controlling for parent education, gender, and age, all ps $< .05$.

Did IH relate to peer nominations and teacher-report measures? For the remaining non-self-report measures, all correlations are reported in Table 9. Correlations between these items and the two-factor IH scale are also reported in Appendix B.

A second goal of the present study was to test whether intellectual humility (assessed by self-report) related to peer and teacher perceptions of individual students. I found that intellectual humility did not predict any of the peer nominations and or teacher-report measures, all ps $> .08$.

Did IH predict student achievement? Next, I tested whether intellectual humility related to students' achievement. Intellectual humility was not associated with students' overall grades in math, $r = .12$, $p = .29$, their self-reported English grade, $r = .08$, $p = .50$, or students' self-report fall GPA, $r = .10$, $p = .44$.

Did IH predict growth in achievement? Another goal of the present study was to test whether intellectual humility contributed to students' growth in math achievement over time. To investigate a possible contribution, I fit a growth model using students' 11 unit tests to determine whether there was a typical trajectory of math achievement through the school year. This model yielded somewhat adequate fit to the data, $\chi^2 (52, N = 87) = 106.71$, $p < .001$, RMSEA $= .11$, CFI $= .92$, TLI $= .92$. Overall there was a small but significant increase in average achievement over the school year. Moreover, the

means of the intercept and slope significantly differed from zero indicating that there was individual variability around the average trajectory.

To test whether intellectual humility helped explain variance around the average trajectory, I fit a second model entering intellectual humility as a predictor of growth. Intellectual humility was indexed by three parcels of three items each. This model had somewhat adequate fit to the data, $\chi^2 (96, N = 87) = 164.53, p <.001$, RMSEA = .090, CFI = .91, TLI = .90. Intellectual humility was not associated with the intercept, or with the slope, ps > .05, indicating that those higher in IH did not differ in terms of baseline level of achievement, or by growth in achievement over time.

<div align="center">

Summary of Findings

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Overall, Study 7 provided some support for my hypothesis that intellectual humility is relevant for adolescents' learning in school, and did so in a real-world context. Intellectual humility was positively associated with adaptive motivational outcomes (e.g., learning goals, intrinsic motivation, positive effort beliefs), study strategies, and students' willingness to collaborate with others. IH was not associated with overall achievement, growth in achievement, peer nominations, or teacher-reported IH, or teacher reported engagement in learning.

Study 7 also raised questions about the intellectual humility scale. The reliability of the scale was lower than it had been in previous studies. Additional analyses suggested that the negative indicators of IH and the positive indicators of IH may have tapped two separate factors. A summary and discussion of results from the 2-factor IH scale are presented in Appendix B.

Discussion Studies 6 and 7

Taken together, the results from Studies 6 and 7 suggest that intellectual humility is related to some outcomes that are relevant for learning in school. Notably, most of the findings observed among college students replicated among high school students suggesting that IH may be a valid construct among adolescents and young adults.

Students higher in IH had stronger learning goals in school, and weaker performance goals. Having a strong motivation to learn is widely considered to be more adaptive than having strictly performance motivation (Dweck, 1999). Research has shown that when students are highly concerned about looking smart, their performance-orientation can foster a helpless response in school (e.g., giving up, withdrawing effort), especially if they believe that their natural ability in an area is not very high (Elliott & Dweck, 1988). By contrast, students who are more interested in learning new things tend to have mastery-oriented responses to challenging situations in school (e.g., persisting despite difficulty) (Farrell & Dweck, 1985). Thus, in these studies IH was associated with a more adaptive motivational profile.

Students higher in IH also used effective learning strategies more frequently. Students in college and high school were more likely to engage in metacognitive self-regulation – checking their understanding as they went along. Students in high school were also more likely to use effort regulation - persistently exerting effort in classes[40]. Students higher in IH also reported being more collaborative when working with others. Given that collaborative and deep learning skills are increasingly recognized as

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[40] The correlation between effort regulation and IH among college students was significant at the bivariate level, but was weakened when controlling for gender, suggesting that it was not as robust an association.

contributing to success in college and in careers (Soland et al., 2013; NRC, 2012), these findings suggest that IH may be one psychological disposition that can help students succeed.

What might explain inconsistent findings across studies? Although many findings replicated across the college and high school samples, a few did not. First, intellectual humility positively predicted ability goals in Study 7 but not in Study 6. One possible explanation for this discrepancy is that high school students may have struggled to interpret the ability goal items (e.g., "In school I am focused on demonstrating my intellectual ability"), which were a bit more abstract than the other achievement goal items. It could be that high school students interpreted the ability goal items as assessing a general concern for school.

Another difference in findings was that intellectual humility related to help-seeking among high school students, but not college students. The measure of help-seeking was not reliable in the college study, but was more reliable in the high school study. This suggests that patterns of help-seeking were quite different in the high school and university contexts. Undergraduates may have sought help less frequently, and in different ways than high school students.

Self-esteem and confidence in intelligence were associated with IH in Study 7, but not in Study 6. Recall that IH was also inconsistently related to self-esteem and confidence across Studies 1-5. Differences in the number and types of items used to assess confidence and self-esteem may have contributed to the discrepancies here (Study 7 used one-item measures of confidence and self-esteem and Study 6 used multi-item measures). In addition, the ordering and grouping of survey items may have artificially

inflated the associations between IH and these constructs in Study 7. The confidence and self-esteem items were grouped together with the IH items, and came at the very end of the list of IH items. Research has shown that this type of item grouping, and item ordering can enhance correlations (Krosnick & Presser, 2010).

What might explain the null findings? Despite possible associations, intellectual humility did not relate to a number of outcomes in Study 7 including peer nominations, teacher reports, grades and growth in grades over time.

Regarding peer nominations and teacher-report data, intellectual humility may not attract much attention from peers and teachers. Humility is sometimes called "the quiet virtue" (Chancellor & Lyubomirsky, 2013) and, as such, it may be difficult to detect. Moreover, regarding the teacher-report of students' IH, the teacher was responsible for 138 students and may not have had sufficient one-on-one time to gauge students' intellectual humility. By contrast, in previous research, informants rating a target's humility have often been close friends or partners (e.g., Davis et al., 2011).

Regarding achievement, it may be that intellectual humility does not shape achievement outcomes much among young adolescents in school because most young students (who have relatively little knowledge) may be open to learning from their teacher regardless of their level of intellectual humility. As students grow and their knowledge develops, the association between intellectual humility and achievement may become more pronounced. This idea is somewhat supported by Rowatt, et al.'s (2006) finding that college students higher in general humility had higher grades relative to those lower in general humility.

For an additional possible explanation of null findings, and a discussion of the results from the 2-factor IH scale, see Appendix B.

Limitations and future directions

The present studies have several limitations. First, both study samples were relatively small, particularly the sample in Study 7. As such, statistical tests in may not have been adequately powered to detect significant effects. Moreover, it's not clear if the findings from these studies would replicate among different populations of students (e.g., among high school students who were more racially diverse, or among college students from non-elite universities).

Second, the findings in Studies 6 and 7 are correlational and, as such, it is not possible to identify the direction of effects in either study. Future research should examine the causal contribution of IH to learning outcomes.

Third, these studies did not examine how situational variables such as classroom climate or subject matter might shape the associations between IH and learning outcomes. Research has shown that context affects students' motivation and achievement considerably (for a review see the National Research Council, 2004), and, thus, person-context interactions may affect the ways that IH relates to other outcomes. For example, it could be that intellectual humility is most beneficial for motivation in subjects like math, where being open to alternative perspectives, or answers is not as built-in to the pedagogy as it is in subjects like English. Future research should investigate possible person-context interactions that may be at play among IH and other constructs.

Another area for future research is examining whether intellectual humility matters for other learning-relevant outcomes. For example, IH may predict more

advanced thinking (Kuhn, 1989), and more actively open-minded thinking (Baron, 1994). Relatedly, IH may relate to moral and civic character strengths, an issue that is discussed more thoroughly in the General Discussion of this dissertation (see Chapter 6).

In addition to examining outcomes of IH, further research could investigate the plasticity of IH, and other potential sources of it. Results from Study 7 suggested that high school students slightly, but significantly, increased in IH over a 3-month period. This finding suggests that IH is malleable among adolescents. Additional research could examine the factors (in addition to beliefs about intelligence) that might foster intellectual humility.

However, the most pressing issue for future research on intellectual humility among adolescents and young adults is measurement. The intellectual humility scale had lower internal reliability in Study 7 than it had in past studies. Moreover, some analyses suggested that the IH scale may have tapped two distinct constructs in Study 7, each explaining unique variance in key outcomes such as achievement (see Appendix B for more information). More research is needed to fortify the IH scale. For example, researchers could examine how young adolescents interpret the scale items and whether those interpretations are different than college students' and adults' interpretations of scale items. Future research could also examine the possible effect of context on participants' survey responses. In the present research, adolescents completed the survey measure in class, making school and related thoughts and concerns highly salient. By contrast, college students completed the survey outside of class, on their own time. It is unclear whether the different survey administration contexts may have affected responses.

CHAPTER 6: GENERAL DISCUSSION & CONCLUSION

General Discussion

Despite longstanding recognition of its importance, empirical research on intellectual humility is only just emerging. The present research makes four primary contributions to understanding IH: 1) it conceptualizes IH and provides one way to assess it; 2) it demonstrates that intellectual humility enhances individuals' openness to the opposing view; 3) it shows that IH is associated with a number of learning-relevant outcomes including motivation, and learning strategies among college and high school students; 4) it identifies beliefs about intelligence as one source of intellectual humility.

More specifically, Studies 1 and 2 provided evidence for the convergent and discriminant validity of a novel IH scale, and tested whether IH related to participants' responses to disagreement. Participants higher in IH were more open to the opposing view when responding to hypothetical disagreements about school material and political issues, and they were more respectful in the attributions they made for why a disagreement had occurred.

In Studies 3 and 4, IH related to a behavioral measure of participants' openness to opposing socio-political views of import. Relative to those lower in IH, intellectually humble participants read more reasons justifying a socio-political view that opposed theirs. Those higher in IH also felt that they learned more by reading reasons than those lower in IH, and their desire to keep learning about issues remained stronger. Those higher in IH were also marginally more likely to articulate a greater number of reasons justifying the opposing socio-political view relative to those lower in IH. However, the association between IH and number of reasons articulated was only marginally

significant, and people's ability to generate reasons was also related to a number of factors other than IH, such as participants' level of education and political involvement.

In Study 5, experimental evidence supported the causal relations between beliefs about intelligence, intellectual humility and responses to disagreement. A growth mindset induction successfully enhanced intellectual humility. Intellectual humility, in turn, boosted participants' openness to the opposing view during disagreements. Study 5 also tested whether a situational variable – experiencing intellectual success or failure – might alter the associations between beliefs about intelligence, intellectual humility and responses to disagreement. Regardless of experiencing an intellectual success or failure, participants in the growth mindset condition remained more intellectually humble than those in the fixed mindset condition, suggesting the robustness of this association across failure and success experiences.

Studies 6 & 7, examined intellectual humility and its relation to educational outcomes among college and high school students. College and high school students who were higher in intellectual humility had stronger motivation to learn, used a number of effective learning strategies and reported being more collaborative when working with others. High school students higher in IH also had more positive views of effort. However, intellectual humility did not relate to achievement, peer nominations or teacher reports.

Overall, these seven studies provide consistent evidence that those higher in intellectual humility have a greater thirst for learning. They are more curious (Study 1), more open to learning about the opposing view (Studies 1, 2, 3, 5), more interested in

learning about socio-political issues (Studies 2-4), and endorse stronger learning goals (Studies 3, 4, 6, & 7).

These studies also consistently show that those with more of a growth mindset of intelligence have higher intellectual humility (Studies 1 – 5). Moreover, inducing a growth mindset of intelligence successfully enhanced intellectual humility. This suggests that intervening at the level of people's beliefs about intelligence offers one way to increase intellectual humility and related adaptive behaviors.

In addition to contributing to understanding of IH and its consequences, the present research also speaks more broadly to work in education and psychology. In the subsequent sections, I describe connections between this research and related work on intellectual biases and character education.

Rounding out the study of intellectual arrogance

Past research has devoted considerable attention to exploring individuals' "intellectually arrogant"[41] tendencies, which have been evident in a number of self-serving intellectual biases. For example, research has shown that people are naïve realists, tending to believe that they see the world as it really is and that those who disagree are simply incorrect (Ross & Ward, 1996). Individuals also tend to overestimate their knowledge of how complex devices work (Rozenblit & Keil, 2002), they remember and pay attention to information that confirms their own beliefs (Nickerson, 1998), and unfairly scrutinize evidence that does not match their beliefs (Edwards & Smith, 1996). Moreover, people are generally blind to their own intellectual biases (Pronin, 2007).

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[41] This term is not one used in the literature. I use this term to convey that these tendencies appear to work in opposition to IH.

Overall, this research suggests that humans often fail to evaluate their own and others' knowledge accurately, fairly, and rationally, given their susceptibility to intellectual bias.

The research on such tendencies has produced seminal breakthroughs in understanding how people make decisions, and how cognitive and affective processes interact to shape thoughts and behaviors. This research has also captured widespread attention as the focus of several popular books (e.g., Schultz, 2010; Kahneman, 2011).

Yet, what the intellectual bias research does not elucidate or often highlight is humans' capacity to defy or overcome arrogant tendencies and exhibit intellectual humility.

Thus, the present research helps round-out attention in the psychological literature by shining a light on the less-studied side of the arrogance-humility continuum. Indeed, the research in this dissertation suggests that people are capable of thinking and behaving in ways that are intellectually humble. Moreover, this research demonstrates that intellectual humility itself is malleable and that it may be enhanced or dampened, for one, by adopting different beliefs about the nature of intelligence.

Others' ongoing research is examining how IH may attenuate some of the most notorious intellectual biases (Thrive Center for Human Development, 2015). However, future research on intellectual humility should probe more deeply into the relation between IH and self-serving bias in the intellectual domain. For example, how does intellectual humility interact with emotion to shape cognitive processes? What factors explain why some individuals can recognize and acknowledge their intellectual bias, while others cannot? Such work would move from documenting arrogant tendencies, to helping individuals understand how they may overcome them.

Intellectual humility and character education

  Locating IH in the character taxonomy. The present research is also relevant to the study of character education. Educating children to be moral and respectful citizens has been a goal of the American education system since it began (McClellan, 1999). As such, character education has traditionally sought to cultivate civic and moral character strengths, including integrity, kindness, tolerance, and an ethic of participation and community service (Seider, 2012; Lickona, 1991; Lickona & Davidson, 2005). More recently, research on character has expanded to include attributes thought to contribute to academic success (Lickona & Davidson, 2005). These strengths, collectively referred to as performance character, include grit (Duckworth, Peterson, Matthews & Kelly, 2007), self-control (Duckworth & Seligman, 2005), effort, and ingenuity (Lickona & Davidson, 2005; Tough, 2012). In addition, scholars have argued for the inclusion of a fourth dimension of character focused on fostering good thinking, and acquisition of knowledge and understanding (Baehr, 2012; Richert, 2002). This fourth dimension is known as intellectual character (Richert, 2002; Seider, 2012; Baehr, 2012).

  Recent research has sought to empirically distinguish between the different types of character. In one study, Duckworth and colleagues (2014) conducted exploratory and confirmatory factor analyses of questionnaires designed to tap moral, performance, and intellectual character among middle school students. Researchers found support for their predicted three-factor structure of character. That is, moral, performance, and intellectual[42] character items loaded on three separate factors.

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[42] Notably, some of the items that loaded on the intellectual character factor (e.g., "I show enthusiasm"; "I invigorate others") did not seem necessarily relevant to the pursuit of knowledge and understanding.

This raises the question of where intellectual humility might fall within the character taxonomy[43]. Most scholars who write about intellectual humility consider it an intellectual virtue, and thus, it seems most fitting that intellectual humility should be classified as intellectual character (e.g., see Baehr, 2014; Roberts & Wood, 2003). Indeed, the present research provides support for intellectual humility as an intellectual character strength. Those with intellectual humility were consistently more interested in learning (Studies 1-7), more open-minded in considering the opposing view (Studies 1-5), more curious (Study 1) and more motivated to learn than to look smart (Studies 6 & 7). Taken together, their strong learning orientation should make those high in IH better able to expand their knowledge and understanding.

However, in the present research intellectual humility also contributed to civic and performance outcomes. For example, in Studies 1-5 those higher in intellectual humility were more respectful and tolerant of the opposing socio-political view. Openness and willingness to engage in dialogue is a hallmark of effective democratic deliberation (Malin, Jahromi-Ballard, Attai, Colby, Damon, 2014), a key civic outcome. Moreover, the openness of the intellectually humble was not explained by socio-political apathy. On the contrary, those higher in intellectual humility often had stronger convictions about issues than their less intellectually humble peers (Studies 3 & 4). Thus, those higher in intellectual humility were more willing to engage in respectful exchanges around contentious issues. As such, the present research suggests that IH can enhance civic outcomes as well as intellectual ones.

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[43] Scholars of character education widely consider character strengths to encompass thoughts, feelings and actions (Seider, 2012). Thus, when describing IH as character, scholars of character would consider this concept to include the psychological aspects of IH, (acknowledging the partial nature of one's knowledge and valuing others' intelligence) and the behaviors that IH predicts.

Regarding performance character, those higher in IH put forth more effort in school (Study 7), and had more positive beliefs about effort (Study 7). Effort is at the heart of achievement in the performance-character framework (Seider, 2012) and, thus, IH may have contributed to a key performance outcome as well as to intellectual outcomes.

Fostering intellectual humility in school. Research also suggests that education can foster students' character strengths. For example, Seider (2012) demonstrated that each school's character goals can make a difference in terms of the outcomes that students eventually develop. For example, a Boston charter school that sought to develop moral character had students who grew significantly in empathy and integrity over the school year, controlling for Time 1 empathy and integrity (Seider, 2012). A different Boston charter school that focused on cultivating performance character had students who grew significantly in persistence and achievement over the year, controlling for baseline levels of these outcomes (Seider, 2012)[44].

Despite some promising results, character education experts caution that programs are not likely to be successful when they are simply inserted into a school's existing culture and practices. Seider (2012) argues that the "cutting and pasting" of character education curricula across schools, without paying much attention to the school context and culture, led to seven character education programs' failure to produce any significant results in a robust randomized controlled trial (Seider, 2012, p. 220; see also Ruby & Doolittle, 2010). Experts agree that character education programs work best when they are "homegrown", developed by stakeholders to accomplish their particular mission, and

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[44] There was no "no-treatment" control group in this study, but students receiving different "active treatments" of character education did differ in terms of their character outcomes.

when they fully infiltrate the school's culture and practices (Seider, 2012; Berkowitz & Bier, 2005).

What, then, might a school community intent upon cultivating students' intellectual humility do to accomplish their goal? For one, the present research suggests that practices known to foster a growth mindset of intelligence will also foster IH. These practices include direct instruction to teach students that intelligence is malleable (Blackwell et al., 2007), praising students for effort rather than ability (Mueller & Dweck, 1998), and having educators who believe and act according to the belief that each student has intellectual potential (Dweck, 2010).

Beyond cultivating a growth mindset, it's plausible that school cultures that value learning over rote delivery of right answers, and learning over grades and test scores would also help foster IH. Modeling IH may also help to develop it in students. For example, schools in which administrators and teachers readily acknowledged the limitations of their knowledge and are open to learning from others may encourage students to do the same. Moreover, classroom practices that challenge students to respectfully consider both sides of contentious issues might also foster intellectual humility. Identifying and evaluating which practices at the classroom and cultural level work best to foster intellectual humility in schools is an important area for future research.

Ongoing research on IH

To complement and expand the research presented here, I'm currently working on several additional research projects related to IH. First, I'm continuing to refine the intellectual humility scale. Analyses suggested that some scale items were inconsistently

loading across studies, that the scale's factor structure was uncertain, and that the reliability of the scale varied across studies. Thus, I am examining the scale's factor structure and reliability when inconsistently-loading items are removed from the scale.

Second, I'm examining intellectual humility and group work. Building on the findings from Studies 6 & 7 that students higher in intellectual humility reported being more collaborative when working in groups, my ongoing project investigates how intellectual humility relates to students' collaborative behavior. Specifically, I am examining how pairs of students matched for their level of intellectual humility work together on an open-ended task (coming up with a ranked list of the 5 most important things that incoming students in their college need to know to succeed in college), and on a math puzzle. In this study, I am videotaping students' behavior, and collecting their self-reported satisfaction with the interaction. I predict students who are high in intellectual humility will be more respectful and responsive to one another, and will ignore and dismiss their partner's suggestions less frequently. This more reciprocal exchange may lead dyads high in intellectual humility to feel more satisfied with their collaborative experience.

In a third project, I am examining the relation between intellectual humility and remediation. Here, I test whether intellectual humility predicts participants' preferences for redressing an area of intellectual weakness. In one study, participants complete a set of difficult spatial reasoning problems representing three content modules (i.e., angles, cubes, and polygons)[45]. After completing the problems, participants are given predetermined feedback that they did well on two of the modules, but poorly on a third.

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[45] Past research has demonstrated that individuals have difficulty determining whether they have answered these problems correctly (Nussbaum & Dweck, 2008).

Participants are then asked to select a tutorial on one of the three modules. The prediction is that those higher in intellectual humility, given their increased interest in learning, will select the failed module tutorial so that they can expand their knowledge. Preliminary results from one correlational and one experimental study support this hypothesis.

Is intellectual humility always beneficial and can you ever have too much?

Throughout this research, I have focused on the benefits of intellectual humility. But are there circumstances in which intellectual humility might be harmful, or disadvantageous? For example, does IH ever hold someone back from succeeding at work, or make someone seem unknowledgeable or even incompetent? This question could be empirically tested more thoroughly in future researcher. However, it is possible that IH could be detrimental in contexts where intellectual arrogance and rigid certitude are celebrated and rewarded (e.g., in corporate cultures such as Enron's, as described by McClean & Elkind, 2003); however, given the present research and past work on general humility, I would also predict that such contexts are rare and perhaps short-lived. It seems more likely given the evidence presented in this research, and additional research documenting the benefits of general humility for working individuals (e.g., see Owens et al., 2013) that intellectual humility opens people to learning, allows them to face difficult issues and to work better with others – all of which fuels success, and positive relationships with colleagues.

Along the same lines, can one ever have too much intellectual humility? Aristotle wrote that all virtues are the mean between two extreme vices (Aristotle & Kenny, 2011). In the case of IH, some have suggested that having too little intellectual humility would mean having the vice of intellectual arrogance, and having too much IH would mean

having the vice of intellectual diffidence (Samuelson et al., 2012). However, in this research, I did not find any evidence that having too much IH (as assessed by the IH scale) was maladaptive. The associations between IH and adaptive outcomes such motivation and openness were linear indicating that as IH increased, so did benefits. Moreover, those who had higher IH also tended to have stronger convictions about socio-political issues (Studies 3 and 4). This suggests that a high level of intellectual humility does not necessarily make individuals unable to have strong opinions. However, future research could examine possible outcomes of having extremely high intellectual humility.

Conclusion

Currently, social scientists are only on the cusp of understanding the nature and consequences of intellectual humility. The present research attempts to contribute to this emerging field. In this work, intellectual humility fostered more productive responses to disagreements, and was associated with a number of outcomes that are relevant for learning in school. This research also identified beliefs about intelligence as one source of intellectual humility, suggesting that intervening at the level of individuals' beliefs offers one way to shape intellectual humility and related outcomes. Moving forward, many interesting questions about intellectual humility remain open for empirical exploration; indeed, "how little we know, how eager to learn," (Templeton Foundation).

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Table 1: Intellectual humility scale items

1 I am willing to admit it if I don't know something.
2 I like to compliment others on their intellectual strengths.
3   I try to reflect on my weaknesses in order to develop my intelligence.*
4 I actively seek feedback on my ideas, even if it is critical.
5 I acknowledge when someone knows more than me about a certain subject.
6 If someone doesn't understand my idea, it's probably because they aren't smart enough to get it. (R)*
7 I sometimes marvel at the intellectual abilities of other people.*
8   I feel uncomfortable when someone points out one of my intellectual shortcomings. (R)
9 I don't like it when someone points out an intellectual mistake that I made. (R)

*denotes item that was removed for the 6-item scale that had more equal loadings across studies

Table 2: Intellectual Humility in relation to other psychological constructs

Constructs	Definition	Predicted relation to IH	Key differences from IH
Need for Cognition	The tendency to enjoy and engage in thinking Cacioppo & Petty, 1982	Positively related	A person high in IH would likely exhibit a high need for cognition, but the latter does not capture the core elements of IH of acknowledging the intelligence of others, and acknowledging the partial nature of one's knowledge.
Narcissism	Personality trait characterized by a grandiose view of self, sense of superiority, self-absorption and sense of entitlement Emmons, 1987	Negatively related	IH is not merely the lack of self-absorption or superiority that we would expect from someone low in narcissism. IH also captures recognition of intellectual limitations and appreciation of others.
Openness to Experience	Personality dimension captures a tendency to be curious, imaginative, an independent thinker who is amenable to new ideas, appreciates art, novelty and adventure. John, Donahue, & Kentle, 1991	Positively related	Openness to experience emphasizes an individual's preference for novelty in life. As such, it does not capture the key dimensions of IH that involve recognizing others' intelligence and recognizing the limitations of one's knowledge.
Need for Closure	A person's desire for a firm answer to questions and an aversion toward ambiguity. Webster & Kruglanski, 1994	Negatively related	Although a person's need for cognitive closure may sabotage IH, absence of need for closure does not necessarily lead to presence of IH.

Modesty	Letting one's accomplishments speak for themselves, not seeking the spotlight; not regarding oneself as more special than one is. Park, Peterson & Seligman, 2004	Positively related	Modesty differs from IH in its focus on social awareness and not drawing too much attention to oneself. By contrast, the central features of IH concern how one thinks about their own and others' knowledge and intelligence.
General Humility	Having an accurate view of one's abilities and limitations, appreciation of others' abilities, sense of personal finiteness. Bollinger, 2010	Positively related	General humility is a broader humility construct than IH. It involves having an accurate view of one's abilities and limitations and a general sense of personal finiteness in many domains. By contrast, IH is focused on the intellectual domain.
Epistemic Curiosity	The drive to know. Litman & Spielberger, 2003	Positively related	Epistemic curiosity does not necessarily imply that one acknowledges the partial nature of their understanding, and the value of others' intelligence.

Table 3: Study 1 correlations, means and standard deviations

		1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	Intellectual humility	1													
2	Need for closure	-.075	1												
3	Narcissism	-.064	.376**	1											
4	Need for cognition	.284**	-.111	-.003	1										
5	Openness to experience	.260**	.038	.172*	.441**	1									
6	Conscientiousness	.357**	.123	.173*	.260**	.281**	1								
7	Extraversion	.111	-.073	.426**	.157*	.030	.170*	1							
8	Agreeableness	.368**	-.267**	-.058	.051	.177*	.353**	.214**	1						
9	Emotional stability	-.204**	.337**	-.103	-.201**	.070	-.297**	-.278**	-.212**	1					
10	Epistemic curiosity	.416**	-.065	.021	.621**	.590**	.348**	.061	.233**	-.152*	1				
11	General humility	.423**	-.151*	-.141	.358**	.333**	.290**	.079	.314**	-.155*	.346**	1			
12	Self-esteem	.110	.113	.480**	.158*	.174*	.355**	.360**	.080	-.395**	.193**	.070	1		
13	Confidence	.167*	.034	.431**	.320**	.232**	.327**	.281**	.111	-.369**	.269**	.214**	.670**	1	
14	Mindset	.281**	-.118	-.018	.177*	.256**	.222**	.130	.288**	-.062	.224**	.260**	.056	.155*	1
	M (sd)	4.86 (.75)	4.43 (.89)	4.30 (.84)	4.31 (.96)	5.36 (1.01)	5.31 (.98)	4.22 (1.38)	5.24 (.97)	4.08 (1.31)	5.00 (1.07)	4.67 (.56)	4.34 (1.64)	4.73 (1.44)	5.14 (1.30)

**Correlation is significant at the 0.01 level (2-tailed).

*Correlation is significant at the 0.05 level (2-tailed).

Mindset is beliefs about intelligence; Confidence is confidence in intelligence; Emotional stability is scored such that higher scores indicate lower emotional stability

Table 4: Study 2 correlations, means and standard deviations

		1	2	3	4	5	6	7	8	9	10	11	12	13
1	Intellectual humility	1												
2	Need for closure	-.176*	1											
3	Narcissism	-.197**	-.028	1										
4	Need for cognition	.406**	-.375**	.034	1									
5	Openness to experience	.404**	-.244**	-.009	.632**	1								
6	Conscientious	.253**	.140	-.137	.156*	.097	1							
7	Extraversion	.184*	-.141	.374**	.123	.127	.110	1						
8	Agreeableness	.406**	-.089	-.334**	.148*	.165*	.416**	.161*	1					
9	Emotional stability	.311**	-.276**	.178*	.249**	.163*	.411**	.380**	.247**	1				
10	Modesty	.310**	.096	-.557**	.102	.114	.361**	-.257**	.467**	.065	1			
11	Self-esteem	.228**	-.138	.114	.203**	.103	.469**	.321**	.344**	.549**	.160*	1		
12	Confidence	.111	-.036	.240**	.312**	.179*	.175*	.158*	.018	.373**	-.089	.404**	1	
13	Mindset	.358**	-.236**	-.191**	.334**	.339**	.192**	.027	.322**	.190**	.164*	.228**	.041	1
	M (sd)	4.79 (.86)	4.36 (.94)	1.28 (.21)	4.72 (1.07)	5.52 (1.11)	5.22 (1.04)	3.67 (1.44)	5.14 (1.06)	4.32 (1.33)	4.95 (.94)	5.01 (1.21)	1.80 (.32)	4.90 (1.40)

*Correlation is significant at the 0.05 level (2-tailed).

**Correlation is significant at the 0.01 level (2-tailed).

Mindset is beliefs about intelligence; Confidence is confidence in intelligence; Emotional stability is scored such that higher scores indicate lower emotional stability

Table 5: Study 3 correlations, means and standard deviations

		1	2	3	4	5	6	7	8	9
1	Intellectual humility	1								
2	Mindset	.156*	1							
3	Learning goals	.533**	.305**	1						
4	Attitude strength	.201*	.046	.086	1					
5	Baseline knowledge	.129	.033	.192*	.301**	1				
6	Political engagement	.226**	.190*	.313**	.206**	.343**	1			
7	Political ideology	-.030	-.017	-.063	-.051	.014	-.122	1		
8	Matching reasons	.183*	.017	.077	.007	.002	.099	-.090	1	
9	Opposing reasons	.168*	.052	.118	.090	-.016	.107	-.065	.761**	1
	M (sd)	4.90 (.65)	4.83 (1.60)	5.80 (1.14)	81.90 (19.68)	60.25 (23.52)	4.56 (1.51)	3.66 (1.71)	1.28 (2.07)	1.50 (2.34)

*Correlation is significant at the 0.05 level (2-tailed).

**Correlation is significant at the 0.01 level (2-tailed).
Mindset is beliefs about intelligence with higher values indicating more of a growth mindset; baseline knowledge is incoming knowledge about issues; attitude strength, and baseline knowledge are averaged across issues

Table 6: Study 4 correlations, means and standard deviations

		1	2	3	4	5	6	7	8	9	10
1	Intellectual humility	1									
2	Mindset	.299**	1								
3	Learning goals	.579**	.184	1							
4	Attitude strength	.352**	.169	.416**	1						
5	Issue importance	.322**	.282*	.387**	.540**	1					
6	Baseline knowledge	.332**	.172	.347**	.532**	.645**	1				
7	Political engagement	.273*	.271*	.409**	.303**	.497**	.622**	1			
8	Political ideology	.042	.013	-.088	-.144	.036	.128	.215	1		
9	Matching reasons	.141	-.010	.289**	.233*	.162	.130	.131	-.106	1	
10	Opposing reasons	.221	.061	.247*	.191	.235*	.018	.259*	-.118	.640**	1
	M (sd)	4.91 (.95)	4.62 (1.59)	5.76 (1.25)	75.88 (16.47)	4.46 (1.34)	4.45 (1.28)	4.47 (1.67)	3.46 (1.76)	3.37 (1.71)	2.16 (1.08)

*Correlation is significant at the 0.05 level (2-tailed).

**Correlation is significant at the 0.01 level (2-tailed).

Mindset is beliefs about intelligence with higher values indicating more of a growth mindset; baseline knowledge is incoming knowledge about issues; attitude strength, baseline knowledge and issue importance are averaged across issues

Table 7: Study 6 correlations, means and standard deviations

		1	2	3	4	5	6	7	8	9	10	11	12	13
1	Intellectual humility	1												
2	Learning goals	.417**	1											
3	Normative ability goals	-.432**	-.195	1										
4	Normative outcome goals	-.135	.117	.621**	1									
5	Ability goals	-.010	.288*	.414**	.481**	1								
6	Intrinsic goal orientation	.273*	.660**	-.129	.091	.113	1							
7	Test anxiety	-.165	-.215	.113	-.033	.062	-.440**	1						
8	Metacognitive self-regulation	.339**	.525**	-.040	.131	.183	.567**	-.441**	1					
9	Effort regulation	.243*	.494**	-.085	.253*	.209	.573**	-.510**	.700**	1				
10	Valuing group work	.235	.198	.011	.184	.263*	.073	.162	.204	.124	1			
11	Cooperation in groups	.467**	.275*	-.264*	-.014	.149	.064	.095	.166	.009	.131	1		
12	Confidence in intelligence	.133	.502**	.077	.275*	.227	.580**	-.431**	.510**	.503**	.273*	.081	1	
13	Self-esteem	.138	.269*	.093	.319**	.295*	.345**	-.509**	.361**	.496**	.244*	.230	-.004	1
	M (sd)	4.92 (.63)	5.59 (.90)	3.02 (1.92)	4.10 (1.31)	4.62 (1.27)	5.23 (.99)	3.87 (1.12)	4.53 (.81)	4.71 (1.18)	4.72 (1.02)	5.02 (.76)	5.29 (1.23)	5.12 (1.45)

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Table 8: Study 7 self-report correlations, means and standard deviations

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	Intellectual humility	1														
2	Learning goals	.357**	1													
3	Normative ability goals	-.226*	.193	1												
4	Normative outcome goals	.014	.431**	.598**	1											
5	Ability goals	.260*	.623**	.371**	.485**	1										
6	Intrinsic motivation	.249*	.556**	.116	.347**	.492**	1									
7	Effort beliefs	.302**	.503**	.064	.270*	.360**	.430**	1								
8	Metacognitive self-regulation	.471**	.705**	.043	.249*	.534**	.463**	.464**	1							
9	Effort regulation	.337**	.589**	.077	.279**	.531**	.531**	.520**	.736**	1						
10	Help seeking	.290**	.367**	-.076	.164	.306**	.303**	.479**	.516**	.517**	1					
11	Valuing group work	.122	.088	-.279**	-.123	-.102	.061	.112	.132	.030	.131	1				
12	Cooperation in groups	.405**	.126	-.559**	-.239*	-.089	.077	.055	.222*	.205	.054	.444**	1			
13	Confidence in intelligence	.296**	.633**	.165	.258*	.472**	.563**	.443**	.530**	.439**	.440**	.072	.047	1		
14	Self-esteem	.375**	.240*	-.013	-.030	.194	.199	.260*	.401**	.243*	.339**	.240*	.168	.587**	1	
15	Average grades	.115	.492**	.278**	.423**	.484**	.403**	.291**	.323**	.417**	.222*	-.209	-.175	.339**	.124	1
	M(sd)	4.56 (.74)	4.42 (1.34)	2.74 (1.51)	4.31 (1.66)	4.49 (1.46)	4.10 (1.57)	5.55 (1.30)	4.40 (1.11)	4.58 (1.35)	4.76 (1.45)	5.06 (1.55)	5.12 (1.26)	4.77 (1.74)	4.39 (1.83)	84.60 (10.78)

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Table 9: Study 7 other-report correlations, means and standard deviations

		1	2	3	4	5	6	7
1	Intellectual humility	1						
2	Positive peer nominations	.184	1					
3	Peer nominations: bully	.052	-.116	1				
4	Peer nominations: picked on	-.063	-.150	.003	1			
5	Teacher report IH	-.042	.058	-.070	-.173	1		
6	Teacher report engagement	.148	.497**	-.246*	-.097	.257*	1	
7	Average grades	.115	.568**	-.176	-.038	-.048	.832**	1
	M(sd)	4.68 (.93)	.94 (.88)	.11 (.47)	.29 (.99)	4.89 (1.13)	4.82 (1.64)	84.60 (10.78)

**. Correlation is significant at the 0.01 level (2-tailed).

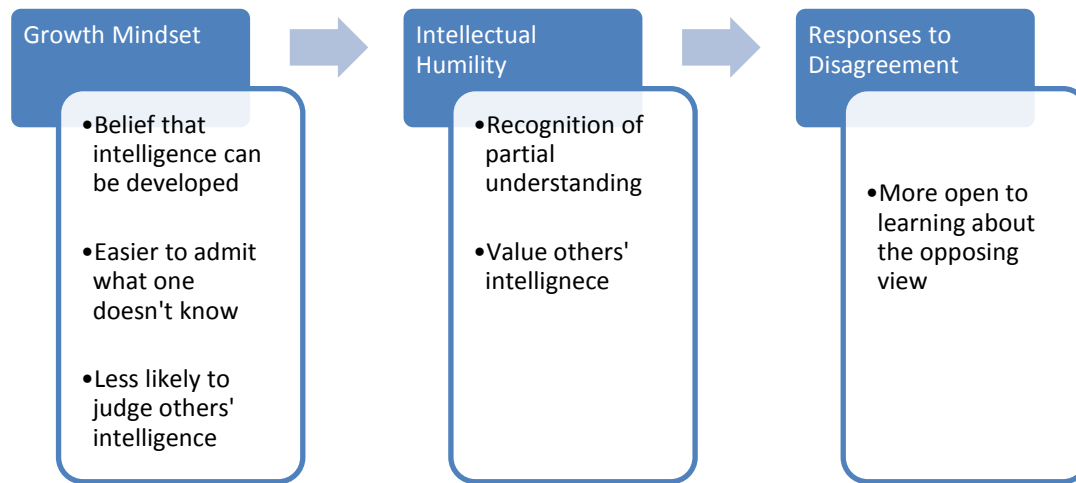*. Correlation is significant at the 0.05 level (2-tailed).

Figure 1. Hypothesized model of the relation between beliefs about intelligence, intellectual humility, and responses to disagreement.
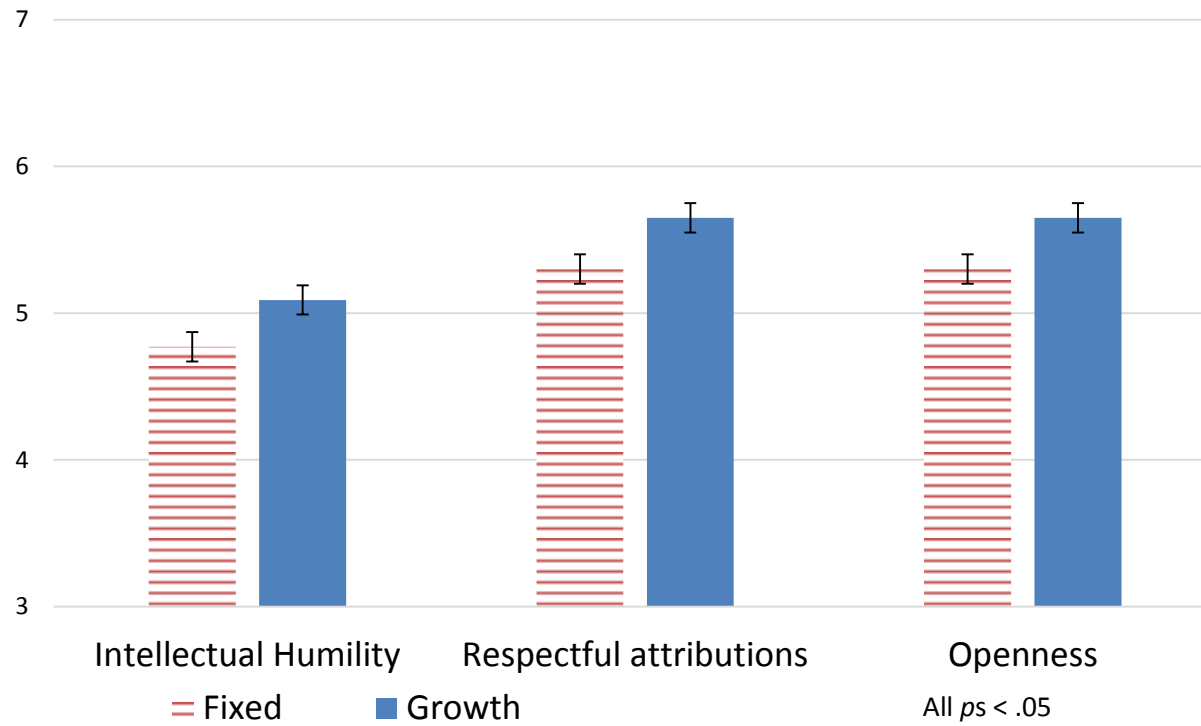
Figure 2: Effect of mindset condition (fixed vs. growth) on intellectual humility, respectful attributions, and openness in Study 5
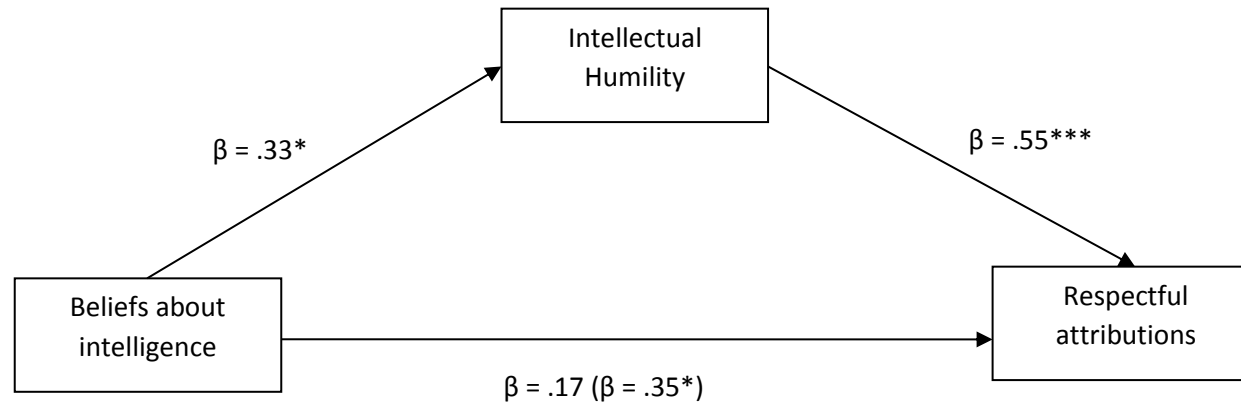
Figure 3. Mediation of IH on beliefs about intelligence, and respectful attributions, Study 5. *Note:* Fixed mindset coded as 0; growth mindset coded as 1. The parenthetical numbers indicate betas before including the mediator. ***p <.001; **p <.01; *p <.05.
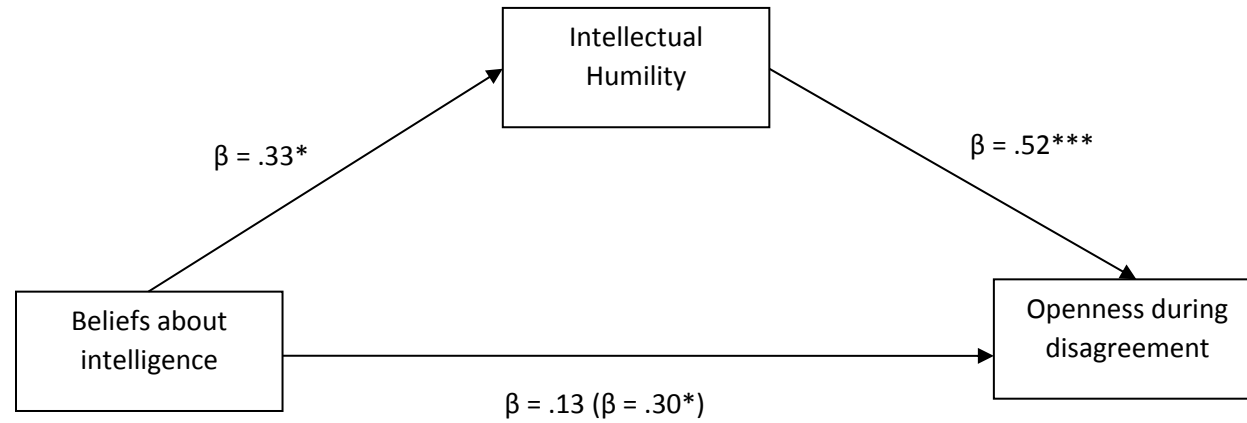
Figure 4. Mediation of IH on beliefs about intelligence and openness in disagreement, Study 5. *Note:* Fixed mindset coded as 0; growth mindset coded as 1. The parenthetical numbers indicate betas before including the mediator. ***p <.001; **p <.01; *p <.05

Appendix A

Intellectual Humility Scale
- Original 23 items (12 items reverse-scored so that higher scores indicate greater intellectual humility)
- Answered on a 7-point Likert scale anchored at 1(*not at all true of me*) and 7(*extremely true of me*)

1. I am willing to admit if I don't know something.
2. I know that I can learn a lot from other people.
3. I like to compliment others on their intellectual strengths.
4. When working on a project with others, I usually have the best ideas. (R)
5. I want people to know that I am an intelligent person. (R)
6. I don't like it when someone points out an intellectual mistake that I made. (R)
7. I can learn from others' ideas, even if I disagree with those ideas.
8. I am more intelligent than most people my age. (R)
9. If I'm in an intellectual disagreement, I usually find merit in the other person's point of view.
10. If I make a mistake, I become concerned that other people will think I'm stupid. (R)
11. At work or school, I actively seek feedback on my ideas, even if it is critical.
12. I acknowledge when someone knows more than me about a certain subject.
13. It's easy for me to 'out-smart' others. (R)
14. I am usually open to revising my beliefs and ideas.
15. If I do something smart, I only feel that it is an accomplishment if other people know about it. (R)
16. I like proving to others how smart I am. (R)
17. I don't like working with people who are not as smart as I am. (R)
18. If someone doesn't understand my idea, it's probably because they aren't smart enough to get it. (R)
19. I sometimes marvel at the intellectual abilities of other people.
20. I care more about pursuing knowledge than about being rewarded by others for my intelligence.
21. It makes me feel uncomfortable when someone points out one of my intellectual shortcomings. (R)
22. I try to reflect on my weaknesses in order to develop my intelligence.
23. I am often aware of the intellectual stupidity of others. (R)

Appendix B

Supplementary analysis of a 2-factor IH Scale in Study 7
Given the low reliability of the IH scale in the present study and the questionable

factor structure of the scale, I tested the associations between the dependent variables and

2 IH factors. One factor had all positive indicators of IH (6 items, $\alpha = .63$; e.g., "I am

willing to admit it if I don't know something"; "I actively seek feedback on my ideas

even if it is critical"; "I like to compliment others on their intellectual strengths"). And a

second factor of all negative indicators of IH (3 items, $\alpha = .55$[46]; "I don't like it when

someone points out an intellectual mistake that I made"; "I feel uncomfortable when

someone points out one of my intellectual shortcomings"; "If someone doesn't

understand my idea, it's probably because they're not smart enough to get it"). The two

factors were not correlated, $r = .01$, ns.

What did the negative indicators of IH predict? See Table 1 for all

correlations, means and standard deviations of the 2-factor IH scale with self-report

outcomes. See Table 2 for results on the other-report outcomes.

The composite of negative indicators was positively associated with overall

grades, $r = .24$, $p = .03$, but was not associated with growth in grades over time, $p = .45$.

The negative indicators of IH were marginally positively associated with teacher-reported

engagement, $r = .18$, $p = .09$, but were not associated with peer nominations, $r = .17$, $p = $

$.15$[47].

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[46] Alpha increases to .66 when one item, "If someone doesn't understand my idea it's probably because
they're not smart enough to get it", is dropped. The correlation between these two items was $r = .49$, p
$<.001$.
[47] These marginal associations seemed to be driven by two of the items ("I don't like it when someone
points out an intellectual mistake that I made" and "I feel uncomfortable when someone points out one of

Notably, the correlation between IH and grades remained significant controlling for the positive indicators of IH, $r = .25$, $p = .02$. This suggests that the positive and negative IH factors explained independent variance in students' achievement.

Regarding students' motivation, the negative indicators of IH were associated with normative outcome and normative ability goals, rs = .21 and .49, ps < .05, and were not associated with learning goals, $r = -.09$, $p = .39$.

What did the positive indicators of IH predict? The composite of positive indicators of IH was also positively associated with peer nominations, teacher-reported engagement, overall grades, and growth in grades over time, rs from .29 to .32, all ps < .05. These correlations remained significant when controlling for the negative indicators of IH, again demonstrating that each factor of the scale independently predicted grades. Moreover, the positive indicators of IH were positively associated with learning goals, $r = .48$, $p < .001$, and were not associated with either type of performance goal, all ps > .10.

Two possible paths to achievement. Next I tested whether achievement goals would help explain the associations between the two IH factors and achievement. Starting with the negative indicators of IH, a bias-corrected bootstrap mediation model with 5000 bootstrap re-samples and 95% confidence interval supported the role of performance goals (a composite of normative ability and normative outcome goals) in mediating the relation between the negative indicators of IH and achievement, $B = 1.46$; $CI = .58$ to 2.82.

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my intellectual shortcomings"). The third item, "If someone doesn't understand my idea it's probably because they're not smart enough to get it," was not associated with any of the outcomes, ps > .70.

By contrast, a bootstrapping analysis supported the mediating role of learning goals in the relation between the positive indicators of IH and achievement, $B = .2.90$; $CI = 1.45$ to 5.32.

I also tested whether learning goals mediated the effect of the positive indicators of IH on students' growth in achievement. That is, whether the positive indicators of IH boosted students' motivation to learn, which, in turn, increased their growth in achievement over the school year. For this test, I entered intellectual humility as a predictor of learning goals, and learning goals as a predictor of growth in grades, controlling for students' baseline achievement. The model had questionable fit $\chi^2(83, N = 87) = 291.89$, $p < .05$, RMSEA $= .13$, CFI $= .79$, TLI $= .76$, and all paths in the model were statistically significant, $p < .05$. Although tentative given the low model fit, there was a significant indirect effect ($p = .01$) suggesting that the positive indicators of intellectual humility boosted students' motivation to learn, which in turn increased their achievement over time.

Summary of Findings

In Study 7, high school students higher in the positive indicators of IH received a greater number of positive peer nominations, and had higher teacher-reported engagement in learning. They also had higher overall achievement and greater growth in achievement over the school year, which may have been fueled by their strong learning goals. However, students higher in the negative indicators of IH – specifically, students who felt uncomfortable when others noticed their intellectual mistakes – also had higher overall achievement, but their achievement may have been fueled by a heightened motivation to look smart.

Discussion of supplemental analyses

Although tentative, supplemental analyses of the intellectual humility scale suggested that the null findings observed in Study 7 with the 9 item IH scale may have resulted because the IH scale tapped two distinct factors. If so, the null findings may have been largely the result of the separate factors in the IH scale cancelling out the effect of other factors. The IH scale had lower internal consistency in Study 7 than in past studies, suggesting that the items in this scale did not hold together as one construct as they had (to some extent) in previous studies. Moreover, the positive indicators of IH and the negative indicators of IH loaded on separate factors, and these factors were not correlated.

The separate IH factors were uniquely associated with various outcomes. A composite of the positive indicators of IH was positively associated with positive peer nominations and with teacher-reported engagement in school. At the same time, the negative indicators of IH (in their raw, non-reverse-scored form) were also marginally positively associated with these outcomes. Thus, when the negative indicators of IH were reverse-coded and combined with the positive indicators, the associations between IH and the outcomes were muted.

This effect was even more pronounced for academic achievement. The composite of negative indicators of IH and the composite of positive indicators of IH were both positively associated with higher achievement. Each of these correlations remained significant controlling for the effect of the other composite. This suggests that both IH composites explained significant and unique variance in achievement.

Moreover, the positive and negative indicators of IH related to different achievement goals. The negative indicators of IH were positively associated with performance goals and were not related to learning goals. By contrast, the positive indicators of IH were positively associated with learning goals, and were not related to performance goals.

Conclusion

What, then, can be said about the relation between IH and achievement? The present 2-factor analyses suggest that even though both positive and negative markers of IH can result in higher grades, the respective paths to achievement look very different. Those higher in positive indicators of IH may have ended up with better grades because they were highly motivated to learn. By contrast, those higher in the negative indicators of IH may have ended up with better grades because they were highly motivated to look smarter than others. Past research suggests that the latter motivational profile is more fragile, and can foster a helpless response when students encounter challenging situations in which they may fear appearing unintelligent (Dweck, 1999). Thus, the positive markers of IH appear to contribute to achievement by fostering a more adaptive and durable type of motivation.

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Table 1: Study 7, 2-factor IH scale self-report correlations, means and standard deviations

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1	IH positive indicators	1															
2	IH negative indicators	.010	1														
3	Learning goals	.482**	.093	1													
4	Normative ability goals	.044	.486**	.193	1												
5	Normative outcome goals	.148	.207*	.431**	.598**	1											
6	Ability goals	.443**	.210	.623**	.371**	.485**	1										
7	Intrinsic motivation	.321**	.040	.556**	.116	.347**	.492**	1									
8	Effort beliefs	.238*	-.185	.503**	.064	.270	.360**	.430**	1								
9	Metacognitive self-regulation	.557**	-.002	.705**	.043	.249*	.534**	.463**	.464**	1							
10	Effort regulation	.384**	-.024	.589**	.077	.279**	.531**	.531**	.520**	.736**	1						
11	Help-seeking	.313**	-.047	.367**	-.076	.164	.306**	.303**	.479**	.516**	.517**	1					
12	Valuing group work	-.035	-.277**	.088	-.279**	-.123	-.102	.061	.112	.132	.030	.131	1				
13	Cooperation in groups	.167	-.486**	.126	-.559**	-.239*	-.089	.077	.055	.222*	.205	.054	.444**	1			
14	Confidence in intelligence	.421**	.111	.633**	.165	.258*	.472**	.563**	.443**	.530**	.439**	.440**	.072	.047	1		
15	Self-esteem	.409**	-.059	.240*	-.013	-.030	.194	.199	.260*	.401**	.243*	.339**	.240*	.168	.587**	1	
16	Grades	.287**	.240*	.492**	.278**	.423**	.484**	.403**	.291**	.323**	.417**	.222*	-.209	-.175	.339**	.124	1
	M(sd)	4.68 (.93)	3.69 (1.21)	4.42 (1.34)	2.74 (1.51)	4.31 (1.66)	4.49 (1.46)	4.10 (1.57)	5.55 (1.30)	4.40 (1.11)	4.58 (1.35)	4.76 (1.45)	5.06 (1.55)	5.12 (1.26)	4.77 (1.74)	4.39 (1.83)	84.60 (10.78)

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Table 2: Study 7, 2-factor IH scale other-report correlations, means and standard deviations

		1	2	3	4	5	6	7	8
1	IH - positive indicators	1							
2	IH - negative indicators	.010	1						
3	Positive peer nominations	.316**	.156	1					
4	Peer nominations - bully	-.035	-.148	-.116	1				
5	Peer nominations - picked on	-.072	.005	-.150	.003	1			
6	Teacher report IH	-.048	.001	.058	-.070	-.173	1		
7	Teacher report engagement	.286**	.181	.497**	-.246*	-.097	.257*	1	
8	Grades	.287**	.240*	.568**	-.176	-.038	-.048	.832**	1
	M(sd)	4.68 (.93)	3.69 (1.21)	.94 (.88)	.11 (.47)	.29 (.99)	4.89 (1.13)	4.82 (1.64)	84.60 (10.78)

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).