

5-2018

Ways of Knowing: An Exploration of the Epistemological Development of Undergraduates

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WAYS OF KNOWING: AN EXPLORATION OF THE EPISTEMOLOGICAL
DEVELOPMENT OF UNDERGRADUATES

A thesis

Presented to

The School of Social Sciences, Education & Business

Department of Higher Education and Student Development

Taylor University

Upland, Indiana

In Partial Fulfillment

of the Requirements for the Degree

Master of Arts in Higher Education and Student Development

by

Eli Casteel

May 2018

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**Higher Education and Student Development
Taylor University
Upland, Indiana**

CERTIFICATE OF APPROVAL

MASTER'S THESIS

This is to certify that the Thesis of

Eli Casteel

entitled

Ways of Knowing: An Exploration of Epistemological
Development of Undergraduates

has been approved by the Examining Committee for the thesis requirement for the

Master of Arts degree
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Abstract

Today, the United States is polarized; people cannot agree on facts or how they know their facts. This study was aimed at researching how people know and the development of an epistemic lens, that is, how they know what they know. Literature suggests many undergraduates understand the world as either black and white or relativistic (King & Kitchener, 1994). However, through educational experiences some students move beyond relativistic thinking. The purpose of this study was to explore and understand the significance of an undergraduate course on ways of knowing. The study investigated the experience of undergraduates and how a course on epistemology affected their own epistemic lens. The study implemented a phenomenological design to capture the shared learning experience. Therefore, the following question guided the study: How does an undergraduate course on ways of knowing affect a student's epistemic lens? Notable findings from the study include the importance of diversity of thought in class discussions, a strengthening of worldviews, and an increased value on uncertainty. Implications for the study are an increase in exposure to diverse thoughts and experiences, an increase in self-awareness and understanding of others, and a cultivation of critically engaged individuals.

Acknowledgements

I would like to thank Kirin, my future wife, for her enduring care and eternal encouragement. I am also indebted to my life-long friends, Angela and Kevin Gleim, for their graciousness and willingness to persist through poor writing and provide thoughtful revisions. I am grateful to my family and, specifically my brother, who helped me develop keen insights. I am appreciative to my supervisor, Scott Moeschberger, and his faithful support to the project.

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Chapter 1

Introduction

Students studying in America live in a climate of “alternative facts” and “fake news,” where students protest and spread violence over speaker selections, where tolerance is perceived as an imperialistic ideology, and where conservatism is equated with being backwards. According to a study by Pew Research Center (2014), Americans in 2014 were more ideologically polarized than in the past 20 years. The trend seems to be growing, and according to the Higher Education Research Institute at UCLA, the class of 2016 is one of the most politically polarized cohorts in last 50 years (Eagan, et al., 2017). It is fair to say there is considerable misunderstanding between people regarding what they believe and how they adopted certain perspectives. Understanding how people view truth and different ways of knowing is essential to bridging gaps between people groups. Higher education is not a panacea to the problem. Rather, it plays a role in shaping the current climate and the future.

How students engage with concepts around knowing is more important than ever in today’s culture. How people know what they know has grown in importance as individuals are inundated with varying sources of information, different forms of arguments, and increasing diversity. According to an article by the National Public Radio, college students struggle to detect bias within news sources like tweets (Domonoske, 2016). Today, students have access to more information than ever before

in human history. To understand how students know what they know and how students view concepts like certainty, truth, and sources of knowledge is imperative for higher education. The development of critical thinking is often described as an important outcome of higher education (Bok, 2013). Understanding students' epistemological outlook is essential to developing critical thinking in graduates who can then communicate their ideas clearly and navigate complex issues.

Higher education research illustrates an evolving trend in how individuals understand what they know and how they approach certainty. The basic arc of this developmental progression starts with students who are dualistic thinkers; they perceive certainty and truth as tied to the source of authority (Baxter Magolda, 2004; King & Kitchener, 2004; Kuhn, 2000). Next, the epistemic lens morphs into a relativistic understanding of certainty and sources of truth (King & Kitchener, 2004). Finally, if the individual continues to develop their epistemic understanding, the student transitions into a reflective stage of knowing where certainty is understood in terms of probability and where sources of knowledge are weighed on merit (King & Kitchener, 2004; Kuhn, 2000). According to King and Kitchener (2004), the developmental arc of college students is that they start in the dualistic phase of thinking about knowing, and by the end of their time in college, they emerge into the relativistic stage. A relativistic understanding of knowledge does not align with the goal of higher education or what is needed to equip students to engage in a technological age swamped with information.

Multiple studies support the claim that education assists in the process of developing a student's epistemic lens (Hofer & Pintrich, 1997). It is important for centers of education to support the development of students' epistemic lens. A course on

epistemology is potentially a way of evolving students' understanding of investigating how they know what they know. Such an education equips students to engage meaningfully in the world. As the world continues to change more rapidly, students' ability to understand varying sources of knowledge and analyze them will become increasingly important. The exploration of epistemologies allows for conversations and debates to happen at a deeper level, which provides a clearer understanding of how others understand reality.

Purpose Statement

The purpose of this study was to understand how studying ways of knowing affects a student's epistemic lens. The research project explained how students devolve, stagnate, or evolve in their understanding of sources of knowledge. This study explored the shared experience of students' attitudes towards epistemology. The study was guided by the following question: How does an undergraduate course on ways of knowing affect a student's epistemic lens?

Chapter 2

Literature Review

Introduction

Higher education is concerned with the development of students. Scholars within the field are well aware that development occurs before students arrive on college campuses and hopefully continues long after they leave their respective institutions. This understanding means scholarly research on the subject of epistemological development (how one knows) is not necessarily limited or confined to the traditional four years a student is enrolled in college because development is broader than any one discrete period of time. Therefore, the scope of this literature review starts with the broad perspective of examining the topic of epistemology, and then specifically considers two schools of thought within epistemology. The first perspective—declarative knowledge—explores the objective nature of epistemology (Greene, Azevedo, & Torney-Purta, 2008; Hofer, 2001; Kuhn, 1999; Neuhouser, 2001). The second viewpoint—personal epistemology—investigates how students construct their own ways of knowing (Baxter Magolda, 2004; King & Kitchener, 1994). Contained within the lens of personal epistemology is developmental knowing, which studies how a student-constructed epistemic lens develops. The literature then discusses how epistemic change occurs and, finally, ends with a conversation on the intersection of epistemology and the classroom. Figure 1 depicts the schools of thought and their connections.

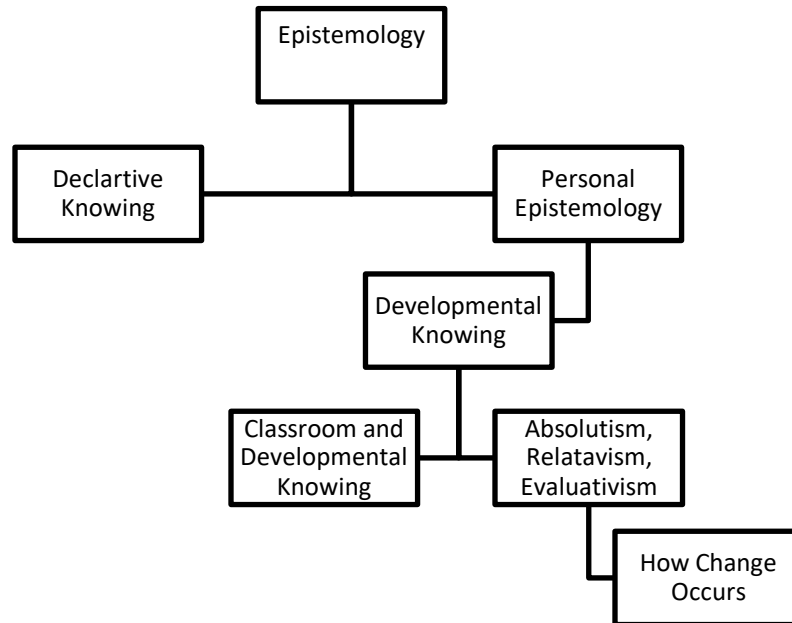


Figure 1. Epistemology school of thought tree.

Epistemology

Epistemology originates from the Western tradition of thinking about thinking. The act of thinking about thinking is a metacognitive process (Bendixen & Rule, 2004). Epistemic scholarship is a field of study within metacognition. Epistemology is the study of how a person knows, or the study of knowing (Kuhn, 1999). Epistemology is often associated with the phrase “how a person knows what they know” and typically involves concepts such as justification and sources of knowing. Some authors, like Bradley and Howell (2011), understand knowledge as belief justified, which is to assert a set of valid and logical reasons for why a person holds their beliefs. Bradley and Howell (2011) and other thinkers fall into the school of thought of declarative knowing, which is more concerned with the justification and logical reasoning of knowing (Greene et al., 2008; Hofer, 2001; Kuhn, 1999; Neuhouser, 2001). Another school of thought within epistemic inquiry is developmental knowing, a branch focused on how an individual processes and

understands different sources of knowing (Baxter Magolda, 2004; King & Kitchener, 1994). Both schools of thought (declarative knowing and developmental knowing) focus on various sources of knowledge. Bradley and Howell (2011) outlined four distinct types of sources of knowledge: priori knowledge (innate), posteriori knowledge (experience), intuition, and authority.

Declarative Knowing

Declarative knowing is a branch of epistemic studies, which follows a more traditional philosophical understanding of epistemology. Greene et al. (2008) argued that philosophical epistemology is the study of how we know what we know and has less to do with knowing and more to do with the justification of knowing. The concept of objectivity delineates the primary difference between developmental knowing and the declarative knowing. While justification operates in the realm of valid arguments and sound reasoning, developmental knowing is the process of how a person's perspective and understanding of knowing changes. Therefore, declarative knowing thinkers are principally concerned with the justification of knowing.

Objectivity is an assumption within the declarative knowing perspective. A common assumption within declarative knowing scholarship is a modern understanding of reality. This modern approach to reality is exhibited by the concept of separate-knowing, which is the detached and impersonal idea that there is a limited number of valid sources of knowing and they need to be verifiable (Hofer, 2001). Neuhouser (2001) argued that there are four ways of substantiating knowledge: empiricism using the five senses; authority; reason (logic); and intuition. The key to Neuhouser's claim is not his argument regarding the four sources of knowledge but, rather, the idea that knowledge

needs to be substantiated. Therefore, the idea of justification is a clear marker of the declarative knowing school of thought for epistemic studies.

It is similarly true that clear, rational, and logical arguments justify knowledge. Therefore, declarative knowledge understands epistemology consistently through a procedural approach. Procedural knowing is how to justify knowing (Kuhn, 1999). A simple way of understanding procedural knowing is comparing it to a mathematical equation or cooking instructions. It is a step-by-step approach with clear litmus tests and guidelines along the way that communicate back to the thinker whether the knowledge is true, valid, and sound. Declarative knowing thinkers view epistemology as the nature and justification of human knowledge (Hofer, 2001). This school of thought contends that thinkers change their perspective through arguments and reasoning through beliefs (Kuhn, 1999).

To reiterate, the epistemic approach of declarative knowing exemplifies a modern and rational understanding of reality, which claims individuals change perspectives through valid truth claims. Therefore, declarative knowing is inherently more of an objective approach to epistemology.

Personal Epistemology

In contrast to declarative knowledge is personal epistemology. Personal epistemology, which contains the school of thought of developmental knowing, is a more subjective approach to epistemology. It is less concerned with the justification of a claim and more concerned with the sources of knowledge and changing nature of how people understand the sources of knowledge. Bendixen and Rule (2004) tied personal epistemology into beliefs about certainty and sources of knowledge. Whereas declarative

knowing is a descriptive approach that relates less to one's perception of reality and more to the nature of reality, the personal epistemology view is a constructed reality that relates to the perception of reality.

Personal epistemology is a widening of perspective. King and Kitchener (2004) submit that a person's epistemic lens determines interpretation. Therefore, the school of thought of personal epistemology sees perception as evolving, thus influencing the limits and certainty of knowledge. Instead of exclusively using logic and objective knowing as in declarative knowing, personal epistemology is open to other forms of knowing. For example, Chinn, Buckland, and Samarpungavan (2011) argued personal epistemology includes other sources of knowing like testimony, revelation, and memory. Those sources are all enmeshed within a person's perception, which is a clear example of how the epistemic perspective of personal epistemology is concerned with how individuals relate to and perceive knowing.

Developmental knowing. Comprised within the literature of personal epistemology is developmental knowing. Some prominent scholars within this subfield of personal epistemology are Baxter Magolda on identity development, King and Kitchener on reflective thinking, and Perry on moral development. A shared assumption between personal epistemology and developmental knowing is that people construct meaning as they interact with their environment, which then, in turn, changes their perception of their own environment. Individuals actively interpret and attempt to make meaning of their experience (Baxter Magolda, 2004; King & Kitchener, 1994). Meaning-making is a critical component within developmental knowing. As individuals adjust how they make meaning of sources of knowledge, their understanding of the sources

themselves may shift simultaneously (Hofer & Pintrich, 1997). Therefore, developmental knowing as an epistemic branch primarily addresses the understanding of how individuals approach sources of knowledge that inform their views of truth.

As a discipline within personal epistemology, developmental knowing points to a general trend in how individuals develop and understand knowing. The trajectory moves between three broad and multifaceted phases: first to absolutism, then to relativism, and finally to evaluativism (Bendixen & Rule, 2004). This epistemic path of absolutism to relativism to evaluativism is complex and integrated, and the route of development does not happen lock step, so multiple phases could present themselves at one time (Bendixen & Rule, 2004; King & Kitchener, 2004).

Developmental knowing as a field of inquiry sees the process as dynamic and fluid. King and Kitchener (2004) described it as clusters or waves within the pattern instead of strict stages. Therefore, people often give answers that are bunched in certain areas like relativism but can also respond with some answers that fall in different areas like absolutism or evaluativism, which is the last stage in epistemic development and is epitomized by the contextual knower. Notably, individuals give a majority of responses within one general cluster but potentially might respond or show different ways of understanding knowledge outside of the area into which they readily fall. These outlying areas of understanding are part of the process that move individuals along from absolutism to relativism or from relativistic understanding of knowledge to evaluativistic understanding. The literature supports a general trend forward in development (King & Kitchener, 1994). Figure 2 shows the epistemic phases in progression.

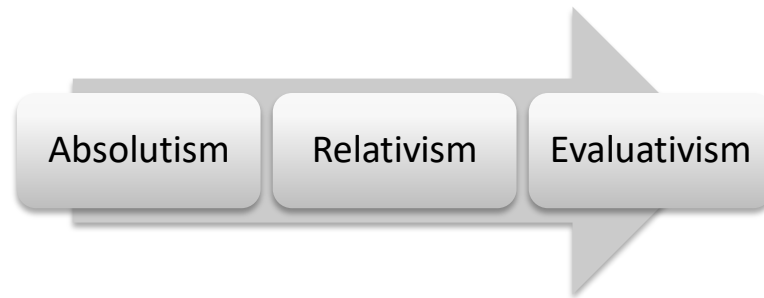


Figure 2. Epistemic progression.

Absolutism. The first phase within developmental knowing is absolutism. A primary assumption within this phase is that truth and certainty are attainable and, if truth is unknown, it is only because one has not attained it yet. Baxter Magolda (2004) described this phase as absolute knowing and argued that it is black and white; knowledge comes from a source of authority (e.g., teachers), and clear communication leads to understanding. Perry (1968) described this as duality, or the marriage of authority to knowing, which often lacks viable alternatives of understanding. Similarly, King and Kitchener (2004) articulated this phase as pre-reflective thinking, suggesting that knowledge is certain and known from authority and is supported through personal opinion. Kuhn (1999) stated absolutist epistemological thinking sees information as the answer to every problem and conflict as resolved by external authorities. The hallmarks of this phase are dualistic thinking, authority as the most valid source of knowledge, and certainty of truth. For example, many college students typically enter college at some point within the cluster of absolutism (King & Kitchener, 2004).

Relativism. The second phase in the general trajectory of developmental knowing is relativism. This cluster within the pattern of epistemic development is a subjective approach to knowledge in which individuals see all sources of knowledge as equal and all

claims of truth as equal. Baxter Magolda (2004) called students in this area “transitional knowers.” Students discover sources of authority are not all-knowing, which leads to independent knowers who challenge the epistemic source of authority and begin to hold their own opinions as equally valid. Kuhn (1999) referenced this phase as multiplism epistemology, which is described as the giving up of certainty. King and Kitchener (2004) described this phase as quasi-reflective, in which uncertainty becomes part of the knowing process and recognizing knowledge as constructed.

The trademark of relativism is the departure of certainty and the demotion of authority as the chief source of knowledge. Absolutism is unidirectional knowledge that comes from authority, while relativism acknowledges the construct of knowledge and sees it as multidirectional. Further, individuals in this phase often do not see truth as exclusive or certain. To continue the above example, if college students develop during university, they most likely graduate at this level of epistemic thinking (King & Kitchener, 2004).

Evaluativism. The final cluster within the pattern of developmental knowing is evaluativism. Baxter Magolda (2004) described a person in this final all-encompassing phase as a contextual knower. Contextual knowers are capable of constructing an individual perspective by judging evidence in context. An evaluative epistemology entails understanding that some views are better than others, and knowing is understood as a process in which judgment and evaluation occurs (Kuhn, 1999). Lastly, in the final phase of development of King and Kitchener’s (1994) model, individuals are deemed reflective thinkers. This last cluster of development is when sources are put into context

and weighed by merit. Kuhn, Cheney, and Weinstock (2000) argued that, in this final phase, an individual understands knowing through varying levels of merit.

The final stage is essentially an integration of declarative knowing with proportional understanding of certainty. It is also marked by an understanding of certainty through a probabilistic lens merged with merit-based reasoning. Few reach the very end of this last phase, and most who do achieve this level of reflection are post-graduate students (King & Kitchener, 2004).

How change occurs. It is theorized that cognitive disequilibrium is a main change agent (Bendixen & Rule, 2004). The disequilibrium comes from assumptions colliding within the specific phase of development (i.e., absolutism, relativism, or evaluativism). Baxter Magolda (2004) argued development occurs when internal assumptions interact with external experiences. For example, this disequilibrium may occur when a student's absolutist epistemic assumptions are challenged by experts and well-educated professors. The disagreement between the faculty members who represent a source of knowledge (authority) clash with the understanding of absolutism, which tends to view the world through a strict sense of certainty about knowledge. Conflicting truth claims stated by faculty are incoherent within an absolute framework because a clear and correct answer exists within that lens understanding of knowledge, so, according to absolutist thinkers, experts within a field of study cannot disagree.

Therefore, when epistemic doubt enters and creates dissonance or uncertainty, the student is left to look for a new way to make meaning out of the source of conflicting authorities. Change then occurs through epistemic uncertainty and incongruence of expectations (King & Kitchener, 1994; Perry, 1968). Further, Kuhn (1999) posited

change can occur within three different domains: aesthetic, value, and truth. In sum, individuals often follow the same path of absolutism to relativism to evaluativism, but it can happen on different tracks (aesthetic, value, and truth).

Classroom and developmental knowing. College students and graduates experience the most epistemic development. According to Baxter Magolda (2004), what people believe about their ability to learn directly stems from their understanding of how they know what they know (epistemology). The epistemic lens of absolutism, relativism, and evaluativism directly parallel how a student understands their ability to learn. For example, if a student exhibits the dualistic thinking of absolutism, their ability to understand abstract or non-binary issues is hindered. Further, a student using a relativist epistemic lens is less likely to engage critically in some merit-based reasoning around difficult topics. Additionally, King and Kitchener (2004) articulated that students and individuals have a developmental range, or a measurable difference between their functional level (performance without support) and optimal level (contextual support). Contextual support is essential for development and the ability to help guide and create dissonance-stimulating change.

As articulated by Kuhn, varying domains of development in aesthetic, value, and truth are processed by and develop differently in students. For example, according to Kuhn and colleagues (2000), physical truth is the domain most likely to retain absolutism. Physical science possesses some of the larger hindering blocks for epistemic development. Further, students are inclined to pursue what is valuable to them (Chinn et al., 2011). The literature implies that students may be more inclined to adopt different

epistemic lens if they are advantageous to the student. Therefore, the environment in which students find themselves is critical for change to occur (King & Kitchener, 2004).

Summary

Overall, within higher education literature on epistemological development, there are two primary schools of thought: declarative knowing and personal epistemology. The two essentially represent a modern and postmodern approach to epistemology. On one hand, declarative knowing assumes an objective reality in which logic and the justification for knowing are critical. On the other hand, personal epistemology operates in a subjective reality, and the construct of knowing involves orthodox and unorthodox sources in the pursuit of personal knowledge and truth.

Developmental knowing, which is a branch of thought within personal epistemology, synthesizes declarative knowing and personal epistemology. A student following the developmental knowing arc starts in the absolutism phase, then progresses to the relativist phase, and finally ends in the evaluativistic framework. In evaluativism, the two schools thought merge together to create a balanced epistemic lens based on merit and probability. Progression between each phase is induced through cognitive disequilibrium.

Chapter 3

Methodology

This study explored how an undergraduate course on ways of knowing affected a student's epistemic lens. This research study examined the effects of a mathematics course on ways of knowing and looked into the development of students' epistemic lens using King and Kitchener's Reflective Judgment Model (King & Kitchener, 1994). The methodology of the study was a phenomenological design. The design consisted of convenience sampling followed by semi-structured interviews. The interviews were conducted from a sampling of students from a mathematics class and explored the effects of the course on their epistemic lens.

Design

The research design was an exploratory qualitative study using a hermeneutical phenomenology design (Creswell, 2013). This research design was selected because it allowed for the optimal exploration into the research question that investigated the lived experience of the students in a ways of knowing course. It also illuminated how students were affected by the course, allowing for an in-depth examination of the shared experience of the students in the course. This investigation into the common experience of the course provided an opportunity to develop a thick and rich description of the student experience.

The research question asked, “How does a course on ways of knowing affect a student?” The word *affect* implies some form of change, and the inclusion of the word *how* in the question necessitates an explanation. Therefore, the design must account for, or have the ability to, investigate change as well as have the potential to interpret the experience. The *effect* and the *how* is exposed through the qualitative hermeneutical phenomenological approach. Further, this design type allows for the natural sequence of the class to be examined via qualitative interviews to refine and hone in on how students develop.

Context

The context for this study took place at a small, private, not-for-profit, faith-based university located in a rural area in the Midwest of the United States. The institution is classified as highly residential, with roughly 2,000 students enrolled and nearly all living on campus. The institution has a high retention rate and enrolls primarily traditional college-aged students between the ages of 18 and 22. Demographically, the school is predominantly white; roughly 57% of the student body identify as female and 43% as male. The most salient trait relating to the study is that the institution identifies itself as faith-based. How a student’s faith life informs their view of truth was exposed through the research process.

The course. The course is a four-credit, 200-level, undergraduate mathematics course on ways of knowing (epistemology). A few of the class goals include:

To be able to use critical thinking to evaluate for soundness of deductive reasoning, to understand the strengths, limitations, and interrelationships among reason, intuition, creativity, and revelation as ways of knowing in a variety of

fields, and to be able to articulate some of the similarities and differences among the ways of knowing in the major human intellectual enterprises, such as science, mathematics, history, theology and the arts. (see Appendix A)

The course is an honors distinction class at the university and is open to all students; thus, students can enroll who are not in the honors program, which was the case in the study. The course outline is provided as appendix A.

Participants. The target population is the twelve students who completed the course on ways of knowing. The purpose for using the entire class was to gather as many data points as possible, which is critical because a phenomenological design type typically has at least three participants (Creswell, 2013). Convenience sampling was employed, garnering seven participants—three females and four males. A variety of majors were represented including: philosophy, composition, Spanish, mathematics education, and chemistry. The majority of participants were seniors by standing, and no underclassmen (freshmen or sophomores) were interviewed.

Procedure

First, each student in the class was solicited for participation via email. The students were blind carbon copied so as to protect their individual identities and to avoid any peer pressure from seeing other participants who decided either to engage in the study or to opt out. Participants were asked continuously to be interviewed until there were at least five interviewees, which is two more than the suggested minimum by Creswell (2013) for qualitative phenomenological study. After two rounds of email solicitations, seven students volunteered to participate in the study. Interviews were conducted over a two-week period. The interviews were semi-structured, one-on-one,

with open-ended questions to explore the shared experience or phenomenon of the course (see Appendix B; Creswell, 2007). The interviews lasted between 33 to 47 minutes; the variance for interviews was due to the brevity or lengthiness of responses to protocol questions. Each interview was recorded and transcribed. Lastly, the interviews were analyzed and coded for themes.

Analysis

This study explored the common experience of the class through interviews. The interviews were first coded into significant statements about how participants experienced the topic. Those coded statements were then bunched into meaning units (Creswell, 2013). These meaning units represented the themes in the coded information. The goal of meaning units was to identify shared experiences among the interviewees (Creswell 2013). Interviews were then coded for how the thoughts and experiences occurred. These occurrences or how the experiences happened are the structural description of the shared understanding (Creswell, 2013).

The synthesis of the structural description or how the phenomenon occurred, combined with the meaning units or the themes of the experience, provided the essence of how the course affected the students' ways of knowing. The purpose of looking at both the structural description and the meaning units was to identify the *how*—structural description—and the *effect*—meaning units—thus answering the research question. Additionally, due to the conceptual and abstract nature of the study, member checking was utilized to better capture the essence of what participants are trying to communicate (Creswell, 2013).

Chapter 4

Results

The results of this study explore the effects on participants enrolled in a course on ways of knowing (a mathematics course that investigated epistemology) and how it affected their epistemic lens. Therefore, the findings investigate complex ideas relating to diversity of thought, the importance of modeling and application, shifting foundational beliefs about reality, the concept of certainty, and the formation of views. Two themes and two sub-themes emerged from the seven 30- to 45-minute interviews. Each interview provided rich content, and all participants were willing to explore, reflect, and provide indirect assessment of how their understanding developed. Each participant described the importance of being involved and engaged in the topic.

The participants represented a variety of perspectives and majors. In regards to the impact of the course on their beliefs, two main themes, along with the two sub-themes, emerged: the importance of diversity of thought in conversation (main theme); the importance of modeling inquiry and the importance of application (sub-themes); and disruption in personally held thoughts (main theme).

When asked about concepts relating to epistemology, participants reflected thoughtfully. Also, it was apparent in the interviews that each participant had mentally engaged the topic of knowledge. Two main content themes materialized: strengthening of worldviews and evolving understanding of uncertainty. Three sub-themes surfaced as

well: understanding the importance of axioms, nurtured belief formation, and post-modern thought. For confidentiality, all participant names were changed.

Table 1

Participant Representation in Structural Description Themes

Participants	Participant Representation in Structural Description Themes Change: How Epistemic Understanding Develops			
	<u>Theme 1:</u> <u>Conversations</u>	<u>Sub-Theme A:</u> <u>Modeling</u>	<u>Sub-Theme B:</u> <u>Application</u>	<u>Theme 2:</u> <u>Disruption</u>
	James	×		×
Lisa	×			
Sam	×	×	×	
Ellie	×			×
Pam	×	×	×	×
Bill	×			×
Greg	×	×		×

Table 2

Participant Distribution: Content Themes

Participants	Participant Distribution: Content Themes Content: Epistemic Concepts				
	<u>Theme 3:</u> <u>Strengthening</u>	<u>Theme 4:</u> <u>Certainty</u>	<u>Sub-Theme</u> <u>C: Axioms</u>	<u>Sub-Theme</u> <u>D: Belief</u>	<u>Sub-Theme</u> <u>E: post-M</u>
James	×	×	×	×	
Lisa	×				
Sam	×	×	×		
Ellie	×	×	×	×	×
Pam	×	×		×	×
Bill	×	×	×	×	×
Greg	×	×	×		×

Theme 1: The Importance of Diversity of Thought in Conversation

All seven participants made note of or alluded to the dialectical and conversational nature of the course. They highlighted that the course allowed for discussion, and they appreciated that the class represented a variety of viewpoints. James illustrated this theme: “[The class] was very discussion oriented. We sometimes had varying viewpoints and we would stop and discuss them and then not necessarily come down to a right answer in the end.” Sam further exemplified the finding:

We got to discuss with each other and argue with each other, if we needed to.

Yeah, so I think we were presented with many different ideas, and we could say

our thoughts and opinions about those [ideas], and work through what we believed.

As a class, the ability to ask questions of each other and share various arguments and perspectives was critical to each student's perception of how they learned and developed. Greg gave a third example of how the course shaped ideas around epistemology: "My favorite part of the class was the discussion, and [the discussions] did allow me to deepen in different areas of applying epistemology to math, science, and theology." The importance of dialogue was a clear and consistent theme throughout the interviews.

Sub-theme: The importance of modeling inquiry. Three of the seven participants discussed that the modeling of the professor demonstrated how to approach epistemology. Greg stated, "I think the way [the class] was set up, kind of, reflected the instructors view on how to know something, you have to look at it from a variety of different angles." Sam further highlighted the significance of the professor: "The professor . . . at least presented himself in the class as someone who is open, and who knows what they do not know." Not all participants explicitly discussed the significance of how the professor modeled inquiry.

Sub-theme: The importance of application. Three participants spoke to the importance of the final project in the course. The three responses came from a protocol question asking about significant reflections from the course. Pam succinctly explained the significance of the application: "I learned a lot through [the final presentations]. What I took away from [everyone's presentations] as a whole is how you can apply ways of knowing to every field of study." Students stated the importance of seeing how

epistemology applies to everything and how the diversity of subject interest shown through the presentations allowed for greater understanding.

Theme 2: Disruption in Personally Held Thoughts

Five participants shared how they felt challenged, shaken, or surprised by the material, conversations, or something presented by the professor. These participants who made note of or reflected on a moment of cognitive dissonance also are represented in content theme of evolving thoughts on certainty (see Table 1 and 2). The classroom conversations provided an environment for students to interact with varying perspectives.

Responding to a follow-up question regarding probability and certainty, James said,

Yeah [probability] troubled the waters of what I think about certainty, but it did not sink the boat. . . . I would come to class with a preconceived notion, and then I would hear an argument about what I believe, and then I would be like oh, I do not have an answer to that.

James offered a clear example of the process of students bringing to class preconceived notions or assumptions about concepts, such as certainty and truth, followed by these basic assumptions being challenged through dialogue with peers.

In contrast to James, Bill's reflections revealed a variant form of dissonance: "It was interesting how other people saw truth, and how they want so desperately to find something to show that is true. And it's relative truth and absolute truth, and how messy those sides become." Bill's reflections referred to his peers and noted differing perspectives, while his own views were challenged. Both James and Bill experienced some form of incongruence. James' dissonance related to the concept of certainty, while Bill's disruption in thought connected to how he expected the class to think.

A third example came from Pam's interview. Her dissonance followed the typical model in disrupted thinking:

At points in the class, I felt like my idea of truth was kind of shaken in the sense that . . . like it is so hard to know what is truth because all these different layers we look through, . . .for example there is no deductive proof of God's existence and which kind of shook me, and I had never considered that before, and I thought there has got to be proof, because I know he is real, but then I thought how do I know?

Pam's dissonance was driven by new material that challenged previous assumptions, specifically her assumption about there being deductive proof for God.

The five participants' disruptions were due to a new perspective, so diversity of thought was critical to understanding the mechanics of how students' thoughts developed. For example, James said, "People [were] throwing out ideas and refining ideas through discussion, and then sometimes that did not include coming to a comfortable spot in the end. And you could think about it after class or not." Only one participant's cognitive dissonance did not stem from concepts of faith and understanding God's existence. The class exposed assumptions in ideological frameworks and faith, causing psychological and existential disturbances in students. The disruption was less an intellectual problem and more a personal challenge to the student's understanding of reality.

Theme 3: Strengthening of Worldviews

The findings unanimously revealed a strengthening of worldviews. This reinforcing of participants' worldview was not anticipated from the literature review.

Ellie described the fortifying process in the following way:

I think that throughout this class examining that to hold any worldview, even purely materialistic or atheistic one, takes a lot of jumps in logic and a lot of axioms in faith, which allowed me to hold on to my Christian faith more strongly. Because um it actually, I feel like it explains the world better and one has to take less jumps in logic and hold less axioms.

Ellie gained a greater understanding of epistemic concepts, specifically, axioms, and, rather than letting go of her faith, she made connections, which furthered it.

Pam also connected topics in the course and developed a more solidified understanding of her worldview:

I think my idea of faith was strengthened. [Faith] was a topic I really enjoyed, when we talked about it. Because um for example going back to the example of the existence of God, there is no proof but we have faith that God does exist from all the evidence like creation, experience, um and that is what God desires for us to have, faith in him, and not like when we see something like we know it's true cause we see it and doesn't require any faith, but God wants us to have faith in him and that is something big that I took away from in the course.

Both Ellie and Pam grew in their understandings of their worldviews, specifically a faith-based perspective. However, it is difficult to discern if the participants actually developed a stronger view that encapsulated all of the knowledge and concepts presented or if they were engaging in confirmation bias.

Bill stated, "There is scientific realism and different beliefs like instrumentalism and [my classmates] were astonished anyone could hold that science is not real because [they said] we can see it and prove it, but [reality is epistemologically uncertain] backed

up my beliefs.” Bill’s reflection applied confirmation bias by using material to back up beliefs. In contrast, Pam stated, “. . . the truth that God exists, for example, did not change, but the way I know [God exists] changed or like it is stronger.” The difference between Bill’s strengthening and Pam’s was that she incorporated and expanded her worldview, while Bill sought information to “back up” a belief; this does not imply change, just validation. All participants claimed strengthened worldviews, but some employed confirmation bias, while others seemed to epistemically develop.

Many of the participants expressed that their perception of epistemology did not threaten their faith and allowed them to engage in any line of inquiry. This assurance in faith and inquiry was expressed by James: “I guess [the integration of my faith with epistemology] gives me a little security, and what I believe about the world gives me a foundation and my academic inquiry will not destroy my faith.” Sam further expanded:

I have become more certain through the class of the New Testament truth, and more certain of what I believe a Christian should be. And how [being a Christian] relates to things like science, math, and to how science does not scare me, or the question of science does not scare me.

Participants appreciated the development of their views and how faith is compatible with open inquiry. This strengthening signals a change of understanding due to the course. They all explicitly stated one of the following: their view was stronger; more certain; strengthened; validated; or they felt more confident of their faith and view.

Theme 4: Evolving Understanding of Certainty

Six of the seven participants shared that their understanding of certainty evolved. Each of them used ideas like finite nature, limited access to certainty, or probability to

illustrate that their view of certainty was not dualist. They expressed relativistic or an evaluativist (contextual knower) perspective. Some, like Pam, compared the concept of limited certainty to the Christian idea of doubt: “I definitely see more value in not knowing. I know that sounds weird, value in doubt. . . . So I think in a small way the course talked about doubt, how we know, and God desires our faith, really helped me.”

Ellie further explained this idea of understanding uncertainty: “It’s sort of paradoxical because I’m more okay with things I label true having uncertainties in them, but also that true thing I hold more loosely, like I’m more able to accept looking at other possibilities for truth.” As demonstrated above, students are aware of the potential inconsistency in their own internal logic of holding truth and uncertainty together; this concept is fleshed out more in the sub-theme of post-modern understanding.

These two concepts—strengthening of worldviews and less certainty—seem to be in tension with one another. Greg spoke directly to this paradox:

I don’t think we can have certainty . . . so strangely I have less confidence in my overall system, but in my Christian understanding, I have more confidence in some things like relating to God and working out God’s personal nature of love.

Additionally, the participants credited their new understanding of certainty to either material from the course or experience.

Sub-theme: Understanding the importance of axioms. Axioms in the interviews were understood as an underlying assumption that is not proven but, instead, is held. Five participants discussed that they either wrestled with or saw the importance of axiomatic choices and the importance of underlying assumptions in relation to

epistemology. This sub-theme also contributed to the development of uncertainty. Greg explained the connection between axioms and uncertainty:

You still need axioms and definitions to give you anything to work with. Then you can try to work with [axioms and definitions] and try to find relationships among them and see what follows. . . . [These axiomatic choices] are where my uncertainty stems from, and I can't be certain of my axioms because they would be part of the system.

The five participants who described axioms and underlying assumption connected this to uncertainty because they see axioms as unjustifiable positions that people use to build their frameworks of understanding, which informs how people know what they know. Axioms, or underlying assumptions, are critical to the essence of certainty. The class explored the concept of uncertainty in light of axioms. Ellie explained her understanding of uncertainty in the following way:

In the first week of class, we talked about the uncertainty of anything and to hold any view you have a certain set of axioms that you can't prove. That goes like as basic as, I don't know, multiplying integers, but as complex as faith. So it was just really interesting to see how like if you start in one set of atheistic axioms, the world makes complete sense from—or not complete sense, but it makes sense using that framework, or if you start out with like a set of Christian axioms I guess, then the world will make sense looking at it from that way.

The quote illustrates a couple of critical thinking processes. First, axioms are the origin of uncertainty for participants because they are fundamental to one's worldview, and they are unproven. Second, Ellie caught herself creating incongruence with her own

views in the quote; specifically, she acknowledged that the axioms a person holds determines the coherence of their worldview Christian or Atheistic.

Sub-theme: Nurtured belief formation. Four of the five participants who spoke to the sub-theme of understanding the importance of axioms also discussed that people's experiences and how people are raised influences individuals' development of axiomatic choices. The implicit epistemic statement these participants made is that experience is a valid way for understanding something and that people do not actively think their way into axiomatic choices. Bill illustrated this sub-theme:

[Their] backgrounds lead to how [my classmates] think in certain ways. People are very malleable, especially younger people. You can train them to think just like their parent and even if they try hard, the apple doesn't fall far from the tree, most people live lives just like their parents.

Ellie continued to unpack the concept when responding to the protocol question probing how experts can disagree:

Honestly a lot of [beliefs] come from like personal experience. Maybe like also parents' beliefs. What area of the country you came from, what socioeconomics you come from has a lot to do with that. . . . So yeah, just like personal experience.

This sub-theme illustrates that the participants believed that people do not logically come to rational belief but are products of their environment.

Sub-theme: Post-modern. Four of the six participants who discussed the idea of uncertainty also shared the idea that they understand reality to have objective truth, but

that humans are epistemologically limited. Participants claimed reality contains truth, but the truth is potentially unknowable. Ellie captured this sub-theme:

I do believe, some don't, that out there in the external world apart from our minds there is an actual material, or an actual truth. And how we perceive can be wrong. Um. I don't think we can always, like humans can't always know which, or what the actual truth is out there. So it might be difficult to tell if someone's understanding is right or wrong. But I think that regardless of what a person believes, the truth out there stays the same.

The participants held the post-modern assumption that reality is not necessarily knowable and is potentially subjective, while holding the modern view that eternal truth still exists. For example, Greg reflected, "As I understand [God and epistemic uncertainty], I don't think that recognizing my finite existence and inability of knowing anything is inconsistent in believing anything about God or reality." Greg merged an understanding of the limits of human knowledge and an axiomatic belief that provided for coherence in his understanding. Pam explained how she arrived at this post-modern synthesis:

The class helped me to see we do not always know what is real, um because like I said in my definition we have different perceptions, we are looking at things through different lenses, and every person sees things differently. It does not change what truth is, but we might not always know what that is.

Pam's understanding of epistemology—that people possess different lenses of knowing and experiences that may impede or craft a different understanding—does not diminish truth. Truth still exists for Pam; it just might not be fully known.

Summary

Four themes and five sub-themes emerged through the interviews. The first two themes—the importance of diversity of thought in conversation and disruption in personally held beliefs—provide a description of how the students perceived epistemic development. Sub-themes—the importance of modeling and the importance of application, respectively—give context to the process of change and how change occurs. The third theme, strengthening of worldviews, and the fourth theme, evolving understanding of certainty, both speak to the nature of epistemology and are descriptions of the content. The content-based sub-themes—understanding the importance of axioms, nurtured belief formation, and post-modern—all derive from the participants' perspective on certainty. All participants experienced a strengthening in their own views, and all noted the importance of varying viewpoints in conversation. The majority of the dissonance present was the psychological act of struggling to understand faith and epistemological concepts. The essence of the experience was that students epistemically changed through cognitive dissonance caused by diverse thought in conversation. This change in thought formed a strengthening in the worldview of the participants and an evolving understanding of certainty.

Chapter 5

Discussion

The Importance of Diversity of Thought in Conversation

Each participant spoke to the importance of dialogue. Specifically, participants shared the significance of hearing multiple sides. The importance of diversity and being exposed to a variety of perspectives is well documented in student engagement literature (Tinto, 1997; Weaver & Qi, 2005). In this study, diversity of thought was critical to the development of the participants. Also, as the modeling inquiry sub-theme indicates, in the classroom the professor modeled openness, which created a place for people to share. The sub-themes of modeling and application both point to an inclusive pedagogy that allowed for an environment in which students voices were validated through dialogical conversation. The pedagogical literature affirms this finding and the importance of student ownership and dialogue when it comes to critical thinking and cognitive development (Hurtado, Alvarez, Guillermo-Wann, Cuellar, & Arellano, 2012).

Diversity of thought provided the breeding ground for development. The epistemic growth that occurred was due to the diverse perspectives in the class, which lead to cognitive dissonance (Bendixen & Rule, 2004). This conversation about diversity and dialogue highlights the significance of facilitating discussions in which diverse opinions and thoughts are shared. Further, authors have noted the importance of diversity and understanding various perspectives for the success of civil and personal engagements

(Putnam, 2007; Redding, 2001). Therefore, the key takeaways from the findings is that a course on epistemology allows for participants to discuss and share in a way that fleshes out different deeply held beliefs about how humans know what they know.

Disruption in Personally Held Thoughts

According to Baxter Magolda (2004), epistemic development occurs when internal assumptions interact with external experiences. Further, King and Kitchener (1994) discussed the importance of environment in creating opportunities for dissonance. All but two participants indicated disruption in thought, which was due to diverse perspectives. Much literature affirms that diverse experiences lead to higher cognitive development outcomes (Bowman, 2010). However, the significance of the finding is that a lot of the research discusses identity-based diversity, but not necessarily ideological or philosophical diversity (Denson & Chang, 2009). The findings in this study suggest that diversity in thought is also a valid and needed stimulant for epistemic change.

Another important finding is the different forms of disruption in thought that occurred in participants. Specifically, some of the participants experienced their underlying assumptions being challenged, and some experienced dissonance via how they anticipated students to react to new knowledge. Thus, disruption was derived from both content and interpersonal interactions. King and Kitchener's (1994) framework of epistemic development applies to both perspectives since they both perceive incongruence of expectations, which stimulates growth. Further, informal and formal peer-to-peer interactions are critical in shaping attitudes and beliefs (Hurtado et al., 2012), and, in the case of this study, the interactions were facilitated in a formal class

setting. This study continues the conversation about how classroom interactions can shape epistemic development, which all participants experienced.

The Strengthening of Worldviews and Uncertainty

Participants grew in their confidence and understanding of their own worldview and expressed a diminished perspective of certainty. These two concepts—strengthening of worldviews and less certainty—seem to be in tension with one another. The schemes of King and Kitchener (1994), Baxter Magolda (2004), and other epistemic scholars explained the shift away from certainty out of dualistic thinking, but the models did not account for this nuanced understanding of the students' perceived, objective Truth: God.

The sub-themes (understanding the importance of axioms, nurtured belief formation, and post-modern) help explain this evolving understanding of certainty and the strengthening of worldviews. Most of the participants described how their understanding of knowledge was built on underlying assumptions. These axioms are the unexamined assumptions, which, when investigated, create change (King & Kitchener, 2004; Schommer, 1993). As shown in the findings, students perceived these axioms or underlying assumptions as a product of environment rather than purely reasoned thought. This developmental nature, in which the environment is critical to a person's epistemic change, is an expected dynamic in King and Kitchener's (1994) model.

Post-Modern

Post-modernism, one of the themes in this study, is the observed pattern of participants explaining their belief in God but also their belief that knowledge is subjective or unknowable because of uncertainty. It is the synthesis of subjective understanding and the belief of an objective reality or God. In many ways, this

post-modern perspective as expressed by four participants is similar to the evaluative phase in the literature (King & Kitchener, 1994), but the main difference is the belief in the continual existence of an objective truth—be it reality or God. This finding is important because it suggests the developmental process of convicted people of faith may follow a different epistemic pattern of growth, which could also explain the tension between uncertainty and the strengthening of worldviews.

Limitations

The four most significant limitations of this study are the selection process, potential misunderstandings of abstract concepts, confounding experiences, and the lack of being able to measure any change. The study implemented convenience sampling, which means that the study may not capture the full essence of the course and the full experience of all the students. Further, conversation was an important aspect of the course, leading to the potential that students who felt disenfranchised in the course discussion would not want to reflect on those negative experiences again, possibly leading them to opt out of the study. Further, the course was an honors section, and the majority of students involved in the study were honors students. Since the researcher works in the honors department, students potentially felt some obligation to participate.

Second, due to the nature of the research design and the question of the study, it is difficult to discern the singular impact of a course while students were taking other classes and were involved in other diverse experiences. These other experiences may actually explain what was impacting the student, while the course potentially provided the students with language to describe those new understandings. One participant did

reference a study abroad experience and how it caused a change in their epistemic understanding, while the class stirred up some of their old questions.

Another limitation is the potential for misunderstanding. The concepts involved in the study—certainty, truth, and knowledge—are all abstract. The researcher's understanding of a term or a student's understanding of a term or concept could mean two different things. Additionally, the participants could have misinterpreted the protocol questions or may have interpreted them differently. The difficulty is compounded because it examines the development of epistemology, and the researcher was looking for a shifting understanding, so a misunderstanding may be interpreted as epistemic development.

Lastly, the qualitative phenomenological nature of the study did not allow for change to be measured. The participants did not engage in any interviews prior to the course, so the study is limited in definitively explaining impact. Any impact from the course is self-determined and declared by the participant, so all development is self-assessed through reflection by the participant.

Further Research

Significant research is still needed in examining how students of faith develop epistemologically. One participant expressed relativistic thinking, and one conveyed some dualistic tendencies in thought, but the other five all seemed to integrate faith with the epistemic concepts of certainty, limits, and nature of knowledge. This finding suggests students of faith develop in a different sequence than dualist thinking to relativistic thinking to evaluatist thinking, or that the course moved students through relativistic thinking with no mention from a participant. A future study could follow

students of faith through their four years at a university and consistently interview them to see if students of faith skip the epistemic lens of relativism. Also, if true, further research is needed into why and how students of faith hold a subjective understanding of reality and objective truth together.

Furthermore, more research is needed regarding diversity and epistemic development within a faith context. All students subscribed to a particular faith, so when they heard a diverse thought, it still originated from persons of faith. It is possible that, if the participants were in class with atheistic or agnostic students, they would still experience a strengthening in their faith-based worldview. Additionally, one could extend this logic to domains outside of diversity of thought and ask what the effect would be if there were more diverse voices in terms of race, sexual orientation, gender orientation, or nation of origin.

Lastly, the concept of epistemic humility necessitates further exploration. Specifically, research is needed regarding the role of epistemic humility within faculty members. The ability to model epistemic humility was an important sub-theme, and the capacity to hold one's view loosely and teach others is a needed craft. Therefore, a study exploring how faculty members understand their own epistemic lens and how it relates to how they teach is important.

Implications and Recommendations

The study illustrated three implications and three recommendations. If universities want to challenge the growing difficulties of a polarized society, this study on the effect of an epistemology course on undergraduate students provides helpful frameworks and guidance to scholar practitioners and professors. Epistemic development

is critical for self-awareness, productive dialogue, and preparing citizens. Greater awareness of self and the ability to think critically are often stated benefits of higher education, both of which are implied outcomes of a course on epistemology.

The first significant implication of the study is that a better understanding of one's worldview is achieved through a course on epistemology. This understanding is seen clearly in the theme of strengthening of worldviews and in the participants' ability to critically think and reflect about their own thinking and experiences. Much time is spent hand-wringing over the question of whether students are gaining in critical thinking (Pascarella, Blalch, Martin, & Hanson, 2011). Studies have suggested that metacognitive strategies provide tools for students to engage and to better critically think critically (Willingham, 2008). The inference in this study is that a class on epistemology, which is metacognitive, helped students gain greater self-understanding and a more confident sense of their own worldview or faith.

Second, diversity of thought is essential to student development. Diversity of thought and experience as a catalyst for change is affirmed in the literature (Pascarella, Martin, Hanson, Trolan, Gillig, & Blaich, 2014). The implication is that students benefit from being in an environment in which they can share and feel safe to expose different ideas and that they need to be exposed to other forms of diversity. Further, students exposed to epistemology are more equipped to engage in diverse conversation because they know their own epistemic system and understand that other people may hold different ideas of how they know what they know, which provides them with epistemic humility.

The third implication of the study is that this course on epistemology has the potential to create thoughtful citizens. These students possess an epistemic humility and understanding that allows for critical engagement. Studying epistemology allows students to see beyond relativism and contextual thinking (King & Kitchener, 1994). As society becomes more pluralistic, understanding how people know something to be true is crucial because meaningful dialogue depends on understanding. Therefore, this study submits the following three recommendations.

First, universities need to encourage encounters with diverse thoughts. Cognitive dissonance is critical for epistemic development, and meaningfully engaging in diversity of experience and thought is essential to the process of developing. Further, these interactions need to be supplemented with support either through the framework of a class or through some larger programmatic system that supports students through their incongruences.

The second recommendation is to include epistemological conversations in student leaders' training. The benefits include better understanding of self and how others arrive at valid, differing opinions. Therefore, the hope is that meaningful dialogue could occur instead of debate if students understand how others come to know something and how they come to know what they know. Student leaders need the ability to understand how others think and the epistemic humility to know that they cannot be certain of everything.

The final recommendation is for universities to include an epistemology course in their general education curriculum. The class does not necessarily need to be taught by philosophy departments. This study examined an epistemology course that was taught

out of the math department. The importance of introducing epistemology to the general education requirements creates space for the benefits of epistemic humility, increased understanding of self and others, and the cultivation of responsible citizens who can meaningfully engage in dialogue.

Summary

The essence of a class on ways of knowing was that students encountered diverse thought through materials, instruction, and discussion among peers that led to interference in personally held beliefs, which, in turn, strengthened worldviews and developed the concept of certainty. Courses on ways of knowing are of ever-growing importance. As the world becomes more connected and the country becomes more polarized, the ability to understand how someone knows and perceives the world is essential to dialogue. Through learning about ways of knowing, students develop their own faith and epistemic humility. Faith and humility are two qualities that are in short supply in the current fabric of education, which makes the benefit of this course crucial. As students reflect on how they know what they know, they gain a wider understanding of their own faith and worldview that emboldens them to engage inquiry without fear. Through that inquiry they perceive a vast and diverse world instilling a sense of humility. As students develop in their own ways of knowing, they are trailblazers in escaping the temptation of relativism and a light to showing better ways of understanding the world.

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Appendix A

Course Outline: (Partial, tentative list of topics covered, but not necessarily in this order.)

- I. Introduction to Ways of Knowing
 - a. Truth
 - b. Reality
 - c. Knowledge
 - d. Faith
 - e. Certainty
 - f. Doubt
 - g. Imagination
- II. Mathematics (emphasis on the deductive method)
 - a. Overview of mathematics
 - b. Geometry
 - c. Logic
 - d. Probabilistic thinking
 - e. Infinity and mathematics
 - f. Beauty of mathematics
 - g. Higher dimensions
 - h. Chaos
- III. The Relation of the Mathematical Method to Other Areas
 - a. Science
 - b. History
 - c. Literature
 - d. Law
 - e. Religion

Appendix B

Interview Questions

1. How did your course on ways of knowing affect you?
2. How would you define epistemology?
 - a. What was your previous notion, if any, of the concept of epistemology?
 - b. How would you say the class impacted your thought on how you know?
3. How has the class on ways of knowing changed how you understand truth?
4. How has the class on ways of knowing changed how you understand certainty?
5. How do you come to hold something as true?
 - a. What bases do you use to support your view?
6. When you hear experts disagree what do you think?
 - a. How did you come to hold that view?
7. How do people come to hold different views?
 - a. How did you come to hold that view?
8. Are people ever right or wrong in their understanding of knowing something?
 - a. If so, how did you come to hold that view?
 - b. If not, what do you think?
 - i. How did you come to hold that view?

