Performance characteristics of measurement instruments of epistemic curiosity in third-year medical students

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Abstract
Epistemic curiosity is theorized to underlie the adoption of learning goals, studying strategies, and skill development critical to becoming a successful physician. However, there is relatively little research regarding the measurement of epistemic curiosity in medical learners. We administered the I- and D-type curiosity and Need For Cognition (NFC) scales to assess individual differences in epistemic curiosity, and the Study Processes Questionnaire to measure tendencies to employ “Deep” or “Surface” learning goals and strategies to 90 third-year medical students in academic years 2010 and 2011. The performance characteristics of these instruments were characterized, and path analyses were conducted to examine the relationships between these instruments. Individual differences in I- and D-type curiosity were positively associated with tendencies to set goals and use strategies aimed at developing a deeper understanding of knowledge. NFC was negatively associated with goals and strategies that involved seeking only a surface understanding of new information. Our results demonstrate that in a population of medical learners, I- and D-type curiosity scale scores significantly predict seeking a deeper understanding of new information, while NFC scale scores may be better considered as a marker of avoiding superficial study processes but not necessarily engaging in deeper approaches.

Introduction
Epistemic curiosity is the desire to seek out new information that is expected to stimulate positive states of intellectual interest or reduce undesirable conditions of uncertainty. Epistemic curiosity, therefore, refers to a set of internal motivations for learning and could be alternatively referred to as “cognitive curiosity” or “cognitive motivations” for engaging in the work of learning something new. Epistemic curiosity motivates students to approach opportunities for learning, to think about new ideas, ask questions, and solve problems. Differences in epistemic curiosity predict students developing learning goals aimed at mastering new material for reasons of both personal enjoyment and achieving superior academic performance through hard work. Semi-structured interviews of college undergraduates revealed that their intellectual curiosity “to discover the unknown” was an important factor in identifying which students chose to pursue a Ph.D., M.D./Ph.D. or M.D. degree with the ultimate goal of doing research. Such studies suggest that epistemic curiosity is associated with setting both short- and long-term learning goals, as well as the pursuit of careers that involve the critical and rigorous analysis of new information.

In this context, our study describes the performance characteristics of a series of psychological measurement instruments that assess different aspects of epistemic curiosity. Specifically, we administered the Interest (I) and Deprivation (D) type curiosity scales, the Need For Cognition scale (NFC), and the Study Process Questionnaire to a cohort of third-year medical students. In this paper, we describe the performance characteristics of these instruments in this population of learners.
**Medical students**

In medical students and trainees, epistemic curiosity is believed to contribute to setting learning goals aimed at gaining a deeper understanding and mastery of skills that enhance the development of clinical expertise. Curiosity likely plays a role in developing meticulous problem solving strategies that reflect “specific, evidence-based approaches” to making diagnoses and caring for patients. These strategies help physicians make challenging diagnoses and take greater intrinsic pleasure in successfully caring for patients.

Therefore, as epistemic curiosity helps shape medical students’ learning goals and knowledge-gathering strategies, individual differences in epistemic curiosity are theorized to play an important role in achieving a successful, rewarding, and meaningful career in medicine. As such, an improved understanding of the characteristics of instruments used to measure epistemic curiosity in medical students is desirable. Furthermore, describing the relationship between epistemic curiosity and how medical students develop learning goals to achieve a deeper understanding of new knowledge may be important for medical educators.

Although the potential importance of curiosity in medical learners has been acknowledged in the literature, to date relatively little empirical research has been conducted to rigorously describe the performance characteristics of instruments used to measure aspects of epistemic curiosity in medical students. In addition, the relationships between epistemic curiosity and students setting learning goals or adopting rigorous methods and strategies aimed at gathering and comprehending new information have not been previously described. In the present study, we assessed different aspects of epistemic curiosity in medical learners using 3 reliable and valid questionnaire instruments. We also assessed the degree to which students applied specific goals and strategies aimed at learning course material, and determined associations between these goals and strategies with measurements of epistemic curiosity.

**Hypotheses**

We hypothesized that epistemic curiosity would be positively associated with using learning goals and strategies oriented towards deep processing and understanding new information. We further hypothesized that epistemic curiosity would be either unassociated or negatively associated with learning goals or strategies aimed at obtaining only a shallow or surface level of understanding.

**Context**

Third-year Harvard Medical School (HMS) students at the Beth Israel Deaconess Medical Center (BIDMC) enrolled in a year-long longitudinal curriculum for third-year medical students were invited to participate in this study. Students completed self-report instruments that assess individual differences in different aspects of epistemic curiosity and tendencies to engage in either “deep” or “surface” approaches to learning. To assess our hypotheses and describe the performance characteristics of these instruments, the magnitude and direction of the relationships between epistemic curiosity and deep or surface approaches to learning were evaluated with path analysis.

**Materials and Methods**

**Instruments and measures**

To assess individual differences in epistemic curiosity, 3 questionnaire measures found to be valid and reliable in previous research were administered to third-year students: The Interest (I) and Deprivation (D) type curiosity scales and the Need For Cognition scale (NFC). Each scale measures theoretically distinct, but related, aspects of epistemic curiosity. The I- and D-type curiosity scales assess tendencies to experience different underlying affective states associated with different goals for making use of desired knowledge. For example, I-type curiosity involves learning something new with the expectation of stimulating pleasurable states of interest, while D-type curiosity is characterized by seeking out new knowledge in order to solve a bothersome unsolved puzzle or problem. The NFC scale is a more “general” epistemic curiosity measure that assesses tendencies to approach situations anticipated to be intellectually engaging and to avoid situations where intellectual stimulation is deemed unlikely.

Although the 3 epistemic curiosity measures used in this study assess theoretically distinct expressions of this construct, there is some controversy over the extent to which they are psychometrically distinct. We conducted an exploratory factor analysis using oblique rotation of responses to all 28 of these items and found clear evidence of 3 factors, one defined by the 5 I-type items, one defined by the 5 D-type items, and one factor defined by the 18 NFC items.

In order to determine the kinds of learning goals and strategies utilized by medical students, we administered the Study Process Questionnaire (SPQ). The SPQ was designed to assess different approaches (i.e., motives and strategies) to learning,