

Faculty perceptions of critical thinking at a health sciences university

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Abstract: The fostering of critical thinking skills has become an expectation of faculty, especially those teaching in the health sciences. The manner in which critical thinking is defined by faculty impacts how they will address the challenge to promote critical thinking among their students. This study reports the perceptions of critical thinking held by health sciences faculty representing multiple disciplines. The results provide a working definition of critical thinking and its components, and indicate the importance that critical thinking is given in the education of health care students. Implications of these results for teaching and learning are presented.

Keywords: accreditation standards, critical thinking, faculty development, health care professionals, qualitative data, survey.

I. Background.

The inclusion of critical thinking among the goals of academia has become commonplace. Critical thinking is listed by the Association of American Colleges and Universities as one of the major intellectual and practical skills that should be fostered by postsecondary education (Association of American Colleges and Universities, 2011). Critical thinking is also acknowledged as a desirable outcome in many health sciences educational programs. The Standards for Accreditation of Medical Education Programs Leading to the M.D. Degree state that medical students should "acquire skills of critical judgment based on evidence and experience" (Liaison Committee on Medical Education, 2012, p. 7). The Accreditation Council for Pharmacy Education Standards and Guidelines for the Professional Program in Pharmacy Leading to the Doctor of Pharmacy Degree state that teaching and learning methods should foster the "development and maturation of critical thinking and problem-solving skills" (Accreditation Council for Pharmacy Education, 2011, p. 20). The American Dental Education Association prominently featured critical thinking in a recent update on competencies for the new general dentist (American Dental Education Association, 2008). Similarly, critical thinking is emphasized in the accreditation standards of nursing (American Association of Colleges of Nursing 2008), podiatric medicine (Council On Podiatric Medical Education, 2011), and occupational therapy (Accreditation Council for Occupational Therapy Education, 2008).

The fact that nearly all health sciences programs recognize the importance of developing critical thinking skills is not surprising. Health care professionals need to develop good clinical reasoning and decision making skills to provide safe and effective care to patients. Lives depend on competent clinical reasoning, and critical thinking and reflective problem solving are cognitive processes which are involved in clinical reasoning (Facione & Facione, 2008).

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While health sciences programs, along with many other higher education programs, recognize the importance of critical thinking, unless there is clarity as to what critical thinking actually is it will be difficult to teach to students (Hatcher, 2000). Lack of agreement on the definition of critical thinking has been noted as a reason for the difficulty in teaching clinical critical thinking skills in nursing students (Allen, Rubenfeld, & Scheffer, 2004). Similarly, a clear understanding of the components or characteristics of critical thinking is needed to design proper assessments to measure student learning outcomes. Several educators assert that without a clear conceptualization over what constitutes critical thinking, valid assessment will remain problematic (Appleby, 2005; Gordon, 2000; Hatcher, 2000; Kennedy, Fisher, & Ennis, 1991). How faculty define critical thinking is therefore key to how it is taught and subsequently to how health science students apply it in the learning of clinical reasoning skills.

The literature provides various definitions of critical thinking from researchers in philosophy, education or critical thinking. Some nurse researchers conclude that the large number of reported definitions and attributes of critical thinking serve to decrease the likelihood of reaching a consensus (Turner, 2005). However, Halpern (1999) has stated that the various definitions of critical thinking include the same underlying principles. Others have also recognized commonalities in the many definitions and attributes associated with the concept of critical thinking (Jones, 2010). A review of the literature indicates that most researchers now agree that general principles of critical thinking exist, that these principles transcend subject matter and can be applied to more than a single subject (ten Dam & Volman, 2004).

The American Philosophical Association published a qualitative study that utilized a panel of experts from various disciplines to come to a consensus for critical thinking utilizing the Delphi method (Facione, 1990). This study has been noted as providing the most rigorously defined version of critical thinking (Oderda et al., 2011) and to be highly cited (Turner, 2005). The study defines critical thinking to be "purposeful, self-regulatory judgment which results in interpretation, analysis, evaluation, and inference, as well as explanation of the evidential conceptual, methodological, criteriological, or contextual considerations upon which that judgment is based" (Facione, 1990, p. 2). This report further states that critical thinking is essential as a tool of inquiry, and therefore it is a liberating force in education and a powerful resource in personal and societal life.

To come to a consensus definition of critical thinking as it applies to nursing, a group of expert nurses also utilized the Delphi method (Scheffer & Rubenfeld, 2000). They determined that critical thinking is an essential part of professional accountability and quality of care, and that critical thinkers exhibit the habits of mind of confidence, contextual perspective, creativity, flexibility, inquisitiveness, intellectual integrity, intuition, open-mindedness, perseverance, and reflection. Further, critical thinkers in nursing practice the cognitive skills of analyzing, applying standards, discriminating, information seeking, logical reasoning, predicting and transforming knowledge. The authors conclude that the consensus definition of critical thinking will allow nursing practitioners, faculty and researchers to share a common language from which to design, utilize and assess this essential component.

Experts agree that critical thinking includes both cognitive skills and affective dispositions (Facione, 1990). Skills refer to cognitive processes of interpretation, analysis, evaluation, inference, explanation and self-regulation (Facione, 1990). Affective dispositions include inquisitiveness, desire to be well-informed, awareness to use critical thinking, trustful of reason, self-confidence in ability to reason, open-mindedness, flexibility, fair-mindedness, honesty to face personal biases, prudence in making judgments, and willingness to revise views

(Facione, 1990). Affective dispositions have also been referred to as intellectual traits (Paul & Elder, 2008) and as habits of mind (Scheffer & Rubenfeld, 2000).

Despite several substantial definitions of critical thinking and the stated importance of critical thinking to academia, educators display confusion and difficulty describing critical thinking. In 1995 Paul and colleagues conducted a study to assess the ability of faculty to teach critical thinking and problem-solving skills (Paul, Elder, & Bartell, 1995). An interview protocol was developed and used with faculty from education and subject matter areas of teaching in private and public California colleges and universities. The results indicated that although the vast majority (89%) of faculty interviewed claimed that critical thinking was a primary objective of their instruction, only 19% could give a clear explanation of what critical thinking was. A large majority of faculty claimed that students lacked appropriate standards to assess their thinking, but only a very small percentage of faculty were able to list any criteria or standards that they required of students, or to provide a reasonable explanation of the standards. The study also found that most faculty were unable to provide plausible examples of how they fostered critical thinking in the classroom, or name specific critical thinking skills they think are important for students to learn. The authors summarize the data by saying that "...most faculty have not carefully thought through any concept of critical thinking, have no sense of intellectual standards they can put into words, and are...in no position to foster critical thinking in their own students or to help them to foster it in their future students...". (Paul, Elder, & Bartell, 1995, third section, para. 13).

A more recent study surveyed clinician medical educators at five medical schools, asking for a definition of critical thinking and for actions that would describe a clinician who was thinking critically and one who was not (Krupat et al., 2011). The results indicated that the overwhelming majority (~85%) framed the definition as a process or ability, with a small minority describing it as a personality trait or disposition. However, the majority of actions describing an absence of critical thinking resulted from heuristic thinking and lack of cognitive effort, consistent with a dispositional approach rather than a lack of cognitive ability. The authors concluded that to foster critical thinking among medical students, clinician educators need to reconcile the definition of critical thinking with the manner in which it is put into action in a realistic clinical scenario. They also concluded that both disposition and ability are necessary for critical thinking and that neither is likely to be sufficient alone, consistent with critical thinking experts (Facione, 1990).

Midwestern University (MWU) is a health sciences university with individual colleges of osteopathic medicine, dental medicine, pharmacy, and optometry. In addition, the College of Health Sciences includes graduate level programs in podiatric medicine, occupational therapy, physical therapy, nurse anesthesia, physician assistant, and clinical psychology. It maintains two campuses; one in Downers Grove, Illinois and one in Glendale, Arizona. The MWU Vision states, in part, that the academic community should: "Nourish intellectual creativity and foster the critical thinking and communication skills that stimulate personal growth and engender professional development" (Midwestern University Catalog, 2012, p.5). As faculty at MWU, the authors are interested in fostering critical thinking skills and dispositions among students, faculty and staff. To that end, we facilitate campus-wide (Arizona) quarterly discussion sessions open to faculty and staff to explore critical thinking concepts.

The primary goal of this research is to determine how faculty that teach in various health care programs define critical thinking. A secondary goal is to determine faculty perception of the role of critical thinking in the education of health professions students. The results provide a

working definition of critical thinking among these faculty, allow comparisons to be made to expert definitions, and also present an opportunity to explore implications for teaching and learning.

II. Methodology.

A. Instrument and participants.

The purpose was to assess faculty definitions of critical thinking and the importance that it has in the education of health care professionals. To access faculty at two separate campuses, the researchers determined that using an online survey would be the most efficient method. Upon reviewing the literature for guidance, a paucity of studies describing surveys designed to determine faculty perceptions or knowledge of critical thinking was found. After reviewing a recent study (Krupat et al., 2011) which surveyed faculty at medical schools, and utilizing the description of critical thinking elements and standards according to Paul and Elder (2008), the authors designed survey questions to address the study purpose. A draft of the survey was developed and the wording and format discussed and revised until an agreement was reached on the final survey tool.

Following approval from the MWU Institutional Review Board, an email link was sent to a total of 550 faculty on both campuses with a request to voluntarily participate in the anonymous online survey. The email included the research purpose, description of the research, potential benefits to the faculty community, assurance of confidentiality as well as no risk to the participant. Survey items included demographic information about respondents including campus location, college affiliation, full or part-time work status, instructional content (basic science or clinical), terminal degree, faculty rank, and experience in university teaching. Nominal survey items (yes/no/unsure) were used to gather quantitative data, and open-ended questions were used to gather qualitative data.

B. Data collection and analysis.

This study employed a mixed methods design using a descriptive survey to collect information about faculty views on critical thinking at a health sciences university. The survey collected demographic data in order to identify the make-up of the responding sample. Cross-tabulation and Chi-Square analyses were used to determine frequencies and dependence of variables among the demographic sub-groups. Quantitative data were analyzed with PASW Statistics 18. Qualitative data were analyzed using the content analysis method, a qualitative research tool used to determine the presence of certain words or concepts within recorded communication. To conduct a content analysis, the text is coded into manageable categories (i.e., words, , phrases,) and then the presence, meanings and relationships of the coded text are analyzed in order to make inferences and to develop themes (Busch et al, 2012.) Response agreement among three participants is typically considered to represent a commonality (Creswell, 2009).

The researchers initially worked independently to code responses for each open-ended question, identifying words or phrases that provided an overall meaning to the response, and then grouping the responses according to meaning similarity, thus generating themes. The researchers met several times as a group to compare and discuss the identified themes until agreement was reached by at least three of the four researchers on the themes and sub-themes.

III. Findings.

A. Demographic data.

A representative sample of 133 faculty members (24%) responded to the survey, with a total of 85 respondents completing every survey item. Responses were approximately equally distributed between the Arizona and Illinois campuses (55% and 45%, respectively). The sample represented members from five colleges, including basic sciences (31%), pharmacy (26%), osteopathic medicine (20%), dentistry (17%), and optometry (5%). More than half of the sample (59%) reported that they were responsible for teaching clinical content.

B. Defining Critical Thinking.

To determine how faculty defined critical thinking, respondents were asked to finish the following survey item: "I would define critical thinking as". There were 83 short answer responses ranging from 5 words to 42 words, with the majority being 20 words or less. Three themes and two sub-themes were identified in the analysis, with 137 words or terms coded into one of the five themes (Figure 1).

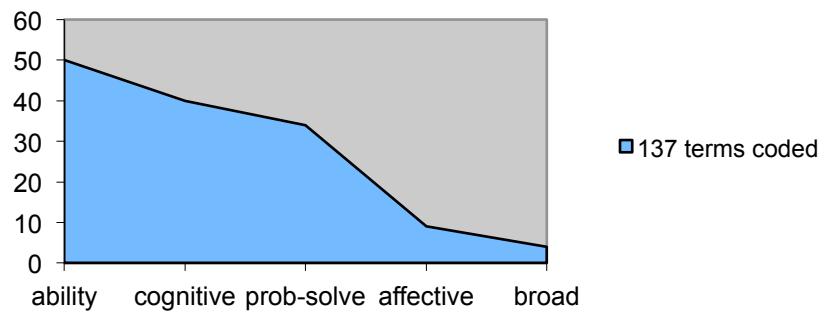


Figure 1. Five themes for defining critical thinking

The predominant theme is that critical thinking was viewed as an ability. Other defining words with similar meaning as 'ability' were process, skill set and action; over half of the respondents used one or more of these terms in their definition. The second theme entailed the cognitive processing of information or evidence. The most frequent cognitive term was analysis (27 responses), followed by evaluation (13 responses). 'Analysis of evidence' was also expressed as evaluating facts, extracting essential elements, and actively synthesizing information, with slightly more than half of respondents including these descriptors. The third theme was decision making or problem solving, with 34 respondents using these exact terms. 'Making reasoned decisions' had similar meaning as: derive conclusions, reach the best possible outcome, solve a complex problem or scenario, and selecting the most appropriate action; over half of the respondents shared these views. Therefore the main type of response could be summarized as an ability or skill to make reasoned decisions or solve complex problems based on critical analysis of available evidence. Approximately three quarters of the responses were of this type. The following quotes are indicative of this most common type of response.

- *"the ability to gather information, identify what pieces of that information are most relevant, to analyze that information, and come to a conclusion with regard to some decision involving that data."*
- *"the ability to extract essential elements of a question or situation, research those elements, select well founded information and synthesize an answer or conclusion"*
- *"the process of purposeful judgment that gives reasoned consideration to evidence, context, methods and criteria"*

A minority of responses did not fit the common type of response described above, and two sub-themes were noted. The first and largest sub-theme recognized the affective dispositions. These definitions emphasized having awareness of multiple contexts or perspectives, diverse or different points of view, personal bias, ethics, open-mindedness, and attitudes. The following responses are reflective of this sub-theme.

- *"ability to view topics from many contexts, ability to understand those with varied views have valid 'other' contexts, ability to learn over time and implement multiple new contexts to understand"*
- *"the ability to use judgment, ethics and knowledge to make clinical decisions using the best evidence available"*

The second and smaller sub-theme consisted of responses that summarized the overall thinking process and were framed in a broad, all-encompassing way. The following responses are representative of this sub-theme.

- *"thinking about thinking or reflective thinking focused on deciding what to believe or do"*
- *"thinking that assesses itself to improve its quality and fairness"*

The coded responses were also separated into clinical or nonclinical faculty and analyzed to determine if the identified themes were influenced by the subject matter taught. The responses were similar among clinical and nonclinical faculty in how critical thinking was defined, with no discernible differences.

C. Components of Critical Thinking.

To obtain additional information about critical thinking the survey asked: "Are there any components of critical thinking?" with a fixed response choice of Yes, No, or Unsure. There were 85 responses with 67 selecting yes and 18 selecting unsure. With respect to demographics, response on this item was dependent only on work status; part-time faculty were more likely to respond 'unsure' than would have been expected ($\chi^2 = 7.1[1]$, $p < 0.008$). Differences for campus location and years of university teaching experience were not statistically significant.

If respondents answered 'Yes' to this item, they were then asked to identify the components of critical thinking; 65 responses were obtained. The majority (~ 51%) mirrored the words used in the responses given for the question to define critical thinking, with three respondents answering simply by referral to their previous answer. There were three equally distributed main themes noted in the majority responses: 1) identification of a question or problem to be solved, 2) obtaining relevant data and information, and 3) analysis of data to reach a

conclusion, solution or outcome to the problem, and one sub-theme: affective dispositions (Figure 2).

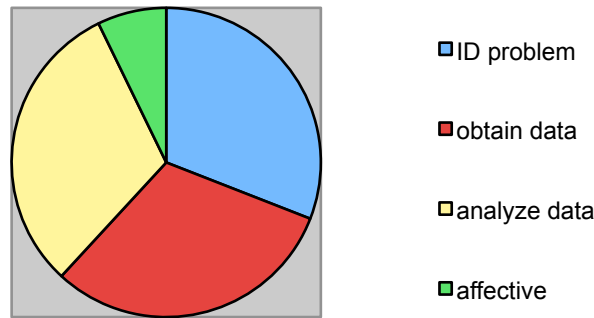


Figure 2. Themes and sub-theme for critical thinking components

The question or problem was also described as: dilemma, issue, or situation. Other descriptions of 'data' were: evidence, facts, knowledge, observation, reading, and listening. Several responses applied various criteria to the data, such as: valid, accurate, relevant, and prioritized. Other words used that had similar meaning to 'analysis' were: reason; apply; infer; synthesize; brainstorm; evaluate; formulate; compare and contrast; predict; and categorize. Other descriptors for 'conclusion' were: decision; implementation; possible results; answer; plan; course of action. The following quotes are representative of the most common type of responses.

- *"understanding the issue at hand, applying (often multidisciplinary) knowledge, and formulation of a plan of action to address the issue at hand."*
- *"Identify the question, assess multiple approaches that might provide a solution, and using experience and knowledge base at hand to determine a course of action."*
- *"1)gathering information by observation, reading listening, etc. 2)evaluating information 3)conceptualizing the information 4) analyzing information to generate a reflection as a guide to belief and action"*

Similarly to how critical thinking was defined, a minority of responses for the components of critical thinking described affective dispositions, either solely or in combination with components of the majority response (problem/question, relevant data and information, analysis to reach a conclusion). The descriptors used for these components included reflection, willingness to learn, affective domain, questioning attitude, and identifying assumptions and biases. The following brief response examples are reflective of this sub-theme.

- *"open mindedness, humility, honesty"*
- *"flexibility, creativity, objectivity"*

D. Critical Thinking Applied to the Education of Health Care Professionals.

After faculty provided their definition of critical thinking and its components, the survey addressed their view of the role of critical thinking in the education of health care students. Eighty one participants responded to the survey item: "Describe how critical thinking applies to the education of health care professionals." A majority (~ 53%) responded that critical thinking is "essential" in the education of health care professionals. Other words that conveyed similar meaning were:

imperative, necessary, needs to be taught, an inherent part, and integral. Explanations as to *why* critical thinking was thought to be essential were frequently given, and three sub-themes were identified: (1) for optimal patient outcomes, (2) to handle change (in an individual patient and in the global health care environment), and (3) to work well with patients (holistic) and with providers (interdisciplinary). There was significant overlap of the main theme and sub-themes throughout individual responses; examples are listed in Table 1.

Table1. The themes and sub-themes from responses on how critical thinking applies to the education of health care professionals, with sample statements.

Themes/Sub-themes	Sample Statements
Essential	<p><i>“It is an essential part of being able to accurately diagnose conditions, appropriately advise patients on treatment options and assimilate new medical developments and patient care information.”</i></p> <p><i>“Critical thinking is imperative to teach so that our students have the skills to become confident health care professionals.”</i></p>
Optimal outcomes	<p><i>“Health care professionals make decisions that significantly impact human lives, and so the ability to think well in order to make good clinical decisions is given high priority. Critical thinking goes hand in hand with good clinical decision making, and this is why it is so important in the education of health care professionals.”</i></p> <p><i>“The core responsibility of health care professionals is caring for patient. Information from and about these patients is often messy, incomplete, and poorly organized. In addition, information about best practices and care is often times similarly 'impaired'. Strong critical thinking skills are required to efficiently assimilate this huge volume of 'messy' information and select the most appropriate care plan for the patient - for each and every patient.”</i></p>
Handle change	<p><i>“Health care is always changing; therefore, education needs to instill critical thinking skills in students so they are poised to problem solve as new challenges within health care arise.”</i></p> <p><i>“Health care professionals must be able to critically think to determine a differential diagnosis and a treatment plan. It is also necessary to change course if unpredictable outcomes occur.”</i></p>
Work well with others	<p><i>“Health care professionals must be able to apply critical thinking to many different situations, including recognizing when a test result doesn't look right, when a colleague presents a flawed diagnosis, etc.”</i></p> <p><i>“Health care professionals need to use critical thinking in the development and implementation of treatment plans, applying theory and evidence to practice, establishing therapeutic relationships, working collaboratively with other disciplines, etc.”</i></p>

IV. Discussion & Implications.

A. Defining Critical Thinking and Its Components.

This study provides an assessment of the definition and components of critical thinking as perceived by faculty at a private, health sciences university. To our knowledge, this is the first study to survey health sciences faculty representing multiple disciplines about critical thinking. The main definition of critical thinking was described as an ability or skill to make reasoned decisions or solve complex problems based on critical analysis of available evidence. The majority of the faculty surveyed described the components of critical thinking to be identification of the problem, relevant data and information for this problem, analysis of those data, and an outcome or solution to the problem. The responses for the components of critical thinking generally served to support the definition and provided richer meaning and characterization to the definition. That critical thinking may be defined by its components is supported by the statement that the parts of thinking are fundamental structures of thought that are present whenever thinking occurs (Paul & Elder, 2006). Thus when discussing the majority definition of critical thinking, we refer to this richer and extended definition and include responses both from the 'definition' and from the 'components'.

Experts recognize that critical thinking encompasses cognitive or intellectual skills as well as affective dispositions or intellectual traits (Facione, 1990; Paul & Elder, 2008; ten Dam & Volman, 2004). Skills identified by experts include interpretation, analysis, evaluation, inference, explanation and self-regulation (Facione, 1990). The faculty in this study seemed to recognize four of these skills consistently: interpretation, analysis, evaluation and inference. Brief descriptions of these skills as described by Facione (1990) are provided here. Interpretation is to comprehend the meaning of a wide variety of data or situations, and to make appropriate categories or distinctions in order to understand the scenario. Analysis includes defining terms, comparing or contrasting ideas, and identifying the problem. It also assesses if information provides reasons to support (or refute) a claim. Evaluation brings the concept of assessment, what data are *relevant* to the question, how strong is the fit, and is additional information needed. Inference refers to making reasonable conclusions from the data and judgments, including thinking of a range of possible outcomes.

Overall, faculty recognized that a question or situation needed to be identified, that relevant data needed to be discerned and applied, and that multiple potential outcomes need to be considered. Faculty responses often mentioned the need to organize all of the data of a particular situation: *"ability to 'sort' important information from distracters in scenario"*. Determining the quality and relevance of the data was frequently found in responses: *"assessing accuracy and relevance of facts"*; *"to know what information is still needed to discover to continue"*; and *"to access and evaluate relevant literature"*. The idea of assessing risks and benefits also was mentioned and used to assess the validity of the possible outcome: *"...to step back from a problem, identify possible solutions, weigh the risks and benefits of each of the solutions and choosing the most appropriate solution based on those weighed risks and benefits"*. Concern about outcomes was common in responses: *"the ability to make connections and anticipate the impact of those connections"*. A representative response indicative of these three components is: *"Analysis of the issue; search for possible solutions; ranking the results and arriving at an evidence-based conclusion"*. Thus when viewed en masse, the responses seemed to indicate that the faculty had a reasonable understanding of critical thinking. One expert definition of critical thinking states that it is: *"thinking explicitly aimed at well-founded judgment (analysis), utilizing appropriate evaluative*

standards (evaluation) in an attempt to determine the true worth, merit, or value of something (creative component or outcome)" (Paul & Elder, 2006, p. xxiv). This definition seems to succinctly summarize the majority of responses from these faculty.

However, while the skills of interpretation, analysis, evaluation and inference were either mentioned or inferred in the majority of responses, the skills of explanation (stating or presenting the results of one's reasoning) and self-regulation (self-consciously monitoring one's cognitive activities) were not frequently found. And when the responses were viewed individually, fewer included all four components in their definition. The ability to clearly explain one's reasoning is an important skill, especially for students. Perhaps this skill is less recognized among faculty who view their role as a provider of facts and information to be learned. Another possibility is that the wording of the questions and the short answer response format did not promote inclusion of all six critical thinking skills when providing definitions. While the omission of two or more of the six identified skills could be interpreted in various ways, it does suggest that individual faculty may have an incomplete understanding of what constitutes critical thinking. This has implications toward the instruction of critical thinking; faculty cannot be expected to teach critical thinking well if they do not have a thorough understanding of what it is. It has been stated that some health sciences educational programs have done little to develop critical thinking skills in students (Blouin et al., 2009; Jenicek, Croskerry, & Hitchcock, 2011). However, we must first address faculty perceptions and understanding before we can expect critical thinking to be fostered in the classroom.

Although the majority of faculty in our study focused on cognitive skills associated with critical thinking, a small minority defined critical thinking with an emphasis on the affective dispositions or intellectual traits. Affective dispositions are an important aspect of critical thinking (Ennis, 1996; Facione, 1990; Paul & Elder, 2006; ten Dam & Volman, 2004). They may generally be understood to mean one of two things: 1) the likelihood that a person will use critical thinking skills, or 2) the likelihood that critical thinking skills will be used in a morally or ethically good way (Facione, 1990). One could think critically and use critical thinking skills effectively, but in a manner that would be considered unethical or amoral. It is this type of meaning that the minority response that focused on affective dispositions seemed to indicate. The responses expressed concern for removing personal biases, having a value system, being ethical, open-minded, honest, and humble. Our results are similar to those described in Krupat's study in which only a minority of medical school faculty defined critical thinking in affective dispositional terms (Krupat et al., 2011). However, experts point out that effective critical thinking encompasses both skills and dispositions and that neither is sufficient alone. (Facione, 1990; Paul & Elder, 2008; ten Dam & Volman, 2004). The limited recognition of the affective components lends further support to the need for faculty development opportunities to explore and apply principles of critical thinking.

We also found a second minority response who defined critical thinking using concise, summative statements: "*thinking that assesses itself to improve its quality and fairness*", and "*thinking about thinking or reflective thinking focused on deciding what to believe or do*". These minority definitions are similar to those of experts in the field, such as: "critical thinking is the art of thinking about thinking while thinking in order to make thinking better" (Paul & Elder, 2006, p. xvii). While distinct from the majority definition in the wording used, we felt these minority responses encompassed the elements of analysis (defining thinking), evaluation (assessing thinking), and outcome (improving thinking) that were more explicitly found in the majority responses. Although these responses were brief and concise, we were encouraged that some

provided a more global definition without framing it in a healthcare context, and which was reflective of recognized experts.

B. Critical Thinking as it Applies to the Education of Health Care Professionals.

The majority of faculty surveyed identified critical thinking to be *essential* in the education of health sciences students. This result reflects the stated importance given to critical thinking by the health science professions as well as college and university accreditation agencies. Additionally, this result is in agreement with the survey of more than 22,000 full time faculty at four-year colleges and universities; nearly 100% considered development of student's critical thinking skills to be an essential goal for faculty (DeAngelo, Hurtado, Pryor, Kelly, & Santos, 2009).

Critical thinking experts also consider critical thinking to be essential for health care providers, and it has been described in this context as "the process we use to make a judgment about what to believe and what to do about the symptoms our patient is presenting for diagnosis and treatment" (Facione & Facione, 2008, p. 2). To make this judgment, the clinician should consider the symptoms and evidence in the context of the presenting scenario, use his/her knowledge and skills learned from training and experience, anticipate likely effects of any chosen treatment or action, and monitor the consequences of those delivered actions and care (Facione & Facione, 2008). The sample statements in Table 1 support *why* critical thinking is viewed as essential in the education of health care professionals and reflects the current focus of health care: optimal patient outcomes, being prepared to handle change, working as part of a health care team, and patient-centered care.

It is encouraging that most faculty recognize a common, essential goal of fostering critical thinking skills among students. It implies a willingness to learn more about critical thinking by participating in faculty development opportunities, reviewing the literature and exploring ways to incorporate it into teaching. To facilitate this essential goal, administrators must be willing to provide the necessary resources along with recognition of the time and effort required to integrate critical thinking within the classroom.

V. Limitations.

This study utilized a convenience sample of health sciences faculty within a single institution and the results may not generalize to other populations. Electronic access to an online survey was used to facilitate the number of faculty solicited. The survey was designed by the investigators based on the existing literature, but was not externally reviewed or piloted prior to use in this study. The qualitative responses submitted by the participants were limited to brief descriptions that required some interpretation by the researchers. Three responses were so brief that we were unable to discern meaningful content. More in-depth responses, with less need for researcher interpretation, could have been obtained from personal interviews; however this method requires considerable time and effort from both the subjects and researchers and was not feasible in our situation.

VI. Conclusion.

Critical thinking is recognized as important to student learning by the many educational entities that name it as necessary for successful programmatic outcomes. Experts acknowledge that critical thinking concepts and skills can be taught and learned. If faculty are charged to foster critical thinking skills as part of the curriculum, it is reasonable that they should have a clear and

cohesive understanding of what it is. The adage, you can't teach what you don't know, is appropriate. The majority of faculty in this study proclaim that critical thinking is essential to the education of health care professionals, inferring a willingness to teach it. The predominant way that faculty in this study described critical thinking is an ability to make reasoned decisions or solve complex problems based on critical analysis of available evidence. This description contained some of the expert-defined attributes of critical thinking but was lacking in others, particularly the affective components. This finding supports the need for ongoing faculty development opportunities that fully describe and clearly develop a deep understanding of the concept of critical thinking. These opportunities also need to provide practical methods that can be applied by faculty to promote critical thinking in the classroom.

The results from this study have implications for all faculty who want to improve student learning. Experts acknowledge that specific subject content can be learned only through careful (critical) thinking (Paul & Elder, 2006), indicating the intimate connection between learning of subject content and thinking ability. Superficial thinking leads to short-term retention and poor learning; deep thinking leads to substantive learning and comprehension. Therefore, the ability to promote deep learning is directly impacted by faculty knowledge and incorporation of critical thinking concepts. As faculty better learn about critical thinking and develop methods to foster it, student learning can be expected to improve and successful outcomes can be achieved.

The implications of this study for teaching and learning are summarized here.

1. Faculty should clearly understand and agree on what critical thinking is if they are to teach it.
2. Faculty should be prepared to teach critical thinking and recognize the importance it has to long-term learning.
3. Faculty development opportunities should include the learning and applying of critical thinking skills and dispositions to teaching in a context-specific manner.
4. Administrators should provide necessary resources and recognize the time and effort that will be required by faculty to incorporate critical thinking in the classroom.

This study sets the stage for additional exploration of the impact that faculty perceptions of critical thinking have on teaching and student learning. As this connection is strengthened and further understood, it can lead to evidence-based recommendations that foster and develop critical thinking among all students.

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