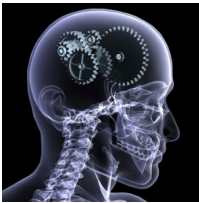




# The Incorporation of Critical Thinking into Medical Education

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“Education is not the learning of facts, but the training of the mind to think”  
- Albert Einstein

## Objective:

To explore the impact of introducing formal critical thinking skills early in medical education

## Background :

### Traditional medical education:

- Presents a focused problem
- Promotes rapid recall
- Fosters stigma for “I don’t know”
- Assesses with short-answer standardized exams
- Emphasizes individual performance

### Real-life medicine and research:

- Confronts multi-disciplinary complex problems
- Requires exploration for information
- Contains incomplete and conflicting information
- Promotes creative and complex solutions
- Requires collaborative problem-solving

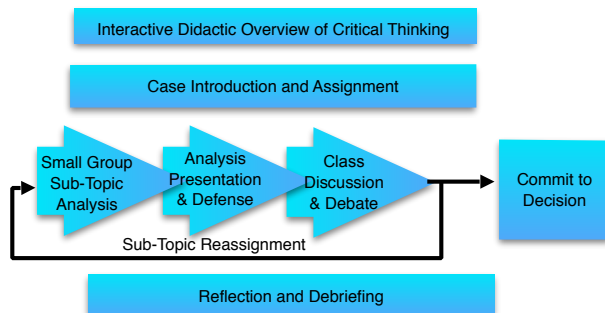
## Approach:

A series of case-based collaborative sessions aimed at developing several distinct skills:

- Defining the scope of a complex problem
- Reducing a problem into definable parts
- Searching for relevant information
- Examining each part from multiple perspectives
- Prioritizing the parts and their potential solutions
- Committing to an actionable solution while acknowledging unaddressed complexities and unknowns.

## Pilot Study Format:

15 first-year MD/PhD students, 2 first-year MD students and 4 IMP fellows participated in 4x 1.5-2h in-class pilot sessions, with accompanying out-of-class small group preparation and reflection



**Case 1 : Research Foundation Executive Board Task  
Redistribution of Foundation Funds Following Budget Cuts**

**Case 2: Debate Topic with 3 Sub-debate Topics**

**Solid Organ Donation Should be Presumed following Brain Death**

## Results (Student Reflections) :

“The nature of the problem we set out to solve was unclear [...] As we began our research our options immediately exploded outside of the limited three sectors that were presented”

“The problem we set out to solve was unclear. As ideas were discussed, the objectives of understanding how to examine and evaluate different domains became more apparent.”

**Initial discomfort with uncertainty evolved into comfort with dissecting a problem**

“Although it was intentionally left vague, we were able to make sense of them”

“No matter how vague or ill defined [a problem] may feel, there is always some direction you can take with more critical thinking. ”

“Though [it] felt a little vague to begin with [...] there was so much discussion and it felt more streamlined and thought provoking. ”

“Having a safe open space to bounce ideas off of each other and flesh out these complicated issues from our viewpoints was invaluable.”

**Value of group discussion for brainstorming and broadening perspective**

“We all think from different angles”

“It was useful to participate in the discussion, to hear all aspects to this question and how this question can be systematically approached from so many different angles.”

“It made me look for support of the side I don’t actually agree with, broadening my perspective.”

“It allowed us to consider both sides and understand the arguments that could be made from each side and the logic behind them even though we were partial to one side”

**Value in having to defend a different sub-topic of the same issue**

“We did learn to attack problems from multiple angles and watch for the various intersections between domains that were illuminating.”

“The juxtaposition of [...] valid but completely contradicting arguments highlighted this idea. Additionally...approaches from viewpoints could even be synergistic.”

“This exercise exemplifies how problem solving can at least be approached if not be easily reached”

“This exercise did give a sense into how difficult this decision can be [...] there may be no right or wrong answer.”

**Insight into complexity of multidisciplinary problems**

“It made me realize that these problems are not as clear-cut as they initially appear. ”

“Allowed for a better understanding of what goes into evaluating each domain and how to begin to consider which to prioritize based on available evidence.”

“It was clear [...] we will face decisions like this throughout our career as researchers, reviewers, etc”

“I definitely see the skills practiced during these sessions as useful in almost any career. ”

**Appreciation of utility of critical thinking skills in future careers**

“These are really important conversations for SCIENTISTS to contribute to and yet they rarely do.”

“I realized that THESE are the questions we should be asking, these are the conversations that will shape our future.”

## Results (Facilitator Reflections) :

With the input of students, attending faculty members and outside consultants, we sought to structure these sessions to optimize our approach. Throughout the pilot, we used our own observations and student and faculty input to adjust our strategy in order to stay in line with our objectives. We found the following components of our design to be the most effective:

Required Element	Result
Presentation to Peers	Compelled High quality work
Use of references from both public and biomedical domains	Increased diversity and creativity of arguments
Collaboration within a small group	Broadened individual perspectives
Defense of multiple sides of the same problem	Reinforced complexity and uncertainty of multi-dimensional problems

## Conclusions:

We assessed this exercise by anonymous reflective feedback, open discussion, and analysis of the written and oral presentations. Through these assessments, several themes emerged. Students initially felt discomfort in having to define a vague problem, but this discomfort diminished as the exercise proceeded. Students saw the merit of working in a group, citing that their peers helped them to define an initially vague problem and that the group discussion expanded their perspective. They appreciated the value of analyzing a problem from multiple angles, citing that this highlighted the complexity and often inconclusiveness of multi-disciplinary problems. On a broader scale, students were initially skeptical of this exercise in how it related to their careers, but as the exercise progressed, their perception of its utility increased. While this was a pilot study limited by both the number of students and sessions, preliminary results suggest that there is value in early emphasis of critical thinking to improve students’ ability to define, organize, and analyze relevant information, and to broaden their perception of skills that will be useful to both their clinical and research careers.

## References:

1. Densen P. Challenges and opportunities facing medical education. *Trans Am Clin Climatol Assoc.* 2011;122:48-58. PMID: 21686208
2. Tversky A, Kahneman D. Judgment under uncertainty: heuristics and biases. *Science.* 1974 Sep 27;185(4157):1124-31. PMID: 1753457
3. Kahneman, Daniel. *Thinking, Fast and Slow.* Farrar, Straus & Giroux, New York, NY, 2011.
4. Krupat E, Richards JB, Sullivan AM, Fleenor TJ Jr, Schwartzstein RM. Assessing the effectiveness of case-based collaborative learning via randomized controlled trial. *Acad Med.* 2015 Nov 24

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“We look for medicine to be an orderly field of knowledge and procedure. But it is not. It is an imperfect science, an enterprise of constantly changing knowledge, uncertain information, fallible individuals, and at the same time lives on the line.”

— Atul Gawande