

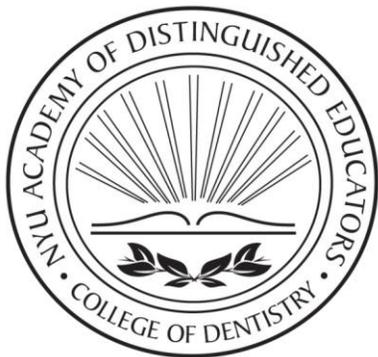
# Building excitement for critical thinking

A White Paper developed by

New York University College of Dentistry  
Academy of Distinguished Educators  
Think Tank Committee on Critical Thinking

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## Preamble

The Academy of Distinguished Educators (Academy) of New York University College of Dentistry (College) is a group of faculty members who are committed to elevating the quality of teaching and learning at the College. The Academy promotes innovation, experimentation, and evaluation of methods used for instruction and assessment, and encourages approaches that are reasonable and evidence-based.

This white paper is a result of the Academy's *think tank* function, in which conditions, policies, and practices affecting the College are examined and contextualized, along with suggested opportunities to guide institutional enhancements.

The process of topic selection derives either from within the Academy or at the request of the leadership of the College. Academy members voluntarily elect to participate in topic-specific working committees. Committee members then meet to discuss the charge and exchange ideas. At the point of providing written documentation of the process, the authors of a white paper provide insights from the literature and suggest a limited set of opportunities for moving forward that are both reasonable and evidence-based in the form of a working draft. After the working draft is developed, it is shared with communities of interest in an iterative process, through which feedback and comments are received and incorporated.

The first working draft of a white paper will thus be distributed to the executive members of the Academy, to the general members of the Academy, the members of the faculty council, and the members of Executive Management Council, the latter of which is comprised of deans, supervisors, leaders, and administrators from the New York University College of Dentistry. Final editorial decisions are made by consent of the authors of the white paper.

## Introduction and Approach

What is **critical thinking**? Although the terminology “critical thinking” is commonly used in education at all levels, consensus on a definition of critical thinking does not yet exist. The Commission on Dental Accreditation (CODA) describes four dimensions of critical thinking: (1) the application of logic and accepted intellectual standards to reasoning, (2) the ability to access and evaluate evidence, (3) the application of knowledge in clinical reasoning, and (4) a disposition for inquiry that includes openness, self-assessment, curiosity, skepticism, and dialogue.<sup>1</sup> As such, CODA believes that critical thinking is foundational to the teaching and deep learning of any subject. In fact, CODA has determined that dental students must exhibit competence in critical thinking as a requirement for graduation from an accredited institution.<sup>1</sup>

In order to teach and assess critical thinking skills in a meaningful way, a greater challenge exists – that of creating a *culture of inquiry* that motivates and encourages the implementation of critical thinking in all institutional policies and practices. For faculty, this means adopting an attitude toward critical thinking that allows learners to feel confident in their prerogative to inquire and verbalize their thought processes. For dental students, this means continually rekindling excitement around their choice of dentistry as a profession. For all community members at the College, this means celebrating a working and learning environment where people feel safe to challenge assumptions, express doubt, and apply reason in evidence-based decision-making.

The three authors of this paper represent diverse disciplinary perspectives, namely, general dentistry, orthodontics, and epidemiology. Collectively, they participate in clinical training, didactic instruction, classroom innovation projects, simulation laboratories, and mentorship (pedagogy and research). Each author has been active in dental education for a minimum of twenty years. In a series of face-to-face meetings over the past year, the authors decided to employ a heuristic approach rather than an evidence-based approach to developing this white paper. Accordingly, each author independently searched the published literature to identify two scientific articles or scholarly works with a central theme of building excitement for critical thinking. The authors then read each of the six identified papers with the goal of identifying at least one useful point or idea that moved them per article, termed a *pearl*. Next, they documented their insights and met to discuss ways to meaningfully present and implement their findings.

The purposes of this white paper are to: (1) describe principles that support a culture of inquiry, (2) identify methods of instruction and assessment (practices) for attaining critical thinking skills, and (3) suggest opportunities for enhancing the teaching and learning environment at the College.

## Primary References

In their forward thinking chapter, **A transformation model for passion in the workplace**,<sup>2</sup> Boverie and Kroth describe and urge the adoption of ecological workplace organizations and environments to facilitate human potential. This model attends to the emotional needs of individuals. Work should be fun, exciting, and joyful. Individuals need to feel their work is important and meaningful. The authors believe that work without joy or meaning results in burnout, lifelessness, lack of creativity, and a dearth of initiative. Alternatively, organizations that de-emphasize the natural order and view workers as mechanistic instruments can encourage learned helplessness, which is a fatalistic response stemming from the belief that whatever one does will not matter. The authors describe an iterative transformational process to help employees and organizations realize greater depths of passion and motivation. Often this process requires revealing organizational assumptions about the past, present, and future. The authors observe that most organizational cultures were not created systematically or with a specific design in mind. Hence, many cultures have dysfunctional aspects that inhibit employee development and passion for work. In their view, one of the most liberating acts is to create a climate in which critical thinking is the norm.

In his provocative essay **Assessing critical thinking**,<sup>3</sup> Brookfield describes critical thinking as essential to a participatory democracy. He claims that critical thinking can redirect the flow of power in personal and professional interactions. Further, he observes that critical thinking often reveals assumptions that are accepted by members of a community who believe it is in their best interest to do so, when in fact the acceptance of these assumptions serves others who may not have their best interests at heart. The essay describes critical thinking as context bound and as a socially constructed process. In order to self-reflect, we need others to be our critical mirrors. Brookfield presents examples of critical thinking exercises that can form the basis for guided reflection and assessment. In each of these exercises, learners reveal assumptions, check for accuracy and validity, and consider alternative perspectives. He concludes by emphasizing the importance of role models for critical thinking and believes that students will learn critical self-assessment partly by observing how their teachers engage in the process.

In their innovative article **Operation ARA (acquiring research acumen): a computerized learning game that teaches critical thinking and scientific reasoning**,<sup>4</sup> Halpern and colleagues present their critical thinking learning game. The purpose of the game is to teach foundational scientific principles and methods, while also providing a toolkit for questioning assumptions, identifying bias, and examining alternate perspectives. Operation ARA was designed to incorporate best practices in the science of learning and serious games.

In the published transcript of his distinguished lecture, **Too much content, not enough thinking, and too little FUN**,<sup>5</sup> DiCarlo argues that instilling a passion for life-long learning is the primary function of education. In order to accomplish this goal, he

proposes allocating classroom time to provide space for active inquiry, discussion, and collaborative problem solving.

In her pragmatic article, **Using literature and innovative assessments to ignite interest and cultivate critical thinking skills in an undergraduate neuroscience course**,<sup>6</sup> Lynd-Balta presents an instructional method to support teachers and their students in acquiring content knowledge, developing critical thinking skills, and conveying excitement in the classroom. This entails augmenting traditional instruction in an upper level undergraduate neurobiology course with a multifaceted project. Specifically, all aspects of the project relate to a common underlying theme, in this case, a neurodegenerative disorder (amyotrophic lateral sclerosis or ALS, commonly known as Lou Gehrig's disease). The project involves reading nonscientific literature, writing a reflective reaction essay guided by a set of questions, and creating an evidence-based informational pamphlet that considers the perspectives of the sponsoring organization and target population.

Finally, in their breakthrough article, **Using the Four Questions Technique to Enhance Critical thinking in Online Discussions**,<sup>7</sup> Alexander and colleagues describe a technique to enhance critical thinking in online discussions. By asking four standardized questions, students are provided with a scaffold to: (1) *analyze*, i.e., identify one important concept, finding, theory, or idea, (2) *reflect*, i.e., ponder why it is important, (3) *relate*, i.e., apply it to one's life, and (4) *question*, i.e., consider what new questions it has raised.

## Insights from the Literature (“Pearls”)

Consequent to in-person meetings and e-mailed correspondences relevant to these six primary references, the authors of this critical thinking white paper reached consensus on the three most important insights (“pearls”) derived from each of the six papers reviewed. Table 1 lists these pearls.

Note that the pearls are sentences quoted verbatim from the published work. Reviewed papers are noted in bold typeface, and italics were added to quoted sentences to emphasize the essential phrases or ideas that captivated the authors and/or were introduced in more than one published paper or chapter.

**Table 1:** Pearls gleaned from the primary references on building excitement for critical thinking

<b>A transformative model for passion in the workplace<sup>2</sup></b>
<i>Organizations often promote learned helplessness</i> (the giving-up reaction, the quitting response that follows from the belief that whatever you do doesn't matter) in their employees.
One of the most <i>liberating acts</i> is to create a climate in which critical thinking is the norm.
Just as individuals seek intimacy and emotional connectedness with others, in organizations, employees seek connections with their fellow employees and to their work ( <i>occupational intimacy</i> ).
<b>Assessing critical thinking<sup>3</sup></b>
Critical thinking entails adults understanding that the <i>flow of power</i> is a permanent presence in our lives.
If critical thinking is <i>context and person specific</i> , if its manifestation is irrevocably embedded in its cultural surroundings, then an intelligent approach to assessment requires that it be grounded in local conditions.
If critical thinking is conceived as an <i>irreducibly social process</i> , then our peers (and teachers) become important critical mirrors.
<b>Operation ARA: a computerized learning game that teaches critical thinking and scientific reasoning<sup>4</sup></b>
Effective tutors need to both <i>correctly gauge and adapt</i> to the student's current level of understanding.
Ideally, <i>everyone should know how to critically evaluate</i> the products of science and evidence-based claims, even when the topic seems distant from our usual notions of what constitutes science.
Learners need to <i>expend more effort when learning conditions are variable</i> , but the hard work of effortful learning pays large dividends when long-term retention is assessed.
<b>Too much content, not enough thinking, and too little FUN!<sup>5</sup></b>
We must <i>reduce the amount of factual information</i> that students are expected to memorize because students are going to forget that information.
To encourage thinking we must <i>create a joy</i> , an excitement, and a love for learning.
Students may forget what you said, and forget what you did, but will <i>never forget how you made them feel</i> .
<b>Using literature and innovative assessments to ignite interest and cultivate critical thinking skills in an undergraduate neuroscience course<sup>6</sup></b>
The <i>majority of students are young and healthy</i> , so it is particularly effective to use literature before studying a particular disease/condition/dysfunction, because most students have little or no experience with it.
As students explore the topic from multiple perspectives, they recognize the <i>interconnectedness of science and society</i> and confront ethical and moral issues related to science.
The information <i>sparked extensive in-class discussions</i> about disease processes, individual's rights, and society's responsibilities.
<b>Using the four-questions technique to enhance critical thinking in online discussions<sup>7</sup></b>
After each one of the three discussion forums, evidence of critical thinking was measured by rating students' comments according to a <i>validated critical thinking rubric</i> .
<i>Identify one important concept</i> , research finding, theory, or idea in psychology that you learned while completing this activity.
Apply what you have learned from this activity to <i>some aspect of your life</i> .

## Analysis and Critical Reflection: Best Principles and Best Practices

In an effort to understand and summarize transferable **best principles** and **best practices** on building excitement for critical thinking, the authors of this white paper began constructing a list of pointers that might be helpful toward creating a culture of inquiry at the College. Upon critical reflection of the pearls culled from the scientific and scholarly literature (Table 1), the following themes emerged and were categorized by the authors.

### (1) **Best principles that support a culture of inquiry**

- Create and foster a safe environment at the College, where assumptions are routinely questioned for teaching and learning critical thinking skills.
- Develop vehicles for facilitating meaningful and constructive exchanges among faculty, students, and staff, since critical thinking is a social process.
- Pay particular attention to the settings, frameworks, and background features of the presented problems and solutions, as critical thinking is necessarily context bound.

### (2) **Best practices for attaining critical thinking skills (methods for instruction and assessment)**

- Use active learning methods that involve students whenever possible, rather than passive learning methods intended mainly for content delivery.
- Utilize a range of teaching and learning approaches and techniques, because variability enhances transfer.
- Utilize questions to guide/enhance critical thinking.
  - Identify or analyze one important concept.
  - Probe or reflect on why the identified concept is important.
  - Apply or relate the identified concept to an aspect of one's life.
  - Question assumptions and challenge the status quo.
- Role model critical thinking for students.
- Utilize or develop reliable, valid, evidence-based tools to monitor outcomes.

## Opportunities

Recognizing that critical thinking is context and person specific,<sup>3</sup> and having identified best principles and best practices based on the reviewed primary literature, the authors considered opportunities to enhance critical thinking skills within the College. These suggestions are pragmatic in that they can be incorporated into the present structure of the curriculum with only minor adjustments.

### (1) **Case discussions at monthly morning rounds**

- a. Faculty moderators could guide students to identify, research, and test their assumptions, and to encourage and explore multiple perspectives and alternatives.
- b. Case scenarios could vary in complexity and be sequenced to increase in complexity over time.

### (2) **D3/D4 evidence-based written projects**

- a. This project requires students to identify/construct a clinical question, conduct an evidence-based search of the literature to address the clinical question, appraise the evidence, draw conclusions, apply conclusions to patient care, and assess results.
- b. Evaluation of this project could include utilizing a validated critical thinking rubric.<sup>7</sup>

### (3) **Integrated case presentation seminars**

- a. These seminars involve D1-D4 students in a team-based presentation. A D4 student presents a patient with a problem. A D1 student presents the physiology of the problem. A D2 student presents the pathology of the problem. A D3 student formulates a clinical question and appraises evidence in the scientific literature to address the question.
- b. For the most part, aside from the presenters, the learning is passive. Solutions derive from the idea of increasing active learning experiences. Some examples to consider:
  - i. Small groups simultaneously engaged in problem-solving.
  - ii. Introducing nonscientific literature that relates to the patient's condition, followed by guided questions to enhance critical thinking.

### (4) **Self-assessment portfolios**

- a. D1-D4 students write reflection essays about their experiences at the College.
- b. Focused questions would help to guide students through these critical thinking exercises.

## Conclusions

For learners to be passionate, there must be elements of joy and meaning in their work. A culture in which direction is given without meaningful, participatory, thoughtful discussion is not one that engenders critical thinking. Faculty at the College often question what happens to students between admission and graduation. Why do they lose their sense of excitement for a profession that they have chosen? In order to maintain (or produce) passion in the College, all constituents must intentionally question assumptions to discover, design, and develop a nurturing environment that promotes joy and meaning<sup>2</sup>.

The College has many programs in place that are ideal platforms for enhancing critical thinking skills. Structure, guidance, and focus will elevate these programs to become more meaningful to the students, and more easily assessed by the faculty.

In order to effectively teach students to engage in critical thinking, faculty must model that behavior.<sup>3</sup> A culture of critical thinking must permeate the entire community, from leaders to learners. During the process of creating this white paper, the authors sought to incorporate critical thinking into the process intrinsically. They utilized their own identified principles of critical thinking in order to generate their data and draw conclusions. As a result of this process, each author has reported increased excitement for teaching. While it would be inappropriate to generalize from these results to our peers and students, we are hopeful that a culture of critical thinking at the College will energize learners and teachers alike.

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