

Core Themes in Critical Thinking: Perspectives from Students and Teachers

J. Nyléhn, C. Boge, and J. Soulé, *University of Bergen*

ABSTRACT: There is a broad consensus that university studies should facilitate students' critical thinking skills, as asked for in a multitude of policy documents and from work life. There is, however, a lack of consensus of what critical thinking is. The present study investigates university students' and teachers' understanding of critical thinking, and what barriers they perceive prevent critical thinking. Three main dimensions were found in the concept of critical thinking: 1) *skills* (e.g., interpretation, hypothesis testing, evaluation of validity, discussion); 2) *dispositions* (e.g., predispositions and biases, openness for multiple viewpoints, willingness to reconsider established truths, belief in authority); and 3) *knowledge* (e.g., lack of knowledge and experience, lack of time, unclear concept). University teachers estimated a higher amount of critical thinking in university courses compared to the students, and the teachers also mentioned more diverse examples of critical thinking, especially in relation to research skills. Both students and teachers reported *time* to be the main barrier for critical thinking. Other barriers were lack of adequate knowledge, experience, exposure to a multitude of perspectives and biases. The study concludes with recommendations for teaching.

1 INTRODUCTION

There is a broad consensus that critical thinking is of uttermost importance in higher education, as shown in many different policy documents as well as asked for from working life (Meld.St. 16 (2020-2021), Meld.St. 16 (2016-2017), Parr et al. 2022, Penkauskienė et al. 2019). Despite this consensus, there is a lack of agreement of what critical thinking is (Gunawardena and Wilson 2021, Moore 2013). University teachers should facilitate students' development of critical thinking, but the multitude of definitions might confuse (Moore 2013). Gunawardena and Wilson (2021) state that the diverse definitions and inconsistent terminology of critical thinking is a major problem to accomplish this goal.

To increase the knowledge of the content of critical thinking, we put forward the following research questions:

- How do teachers and students understand the concept of critical thinking?
- How and to what degree do teachers and students perceive critical thinking as a part of teaching?
- Which barriers do teachers and students perceive for critical thinking?

2 THEORETICAL FRAMEWORK

Moore (2013) warned against regarding “critical thinking” as a singular concept. On the contrary, the concept “critical thinking” might be understood as a “family resemblance group” in the tradition stemming from Wittgenstein (Fox 2014). A family resemblance group consists of interconnected and related words or topics, which overlap and underpin a concept in a complicated network (Fox 2014). The items partly overlap with each other, leading to multiple layers of connections within a complicated concept. Such complicated terms are caused when humans engage in iterative social negotiations of their meaning.

Conceptual complexity is to be expected in a family resemblance group. Such concepts are dimensional, and subsets of the dimensions might be useful for different purposes. Thomas and Lok (2015) reviewed the research on critical thinking and identified and structured the components they found. They identified three main categories: skills, dispositions, and knowledge (*Fig. 1*). Each of the main categories consisted of three subcategories in the model of Thomas and Lok (2015).

Several *cognitive skills* are relevant for critical thinking. Thomas and Lok (2015) suggest three subsets of critical thinking skills: 1) *reasoning*, the ability to identify and explore evidence and explanations; 2) *evaluation*, the ability to analyze and interpret; and 3) *self-regulation*, the ability to reflect upon and gather evidence.

Personal *dispositions* are also of relevance, defined as willingness to perform something under certain conditions. Thomas and Lok (2015) put forward three categories of dispositions relevant for critical thinking: 1) *attitudes*, for example being open-minded; 2) *intellectual virtues* as being truth seeking and curious; and 3) *habits of mind*, for example the tendency to move beyond black-and-white (dichotomous) thinking.

Thomas and Lok (2015) identified three subclasses of *knowledge* relevant for critical thinking: 1) *general information* that enables evaluation; 2) *knowledge specific* for the discipline or context; and 3) *experience*, including personal development through life and work. The deep connection between knowledge and critical thinking is widespread in literature, and numerous authors point out that critical thinking is not possible without knowledge. Willingham (2019) argues that critical thinking needs to be learned in close connection to content knowledge, as knowledge is pivotal to think critically about a topic.

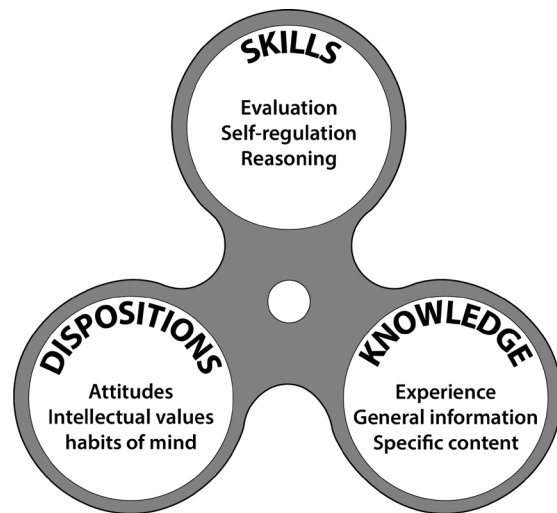


Figure 1. The main categories of the concept of critical thinking, adapted from Thomas and Lok (2015).

3 METHOD

The present work is a qualitative pilot study which aims at 1) exploring how biology students and teachers perceive critical thinking in the teaching activities they participate in, and 2) identifying which barriers they encounter in their curriculum.

We designed a survey based on a short questionnaire created in SurveyXact which consisted of 5 open questions and one question with a 4-point Likert scale (Cohen et al. 2011). The questions were: “What does critical thinking mean to you?”; “Which aspects of critical thinking are important in your academic field?”; “To what extent is critical thinking part of your teaching?” (Likert scale); “In which contexts do students apply critical thinking in your course?”, “Which factors limit students’ critical thinking?” and “What are limits to your own critical thinking?”.

The questionnaire was first sent to the teachers of the Department of biological sciences, University of Bergen. A slightly modified version of the questionnaire was then sent to a group of 4th-year students at the same department. Focus of the questions was equal to those the teachers received, but the phrasing of the questions was adapted to be more suitable for the student respondents.

We used conventional content analysis (i.e., inductive coding or free coding), and assigned codes to excerpts after data collection based on the data material and not previous research and theory (Hsieh 2005). In the present study, all responses were both analyzed and coded individually by the three authors. Codes were then brought together, compared, and discussed in order to identify unique items, to merge semantic duplicates, and to strengthen consistency between the authors’ analyses. The codes were subsequently gathered into categories and later compared to the three main categories of the model of Thomas and Lok (2015).

4 RESULTS AND DISCUSSION

The small survey on critical thinking gave us 16 valid teacher responses and 9 valid student responses. Numerous dimensions were identified in the answers, in accordance with Moore (2013) and Thomas and Lok (2015). However, the concept “critical thinking” seems to be perceived as more complex and multifaceted among teachers, compared to the students understanding of the concept. As we finished coding the teacher response to the first question, “What does critical thinking mean to you?”, we counted

15 unique codes. The most frequent of these codes among teachers are *validity*, *perspectives*, *information evaluation* and *judgment*, while the most frequent code among students is *being critical*. This is expressed by one of the students “to be critical to information and to be skeptical and questioning something”. Analogous to the teacher respondents, the second most frequent codes among students are *validity* and *judgment*. Some students responded that the meaning of critical thinking was unclear, that it was hard to know what it meant. The code “to be critical” is more prevalent in student answers than among teachers, which might indicate a shallow understanding of critical thinking (“critical thinking is to be critical”), lacking depth and examples.

When asking the teachers which aspects of critical thinking they find important for their academic field (Question 2), the most frequent code is *methodological criticism*. This implies the ability to both use and evaluate relevant research methods, and models, for example accurate procedures for collecting and analyzing data, and critically evaluate mathematical models. *Knowledge* is the second most frequent code among the teacher answers: in order to be critical, adequate knowledge of the subject is essential. Students, on the other hand, consider *information evaluation* to be the most important aspect of their field of study. In addition, students highlight the importance of critically evaluating different points of view (*perspectives*), as well as clear *graphical presentations*. Contrary to the teachers, *methodological criticism* is not mentioned by the students.

In the third question we asked the teachers to what extent critical thinking is part of their teaching, by using a 4-point Likert scale (*to a large extent, to some extent, little, not at all*). Students were asked to what extent critical thinking has been part of the teaching they have participated in, giving them the same scale as the teachers. All teachers claim that critical thinking is part of their teaching, 56 % stated it is a major part of their teaching while the remaining 44 % stated it is to some extent part of their teaching. Two thirds of the students agree that critical thinking is to some extent part of the teaching, while one third of the students experienced that critical thinking was a little part of the teaching.

In the fourth question the respondents were asked to exemplify activities where students apply critical thinking in their courses. Many teachers mention *discussion* and *methodological criticism* as activities, other examples of critical thinking in teaching include to discuss different sources of information and literature (*information evaluation*) or implementing critical thinking as a part of *problematization*, *reflections* and students giving feedback to other students (*peer evaluation*). Students – on the other hand – emphasize *information evaluation* as the most frequent example where critical thinking is used in their courses. The second most frequent mentioned examples include *perspectives*, explained by one of the students as “comparing statements, articles or facts”.

Regarding factors that limit the use of critical thinking in teaching (Question 5), teachers and students are more aligned. *Lack of experience* is by far the most frequent factor according to the teachers: “Respect for authorities, lack of experience in assessing and discussing a case from several sides”, as one teacher puts it. Lack of *time*, *belief in authority*, lack of *knowledge* and *bias* are other factors mentioned by several teachers in the survey. Students emphasize *knowledge* and *lack of experience*, as well as *time*, *superficial learning* and *information evaluation*.

In the sixth and last of the open-ended questions we asked what limits teachers’ and students’ personal critical thinking. Once again answers were aligned, as lack of *time* is the most frequent code in both the teacher and student survey. *Bias* and lack of *knowledge* are other factors mentioned by both groups.

4.1 Categories of critical thinking

We identified three main categories with subcategories in the qualitative content analysis (Fig. 2): 1) *skills* (e.g., interpretation, hypothesis testing, evaluation of validity, discussion); 2) *dispositions* (e.g., predispositions and biases, openness for multiple viewpoints, willingness to reconsider established truths, belief in authority); and 3) *knowledge* (e.g., lack of knowledge and experience, lack of time, unclear concept).

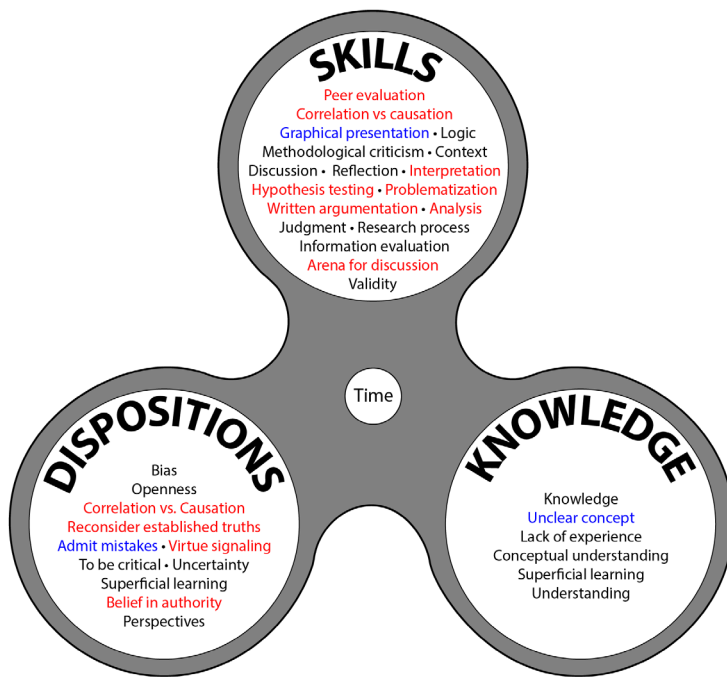


Figure 2: Categorization of the codes by the main categories of the concept of critical thinking, adapted from Thomas and Lok (2015). Red: codes only found in the teachers' survey; blue: codes only found in the students' survey; black: codes found in both surveys.

Students, on the other hand, seem to focus more on explicit examples of critical thinking. For example, to interpret graphs critically, especially notifying the starting point of the axes. In addition, many students associate critical thinking with the process of searching for relevant literature and information and critically evaluate the results of the search. Several of the students stress the importance of being critical to information on the Internet and social media.

4.3 Perceived barriers to critical thinking

Time is by far the most frequently mentioned barrier for critical thinking among both students and teachers. This is not surprising, as critical thinking is hard work, involving conscious and deliberate processes in the restricted working memory (Baddeley 2012, Willingham 2019).

Furthermore, superficial knowledge and lack of deeper understanding are recognized as a barrier for critical thinking in the present study. Critical thinking depends on a foundation of knowledge to build judgments upon (Lang 2016). Knowledge is also a main category in the model of critical thinking in Thomas and Lok (2015). Students are in the process of becoming a scholar, to acquire knowledge and learn the central skills and competences of a specific discipline. Their knowledge bases need to be built step by step, accompanied by their development of critical thinking. Agarwal et al. (2019) recommend mixing the learning of factual knowledge with higher order thinking.

Students also frequently mentioned belief in authority and the habit of believing that the textbook is the truth as barriers for critical thinking. Both students and teachers mentioned multiple perspectives as valuable to think critically on a given topic. Some teachers pointed out the lack of challenging viewpoints, for instance stating that they live in a “echo chamber around the lunch table”. Taken together, a diversity in perspectives is proposed as highly useful to support critical thinking.

Numerous respondents mentioned biases and predispositions as barriers for critical thinking. The fact that so many among the respondents mentioned bias can be seen as positive, as the first step to being more aware of our fast-paced and potentially unfair judgments and blind spots. On the other hand, mentioning bias might represent only a superficial awareness and not a willingness to challenge one's own predispositions. Furthermore, a teacher mentioned “virtue signaling” as a showoff of being correct, and a student mentioned the “shame of admitting mistakes” as barriers to critical thinking. Both statements might be interpreted as fear of thinking freely and openly, caused by our dependencies on each other and adaptations of the social brain (Dunbar 2003).

Our results are in accordance with the model of Thomas and Lok (2015). Both studies identified three similar main categories, critical thinking *skills*, *dispositions* and *knowledge*. We collected the data and coded the answers prior to reading Thomas and Lok (2015) and categorized our material independently of their model.

4.2 Critical thinking in teaching

According to the students, critical thinking is included in little or some degree in teaching. The teachers, however, state that there are some or high degree of critical thinking included in their teaching. This discrepancy might be solved when looking at what students and teachers understand as critical thinking. The teachers are giving more examples of critical thinking, especially research-related skills, for instance hypothesis testing.

4.4 Limitations of the study

The present survey is a pilot study collecting data from a limited set of biology teachers and students from a single department. Our results thus reflect the perception of and barriers to critical thinking in a local teaching and learning environment.

4.5 Recommendations for critical thinking in teaching

We recommend increasing (self-)awareness about critical thinking, its meaning, its various forms and its implications:

- A good starting point would be to be more conscious about critical thinking and to be aware of the multiple meanings of critical thinking. Willingham (2019) further emphasizes the importance of a tight learning design to align the subject matter and critical thinking.
- Present multiple viewpoints for the students, let them compare and judge the different perspectives. Be explicit and share your own “critical methods” and give examples on how you as a scholar read articles and textbooks to help them nuance their belief in authority.
- Establish an “open” climate in your classroom where no questions are too stupid; cultivate an open mind and curiosity for other perspectives.
- Give students the opportunity to be trained in argumentation, both oral and written. Provide an arena for debate and discussions.
- Notify students whenever they actually apply critical thinking, as a form of “positive reinforcement” to help them recognize what critical thinking is about.
- Critical thinking should also ideally be applied all over the curriculum, and not restricted to singular cases or when the teacher points out that it is needed.

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