Clearing House
Unterricht

Short Review

Critical thinking as an instructional goal: From definition to promotion

Can promoting critical thinking be an instructional goal? This question has also engaged educational research since the 1930s. From the discourse, a robust theoretical definition has since emerged that describes critical thinking attitudes and skills in a way that can be specifically taught and empirically tested. Since then, numerous empirical studies have emerged. They examine how students can be supported in learning critical thinking. The meta-analysis "Strategies for teaching students to think critically: A meta-analysis" by Abrami and colleagues (2015) is the first to comprehensively collect and systematize these empirical findings.

INTRODUCTION. The Enlightenment Period achieved the realization for humankind's ability to use one's own mind in a critical capacity. Critical thinking includes a fundamental willingness to question things and get to the bottom of them - in other words, a basic critical disposition - as well as specific cognitive skills to arrive at a reasoned and explainable judgment, which involves posing questions, researching independently, analyzing, evaluating, and integrating information.

META-ANALYSIS AT A GLANCE

Focus of the study	Promotion of critical thinking in the classroom
Target group	From elementary school students to adults
Average effect size	Small positive effect (g = 0.30)
Further findings	Critical thinking promotion was most effective with a combination of application-oriented instruction, dialogue-based learning, and mentoring (g = 0.57; medium effect)

It is undeniable that this competence is a particularly important guiding principle for a mature and responsible individual. Yet, there is heated debate regarding the question of how to foster this complex construct consisting of dispositional attitudes and cognitive abilities in the classroom. In the predominately theoretical discussion, which has lasted decades, the point of view which is repeatedly put forward is that a controlled and regulated instructional framework is completely at odds with critical thinking.

The present meta-analysis empirically investigates this argument. Taking all available empirical findings into account, it clarifies whether critical thinking can be promoted in the classroom, and if so, in what way(s). In doing so, this study also provides indications as to whether critical thinking needs to be, for example, explicitly trained in specially developed teaching units, or whether it can be taught together with subject-specific content.

WHAT IS THIS STUDY ABOUT? The first empirical studies of critical thinking emerged in the United States as early as the 1930s. In the 1980s, an expert committee of the American Philosophical Association developed a definition of critical thinking from the state of research (Facione, 1990). The most important characteristics are summarized here, "Critical thinking: The Delphi consensus report.". This comprehensive description of the basic cognitive skills and dispositional attitudes for critical thinking forms the foundation of the present meta-analysis.

Abrami and colleagues identify a total of 867 relevant studies available in English from 1930 to 2009, more than 70% of which were published after 1990. Based on these studies, they address the question of whether critical thinking can actually be promoted in the classroom. In further moderator analyses, they also clarify particularly effective ways that teachers can facilitate the promotion of critical thinking.

They divide the analysis process into two phases. In the first phase, with the help of a methodological analysis, they selectively sorted out studies of poorer methodological quality. Their moderator analyses showed that the quality of the studies (type of study design and type of test instruments) influenced the results of the analyses. Under certain circumstances, this could lead to biased or incorrect conclusions.

In the second phase, they undertook a content analysis with a significantly reduced number of (higher quality) studies. Here, they examined how critical thinking instruction affects various learning outcome criteria (e.g., generic critical thinking skills; subject-specific achievement). Moreover, they documented the type of effects that different support approaches (e.g., Dialogue-based; Mentoring) and delivery modes (e.g., direct critical thinking instruction; infusion with content) have on learning performance. The full list of all moderators and their levels examined can be found in the handout "Individual findings of the meta-analysis at a glance".

WHAT DID THIS STUDY FIND? Based on 341 studies of high methodological quality, the study found an overall small positive effect of $g = 0.30$ for promoting generic critical thinking in the classroom. This effect was stable for different levels of education, subject-matter, and durations of intervention.

Next, they performed a differentiated analysis according to the types of learning success criteria. They found a medium effect ($g = 0.57$; 97 studies) for content-specific critical thinking and a small effect ($g = 0.23$; 25 studies) for critical thinking disposition. Furthermore, promoting critical thinking had a small positive effect ($g = 0.33$; 140 studies) on purely subject-based learning of facts and content.

Looking at the three approaches to critical thinking promotion in class, the authors found significant differences - with each approach being effective in its own right. Interestingly, the combination of all three approaches turned out to be the most effective approach ($g = 0.57$, 19 studies).

In the next step, they went even further by dividing the promotional approaches into different variants. However, only the variations with sufficient empirical findings available are reported here. The statistical analysis showed that among the authentic / anchored

(application-based) forms of instruction, significant positive effects were observed when applied to problem solving (g = 0.35, 31 studies) or role-playing (g = 0.61, 5 studies). For dialogue-based learning, significant positive effects were found when the teacher asked questions (g = 0.38, 19 studies) and when the teacher guided discussions with the whole class (g = 0.42, 16 studies) or with small groups (g = 0.41, 14 studies). A full description of instructional forms can be found here: "Critical thinking: Promotional approaches and variations."

The effects of the different ways of teaching did not differ substantially. Critical thinking can be taught in a variety of ways in the classroom. It did not play a significant role whether it was taught explicitly in the form of abstract principles within lessons specifically for this purpose, or whether it was taught in combination with concrete lesson content. However, critical thinking promotion was most effective when abstract principles were explicitly taught and trained and then illustrated, applied, and deepened using concrete topics (see also "Individual findings of the meta-analysis at a glance").

HOW DOES THE CLEARING HOUSE UNTERRICHT EVALUATE THIS STUDY? The *Clearing House Unterricht Research Group* evaluates the meta-analysis using the following five questions, guided by the Abelson criteria (1995):

How substantial are the effects? The small, stable, overall effect of g = 0.30 indicates (as classified by Cohen, 1988) that it is possible, in principle, to promote critical thinking in the context of instruction. This effect size demonstrates that the probability of a student in the experimental group achieving a better result than in the control group is about 60%. Even short intensive interventions (one hour to two days) produced significant effects. By combining different support approaches (i.e., application-oriented instruction, dialogue-based learning, and mentoring), effects in the medium range can be achieved. The fact that these findings were obtained using (quasi-)experimental research designs and standardized measurement procedures for a complex, wide-ranging construct, suggests that they can be classified as substantial.

How differentiated are the results? The differential nature of the reported effects is assessed for school subject domains, grade levels, and varied outcome criterion (e.g., achievement). Abrami and colleagues compare STEM subjects to non-STEM subjects without finding significant differences. There is no further differentiation within STEM subjects. With respect to age groups, within the secondary school age range, they distinguish between age groups from 11 to 15 and from 16 to 18. Thereby, larger effects are shown in middle school than in high school (g = 0.37 versus g = 0.25) - however, this difference is not significant. Furthermore, the results for different learning success criteria are reported differentially: critical thinking in general, content-specific critical thinking, critical thinking disposition, and subject content learning achievement.

How generalizable are the findings? The generalizability of the overall effect can be classified as high. In the initial analysis phase, the most robust studies were rigorously selected based on moderator analyses of quality, namely, study design type and test instruments.

Therefore, the reported overall effect maintains a good orientation value. The studies show that the overall effect is stable across different subject content, age groups (elementary to adult), and intervention periods (from one hour to more than one semester). In addition, it would be interesting to see the extent to which the effects are also stable across different countries, linguistic and cultural contexts, and across the long period of time in which the different studies were conducted. However, no analyses were conducted on these variables, so no conclusions can be drawn here.

What makes this meta-analysis scientifically relevant? The meta-analysis by Abrami and colleagues can be considered very scientifically significant for several reasons. First, it comprehensively summarizes, for the first time, research on critical thinking promotion from nearly eight decades. Second, it uses the many available effect sizes for an exemplary meta-analytic approach and implements a very high evidence-based quality assurance. Third, it adds a weighty argument to the decades-long theoretical debate about whether critical thinking can be fostered in the classroom (i.e., a formal prescriptive framework). Based on all available empirical studies, it demonstrates that critical thinking can be successfully fostered in the classroom in many ways.

How methodologically reliable are the findings? The meta-analysis almost completely fulfills the methodological requirements for transparency and comprehensibility in many areas. There is only a lack of information disclosure for the coding of the primary studies. Further information on the assessment of the methodological approach can be found in our rating sheet.

CONCLUSION FOR CLASSROOM PRACTICE. Critical thinking can be effectively promoted in the classroom. Based on numerous studies of high methodological quality, the meta-analysis provides a solid argument that it is important for teachers to make the promotion of critical thinking a primary instructional goal. There is a wide range of promising ways to do this in the classroom: from (guided) class discussions to role plays; from explicit teaching of general critical thinking principles to close integration with specific subject content (see also the example study below).

Students can not only learn cognitive tools, but also, to some extent, develop a critical stance. So far, most of the available research on critical thinking comes from the English-speaking world. However, for the German-speaking school context, it provides solid evidence on how teachers can support their students in questioning issues and developing independent arguments in the classroom.

EXAMPLE STUDY

In Kaberman and Dori's (2009) study, critical thinking - based on the ability to ask and then process complex critical questions - is quite effectively promoted through a short training session. The experimental study was conducted in a twelfth-grade chemistry classroom with a total of over 900 students. All students learned within a series of lessons using a complex computer-based learning environment.

Students in the experimental condition received additional training at the beginning of the lesson series. Its core element was a taxonomy for categorizing questions, which also provided guidance on question construction. Teachers who trained for the intervention, presented this taxonomy to the students using case studies (application-based instruction), and guided a practice phase for its application (dialogue-based learning). The control group received no additional training, but otherwise the same instruction.

In the final test, all students dealt with topics for critical thinking application, such as the effectiveness of a chocolate diet, or the danger of patulin toxin in apple juice. They were asked to critically examine the information presented and to make their questions a starting point for their own research. Interviews with the students and the results of the case-based questionnaire tests showed very large effects of the training on the students' ability to think critically and to ask complex, critical questions.

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LINKS.

To the meta-analysis from Abrami and colleagues (2015).

To the study example from Kaberman and Dori (2010).

To the summary of the Delphi Consensus Report.

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