Critical Thinking in Practice: The Priorities and Practices of Instructors Teaching in Higher Education

Lauren Bellaera [1], Yana Weinstein-Jones [1], Sonia Ilie [2], Sara T. Baker [2]

[1] University of Massachusetts Lowell, USA

[2] University of Cambridge, UK

Address correspondence to[1]:

Lauren Bellaera

113 Wilder Street, Suite 300

Lowell, MA

USA

lauren.bellaera@gmail.com

Declarations of interest: None

Funding: This work was supported by Macat International Limited and the US-UK Fulbright Commission.

Acknowledgements: We would like to thank all the university instructors from the UK and US who took part in this research. We would also like to thank Shannon Rowley for her support with the coding of some of the survey data.

[1] Permanent address: The Brilliant Club, Millbank Tower, 21-24 Millbank, London, SW1P 4QP, UK.

Abstract

Critical thinking features in university syllabi, programmes and classes across the globe and is considered one of the primary learning outcomes of higher education. Yet empirically we still know very little about how critical thinking is taught in practice or the extent to which teaching practice is informed by academic research. This study examines the priorities and practices of instructors teaching in higher education. We surveyed 176 instructors in the UK and US and explored how critical thinking is prioritised and taught across five subjects in the humanities and social sciences (history, philosophy, political science, psychology, and sociology). The key findings showed that there was a significant overlap in the critical thinking skills that instructors considered most important (analysis, evaluation, and interpretation) and the skills that they considered least important (creativity, deductive reasoning, description, and problem-solving). These findings were broadly consistent irrespective of the subject taught or country of instruction. We also found that instructors were more likely to teach critical thinking within a subject using an implicit approach as opposed to an explicit approach, and that instructors used dialogue-based activities to develop higher-order thinking skills. We use these findings to consider how we can 'close the gap' between critical thinking theory and practice.

Keywords: *Critical Thinking, Higher Education, United Kingdom, United States, Humanities, Social Sciences.*

1. Introduction

The idea that 'knowledge is power' is quite simply not enough in today's ever-changing world (Pellegrino & Hilton, 2012). Instead, individuals need to think critically in order to adapt to unfamiliar situations and to prevent the spread of misinformation, as the pace of change continues to accelerate, and the complexity of work and the world around us intensifies (Bakhshi, Downing, Osborne, & Schneider, 2017; Barak, Ben-Chaim, & Zoller, 2007; Zucker, 2019). Being able to think critically has been shown to be a strong predictor of academic achievement in children and adults and successful life decisions in general (Butler, Pentoney, & Bong, 2017; Kuhn, 2018; Ren, Tong, Peng, & Wang, 2020).

Developing critical thinking in university students is becoming an increasingly expected as well as desired outcome of higher education (Halx & Reybold, 2005; Jackson, 2010; Facione, 2013; Moore, 2013; Pithers & Soden, 2000; Tsui, 2002). In recent years, universities around the world have prioritised its teaching (Bezanilla, Fernandez-Nogueira, Poblete, & Galindo-Domınguez, 2019). Yet despite this interest in critical thinking, academic institutions are not necessarily seeing improvements in this area. For example, national assessments both in the United Kingdom (UK) and United States (US) have shown that critical thinking is not improving substantively amongst university students (Arum & Roksa, 2011; Pithers & Soden, 1999; Willingham, 2008; but also see Huber and Kuncel, 2016). This concern over a lack of critical thinking proficiency is echoed in industry; a recent survey reported that US business executives felt that only a third of recent college graduates were well prepared when it comes to critical thinking and analytical reasoning (American Association of Colleges & Universities, 2018). Unsurprisingly, given such findings, the demand for tertiary education systems to do more to improve the levels of critical thinking amongst students and close the 'skills gap' is growing (Jackson, 2010; Facione, 2013; Moore, 2013; NACE, 2017; Pithers &

Soden, 2000).

Most research to date has focused on the theorising of critical thinking in higher education; that is, how should critical thinking be defined and taught to support university students. Much less time has been spent examining how critical thinking is practically taught at universities. Given the importance of critical thinking, we aim to understand the extent to which instructors from different subject disciplines in the humanities and social sciences teach critical thinking skills in the UK and US and which specific skills they prioritise. In what follows, we provide a brief overview of how critical thinking has been defined and taught according to academic research.

1.1. Critical thinking: What does the research tell us?

Modern interest in critical thinking stemmed from the 1990s, when there was a flurry of activity by researchers to try and define critical thinking (Facione, 1990; Facione & Facione, 1992; McPeck,1990; Paul 1993). Notable definitions of critical thinking stem from the work of Philosopher John Dewey, who defined it as "the kind of thinking that consists in turning a subject over in the mind and giving it serious consecutive consideration" (Dewey, 1933, p. 3), as well as the work of a cross-disciplinary panel of experts led by Psychologist Peter Facione, who provided a consensus definition: "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. 3). In 1998, Griggs and colleagues summarised 25 different definitions of critical thinking as "a process of evaluating evidence for certain claims, determining whether presented conclusions logically follow from the evidence, and considering alternative explanations" (Griggs, Jackson, Marek, & Christopher, 1998, p. 256). But despite concentrated efforts to define critical thinking no universal definition exists, and in

fact these ‘standard definitions’ are often perceived as being too abstract to be practically meaningful (Duro, Elander, Maratos, Stupple, & Aubeeluck, 2013).

Notwithstanding the high volume of definitions and the concerns over their lack of precision, there is agreement about the key characteristics of critical thinking. For instance, critical thinking can either be a cognitive skill or dispositional characteristic, and it can be taught at a subject-specific or general level (Ennis, 1989; Facione, 1990; McPeck, 1990). Linked to this, there is an on-going debate in the literature regarding the extent to which critical thinking can be taught within specific subjects versus whether it can be taught as a separate ‘standalone’ subject, with many researchers arguing that in order to master critical thinking it must be taught within a specific subject (Lai, 2011; Pellegrino & Hilton, 2012).

Academic researchers, especially those specialising in healthcare and psychology, have been particularly interested in the development of the skills component of critical thinking (Ku, 2009; Sharples et al., 2017). This in turn has led to the creation of a number of skills-based frameworks and taxonomies defining specific critical thinking skills. An early example is Bloom’s Taxonomy of Learning Objectives, where evaluation, analysis, synthesis, and application were identified as higher-order thinking skills (Bloom, 1959). Another framework, based on the work led by Facione (1990; 1992), identified evaluation, analysis inference, deductive reasoning, and inductive reasoning as key critical thinking skills. These set of skills have been applied across a number of disciplines and professions, including nursing (Colucciello, 1997). A third framework was created by Beth Black (2012) for the purpose of higher education admissions tests, and included skills such as analysis, evaluation, and inference. A fourth and final framework created by Dwyer, Hogan and Steward (2014) similarly identified analysis, evaluation, and inference. Crucially, what these four frameworks all have in common is that they identify the same types of critical thinking skills and provide similar definitions for each skill (see Black, 2012; Bloom, 1959; Dwyer et al., 2014; Facione,

1990;1992).

Regardless of how critical thinking has been conceptualised, several approaches exist to support its teaching (Ennis, 1989; Larsson, 2017). These approaches include 'general', 'infusion', 'immersion' and 'mixed'. The general approach explicitly teaches critical thinking as a separate course outside of a specific subject. The infusion approach explicitly teaches both subject content and critical thinking skills, where the critical thinking instruction is taught in the context of a specific subject. While the immersion approach also teaches critical thinking within a specific subject; in this approach, critical thinking is taught implicitly as opposed to explicitly. This approach assumes that critical thinking will be a consequence of interacting with and learning about the subject matter. Lastly, the mixed approach is an amalgamation of the other three approaches where critical thinking is taught as a general subject alongside either the infusion or immersion approach in the context of a specific subject. Studies show that explicitly teaching critical thinking within a subject (i.e. infusion) is the most effective approach for developing critical thinking (Abrami et al., 2008). More recently, there have been efforts by researchers to understand what types of activities can be used to support the teaching of critical thinking, and these have included activities such as dialogue and authentic instruction (see Abrami et al., 2015). However, the extent to which these different approaches and activities are used in practice to support the teaching of critical thinking at university remains to be seen.

1.2. Critical thinking: What do instructors in higher education say?

In this section, we review the existing literature on how critical thinking is defined and taught by instructors at university. Most of the research that we examined (e.g. Allison, 2019; Duro, Elander, Maratos, Stupple, & Aubeeluck, 2013; Halx & Reybold, 2005) was qualitative, asking instructors open-ended questions without providing them with definitions of critical thinking skills, or naming approaches or activities as defined by critical thinking research (e.g.

Abrami et al., 2008; 2015). As such these explorations, whilst capturing instructors' perspectives about critical thinking did not easily map on to current theory . In some cases, the open-endedness of the approaches led to instructors not being able to effectively articulate their needs and priorities for teaching critical thinking. For example, Halx and Reybold (2005) looked at faculty perceptions of critical thinking in a small liberal arts college in the US. They conducted semi-structured interviews with eight instructors from the social sciences, natural sciences, humanities, and arts. An important finding from this study was that instructors were unclear about exactly what abilities they should be developing in students, with most of the instructors teaching critical thinking based on their own definitions and crucially they did not feel trained to teach critical thinking. The importance of the location of the institution and institutional culture was also highlighted in this study, but with the data only being based on one private liberal arts university in the US wider comparisons were not possible. In the present study we included a sample from UK and US higher education institutions to explore whether our findings would generalise beyond one country setting. Similarly, another study conducted interviews and focus groups with four instructors and 26 students from a psychology department in the UK and reported that critical thinking was "an intuitive concept, that was difficult to explain explicitly" (Duro, Elander, Maratos, Stupple, & Aubeeluck, 2013, p. 14). This lack of clarity about critical thinking was also echoed in a survey with lecturers from an agricultural college in the US (Stedman & Adams, 2012). Collectively, these studies show that despite some consensus in the theoretical literature, there appears to be a lack of understanding about how to define critical thinking in UK and US universities. This is interesting given that both the UK and the US are often focal points for critical thinking research, with institutions regularly citing critical thinking as an essential learning outcome of undergraduate study (Association of American Colleges and Universities, 2005; Quality Assurance Agency, 2018). Further research is needed to understand how critical thinking is defined and taught by

university instructors in these two countries, and the extent to which these practices align with theoretical frameworks from the academic research. The latter point here requires a top-down approach such as the one we adopt in the present study, surveying instructors about specific aspects of critical thinking identified by prior research rather than open-endedly. Studies show that the subject discipline also matters when it comes to understanding critical thinking. For example, Allison (2019) examined 17 UK instructors' views on critical thinking from the following subjects: education, environmental science, medicine, and law and criminology. It was found that environmental science was associated with interpreting and analysing information, education with analysing arguments, and medicine with professionalism and decision-making. Yet despite different definitions, the types of methods used to teach critical thinking were similar across subjects (e.g. questioning techniques, class discussions). However, from observations the actual application and effectiveness of these methods varied by subject. This shows that critical thinking needs to be researched within specific subject disciplines to ensure that research in this area can have practical applications (Moore, 2013; Piergiovanni, 2014). Many of the studies described previously have focused on instructors' own definitions, understandings, and beliefs about critical thinking in the UK and the US across a range of subjects. These personal perspectives gained through qualitative data show that often there is a lack of understanding about how to define and teach critical thinking when instructors are asked to engage with this topic based solely on their teaching experiences. Integrating academic research with practitioners' lived teaching experiences has also been emphasised by Bezanilla and colleagues (2019). In their study, they combined a literature review of evidence-based activities for critical thinking and university teachers' descriptions of the activities they used to teach critical thinking. These descriptions were gathered in an open-ended format. The teachers' responses were then interpreted in light of previous academic research. In the present study, we build on previous research to continue to bridge the gap between research and

teaching practice. We used a top-down approach starting from the research literature to define specific aspects of critical thinking and teaching practices that have previously been identified. We then surveyed instructors on how they use these.

1.3. The present study

The aim of the present study is to understand the priorities and current teaching practices of instructors when teaching critical thinking to their students. Specifically, we asked instructors which critical thinking skills they consider most important for their subject and what approaches and activities they used teach critical thinking. Previous studies have asked instructors open-ended questions about how they define critical thinking and, as we have seen, the overall quality of responses is varied. We suggest that a better way to understand this topic is to provide instructors with definitions of critical thinking skills based on academic research, and for them to judge the relative importance of these skills in their subjects. In addition, we get instructors to categorise their teaching practices for critical thinking based on evidence-informed approaches and activities.

The sample of instructors in the present study included 176 instructors from UK and US institutions who taught five humanities and social science subjects: history, philosophy, political science, psychology, and sociology. The present study focuses on the humanities and social sciences because most critical thinking research has been carried out in these areas, and thus many of the existing definitions, approaches and activities apply to these subjects. Although critical thinking is of course necessary in sciences and other subjects, the particular skills that are prioritised, and the way these are taught within higher education in sciences and other subjects, is beyond the scope of the present study.

Overall, the present study addresses the following two research questions:

1. Which critical thinking skills do instructors prioritise in their subject, and does this vary depending on the subject or country that the higher education institution is situated in?

2. How is critical thinking taught in higher education, and does this vary depending on the subject or country that the higher education institution is situated in?

2. Methodology

2.1. Participants

Participants included instructors who taught at least one of the following subjects at university: history, philosophy, political science, psychology, and sociology. They were recruited as an opportunity sample, volunteering to take part in an anonymous online survey about critical thinking. The initial data collection from the survey took place in March 2015 via SurveyMonkey. In May 2019, the online survey was re-opened to collect data from additional instructors using Qualtrics. To recruit instructors, the survey was sent to over 30 UK and US universities; asking departments to share further with relevant colleagues, posted on social media forums (e.g., Twitter and Facebook), and sent directly to personal contacts who were known instructors that taught at least one of the five subjects in the UK or US. The study was granted ethical approval through the University of Cambridge Faculty of Education research ethics review process. The anonymity of the instructors' responses was preserved at all times.

In total, 223 instructors completed the survey and, from this, 176 (43.2% male and 56.8% female) taught one of the five target subjects (history, philosophy, political science, psychology, and sociology) at either a UK or US higher education institution. Participant responses from other countries and subjects were not analysed (n = 47). Figure 1 shows the number of instructors by subject and country. Out of the 176 target instructors, 87 instructors completed the survey in 2015 and 89 in 2019.

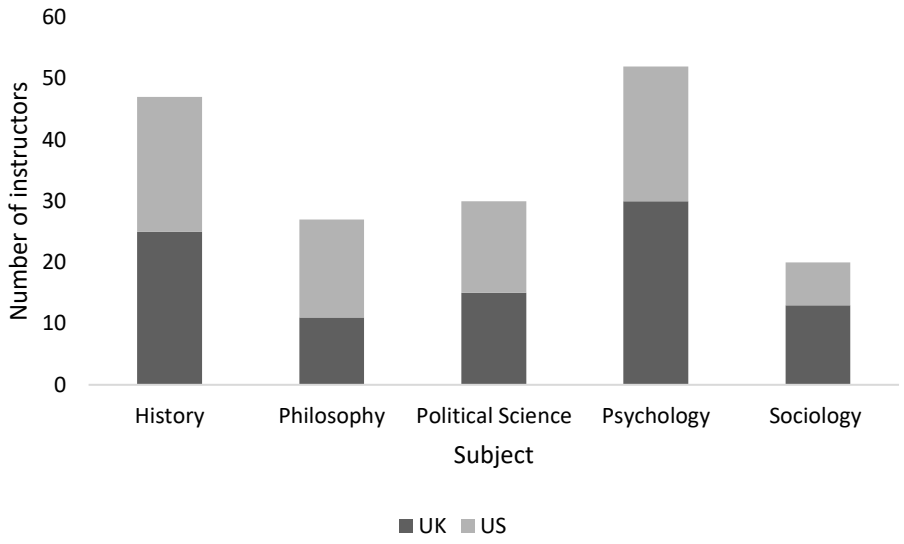


Figure 1. Number of instructors as a function of subject and country.

The majority of the instructors in the sample were aged 25 to 54 years old, and there was a similar percentage of instructors in each of the age groups: 25-34 (23.9%) and 35-33 (23.9%), and 45-54 (22.2%). Only 1.7% were younger than 25 years old and instructors over 55 made up 28.4% of the sample, with 14.2% in each of the groups (55-64 and 65+).

The instructors were from 46 higher education institutions and represented all types of degree-awarding colleges and universities, including russell group universities, red-brick universities, post-1992s (UK), ivy league universities, private universities, and public universities (US). The minimum number of responses per higher education institution was 1 and the maximum number of responses 17. Regarding the academic positions that the instructors held; 76.1%, were in teaching positions ranging from assistant professor (25.0%), associate professor (24.4), to professor (26.7%). In addition, 18.8% of the sample were PhD students or postdoctoral researchers and 5.1% held other positions at the universities. In terms of the types of students that instructors taught, instructors were approximately equally likely to report teaching mostly undergraduates (31.3%), only undergraduates (29.5%), or splitting time between undergraduates and graduate students (30.1%). Only 8.0% mostly or only taught graduate students and 1.1% did not specify what types of university students they taught.

2.2. Materials and procedure

The online survey took five to ten minutes to complete and consisted of two main sections (see Appendix for complete survey). Section 1 consisted of demographic items (gender, age range) and background questions about instructors institution, job position, and type of students and subjects taught. Section 2 explored how instructors defined and taught critical thinking in the teaching of their subject. The survey instrument consisted of 15 questions in total, the majority of which were forced-choice questions. The survey questions, developed by the authors for the present study, addressed key theoretical issues from the research literature, including types of critical thinking skills (Black, 2012; Bloom, 1956; Dwyer, Hogan, & Stewart, 2014; Facione, 1990), approaches to critical thinking (Abrami et al., 2008), and learning activities that support critical thinking (Abrami et al., 2015; Bezanilla, Fernandez-Nogueira, Poblete, & Galindo-Domínguez, 2019). Further details about the content and structure of the survey are available in Sections 2.2.1. and 2.2.2. below (and on request from the first author).

2.2.1. The prioritisation of critical thinking skills in higher education

Instructors were asked to rank ten critical thinking skills (with definitions) in order of importance for the teaching and learning of their subject. The critical thinking skills and definitions used in the survey are presented in Table 1. Seven of the ten skills included in the survey (analysis, deductive reasoning, evaluation, explanation, inductive reasoning, inference, and interpretation) were based on the skills characterised by Facione (1990) and are still widely discussed in the research literature (e.g. Abrami et al., 2015; Staib, 2003). Furthermore, 'creativity' and 'problem-solving' featured in the survey because these skills are often described in the research literature as cognate skills that overlap with critical thinking (see Livingston, 2010; Papaleontiou-Louca, Varnava-Marouchou, Mihai, & Konis, 2014). In addition, we also included 'description' as one of the ten skills represented in the survey as, although not necessarily considered a higher-order thinking skill, it is often cited as an essential

pre-cursor to critical thinking (Bloom, 1956; Krathwohl, 2002). The ten definitions were written by the authors for the purposes of this study following a literature review of the academic research, from which we primarily based our definitions on the work of Facione (1990).

2.2.1. Understanding how critical thinking is taught in higher education

Understanding how instructors across different subjects and institutions teach critical thinking to their students was another key area of interest in the present study. We examined both the approaches and activities used by university instructors. For example, instructors chose the approach that they used most often to teach critical thinking. The response options were created based on the infusion and immersion approaches that represent both explicit and implicit forms of teaching critical thinking (Abrami et al., 2008; Ennis, 1989). We also asked whether standalone critical thinking modules and/or classes were taught at universities.

To identify what activities were typically used to teach critical thinking instructors chose as many activities as they desired from a list of thirteen pre-specified activities (e.g. feedback, questioning, case studies etc.). The activities listed related to activities that have been shown to be effective based on academic research (Abrami et al., 2015; Bezanilla, Fernandez-Nogueira, Poblete, & Galindo-Domínguez, 2019; Nussbaum, 2008; Piergiovanni, 2014). An 'other' response was also provided to capture activities that fell outside of these categories.

Table 1. Skills and definitions used in the survey.

Skill	Definition
Analysis	to be able to examine ideas/information and identify arguments and reasons
Creativity	to be able to visualise a problem and brainstorm productive ideas to create alternatives
Deductive reasoning	to be able to draw a conclusion that cannot be false when based on evidence which is assumed to be the absolute truth
Description	to be able to convey an idea by providing an overview of information
Evaluation	to be able to assess how credible information is and the quality of the argument put forward
Explanation	to be able to state, present and justify information
Inductive reasoning	to be able to draw a conclusion that is likely to be true based on evidence using related knowledge and experience
Inference	to be able to draw together a conclusion which is logically valid and justifiable
Interpretation	to be able to clarify and show understanding
Problem-solving	to be able to create a strategy to find a solution

3. Results

3.1. The prioritisation of critical thinking skills in higher education

Descriptive analysis was used to give an overview of how the 176 instructors ranked the ten critical thinking skills. The mean rank and standard deviation of each of the skill's perceived level of importance is shown in Table 2. The results show that, on average, the critical thinking skills that are considered most important for teaching (i.e. ranked number 1) are analysis, evaluation, and interpretation and the critical thinking skills that are considered least important for teaching (i.e. ranked number 10) are creativity, deductive reasoning, description, and problem-solving. From Fig. 2, we see that there is little overlap in the ranking of critical thinking skills that are identified as number 1 and number 10. That is, if the majority of instructors rank a skill as number 1 then very few instructors rank the skill as number 10 and vice versa. This trend is most apparent for the critical thinking skill analysis, where 42.61% ranked this skill as number 1 and 0.57% ranked it as number 10. There are some exceptions to this trend though; explanation, inference, and inductive reasoning are neither rated as most or least important and explanation appears to be the middle-ranked skill.

To analyse the significance of the ranked data, a general linear mixed model analysis (clustering by instructor) was used to control for the interdependence of skill ratings due to the forced ranking paradigm within instructors. Using this model, we tested the relative importance of each skill, compared to the average of all other skills, within each participant, first without controlling for subject and country effects (explored in Sections 3.2 and 3.3). As above, the analysis showed that the critical thinking skill of explanation was, on average, the middle-ranked skill. The analysis showed a main effect of skill, that is a statistically significant ranking of critical thinking skills within instructors. Analysis, evaluation, and interpretation were each respectively rated as significantly more important ($p < .05$) compared to the middle-ranked skill (explanation). In contrast, creativity, deductive reasoning, description, and problem-

solving were each rated as significantly less important ($p < .05$) compared to the middle-ranked skill (explanation). To account for the fact that data was collected at two points in time (i.e. 2015 and 2019), and as a robustness check for the above analysis, a dummy variable for the most recent date of data collection was additionally included in the models. Without exception, the year in which data was collected was not significantly related to any of participants' rating of each skill all else being equal. Indeed, running the analysis with the additional dummy variable, or estimating the models separately by year of data collection resulted in the same conclusions from the analysis as outlined above.

Table 2. Mean and Standard Deviation of each critical thinking skill relative to perceived level of importance (1 = most important; 10 = least important).

Skill	Mean	Standard Deviation
Analysis	2.59	2.05
Evaluation	3.67	2.16
Interpretation	4.01	2.31
Inference	4.75	2.31
Explanation	5.48	2.45
Inductive reasoning	6.09	2.35
Creativity	6.86	2.79
Problem-solving	7.01	2.57
Description	7.11	2.56
Deductive reasoning	7.42	2.33

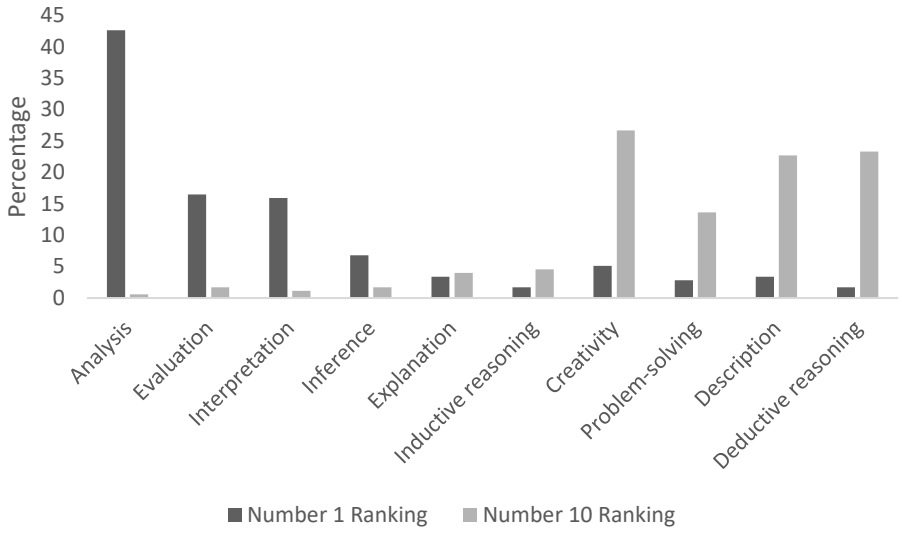


Figure 2. Percentage of number 1 and number 10 rankings for each of the critical thinking skills.

3.2. Comparing the prioritisation of critical thinking skills by subject

We were particularly interested in whether there was any variation regarding the relative importance of critical thinking skills as a function of subject (history, philosophy, political science, psychology, and sociology). The linear mixed model described in 3.1 above was supplemented with an interaction term (each respective subject by skill ranking). To account for the multiple comparisons undertaken (6, for each subject), we used a post-hoc Bonferroni correction multiplying the obtained p value by 6; and report statistically significant results when the adjusted p value is smaller than 0.05. Instructors in psychology ranked analysis as the most important skill, followed by evaluation and interpretation; description and deductive reasoning as least important; all other skills were similarly ranked to each other (no statistically significant differences). Instructors in sociology also ranked analysis as the most important skill, followed by interpretation; and the least important skills as deductive reasoning and description, with all other skills not statistically significantly ranked to each other. History instructors displayed a similar pattern, though ranked problem solving as one of the least important skills and evaluation as most important. Political science instructors displayed a

ranking pattern similar to psychology, only instead of problem solving, they ranked creativity in a manner that saw it obtain a ranking closer to the middle than the less important extreme. Philosophy instructors ranked all skills fairly similarly to each other (statistically non-significant differences between the rankings), but also ranked analysis the highest and creativity and problem-solving skills as the least important.

3.3. Comparing the prioritisation of critical thinking skills by country

Finally, we tested whether relative skill importance differed as a function of self-reported country of instruction (US compared to the UK), by substituting the subject interaction term with a country interaction term. The instructors who taught at institutions in the US ranked inference as significantly more important compared to instructors who taught at institutions in the UK ($p < .05$). There were no statistically significant differences in the ranking of any other critical thinking skills by country of instruction.

3.4. Understanding how critical thinking is taught in higher education

Another area of interest in the present study was to understand the extent to which critical thinking is currently taught in higher education settings. To answer this, instructors were asked a number of questions about their institution and how they teach critical thinking to students, including i) is critical thinking taught as a standalone module or class?, ii) do you teach or highlight the importance of critical thinking skills in your subject?, iii) What type of teaching (approaches) do you use to highlight the importance of critical thinking? and iv) What types of activities do you use to teach critical thinking skills? Further details about how instructors responded to these questions are provided below.

3.4.1. Is critical thinking taught as a standalone module or class?

70.5% of instructors said ‘no’, critical thinking was not taught as a standalone module

or class at their university and 17.6% reported that 'yes' such modules or classes were taught. In contrast, a small proportion of instructors were 'unsure' whether these types of modules/classes took place (11.9%). A chi-squared test was conducted to examine whether there were any significant differences in the distribution of the responses for each of the three categories (yes, no, unsure). The results showed significant differences in the distribution of responses (χ^2= 109.99, df = 2, p < .001). In particular, the 'no' category showed a positive residual of 65.3, indicating that more instructors than you would expect by chance reported that standalone critical thinking modules/classes were not taught at their institution.

A chi-squared test examined the association between the distribution of responses (yes, no, unsure) and the country that the higher education institution was located in (UK or US). The results revealed that the differences across country were not significant (χ^2= 5.97, df = 2, p = .051), suggesting that whether or not critical thinking is taught as a standalone module is not dependent on the country of instruction. However, it is worth noting that, the p value did approach significance *(*p = 0.51) and it is possible that this is driven by more instructors in the US reporting that they were unsure about what was taught compared to instructors in the UK (18.3% vs. 6.4%, respectively). We speculate that this nearly significant finding may be because higher education institutions in the US have a much more complicated and devolved university curriculum relative to the UK, so there is more uncertainty about exactly what is covered in the syllabi.

We next examined the association between the distribution of responses (yes, no, unsure) and the subject taught (history, philosophy, political science, psychology, and sociology) using a Fisher's exact test. This analysis, which we ran instead of a chi-squared test, adjusted for the high proportion of small expected cell counts (33.3% of cells were smaller than 5). The distribution of the responses across the different subjects were significant (p = .049). This means that the existence of standalone critical thinking courses varies depending on the

subject. As can be seen in Figure 3, below, the most striking difference was for philosophy, which had a larger proportion of 'yes' category responses relative to the other four subjects, suggesting that stand-alone critical thinking courses are more common in philosophy than history, political science, psychology, or sociology.

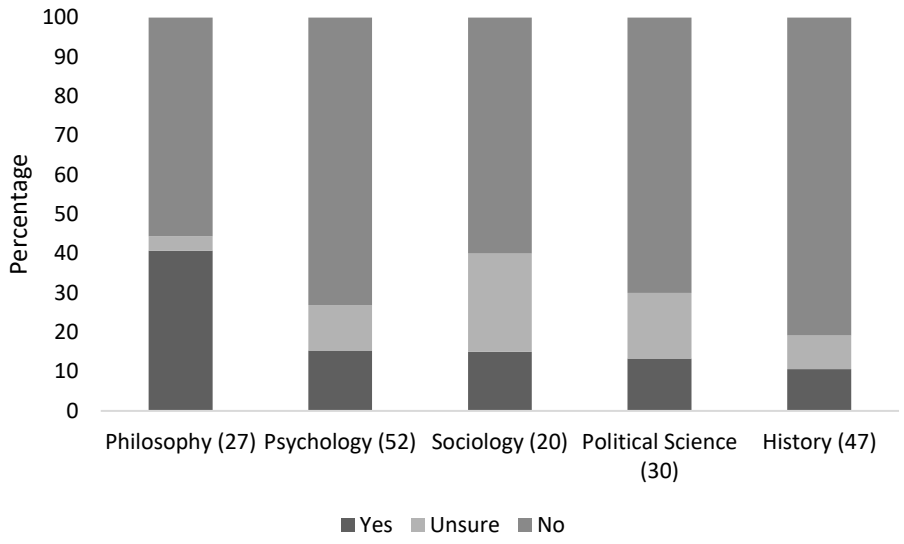


Figure 3. Percentage of responses to the question 'Is critical thinking taught as a standalone course/class?' by subject. Total number of instructors for each subject is reported in parentheses.

3.4.2. Do you teach or highlight the importance of critical thinking skills in your subject?

The majority, 83.0% of instructors, reported highlighting the importance of critical thinking when teaching. Only 8.5% reported not doing this when teaching, and a further 8.5% were unsure as to whether they highlighted the importance of critical thinking. A chi squared test compared the distribution of responses across the different categories (yes, no, unsure). The results showed that the frequency of responses were not equally distributed, (χ^2= 195.01, df = 2, p < .001). In particular, the 'yes' category showed a positive residual of 87.3, indicating that more instructors than you would expect by chance reported that they highlighted the importance of critical thinking when teaching.

Similar to the previous question, a chi-squared test was conducted to see whether there were any significant differences in the distribution of the responses (yes, no, unsure) by country. The results of the test were not significant (χ^2= 5.21, df = 2, p = .08), indicating that we did not observe differences between UK and US instructors in terms of whether they highlighted the importance of critical thinking in their teaching.

We next ran a Fisher's exact test to determine whether instructors of different subjects were more or less likely to highlight the importance of critical thinking. We ran this test instead of a chi-squared test due to the high level of small expected cell sizes for subject (66.7% of cells less than 5). This test was not significant (p = .38), suggesting that in our sample the subject that instructors taught did not have an influence on whether they emphasised the importance of critical thinking (in other words, instructors of all subjects overall did so at a high frequency).

3.4.3. What type of teaching do you use to highlight the importance of critical thinking?

This analysis was based on responses from 175 instructors as opposed to 176; as one participant did not answer the question about types of teaching. A chi-squared test revealed that some types of teaching were used more often than others to highlight the importance of critical thinking (χ^2= 72.16, df = 6, p < .001). The response options are provided in Table 3. Generally, there appears to be less of a focus on teaching critical thinking explicitly and more reliance on it being taught implicitly through subject content. For example, by using a 'combination of explicit and implicit instructions, but with a bigger focus on implicit instruction'. To test this further, we collapsed the response options that mention prioritising 'explicit' types of teaching (statements 1 & 4 in Table 3) and separately, those that mentioned prioritising 'implicit' types of teaching (statements 2 & 5 in Table 3). The results of this chi-squared test showed that more instructors are adopting implicit as opposed to explicit

approaches to teach critical thinking (χ^2= 4.17, df = 1, p =.04), observed values of 69 vs. 47, respectively.

We next ran a Fisher's exact test to examine whether instructors in the UK and US taught critical thinking using different approaches. We ran this test instead of a chi-squared test due to the high level of small expected cell sizes for subject (28.6% of cells less than 5). When broken down by country, there were no significant difference between the types of approaches used (p = .51).

It was not possible to run a Fisher's exact test to examine the relationship between subject and approach (5 x 7 contingency table) because of this analysis was not sufficiently powered.

Next, we looked at whether there was a difference between the usage of explicit and implicit approaches by country and subject. We first ran a chi-squared test to examine whether instructors in the UK and US taught critical thinking using different types of approaches (i.e. explicit vs. implicit). Again, by collapsing the response options that mention prioritising 'explicit' types of teaching and those that mentioned prioritising 'implicit' types of teaching (statements 1 & 4 and statements 2 & 5 in Table 3, respectively), we created two explicit and implicit categories. The results of the chi-squared test showed that there was no significant difference between the frequency of explicit and implicit approaches used by UK-based instructors and US-based instructors (χ^2= 0.18, df = 1, p =.67).

We next ran a chi-squared test to examine whether the usage of explicit and implicit approaches differed by subject. The results of this chi-squared test showed that there was no significant difference between the frequency of types of approaches used across the five subjects (χ^2= 4.78, df = 4, p =.31).

Table 3. Frequency (percentage) of responses to the question 'What type of teaching do you use to highlight the importance of critical thinking?'.

Survey Options	Type of Approach	Frequency (Percentage)
1. I use instructions which explicitly teach critical thinking skills	Explicit	18 (10.3)
2. I use instructions which implicitly teach critical thinking skills.	Implicit	25 (14.3)
3. I use a combination of explicit and implicit instructions equally to teach critical thinking skills.	N/A	49 (28.0)
4. I use a combination of explicit and implicit instructions to teach critical thinking skills; with a larger focus on explicit instruction.	Explicit	29 (16.6)
5. I use a combination of explicit and implicit instructions to teach critical thinking skills; with a larger focus on implicit instruction.	Implicit	44 (25.1)
6. I am unsure which type of instructions I use when teaching.	N/A	6 (3.4)
7. I do not teach critical thinking skills.	N/A	4 (2.3)

3.5. What types of activities do you use to teach critical thinking skills?

In the following section, we examine the types of activities that instructors used to teach critical thinking. This analysis was based on descriptive statistics to explore the data.

To further understand how instructors teach critical thinking, we examined what activities instructors used to teach critical thinking. We presented instructors with thirteen activities that relate to critical thinking based on the research literature (Abrami et al., 2015; see Table 4 for the categories). There was also an 'other' category so instructors could record other activities if they wished. Instructors could choose as many activities as they desired. As can be seen from Table 4, the most popular activity was 'teacher-led discussions', with around ¾ of instructors saying they use this technique to teach critical thinking skills. This was followed by around half of instructors selecting 'pupil-led discussions', 'questions and answers', and 'feedback'. Instructors were also given the opportunity to identify activities that

were not pre-specified via the 'other – please specify category'. These responses were grouped into themes and are shown by asterisks in Table 4.

Table 4. Percentage of instructors choosing each answer for 'Within your teaching which of the following activities/teaching approaches are you most likely to use to teach critical thinking skills?' (indicates activities that were generated by instructors via the 'Other – please specify' option).*

Activity	Percentage
Teacher-led discussions	76
Pupil-led discussions	56
Question and answers	55
Feedback	52
Student presentations	44
Student reflection	44
Assessment (test/peer-assessment)	43
Problem-based learning	38
Case studies / role play	36
Practice	24
Quizzes	16
Mind maps	12
Playing games	11
Other: writing essays/papers/assignments*	7
Other: Including: imaginative empathy/creative visualization/multimedia; contemporary examples; critical realism / teaching philosophy; analysis of articles; class experiments; one-to-one tutorials; Student projects *	< 6

4. Discussion

The present study shows that university instructors across the humanities and social sciences consider analysis, evaluation, and interpretation to be the most important critical thinking skills. Specifically, instructors in psychology, sociology, and political sciences ranked analysis – being able to examine ideas/information and identify arguments and reasons – as most important, as did instructors in philosophy. However, unlike the previous three subjects, the difference between the rankings for philosophy was not statistically significant. For history instructors, evaluation was ranked as most important for their teaching practice. Other studies have also recognised the importance of analysis and evaluation as higher-order thinking skills, with school instructors' using 'analyse' activities to support the development of critical thinking in their students (Cáceres et al., 2020), and academic researchers reporting that analysis is the most important critical thinking skill to master (Facione, 1990).

Moreover, it is also important to discuss the critical thinking skills that university instructors identified as least important (i.e. creativity, deductive reasoning, description, and problem-solving). Deductive reasoning and description were reported as least important for instructors in psychology, sociology and political sciences, and problem-solving as least important for instructors in history. Philosophy instructors followed a similar, albeit non-significant pattern, with creativity and problem-solving skills ranked as least important. Again, similar to the most important critical thinking skills, there appears to be a consensus regarding the skills that are considered less important by instructors, irrespective of subject. In general, the findings from the ranking analysis demonstrate that the same set of critical thinking skills are valued (or not valued) across different subjects in the humanities and social sciences. This has implications for how critical thinking is taught in higher education, discussed below.

There is an on-going theoretical debate about how to teach critical thinking and whether

it can be taught generally (i.e. irrespective of subject content) or whether it needs to be taught within a specific subject (Ennis, 1989; McPeck, 1990). One argument supporting the need for a subject specific approach is that different subjects may require the development of different types of critical thinking skills (Allison, 2019). In the present study, we show that this is not the case as instructors from a variety of subjects rank the same set of skills as 'most important' or 'least important' for their teaching, signifying that there is much more uniformity than variation.

In practice, what this means is that a more joined up approach could be taken to the delivery of teaching practice and curriculum design across degree programmes in the humanities and social sciences, as the same core set of critical thinking skills are required. This, whilst not leading to a purely general or subject-specific approach, does pave the way for a mixed approach whereby both general and subject-specific teaching practices could be used to support learners (Abrami et al., 2008; Ennis, 1989). For example, a general approach could focus on the procedures and mechanisms of the three key critical thinking skills identified in our study (analysis, evaluation, and interpretation) and this teaching could be scaffolded with subject-specific examples and activities. Often a reason cited for not teaching critical thinking is that instructors are unable to condense and formalise critical thinking in a way that makes it teachable (e.g. Duro, Elander, Maratos, Stupple, & Aubeeluck, 2013; Stedman & Adams, 2012). The present study also helps to clarify the teaching of critical thinking in higher education more generally because it shows that the same set of skills do matter across subjects. In terms of how the critical thinking skills were ranked as a function of the country where the instructors were based (UK versus US), we observed no statistically significant differences in the rankings of any critical thinking skills apart from inference. Instructors in the US ranked it as significantly more important compared to instructors in the UK. This significant difference for inference is interesting and would require further qualitative exploration to understand

where this difference has stemmed from. Overall, the lack of differences across the two countries in how critical thinking is prioritised is likely to be because the UK and the US have a similar approach to teaching practices and curriculum design, and therefore it is unsurprising that both countries produce a similar list of 'important' and 'less important' higher-order thinking skills (Association of American Colleges and Universities, 2005; OECD, 2019). An interesting extension of the present study would be to investigate whether countries with different teaching practices and classroom cultures diverge in their prioritisation of critical thinking skills. In the present study, we did not collect information about cultural identify within our samples, but other authors have suggested that the conceptualisation of critical thinking skills may differ between different cultures (Chen, 2017; Howe, 2004). We next turn to look at how critical thinking is taught in higher education. First, based on our sample of 176 university instructors, we see that standalone critical thinking courses or classes are rarely taught at UK or US universities, and if they are taught then it tends to be in philosophy. Duro et al., 2013 also reported that critical thinking is not typically taught as a separate course in the US. The fact that we are significantly more likely to see courses or classes in philosophy, we think, reflects the core content of the subject and the focus on teaching formal logic as opposed to a greater emphasis on teach critical thinking per se. But again, qualitative analysis would be needed to further understand the exact origin of this difference. Instructors reported highlighting the importance of critical thinking when teaching, which aligns with the findings of other authors who show that critical thinking is frequently cited as an essential learning outcome for university students, especially for higher education institutions in the UK and the US (Association of American Colleges and Universities, 2005; OECD, 2019). Additionally, instructors irrespective of subject or country tend to teach critical thinking implicitly by immersing it within the subject they are teaching, where the development of critical thinking is assumed to be a consequence of interacting with and learning about the subject matter.

School instructors and university instructors in Spain and Latin America have also reported adopting an implicit immersion approach to teach critical thinking to their students (Bezanilla, Fernandez-Nogueira, Poblete, & Galindo-Domínguez, 2019; Caceres ´ et al., 2020). This implicit approach differs from the empirical evidence and recommendations of academic research that shows that critical thinking should be infused explicitly in the context of a specific subject in order to yield the most effective outcomes for critical thinking (e.g. Abrami et al., 2008, Bellaera, Debney, & Baker, 2016; Bensley & Spero, 2014). One, perhaps clear, suggestion is that instructors should change how they teach critical thinking and adopt the explicit approach to align with the research literature (Schulz & FiltzPatrick, 2016). However, another more nuanced suggestion is that academic researchers should in fact be more sensitive to how instructors actually teach critical thinking by "position[ing] their studies within the same context in which learning takes place" (Caceres ´ et al., 2020, p. 15). We think that both suggestions could go a long way in bridging the gap between how critical thinking is taught in theory and practice; a bottom-up approach (i.e. instructors modifying their practices) and a top-down approach (i.e. academic researchers modifying their research) could result in more effective teaching for critical thinking in the long term.

Although instructors report using implicit approaches to teach critical thinking, the activities they use do correspond with what academic research says is effective. For example, we observed a trend whereby most instructors reported using teacher-led discussions to teach critical thinking skills. The importance of using dialogue related activities guided by the teacher has been shown to be an effective way to increase critical thinking (Abrami et al., 2015). These findings can help instructors to consider how they can best use discussion to support the development of key skills, especially activities that support the development of analysis and evaluation skills through collaborative argumentation (Nussbaum, 2008).

The present study used established definitions and evidence-informed approaches and activities from the research literature to understand how instructors prioritise and teach critical thinking skills in practice. By using key skills and definitions endorsed by academic research we were able to support instructors to think about how they teach critical thinking in a way that is practically meaningful but that also connects with academic research. This dual aspect approach has been recognised recently by other studies as well, which have primarily focused on instructor perspectives but then analysed and interpreted instructor responses in light of what the research literature says (Bezanilla, Fernandez-Nogueira, Poblete, & Galindo-Domínguez, 2019; C´ aceres et al., 2020). In the present study, we have adopted a similar, yet slightly more directive approach by providing instructors with research-informed skills and definitions to respond to, as opposed to retrospectively mapping instructors' responses onto the research literature. These different approaches also speak to different types of methodology – driven by quantitative and qualitative methods, respectively. Whichever approach is used to connect teaching research and practice, the key message is that the research literature needs to inform and drive innovations in teaching and, as evident from emerging studies, there are a number of methodological ways in which this can be achieved (Crook & Gu, 2019).

There are some limitations to the present study that are worth discussing to inform future research in this area. First, the study was based on an opportunity sample and whilst not uncommon for this type of research, it does introduce bias due to the self-selecting nature of the sample. For example, it is likely that instructors who volunteered to complete the survey had prior knowledge about and/or an interest in critical thinking and therefore the sample is not reflective of all instructors in the UK and the US across the five subjects. Second, to ensure we reached a sufficient sample size overall, the data collection was reopened in 2019 following initial data collection in 2015. Crucially, general changes in the 'zeitgeist' about critical thinking between 2015 and 2019 may have influenced how the instructors completed the

survey. However, our additional analyses comparing the 2015 and 2019 data did not reveal any significant differences in response patterns. Third, we recognise that by asking the instructors to rank the ten critical thinking skills, the priortisation becomes less certain the further it moves away from the number 1 (most important skill) and number 10 (least important skill) rankings. This was not a particular issue for the present study because we were specifically interested in the most important and least important critical thinking skills, but in the future if studies were interested in the overall rankings or the groupings of the middle rankings then another type of ranking procedure should be used (e.g. conjoint analysis; Green, Paul, & Srinivasan 1978).

In terms of developing our research, in addition to university instructors it is important to understand how school instructors and employers prioritise critical thinking, and for the former how they teach it as well. Recent studies have examined critical thinking from the perspectives of school teachers (Caceres ´ et al., 2020; Piedade, Malafaia, Neves, Loff, & Menezes, 2020) and employers (Cruz, Payan-Carreira, Dominguez, Silva, & Morais, 2020). We suggest administering a survey using established definitions, and evidence-informed approaches and activities from the academic literature to school instructors, university instructors, and employers to help provide us with a system-level understanding of what critical thinking skills need to be developed and how. Furthermore, if our survey instrument were to be used widely, it would benefit from some targeted work to establish validity and reliability.

5. Conclusions

This study used the conceptual framing of existing research on critical thinking to take a quantitative look at how UK and US university instructors in the humanities and social sciences defined and taught critical thinking. This was achieved by getting instructors to rank the importance of ten critical thinking skills in the teaching of their subject based on skills and definitions from academic research (Facione, 1990). As well as by getting instructors to identify which evidence-informed approaches and activities they used to teach critical thinking

to their students. The results showed a great deal of consensus in terms of how a group of instructors teaching humanities and social sciences subjects in the UK and the US prioritise and deprioritise the same critical thinking skills – with analysis, evaluation, and interpretation considered the most important for teaching. This emerging evidence of unity, in a field that is often plagued with ambiguity and disparity, shows that critical thinking can be taught in a similar way across a range of subjects in the humanities and social sciences. Based on our sample, the study also revealed that good critical thinking practices are happening at universities, such as the use of dialogue-related activities, but that the mode of teaching is still largely reliant on implicit approaches which are known to be less effective than explicit approaches for developing critical thinking (Abrami et al., 2008). The differences in recommended teaching practices and actual teaching practices indicates that there needs to be a stronger bidirectional connection between research and practice whereby research informs practice and practice informs research (Bezanilla, Fernandez-Nogueira, Poblete, & Galindo-Domínguez, 2019; Farley-Ripple, May, Karpyn, Tilley, & McDonough, 2018). Overall, the importance of instructors understanding how critical thinking skills, approaches, and activities relate to academic research cannot be understated. Going forward, academics should find meaningful ways of connecting the voices of researchers and instructors so that teaching practices can continue to be improved for the next generation of learners..

References

Abrami, P. C., Bernard, R. M., Borokhovski, E., Wade, A., Surkes, M. A., Tamim, R., & Zhang, D. (2008). Instructional Interventions Affecting Critical Thinking Skills and Dispositions: A Stage 1 Meta-Analysis. *Review of Educational Research*, *78*, 1102–1134. https://doi.org/10.3102/0034654308326084

Abrami, P. C., Bernard, R. M., Borokhovski, E., Waddington, D. I., Wade, C. A., & Persson, T. (2015). Strategies for Teaching Students to Think Critically: A Meta-Analysis. *Review of Educational Research*, 1–40. https://doi.org/10.3102/0034654314551063.

Allison, J. 2019. "Critical Thinking Across the Disciplines: Understanding and Application." (Doctoral thesis). University of Plymouth. https://ethos.bl.uk/OrderDetails.do?uin=uk.bl.ethos.772622.

American Association of Colleges and Universities. (2018). *Fulfilling the American dream: Liberal education and the future of work*. Washington, D.C.: Hart Research Associates.

Arum, R., & Roska, J. (2011). *Limited learning on college campuses. Society, 48*, 203–207. https://doi.org/10.1007/s12115-011-9417-8.

Association of American Colleges and Universities. (2015*). Falling short? College learning and career success.* Washington, D.C. Retrieved from http://www.aacu.org/sites/default/files/files/LEAP/2015employerstudentsurvey.pdf

Bakhshi, H., Downing, J. M., Osborne, M. A., & Schneider, P. (2017). *The future of skills: Employment in 2030*. London: Pearson and Nesta. Retrieved from: https://www.nesta.org.uk/sites/default/files/the_future_of_skills_employment_in_2030_0. pdf

Barak M., Ben-Chaim D., Zoller U. (2007). Purposely teaching for the promotion of higher-order thinking skills: A case of critical thinking. *Research in Science Education, 37*, 353–369. 10.1007/s11165-006-9029-2.

Bellaera, L., Debney, L. & Baker, S.T. (2016). Subject comprehension and critical thinking: An intervention for subject comprehension and critical thinking in mixed-academic-ability university students. *The Journal of General Education, 65*, 264-282. doi:10.5325/jgeneeduc.65.3-4.0264

Bensley, D. A., & Spero, R. A. (2014). Improving critical thinking skills and metacognitive monitoring through direct infusion. *Thinking Skills and Creativity*, *12,* 55–68.

Bezanilla, M. J. & Fernandez-Nogueira, D, Poblete, M & Galindo-Domínguez, H. (2019). Methodologies for teaching-learning critical thinking in higher education: The teacher's view. *Thinking Skills and Creativity, 33*, 100584. 10.1016/j.tsc.2019.100584.

Black, B. (2012). An overview of a programme of research to support the assessment of critical thinking. *Thinking Skills and Creativity, 7*, 122–133. doi:10.1016/j.tsc.2012.04.003

Bloom, B. S. (1956). *Taxonomy of educational objectives: Cognitive domain*. New York: McKay.

Butler, H. A., Pentoney, C., & Bong, M. P. (2017). Predicting real-world outcomes: Critical thinking ability is a better predictor of life decisions than intelligence. *Thinking Skills and Creativity*, *25*, 38–46. https://doi.org/10.1016/j.tsc.2017.06.005.

Cáceres, M., Nussbaum, M., Ortiz, J., (2020). Integrating critical thinking into the classroom: A teacher's perspective, *Thinking Skills and Creativity, 37.* https://doi.org/10.1016/j.tsc.2020.100674.

Chen, L. (2017). Understanding critical thinking in Chinese sociocultural contexts: A case study in a Chinese college. *Thinking Skills and Creativity, 24*, 140–151. https://doi.org/10.1016/j.tsc.2017.02.015.

Colucciello M.L. (1997) Critical thinking skills and dispositions of baccalaureate nursing students – a conceptual model for evaluation. *Journal of Professional Nursing 13*, 236–245.

Crook, C., & Gu, X. (2019). How new technology is addressed by researchers in Educational Studies: Approaches from high- performing universities in China and the UK. *British Journal of Educational Technology, 50*, 1173 – 1188. https://doi.org/10.1111/bjet.12750.

Cruz, G., Payan-Carreira R., Dominguez, C., Silva, H. & Morais F. (2020) What critical thinking skills and dispositions do new graduates need for professional life? Views from Portuguese employers in different fields. *Higher Education Research & Development*, DOI: 10.1080/07294360.2020.1785401.

Dewey, J. (1933). *How we think*. Boston: Heath.

Duro, E., Elander, J., Maratos, F. A., Stupple, E. J. N., & Aubeeluck, A. (2013). In search of critical thinking in psychology: An exploration of student and lecturer understandings in higher education. *Psychology Learning & Teaching, 12*, 275-281.

Dwyer, C. P., Hogan, M. J., & Stewart, I. (2014). An integrated critical thinking framework for the 21st century. *Thinking Skills and Creativity, 12*, 43–52. https://doi.org/10.1016/j.tsc.2013.12.004.

Ennis, R. H. (1989). Critical thinking and subject specificity: Clarification and needed research. *Educational Researcher, 18*, 4 –10.

Facione, P. A. (1990). Critical thinking: A statement of expert consensus for purposes of educational assessment and instruction executive summary. The Delphi Report. The California Academic Press, 423(c), 1–19. https://doi.org/10.1016/j.tsc.2009.07.002.

Facione, P. A. (1992). *The California Critical Thinking Skills Test, Form A and Form B, test manual*. Millbrae, CA: California Academic.

Facione, P. A. (2013). *Critical thinking: What it is and why it counts.* Retrieved from Insight Assessmenthttps://www.nyack.edu/files/CT_What_Why_2013.pdf.

Facione, P., & Facione, N., 1992. The California Critical Thinking Disposition Inventory Test Manual., Millbrae, CA: The California Academic Press.

Farley-Ripple, E., May, H., Karpyn, A., Tilley, K., & McDonough, K. (2018). Rethinking Connections Between Research and Practice in Education: A Conceptual Framework. Educational Researcher, (May), 0013189X1876104. https://doi.org/10.3102/0013189X18761042

Griggs, R. A., Jackson, S. L., Marek, P., & Christopher, A. N. (1998). Critical thinking in introductory psychology texts and supplements. *Teaching of Psychology, 25*, 254 – 265.

Halx, M. & Reybold, L. (2005). A pedagogy of force: Faculty perspectives of critical thinking capacity in undergraduate students. *The Journal of General Education, 54*, 293 – 315. 10.1353/jge.2006.0009.

Howe, E. R. (2004). Canadian and Japanese teachers' conceptions of critical thinking: A comparative study. *Teachers and Teaching: Theory and Practice, 10*, 505–525. https://doi.org/10.1080/1354060042000243051.

Huber, C. R., & Kuncel, N. R. (2016). Does College Teach Critical Thinking? A Meta-Analysis. *Review of Educational Research, 86,* 431– 468. https://doi.org/10.3102/0034654315605917.

Jackson, D. 2010. An international profile of industry-relevant competencies and skill gaps in modern graduates. *International Journal of Management Education, 8*, 29 – 58. 10.3794/ijme.83.288

Krathwohl, D. R. (2002). A revision of bloom's taxonomy: an overview. *Theory into Practice, 41*, 212– 218.

Ku, K. Y. (2009). Assessing students' critical thinking performance: Urging for measurements using multi-response format. *Thinking Skills and Creativity*, *4*, 70–76.

Kuhn, D. (2018). *Building our best future: Thinking critically about ourselves and our world*. Wessex Press.

Lai, E. R. (2011). Critical thinking: A literature review. Critical Thinking, (June), 1– 49. Retrieved from http://images.pearsonassessments.com/images/tmrs/CriticalThinkingReviewFINAL.pdf

Larsson, K. (2017). Understanding and teaching critical thinking—A new approach. *International Journal of Educational Research, 84*, 32 – 42. https://doi.org/10.1016/j.ijer.2017.05.004.

McPeck, J. E. (1990). Critical thinking and subject specificity: A reply to Ennis. *Educational Researcher*, *19*, 10 –12.

Moore, T. (2013). Critical thinking: Seven definitions in search of a concept. *Studies in Higher Education, 38*, 506 – 522. https://doi.org/10.1080/03075079.2011. 586995.

NACE (2017). *Job outlook 2018*. Retrieved fromhttp://careerservices.wayne.edu/pdfs/2018-nace-job-outlook-survey.pdf.

Nussbaum, E. M. (2008). Collaborative discourse, argumentation, and learning: Preface and literature review. *Contemporary Educational Psychology, 33*, 345–359.

OECD. (2019). *Fostering students' creativity and critical thinking: What it means in school, educational research and innovation*. Paris: OECD Publishing. DOI: https://doi.org/10.1787/62212c37-en

Paul, R. (1993). *Critical thinking: How to prepare students for a rapidly changing world*. Santa Rosa, CA: Foundation for Critical Thinking.

Pellegrino, J. W., & Hilton, M. L. (2012). *Education for Life and Work.* Washington, D.C.: National Academies Press. https://doi.org/10.17226/13398.

Piedade, F., Malafaia, C., Neves, T., Loff, M., & Menezes, I. (2020). Educating critical citizens? Portuguese teachers and students' visions of critical thinking at school. *Thinking Skills and Creativity*, *37*. https://doi.org/10.1016/j.tsc.2020.100690.

Piergiovanni, P. R. (2014). Creating a critical thinker. *College Teaching, 62*, 86 – 93. https://doi.org/10.1080/87567555.2014.896775.

Pithers, R. T., & Soden, R. (2000). Critical thinking in education: A review. *Educational Research, 42*, 237 – 249. doi:10.1080/001318800440579.

Ren, X., Tong, Y., Peng, P., Wang T. (2020). Critical thinking predicts academic performance beyond general cognitive ability: Evidence from adults and children, *Intelligence, 82*, https://doi.org/10.1016/j.intell.2020.101487.

Schulz, H. & FitzPatrick, B. (2016). Teachers' understandings of critical and higher order thinking and what this means for their teaching and assessments. *Alberta Journal of Educational Research, 62*, 61-86.

Sharples, J. M., Oxman, A. D., Mahtani, K. R., Iain Chalmers, I., Oliver, S., Collins, K., et al. (2017). Critical thinking in healthcare and education. The BMJ. https://doi. org/10.1136/bmj.j2234.

Stedman, N. R., & Adams, B. L. (2012). Identifying faculty's knowledge of critical thinking concepts and perceptions of critical thinking instruction in higher education. *NACTA Journal, 56*, 9 – 14.

Tsui, L. (2002). Fostering critical thinking through effective pedagogy. *The Journal of Higher Education, 73*, 740-763.

Willingham, D. (2008). Critical thinking: Why is it so hard to teach*?, Arts Education Policy Review, 109:4,* 21-32, 10.3200/AEPR.109.4.

Zucker, A. (2019). Using Critical Thinking to Counter Misinformation. *Science Scope, 42*, 6–9.

Appendix: Critical thinking survey

Section 1: Background Information

1. What is your Sex?
   - ☐ Male
   - ☐ Female

2. What is your age?

3. What is the nature and name of your organisation? (e.g. Faculty of Education; University of Cambridge)

4. What students do you teach?
   - ☐ I only teach undergraduate students.
   - ☐ I only teach graduate students.
   - ☐ I mostly teach undergraduate students.
   - ☐ I mostly teach graduate students.
   - ☐ My teaching time is distributed evenly between undergraduate and graduate students.
   - ☐ Other (please specify)

5. What is your affiliation with the organisation?
   - ☐ PhD student

- ☐ Researcher (i.e. Research Assistant/ Postdoctoral Researcher)
- ☐ Lecturer/Assistant Professor
- ☐ Senior Lecturer /Reader /Associate Professor
- ☐ Full Professor
- ☐ Teacher Trainee
- ☐ Other (please specify)

6. What subject(s) do you teach? Please select all the responses which are relevant from the options listed below.

- ☐ History
- ☐ Philosophy
- ☐ Politics
- ☐ Psychology
- ☐ Sociology
- ☐ Other (please specify other in box below)

If you indicated that you teach more than one subject in the previous question, we will ask you to choose just one of those to focus on for **'Section 2: Defining and teaching critical thinking**'. In the box below please identify which subject you will be referring to when answering **Section 2**.

Section 2: Defining and teaching critical thinking

1. In the teaching and learning of your subject, please rank in order the following ten skills.

Position 1 = most relevant to critical thinking in your subject and Position 10 = least relevant to critical thinking in your subject.

Use the cursor to move the skills to the appropriate position. The most relevant skill should be placed at the top in Position 1 and the least relevant skill at the bottom in Position 10.

- ☐ **Interpretation:** to be able to clarify and show understanding
- ☐ **Analysis:** to be able to examine ideas/information and identify arguments
- ☐ and reasons
- ☐ **Inference:** to be able to draw together a conclusion which is logically valid
- ☐ and justifiable
- ☐ **Evaluation:** to be able to assess how credible information is and the quality
- ☐ of the argument put forward
- ☐ **Explanation:** to be able to state, present and justify information
- ☐ **Description:** to be able to convey an idea by providing an overview of
- ☐ information
- ☐ **Deductive reasoning:** to be able to draw a conclusion that cannot be false
- ☐ when based on evidence which is assumed to be the absolute truth
- ☐ **Inductive reasoning:** to be able to draw a conclusion that is likely to be
- ☐ true based on evidence using related knowledge and experience
- ☐ **Problem solving:** to be able to create a strategy to find a solution
- ☐ **Creativity:** to be able to visualise a problem and brainstorm productive
- ☐ ideas to create alternatives.

Please use the comment box below if you would like to add any further comments about what critical thinking is.

2. To your knowledge, are critical thinking skills taught as a stand-alone module or class in your department or University?

☐ Yes

☐ No

☐ Not sure

3. When you teach a session, do you teach or highlight the importance of critical thinking skills for work in your subject?

☐ Yes

☐ No

☐ Not sure

4. What type of teaching do you use to highlight the importance of critical thinking? Critical thinking skills may be defined as objectives of the course and therefore instruction of critical thinking may be done explicitly. Alternatively, critical thinking skills may not be defined as objectives of the course, but may be implicitly embedded in teaching. Another possibility is that you may not teach it at all, whether explicitly or implicitly.

- ☐ I use instructions which explicitly teach critical thinking skills.
- ☐ I use instructions which implicitly teach critical thinking skills.
- ☐ I use a combination of explicit and implicit instructions equally to teach critical
- ☐ thinking skills.
- ☐ I use a combination of explicit and implicit instructions to teach critical thinking
- ☐ skills; with a larger focus on explicit instruction.
- ☐ I use a combination of explicit and implicit instructions to teach critical thinking
- ☐ skills; with a larger focus on implicit instruction.
- ☐ I am unsure which type of instructions I use when teaching.
- ☐ I do not teach critical thinking skills.

5. Within your teaching which of the following activities/teaching approaches are you most likely to use to teach critical thinking skills? Please select all the options which apply.

- ☐ Quizzes
- ☐ Group discussion/debate led by the teacher
- ☐ Group discussion/debate led by students
- ☐ Questions and answers/question prompts
- ☐ Student presentations
- ☐ Problem solving/problem-based learning
- ☐ Case studies/role play
- ☐ Playing games
- ☐ Practice

- ☐ Feedback
- ☐ Assessment (tests/peer-assessment)
- ☐ Mind maps/other graphical organisers
- ☐ Student reflection (e.g. self-reflection/perspective taking)
- ☐ Other (please specify)

Please use the comment box below if you would like to add any further comments about teaching methods.

6. Please identity the one activity/teaching approach that you have found most effective for improving the critical thinking skill that you identified as most relevant (i.e. Position 1) above.*

- ☐ Quizzes
- ☐ Group discussion/debate led by the teacher
- ☐ Group discussion/debate led by students
- ☐ Questions and answers/question prompts
- ☐ Student presentations
- ☐ Problem solving/problem-based learning
- ☐ Case studies/role play
- ☐ Playing games
- ☐ Practice
- ☐ Feedback
- ☐ Assessment (tests/peer-assessment)
- ☐ Mind maps/other graphical organisers

- ☐ Student reflection (e.g. self-reflection/perspective taking)
- ☐ Other (please specify)

7. Which format would you expect to be most effective to teach students critical thinking skills online (not in person):

- ☐ Audio + video
- ☐ Audio only
- ☐ Text only
- ☐ All of the above
- ☐ None of the above
- ☐ Other (please specify)

8. How often do you consult primary academic sources (i.e. psychology/education journals) on how to teach critical thinking skills?*

- ☐ Frequently
- ☐ Sometimes
- ☐ Rarely
- ☐ Never

9. Would you like more training about how to teach critical thinking skills?*

- ☐ Yes
- ☐ No

☐ Not sure

*These survey questions were only used in the 2019 version of the survey.

Responses to questions 7, 8 and 9 were not included in the analysis for this study.