

**Exploring Finnish University Students' Perceived Level of  
Critical Thinking  
Aaron Orszag**

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## **ABSTRACT**

Orszag, Aaron

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Critical thinking is believed to be a 21<sup>st</sup> century skill that many employers consider crucial when hiring recent graduates. However, it is debated whether critical thinking should be taught in academic foreign language courses at the tertiary level, which primarily aim to develop students' language and communication skills. This localized, exploratory research examines Finnish university students' self-reported critical thinking skills and dispositions after completing the compulsory academic English courses. The aim of the research is to examine what skills and dispositions students feel competent in, and discover if there is a correlation between students' self-reported critical thinking ability and such factors as gender, age, years spent in university, and the importance attributed to critical thinking. The second aim is to understand how students view critical thinking and to identify activities that contributed to their critical thinking development. A mixed-methods questionnaire was used to collect data, which was developed on the basis of Facione's (2013) framework of critical thinking, consisting of six skills and seven dispositions. Twenty-four students participated in the study, including students from various faculties, such as education, humanities, business, information technology, and sports and health sciences. The data was collected at a university in Central Finland in the fall of 2014, and was analyzed using nonparametric statistical methods. The results indicate that the participants are quite confident in their critical thinking ability but have a rather narrow view of the skills and dispositions that constitute critical thinking. The students also perceived reading and social interaction as important factors contributing to their critical thinking development. The findings suggest that an infusion method, which focuses on field-specific subject matters and uses activities that explicitly focus on various components of critical thinking, can increase students' awareness of critical thinking skills and dispositions. The results also indicate that using dialogic teaching methods and strategies, which utilize the power of meaningful talk, can contribute to the development of students' critical thinking ability.

Keywords: critical thinking, Finland, tertiary education, English language teaching

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# 1 INTRODUCTION

Both in educational theory and practice there is an increased emphasis on the importance of teaching 21<sup>st</sup> century skills to university students all over the world. Even though the term 21<sup>st</sup> century skills does not have a generally accepted definition and thus can be interpreted differently, it is widely used in educational research, parallel with other similar terms, such as generic or transferable skills, generic or key competencies, or generic attributes. Each of these concepts refers to a wide range of general knowledge, skills, and dispositions that are regarded as useful and important for success both in higher education and in contemporary workplaces. One of these skills is critical thinking, which is believed by many to be a primary goal of higher education (Flores, Matkin, Burbach, Quinn, & Harding, 2012; van Gelder, 2005). Critical thinking is generally defined as a complex competence consisting of knowledge, skills, and dispositions (McPeck, 1990). Despite the growing emphasis on critical thinking, it has been argued that not all graduates are well prepared to think critically (Creshaw, Hale, & Harper, 2011; Hosler & Arend, 2012). In addition, since the global environment is constantly changing, there is more and more emphasis on possessing and evaluating knowledge as well as on producing new ideas. According to James B. Appleberry, president emeritus of the American Association of State Colleges and Universities, “The sum total of humankind’s knowledge doubled from 1750–1900... It has been further projected that by the year 2020, knowledge will double every 73 days” (as cited in Reed & Stavreva, 2006, p. 436). This trend is forcing students and teachers to process and evaluate more and more information by making a judgment about the relevance and reliability of the information (Yang & Gamble, 2013). This new global environment might also affect current views of knowledge. Instead of considering knowledge as intellectual capital that a person already possesses (Jarvis, 2007), individuals might be expected to identify gaps in their knowledge, find new information to fill those gaps, and use that knowledge in creative ways. All these trends suggest that teaching critical thinking is of paramount importance for students in contemporary higher education, and it might become even more important in the future.

This study sets out to explore university students’ perceptions of their critical

thinking after completing the compulsory academic English course(s) at a Finnish university. To the best of the researcher's knowledge, research conducted in the Finnish higher education context has approached the issue from a narrower perspective, concentrating mainly on argumentation and reasoning, with no study focusing on students' critical thinking in the broad sense. It is hoped that this study will not only provide a starting point for further research, but can help improve students' critical thinking by addressing the possible gap between expected learning outcomes and instructional practices. This empirical research consists of a questionnaire survey, based on Facione's (2013) model of critical thinking skills and dispositions, which explored students' self-rated critical thinking. A dominant-less dominant mixed-methods research design is used, which allows the researcher to investigate the complex concept of critical thinking with both quantitative and qualitative methods (Behar-Horenstein & Niu, 2011).

The main argument in the study is that it seems to be beneficial to teach critical thinking to university students explicitly. It is suggested that an infusion approach to critical thinking, incorporating dialogic learning methods, could make students more aware of the skills and dispositions being developed in the classroom. This can improve students' overall critical thinking ability, and can help teachers reflect on various elements of critical thinking, which could be utilized in instructional design and classroom discourse, including assessment and feedback.

The remainder of the paper is structured as follows. Chapter 2 discusses the conceptualization of critical thinking by synthesizing and critically evaluating the literature on critical thinking. In Chapter 3, the research design, the data collection instrument, and the methods of data analysis are described. Chapter 4 presents the quantitative results, while Chapter 5 discusses both the quantitative and qualitative findings. The final chapter contains the main conclusions, taking into account the limitations of the study, as well as possible lines of future research.

## **2 CONCEPTUALIZATIONS OF CRITICAL THINKING**

### **2.1 Defining critical thinking**

Defining critical thinking is rather difficult. It is a concept that everyone has a basic understanding of, but the term still cannot be clearly defined mainly because of the different conceptualizations of the skills and dispositions that compose critical thinking. The lack of consensus among researchers and practitioners is also related to the debate on whether critical thinking is a general transferable skill or a domain-specific skill. Researchers' views also differ on whether critical thinking is an ability to solve problems or to construct new knowledge. Some scholars have argued that the lack of a common definition of critical thinking has hindered the development of research (Crenshaw, Hale, & Harper 2011), while other scholars stress that establishing a common definition of critical thinking would promote more unity, but would also limit the perspective of investigating critical thinking (Jenkins, 2011; Moore, 2013).

Several scholars emphasize that describing the elements of critical thinking can provide a better understanding of it (Facione, 2013; Ridell, 2007). Studies belonging to this tradition range from listing the sub-skills of critical thinking to demonstrating how these sub-skills can be developed in a classroom setting (see Crenshaw, Hale, & Harper, 2011). Although these studies offer a list of specific skills or diverse activities to teach critical thinking, they are strongly influenced by the particular researcher's views of the components of critical thinking. Sometimes these lists are very elaborate, but often its components remain ill-defined, leaving the reader with a vague idea of the particular sub-skill mentioned. Most of these studies do not seem to be able to clarify the concept of critical thinking any more than a definition does, but they offer the reader a particular perspective on critical thinking. This demonstrates that the way researchers define the elements of critical thinking greatly influence the overall conceptualization of critical thinking.

Researchers who attempt to explicitly define critical thinking are also



influenced by disciplinary perspectives and their own research objectives. There are some differences between the main focus of research in different fields, which always determines the primary approach taken by researchers. According to Pally (1997, p. 295), research on critical thinking can be linked to three main fields: English for Academic Purposes (EAP), cognitive psychology, and transformative pedagogy. The EAP perspective focuses on critical thinking as it is used in teaching English in academic contexts. The cognitive psychology approach stresses the importance of judgment in decision making and problem solving, while in transformative pedagogy the main emphasis is on making students active learners, who use information critically to solve problems and bring about positive changes in society. Halonen (1995, p. 76) takes a similar but slightly different approach when she tries to classify the existing scholarly knowledge of critical thinking. On the basis of the primary research objective, she distinguishes between three categories: basic scholarship, applied scholarship, and social critique. Basic scholarship views critical thinking as a cognitive process and focuses mainly on its educational use. Applied scholarship focuses on how critical thinking can be used to improve the whole learning and teaching process. Finally, the social critique approach emphasizes the role of critical thinking in social and political change. It seems that there is some overlap between Pally's and Halonen's categories. Cognitive psychology and basic scholarship seem very similar in that they both stress the psychological aspects of critical thinking. EAP could be viewed as an example of applied scholarship because EAP is concerned with how critical thinking can be incorporated into learning and teaching English in tertiary education. Finally, transformative pedagogy and social critique scholarship both stress critical thinking as a means to bring about social change.

Undeniably, a researcher's own field of study appears to strongly influence how critical thinking is defined and what it can be used for (Halonen, 1995; Moore, 2013). For example, according to educational researcher Ennis (1985, p. 45), "critical thinking is reflective and reasonable thinking that is focused on deciding what to do or believe." Siegel (1990), who is influenced by educational philosophy, defines critical thinking as rational thinking or "being moved by reasons". These definitions highlight the different emphasis that researchers put on particular aspects of critical thinking.

These conceptual variations have led some researchers to coin their own term

for critical thinking. These terms are all related to critical thinking, but shift the emphasis to one particular aspect (Smith, 2001). For instance, Bailin (2002) uses the term *good thinking*, which emphasizes the normative aspects of critical thinking, and the application of standards and criteria when evaluating ideas. King and Kitchner (2004) use *reflective thinking*, which implies the importance of analyzing and evaluating thought processes and experiences in order to gain a deeper understanding of it. These terms might help to gain more insight into various aspects of critical thinking, but as mentioned earlier, they can also limit the perspective of researching critical thinking.

Although most researchers elaborately describe the skills involved in critical thinking, only a few of them emphasize the role that knowledge plays in critical thinking. One exception is McPeck (1990), who argues that one cannot be an adequate critical thinker without possessing expert knowledge in a particular field. He views critical thinking as a complex competence consisting of various skills and dispositions, while emphasizing the key role of content knowledge. Many researchers would agree that all three components are important, but still they tend to emphasize one or two aspects in their definition (Shim & Walczak, 2012). This study argues that each component of critical thinking is equally important, and views critical thinking as based on the interrelatedness of knowledge, skills, and dispositions. Since this is still a vague definition, a more detailed description of the knowledge, skills, and dispositions of critical thinking is needed. The following sections will elaborate on these three components as well as on the relationship between critical thinking and creative thinking.

### **2.1.1 The role of knowledge in critical thinking**

The role of knowledge in critical thinking is widely discussed in the literature. This section provides a brief overview of the discussion in order to provide a deeper understanding of the concept of critical thinking. The foundation of critical thinking is based on the philosophical principle of *fallibilism* (Ikuenobe, 2001). This principle was already present in some of the ancient Greek philosophers' views, such as Socrates and Plato, but it is typically associated with philosophers of the late 19<sup>th</sup>–early 20<sup>th</sup> century, including Charles Sanders Peirce and Karl Popper. According to this principle, since one's knowledge is always tentative, it is impossible to attain absolute certainty in

knowledge. The ideas of tentativeness and uncertainty are crucial to critical thinking because what an individual believes to be true is only temporary at a given point in time, meaning that this knowledge is always limited and can even turn out to be false. An individual's view at a particular time might change quickly or only within years, but the point is that the possibility for change is always there. The way this individual receives and processes new information is very important in the development of their thinking skills.

Before discussing this process, a few basic philosophical (epistemological) concepts need to be further clarified. In philosophy, *belief* is generally understood as tentative truth, which means that an individual is internally debating the truth of the belief. A *truth*, in turn, is understood as a belief that has been debated internally and found to be true for an individual. The way an individual receives or interprets new information determines whether a belief will remain internally debated, or accepted as truth. Ikuenobe (2001) lists three criteria that describe a belief. First, the belief is likely to be true. Second, a belief is provided honestly, and the individual believes it to be true. Third, there is some evidence supporting that the belief is true. Wells (2009) points out that not questioning truth can often become a habit because it is more convenient. However, individuals can become biased in their thinking, particularly if they are unaware of this habit, as they will be resistant to new ideas that could change their truths and beliefs. This paper will refer to this phenomenon as *truth preservation*, based on van Gelder's (2005) idea. Truth preservation means that an individual will hold onto his or her truth even if a new belief or truth would offer a better alternative because the currently held truth can make his or her life more convenient or can provide meaning at a given point in time or in a given situation. Truth preservation can be difficult for the individual and for others to uncover or admit, which is dangerous as it can greatly affect one's critical thinking ability (Wells, 2009). According to Jarvis (2007), experiencing a *disjuncture* in one's routine (e.g. by creating non-routine situations) allows one to reassess their knowledge and create new meanings. In these situations the individual will either hold onto his or her truth or start to form new beliefs or truths. It is important to emphasize that forming a new truth might not be instant or conscious but a gradual or unconscious process. Still, it seems that one must have a disposition (willingness) to reassess their knowledge in order to become a better critical thinker (Ikuenobe, 2001).

In order to find one's false truths, one needs not only new knowledge but various critical thinking skills and dispositions. In this process, knowledge, skills, and dispositions work together and have an equal role.

Related to the role of knowledge is the discussion on how knowledge is taught. There should be a distinction between knowledge taught as content and knowledge as framing thought (Papastephanou & Angeli, 2007). This is an important distinction in the critical thinking paradigm. Researchers argue that knowledge should not only be taught as content, but should be used to frame new ideas because, as explained above, knowledge is tentative and is always in a process of reassessment. This does not mean that content is not important, but suggests that the overall goal of education is to teach students how to use content to ask new questions, adopt new perspectives, or come up with new ideas. This also implies the importance of teaching the problematic aspects of knowledge (McPeck, 1990). If doubt is not introduced in the classroom, students will form habits and engage in truth preservation. A hypothetical example could be when high school students are taught (as a fact) that early *Homo erectus* migrated out of Africa and settled in the rest of the world for certain reasons. Let us imagine that some teachers do not mention the problems with this theory (that it is very hard to find conclusive evidence to prove it) because of various factors, such as lack of time, teaching to the test, gaps in their knowledge, or their own unconscious truth preservation processes. If students are not allowed to evaluate the evidence, they would be blindly accepting and memorizing facts instead of using the information to reassess their existing knowledge or construct new knowledge. This type of teaching strongly influences students' views of knowledge, implying that knowledge and truth are absolute, which should never be questioned. This, however, can seriously hinder their critical thinking ability and intellectual development. To develop students' critical thinking ability, teachers should not center their instruction on content knowledge, but help students to use the content to question their existing beliefs, attitudes, and views and to develop new ones. This is particularly important in higher education. Some recent studies (Garrison, Anderson, & Archer, 2001; Hosler & Arend 2012) emphasize teachers' *cognitive presence*, which is an important element of students' overall educational experience. The concept of cognitive presence is strongly related to the ideas discussed above as it refers to the extent teachers promote the development of

students' critical thinking in the classroom.

To illustrate the difference between knowledge as content and as framing thought, we can use the analogy of the computer and the human brain. For the last few decades cognitive psychologists have used the computer as a model of human thought, assuming that all action occurs after knowledge is stored in the brain (Prawat, 1991). Obviously, the more information accumulated, the more knowledgeable the person becomes. This view is similar to McPeck's idea that the more knowledge one has, the better thinker this individual is. The current concept of the knowledge-based society is partly underpinned by this principle. Contemporary society puts a heavy emphasis on knowledge as intellectual capital that individuals can accumulate to make themselves more marketable (Jarvis, 2007). The problem with this approach is that knowledge can be defined or even determined by political means and ideologies rather than by empirical (scientific) evidence (English, 2006). Therefore, it is important to introduce doubt into the classroom so that knowledge can be openly analyzed and evaluated. On a broader, disciplinary level, if knowledge is influenced by politics and ideology, a whole discipline or field might become resistant to change (English, 2006) with inert knowledge to guide thinking (Flores, Matkin, Burbach, Quinn, & Harding, 2012). This can also be considered an example of truth preservation or habitual belief, whereby scientific evidence yields to ideology and political pressure (van Gelder, 2005). If this principle appears in teachers' thinking, students will not develop as critical thinkers, but remain passive learners of content. Truth preservation can also occur in individuals if they believe that they are so well informed in a particular topic or field that they stop thinking (Ennis, 1989). They will stop being open-minded because they believe that they have already analyzed and evaluated all the information and think that they possess the absolute truth. In short, it can be risky if the main emphasis is solely on content knowledge. Similarly, it can be risky if the development of students' (and teachers') critical thinking skills is not taken seriously, or if the development of critical thinking skills is declared only in the curriculum/syllabus but does not actually happen in the classroom.

The current explosion of information (i.e. the rapid increase of information available through various media) can lead to information overload, make information management more difficult, and might be causing ethical problems (Flores, Matkin,

Burbach, Quinn, & Harding, 2012). As mentioned earlier, according to James B. Appleberry, president emeritus of the American Association of State Colleges and Universities, by 2020 knowledge will double every 73 days (cited in Reed & Stavreva, 2006). Although this might be an extreme assumption, it implies that as a society we are producing more and more information, which makes it impossible for anyone to possess all the knowledge in a particular field. This is why individuals need to be able to recognize gaps or biases in their knowledge, know where to find new information to fill that gap, and know how to process and evaluate that information. In the same vein, Kompf (2013) admits that access to knowledge is important, but most importantly, one must be able to determine which bits of information are relevant and reliable and which ones require more attention. In other words, during information management, certain choices have to be made based on critical thinking. Related to education, curriculum designers and teachers should always make informed decisions about course content and instructional design based on critical analysis and evaluation.

To sum up, critical thinkers view knowledge as dynamic and constantly changing. They recognize that current knowledge creates new knowledge (Flores, Matkin, Burbach, Quinn, & Harding, 2012). Therefore, teaching content knowledge to students without introducing alternative perspectives, doubt, or allowing students to analyze and evaluate different perspectives will not develop the critical thinking that they need. Paul (2012) claims that knowledge is constructed by the learner through reasoning. He also argues that knowledge that is memorized is no knowledge at all because it can be based on prejudice and biases, which contradicts modern educational principles. In contrast, enabling critical thinking can prevent truth preservation and can lead to questioning knowledge that might have been constructed through political means. English (2006) suggests that the goal of higher education should not be to produce the status quo, but to advance the field of science. Based on the ideas discussed in this section, it can be said that encouraging critical thinking is a useful educational tool to help in the construction of new knowledge.

### **2.1.2 The role of skills in critical thinking**

Some educational researchers and teachers focus on developing individual skills as a way to promote critical thinking (Creshaw, Hale, & Harper, 2011). These skills are

strongly linked to the skills in Bloom's original (1956) taxonomy, particularly the top three levels, which are often referred to as higher order thinking skills (analysis, synthesis, and evaluation) and to two of the lower-level skills (comprehension and application) (Ennis, 1985).

There are several studies that have tried to identify the skills that critical thinking encompasses (Blath, English, Connors, & Beveridge 1999; Facione 2013; Jones 2004; Moore, 2013; Petress 2004; Phillips and Bond 2007; van der Wal 1999). Unfortunately, many of these studies obscure the meaning of different skills by using diverse terms that essentially refer to the same skill, and often they do not provide a detailed definition of the skills mentioned. The reason for this confusion could be rooted in the etymology of the word 'critical' in the phrase 'critical thinking'. According to Merriam-Webster dictionary, the word 'critical' comes from the Greek adjective κριτικός (*kritikós*), which means 'able to discern or judge'. Others argue that the adjective 'critical' derives from the ancient Greek noun κρίσις (*krisis*), which has many different meanings (Coney, 2015). The Online Liddell-Scott-Jones Greek-English Lexicon lists a number of meanings, such as decision, judgement, choice, event, issue, trial, or a turning point in a disease (Liddell, Scott, & Jones, n.d.). The diversity of the meaning of the word 'critical' could be one reason why it is difficult to agree on a generally accepted list of the skills that constitute critical thinking. Ennis (1985) points out that since the concept of higher order thinking skills is also too vague, it is not easy to use in actual practice. For example, the skill of analysis encompasses several different skills used for various purposes ranging from comparing and contrasting ideas, gaining different perspectives, and solving problems. Ideally, all of these purposes of analysis should be considered, but the dominant patterns in a researcher's own discipline or an individual's disposition might be influencing how the word analysis is used. Therefore, when defining the skills belonging to critical thinking, simply listing the skills is not sufficient. Instead, a detailed definition of each skill with concrete examples or a reference to existing theoretical models and definitions of these skills (e.g. Bloom's categories) is needed to provide clarity.

One of the most comprehensive multidisciplinary research that tried to identify critical thinking skills was conducted by Facione in 1990. Facione asked 46 experts in the USA and Canada to identify and describe core critical thinking skills. The experts

were composed of males and females from various disciplines (Facione, 2013). Facione used the Delphi Method, which used a central investigator to question these experts. The central investigator then summarized all of the responses, grouped them into categories, and then asked the experts to comment on them. This limited the authority of some experts that could influence the other experts (Facione, 2013). Altogether six core skills were identified in the study: interpretation, analysis, evaluation, inference, explanation, and self-regulation (Facione, 2013, p. 9, see Table 1). Interpretation means being open-minded and to understand various phenomena, as well as considering different cultural or individual perspectives that can shape each phenomenon. This requires embracing multiple views simultaneously in order to understand the different perspectives on a phenomenon. Analysis refers to identifying stated and unstated relationships between ideas from different sources in order to evaluate information and evidence, gain different perspectives, or to solve problems. Evaluation is used to determine if a stated or unstated statement or argument is valid. This is done by looking at the evidence and taking into account different perspectives and relationships between the statements. Making inferences is being aware of unstated or stated views and to be able to use these views to form conclusions, hypotheses, or judgments. Explanation is demonstrating one's thoughts in a rational manner, providing clarity and accuracy, so that these thoughts cannot be misinterpreted. Finally, self-regulation refers to monitoring one's own thoughts, being aware of personal biases, and understanding the reasoning behind one's own thinking. Other similar research studies on critical thinking skills were narrower in scope, and they focused only on students' own perceptions of critical thinking or were based on interviews conducted with university professors from one university only. Therefore, Facione's research can be considered one of the most extensive multidisciplinary studies on the skills constituting critical thinking, which will also be used as the theoretical framework in the research reported in this study.



Table 1 Facione's (2013) critical thinking skills

Skills	Definition
<b>Interpretation</b>	“to comprehend and express the meaning or significance of a wide variety of experiences, situations, data, events, judgments, conventions, beliefs, rules, procedures, or criteria.”
<b>Analysis</b>	“to identify the intended and actual inferential relationships among statements, questions, concepts, descriptions, or other forms of representation intended to express belief, judgment, experiences, reasons, information, or opinions.”
<b>Evaluation</b>	“to assess the credibility of statements or other representations which are accounts or descriptions of a person's perception, experience, situation, judgment, belief, or opinion; and to assess the logical strength of the actual or intended inferential relationships among statements, descriptions, questions or other forms of representation.”
<b>Inference</b>	“to identify and secure elements needed to draw reasonable conclusions; to form conjectures and hypotheses; to consider relevant information and to deduce the consequences flowing from data, statements, principles, evidence, judgments, beliefs, opinions, concepts, descriptions, questions, or other forms of representation.”
<b>Explanation</b>	“to state and to justify that reasoning in terms of the evidential, conceptual, methodological, criteriological, and contextual considerations upon which one's results were based; and to present one's reasoning in the form of cogent arguments.”
<b>Self-regulation</b>	“self-consciously to monitor one's cognitive activities, the elements used in those activities, and the results deduced, particularly by applying skills in analysis, and evaluation to one's own inferential judgments with a view toward questioning, confirming, validating, or correcting either one's reasoning or one's results.”

Identifying the skills is not the only challenge when trying to define and describe critical thinking. There is also some debate on whether these skills are domain-specific or general thinking skills that can be applied across a wide range of fields. These ideas will be discussed in more detail below.

#### 2.1.2.1 Domain-specific thinking skills or general thinking skills

The debate on whether critical thinking requires domain specific thinking skills (DSTS) or general thinking skills (GTS) is crucial because it influences how critical thinking is defined and viewed in the curriculum, and how it is taught in the classroom. One of the first proponents of the idea of DSTS was McPeck (1981), who argued that to be an effective critical thinker, one needs extensive knowledge in a particular field (cited in Ennis, 1989). One experimental study, conducted by Renaud and Murray (2008) in the context of Canadian higher education, found that when students were given two separate tests measuring their critical thinking with domain-specific and general

questions, the students scored higher when the questions were related to subject-specific (course-related) instead of general issues. Nevertheless, the authors concluded that both types of questions should be used in the classroom. According to them, general measures of students' critical thinking might provide more appropriate results for longitudinal studies, focusing on the extent to which students are able to apply these skills outside the context of a given course, while subject-specific questions might be more appropriate for shorter studies that last about one semester, focusing on students' development of their critical thinking in one particular course. This idea also implies that students who find employment within their field of study might benefit more from developing their critical thinking with domain-specific questions. However, since there is no guarantee that graduates will find a job in their field or that they will be working in their field throughout their career, developing general critical thinking skills also seems to be important.

Similar to McPeck, Facione (2013) appears to favor developing students' subject-specific thinking skills, arguing that one can be a great critical thinker in one field but not in another because of the different level of content knowledge one possesses. This idea underlines the importance of content knowledge as a prerequisite for higher-order thinking skills, particularly in domain-specific topics. Along the same line, Bailin (2002) argues that to think of critical thinking in terms of general skills or processes is a mistake, and that normative criteria and standards developed in a particular field should govern critical thinking. According to these researchers, critical thinking is so strongly connected to knowledge that if a cross-disciplinary method of developing critical thinking skills was developed, it would be so weak in another field that it would almost be useless (Bailin, 2002; McPeck, 1990). Bailin (2002) has argued that each domain should use specific criteria for evaluating critical thinking although she is against applying these criteria mechanically. Instead, she emphasizes the active role of the individuals using the criteria. Applying ready-made criteria uncritically could make thinking a routine and thus could eliminate deep thinking, particularly the skill of self-regulation. Taking this even further, Lipman (2003) argues that criteria should be established by each individual involved in a given situation. One disadvantage of this is that individuals may set their criteria below certain disciplinary standards. Therefore, a set of common, objective, field-specific criteria is useful as a point of reference. The

possible discrepancy between individually and socially established criteria is undoubtedly a risk. Nevertheless, if individuals are encouraged to establish their own criteria which meet or exceed certain field-specific standards, it may promote learner autonomy. Related to this, Paul and Elder (2015) have developed a comprehensive, circular model on how certain universal standards can be used in critical thinking. They argue that a number of universal intellectual standards (e.g., clarity, accuracy, precision, relevance, depth, breadth, logic, significance, or fairness – although they acknowledge the existence of contextual standards) should be applied to elements of reasoning (purpose, question at issue, information, interpretation/inference, concepts, assumptions, implications/consequences, and point of view), and this develops individual dispositions (intellectual traits, such as humility, autonomy, integrity, courage, perseverance, confidence, empathy, and fair-mindedness), which in turn affect intellectual standards. This model provides useful guidelines that teachers can follow to promote using both universally accepted academic standards and students' own intellectual criteria.

The main argument against using the term domain-specific skills was put forward by Ennis (1989), who pointed out that the word 'domain' is also too vague, so it is only possible to make artificial boundaries for a domain. An example of this is engineering as a domain. One can argue that civil or chemical engineering are each a specific domain within engineering that require different skills and knowledge. Using the terms domain, field, or subject creates subjective boundaries that are typically defined by an academic or political institution. This makes identifying these boundaries difficult because they might be different for each institution and might change over time as certain new fields are developed and become integrated into a discipline. This is also reflected in the structure of academic disciplines and university majors as well as in the curriculum.

The debate between domain-specific and general thinking skills is also related to the academic discussion on the importance of declarative and procedural knowledge. Smith (2002) argues that declarative knowledge is usually more domain-specific, while procedural knowledge is more general. He also emphasizes that when students are faced with a new task, they will use not only their existing background knowledge but also their thinking skills that they developed in a variety of other disciplines when completing different tasks. According to Smith, these skills can be equally effective in

another domain as long as they are applied to a similar task. Along the same line, van de Wal (1999) argues that skills are transferable if instructors encourage students to use them in various tasks and they provide examples. Still, some researchers maintain that there are some skills that are domain-specific (Pally, 2001). An example is when radiologists diagnose a disease by analyzing an MRI. These domain-specific skills are usually related to the use of technology in a given field.

In short, because of the conceptual vagueness, it is very important to clearly define every skill that forms critical thinking. As mentioned previously, analysis can generally be interpreted as breaking down information into components and identifying the organizational structure and relationships between ideas, but to what extent different types of analysis are stressed, what exactly is analyzed, how deep the analysis should be, and for what purposes the analysis is made can make analysis a domain-specific skill. For example, analyzing causal relationships might be more important in the natural sciences, while analyzing unstated assumptions has a crucial role in the social sciences.

#### **2.1.2.2 Situational and epistemological critical thinking**

The skills debate is not limited to domain-specific and general thinking skills. It is also important to consider the situations in which critical thinking is applied, which is also related to the purpose of critical thinking. Based on this, van der Wal (1999, p. 4) identified two types of critical thinking:

1. *Situational* critical thinking: used for solving problems and making decisions in practical situations.
2. *Epistemological* critical thinking: analyzing the truth and logic in an argument.

Situational critical thinking is typically required in practice-based fields, such as nursing or social work, while epistemological thinking is needed when analyzing arguments in more abstract and theory-driven fields, such as the humanities or social sciences. Most probably every field uses both types of critical thinking, but one aspect might be more emphasized.

Researchers who insist on normative standards in critical thinking argue that critical thinking cannot be identified with routine mental processes. For example, as mentioned earlier, Bailin (2002) emphasized that critical thinking should not be viewed simply as the application of a set of skills or mental processes routinely and mechanically, and that critical thinking cannot be developed simply by practicing these skills. As she puts it, “simply carrying out a set of procedures is not sufficient to ensure critical thinking, since any procedure can be carried out carelessly, superficially, or unreflectively — in other words, in an uncritical manner” (Bailin, 2002, p. 363). She pointed out that developing students’ thinking skills should not consist of practicing routine strategies, but also focus on the quality of thinking and the particular situation in which critical thinking is required. According to her (2002, p. 368), without acknowledging the normative standards of thinking, it is impossible to take into account the contextual nature of critical thinking. If the situational context is not considered, problem solving can become an automatic process, in which individuals might stop thinking about the problem as a unique problem and rather see it as one in many of the same problems. If, however, a similar problem is placed in a different context, students can develop problem-solving skills and learn that different context can require different solutions. This way, even simple problems might become complex as more and more details about the context are added. Similarly, Bailin, Case, Coombs, and Daniels (1999, p. 280) argued that critical thinking inherently includes strategic judgement, and thus should never become automatic. They emphasized that merely by practicing (repeating) a skill, one cannot become an expert. For example, by practicing reading MRI scans alone is not sufficient for becoming a good doctor – one has to be aware of the specific context, the possibility of alternative solutions, and aim for a high standard in every single situation. The authors also emphasize the role of interaction and feedback, which will be discussed later in more detail.

Papastephanou and Angeli (2007, p. 614) point out that the skills paradigm does not consider the affective domain, that is the motivation and willingness (disposition) of individuals to consistently engage in critical thinking and aim for high standards. This idea implies that the cognitive domain is strongly linked with the affective one. Papastephanou and Angeli (2007) also emphasize that it is important to critique the task at hand and reflect on the potential outcomes of different solutions. For example, if an

individual is commissioned to produce a genetically modified food, a critical thinker will not just solve the problem in a rational way, but will also reflect on broader social consequences, such as potential health issues. Papastephanou and Angeli (2007) argue that viewing critical thinking as a problem-solving process limits its definition to just rational thought and the concern with achieving goals. As Bailin (2002) highlighted, this narrow view could lead educators to teach certain processes to get a desired outcome without reflecting on the possible outcomes of achieving the goal. An illustrative example is Alan Turing, the British mathematician, who managed to break the Nazi codes, but had to cope with some affective consequences of this rational achievement.

### **2.1.3 The role of critical thinking dispositions**

A student can be good at several skills of critical thinking, but still not be a critical thinker. He or she must also have the internal motivation or willingness (disposition) to engage in critical thinking (Bailin et al., 1999; Halonen, 1995; Papastephanou & Angeli, 2007). This idea has very important implications for teachers because students can have mastered all the core critical thinking skills, but if they are not inclined to use them consistently (in and outside of the classroom), then developing the skills is pointless. Therefore, dispositions can be considered as a bridge between skills and constructing knowledge (Perkins & Tishman, 1998). It should also be noted that similar to critical thinking, the concept of dispositions is described by a wide variety of terms, such as Dewey's *good habits of the mind* to Siegel's *critical spirit*. In this paper dispositions are understood as an individual's inclined response to a certain situation (Claxton & Carr, 2004). Nevertheless, a deeper look at dispositions is necessary in order to fully understand this concept.

Perkins, Jay, and Tishman (1993) propose a triadic conception of disposition, which consists of three elements: *inclinations*, *sensitivity*, and *ability*. Inclinations are defined as the impetus individuals feel to behave in a certain way, reflecting an urge, a desire, a motivation, or a habit/tendency (e.g. open-mindedness). Sensitivity is referred to as awareness of the appropriateness of a behavior and alertness to occasions when a certain behavior (e.g. open-mindedness) is needed. Finally, ability means that one has the skills to follow through on the opportunity. These three elements are necessary conditions for behavior, but it is important to emphasize the key role of developing

sensitivity in the classroom.

In the classroom teachers can sensitize students to critical thinking in two ways. The teacher can explicitly state what skill he or she expects to be used or the students can be sensitive to the learning opportunity and apply the appropriate skill without being prompted. Both situations are needed in the classroom, but as students mature, the latter should be preferred by the teacher in order to promote autonomous learning. This shows that dispositions are individual characteristics that cannot be reduced to rules or routine behavior (Siegel, 1999).

There are seven critical thinking dispositions that were identified in the California Critical Thinking Dispositions Inventory (CCTDI), which are aligned to the critical thinking skills that were established earlier (Facione, Facione, & Sanchez, 1994):

1. *Inquisitiveness*: the desire to learn
2. *Systematicity*: being organized
3. *Analyticity*: the way one reasons to solve problems and to anticipate potential difficulties in the future
4. *Truth-seeking*: wanting the best and most current knowledge on a topic
5. *Open-mindedness*: being open to known or conflicting views
6. *Self-confidence*: trusting one's reasoning ability
7. *Maturity*: making unbiased decisions and being aware of multiple answers

When comparing the list of critical thinking skills and critical thinking dispositions, there appears to be some overlap. This is because in critical thinking, the skills and dispositions are dependent on each other when making sound judgments (Bailin, 2002). Thus, critical thinking should be viewed as a complex competence of interrelated elements rather than being composed of separate skills and dispositions.

There might be some concern that these dispositions cannot be developed in a formal school environment. Still, many researchers stress the importance of fostering these dispositions in school to promote a democratic education (Misco & Shiveley, 2010; Siegel, 1999). Lyutykh (2009) emphasizes that for these dispositions to be fostered, an educational culture of critical thinking is necessary. Others maintain that the

development of dispositions will happen even if they are not explicitly taught (Misco & Shiveley, 2010). According to Perkins and Tishman (1998), dispositions will materialize in any environment that engages one's values and beliefs, and schools offer the perfect environment for such growth.

#### **2.1.4 The role of creative thinking**

It is beyond the scope of this paper to discuss the relationship between critical thinking and creative thinking in length, but it is important to note that creative thinking is considered by many to be linked to critical thinking (Papastephanou & Angeli, 2007; Smith, 2001; Lipman, 2003; Paul & Elder, 2006). However, some question this connection and argue that these are two distinct concepts (e.g. Facione, 2013). According to Paul and Elder (2006, p. 34.), these two concepts cannot be separated, and in fact, they should be viewed as different aspects of thinking. Criticality basically means analyzing and evaluating ideas on the basis of intellectual standards, while creativity refers to using the imagination to generate new ideas. Paul and Elder argue that creativity is inherent in the definition of critical thinking as criticality requires open-mindedness and flexibility, while creativity presupposes critical analysis. The authors also point out that critical thinking without creativity basically means being skeptical and negative, while creative thinking without being critical is mere speculation. This implies that creative and critical thinking are inextricably linked and act as a check and balance on each other. It is almost impossible not to recognize the role that creative thinking plays in defining critical thinking.

In this section it was argued that critical thinking is a complex competence, consisting of knowledge, skills, and dispositions. It was defined that knowledge refers not only to content, but also to building on knowledge and use it to form new ideas. It was also discussed that thinking skills can be viewed as general concepts used across disciplines, but the way these skills are used and emphasized in certain disciplines can make them domain-specific. It is important to underline that thinking skills should not be limited to routinely solving problems mechanically, but they should also be used to analyze the context surrounding the problem, whether the problems is worth solving, and the potential future consequences of certain solutions. This section pointed out the importance of applying normative standards, which can guarantee the quality of



thinking. Furthermore, it was argued that individual affective aspects or dispositions play a vital role in critical thought. These dispositions make one more inclined to use critical thinking skills, which in turn allows one to acquire more knowledge. It was also discussed that creative thinking plays an important role in critical thinking.

## **2.2 Developing critical thinking**

### **2.2.1 Approaches to teaching critical thinking**

Developing critical thinking is just as complex an issue as trying to define critical thinking. Even though the development of critical thinking is generally regarded as an important outcome of tertiary education all around the world, there are mixed views on how explicitly various aspects of critical thinking should be taught in the classroom and how critical thinking should be assessed (Tapper, 2004). Halonen (1995) has identified three main approaches related to the teaching of critical thinking:

1. *The trait or dispositional approach*: it sees critical thinking as an innate ability that will naturally develop over time.
2. *The emergent approach*: underpinned by Piaget's ideas, this approach views critical thinking as emerging when one interacts with the environment.
3. *The state approach*: it focuses on the demonstration of critical thought with the focus being on skills (typically listed by a national educational organization). This approach focuses more on testing than the process of critical thinking itself.

There is some validity to the trait or dispositional approach as some people are naturally more critical in their thinking, and most researchers would also agree that the environment also influences one's critical thinking ability, including both formal and informal learning environments. Some researchers have even identified stages that critical thinkers progress through (Elder & Paul, 2010; King & Kitchener, 2004). For example, Elder and Paul (2010) have identified six stages of the development of critical thinking, ranging from the stage of *unreflective thinker* (someone with a wide variety of

thinking skills but without being aware of them or applying them consistently) to the stage of the *accomplished thinker* (someone who consistently and continuously monitors his or her thinking, and also tries to improve it). The authors point out that some individuals will never reach the top stages, and that it is possible to regress to a previous stage.

King and Kitchener (2004) have developed the Reflective Judgment model, which mentions seven stages that can be grouped into three levels: the *pre-reflective* level (stages 1-3), the *quasi-reflective thinking* level (stages 4 and 5), and finally the *reflective* level (the final two stages). The pre-reflective level is when students think that there are absolute answers to questions, and that knowledge is certain. In the quasi-reflective stage students start developing an abstract view of knowledge, and start to recognize that knowledge is individually constructed. The last level is reflective thinking, when individuals consistently and confidently use evidence to support their conclusions. This model is similar to Elder and Paul's (2010) framework in that it emphasizes the importance of reaching a conscious and consistent level of critical thinking.

It seems that the emergent approach (Halonen, 1995), mentioned above, is widely used today. Most researchers argue that critical thinking is not necessarily natural, but it can be developed in the classroom (Barnett & Francis, 2012; Ennis, 1989; Facione, 2013; Prawat, 1991; Smith, 2001; Tsui, 1999). However, the research on this is inconclusive with mixed empirical research results. The main reason behind this may be related to the way critical thinking is defined and tested. Renaud and Murphy (2008) found that undergraduate US psychology students scored higher on a domain-specific test of critical thinking than on a general critical thinking test. According to M. McMullen and W. McMullen (2009), assessing students using a pre-test and post-test provides very little information and does not account for individuality. They conducted a study on graduate nurses in the USA that continually assessed students' critical thinking over a two-year period, and found that individuals who initially scored low on the first pre-test improved their critical thinking skills by fifty-four percent, but those who scored higher on the initial test increased by less than six percent by the end of two years. Although this study demonstrates that students' critical thinking was developed in the program, it does not control for their maturation. Several researchers claim that the development of critical thinking happens naturally parallel with getting older and

gaining more educational experience although the reasons behind it and the way it happens are still unknown (Flores, Matkin, Burbach, Quinn, & Harding, 2012; King & Kitchener, 2004).

Related to the emergent approach of critical thinking, four course structures emerge from the literature (Barak & Shakhman, 2008; Ennis, 1989; Prawat, 1991):

1. *General* or *stand-alone* approach: critical thinking is taught separately from content as a general course.
2. *Infusion* approach: critical thinking is taught related to a particular subject matter. Students are encouraged to think critically by making principles and strategies of critical thinking explicit.
3. *Immersion* approach: similar to the infusion approach, but critical thinking strategies and principles are not made explicit.
4. *Mixed-methods* approach: combining the general approach and the infusion or immersion approach. Students are introduced to critical thinking in a general course, and then apply the principles and strategies in subject-specific courses.

Advocates of the general approach prefer having a critical thinking course that is independent of any domain. The opinions are mixed whether this approach is more beneficial than critical thinking courses focusing on a specific subject matter. A general critical thinking course might not benefit everyone, but it does offer some advantages. Tapper (2004) found that some university teachers see a limited chance of incorporating critical thinking into subject courses due to various reasons (such as time constraints, lack of pedagogical knowledge, large classes), so a separate, general critical thinking course might be beneficial for these students. In addition, some students might not feel confident in their critical thinking skills in a given domain, so a general elective course might suit them more. On the other hand, there is a concern that general critical thinking classes are often too abstract and complex for some students (Halonen, 1995). As a result, these students might develop a negative impression of critical thinking, which can hinder their future learning. Halonen (1995) reminds us that when students are first introduced to critical thinking, it can be overwhelming for them, so it is important to adjust these classes to the level of the students. She recommends developing foundation

skills (e.g. identifying assumptions) first and slowly incorporating more complex skills (e.g. problem solving).

The most popular course structure that is used to develop students' critical thinking appears to be based on the principles of the immersion approach. This could be because it is the most widely studied of the approaches, and because it does not require the explicit teaching of critical thinking. Behar-Horenstein and Niu (2011) stated that fifty-two percent of the empirical studies that they examined in their literature review of critical thinking investigated courses adopting the immersion approach at the undergraduate level. Similarly to the general approach, the immersion approach also poses some challenges for the teacher. Prawat (1991), for example, mentions two concerns of this approach. One is that the teacher must encourage and acknowledge students' own ideas and thoughts even if they are related to other disciplines, which can be difficult as it requires some background knowledge. The second concern is that even though the immersion approach encourages critical thinking, some students might not have the skills and dispositions to take full advantage of this approach in the classroom, which implies that some explicit teaching of critical thinking might be necessary.

In fact, some researchers have found that the immersion approach produced the lowest percentage of students' critical thinking development compared to other approaches (Barnett & Francis, 2012; Behar-Horenstein & Niu, 2011). It should be mentioned that many of these studies focused on undergraduate students, who might not be competent in their critical thinking ability at that point in their studies. The results, however, suggest that students might benefit from explicit instruction in critical thinking at the undergraduate level, but at more advanced levels, an immersion method might be more effective because students might already have most (or all) of the dispositions and skills needed. Furthermore, some undergraduate students might not have developed the dispositions to use a certain skill, which can also be related to cultural norms and conventions. This has particular relevance for classes where students have different cultural backgrounds. Therefore, it appears that the immersion approach might benefit advanced critical thinking students, but for undergraduate students an infusion or mixed methods approach might be more effective.

There seems to be very little research on the infusion and the mixed-methods approaches although there are some intriguing findings indicating that students at liberal

art colleges perceive their level of critical thinking as higher than students in other colleges, and their actual (measured) critical thinking is also higher (Tsui, 2002). Liberal art colleges usually offer general education that integrates arts and sciences, and they put a strong emphasis on synthesizing knowledge from different fields and disciplines rather than simply focusing on knowledge in distinct disciplines. Shim and Walczak (2012) analyzed data collected by the Wabash National Study of Liberal Arts Education, which researched first-year students enrolled in four-year liberal arts programs or institutions. They found that a complex set of factors, such as the types of questions used by the teacher, the types of activities, and the forms and quality of feedback strongly contributed to students' critical thinking development. This is related to the concept of teachers' cognitive presence (Hosler & Arend, 2012), suggesting that the classroom activities and the pedagogical principles/strategies greatly affect students' critical thinking.

Similarly, some researchers have argued that the course structure might not be as important in developing critical thinking as classroom instruction (Tsui, 1999). In their study focusing on students who were taught using the same critical thinking approach but were enrolled in different classes, Behar-Horenstein and Niu (2011) found that the critical thinking gains were more strongly influenced by the instructor than the approach itself. This suggests that teachers seem to have a crucial role in developing students' critical thinking. This issue will be examined in the next section in further detail.

### **2.2.2 Teachers' effect on the development of students' critical thinking**

Teachers can have an enormous effect on developing students' critical thinking ability. McBride, Xiang, Wittenburg, and Shen (2002) found that when teachers demonstrated reasoning in the classroom, it improved students' reasoning ability. Therefore, if a teacher is confident in his or her abilities and demonstrates critical thinking skills, students can use the teacher as a model, which may help them develop their own critical thinking skills and dispositions. In fact, it is typically the instructor who decides which of the four approaches will be used in the classroom. Jenkins's (2011) findings show that teachers who feel more confident in their own critical thinking tend to use more critical thinking in the classroom compared to teachers who are less confident. This

means that instructors are making conscious decisions on whether to directly incorporate critical thinking into classroom instruction.

Although teachers can be used as models, students still need to actively engage in critical thinking. Van Gelder (2005) points out that critical thinking will not develop overnight and is sometimes a long process. This indicates that teachers should not expect instant results, but provide students with as many opportunities as possible in the classroom. Lipman (2003, p. 49.) further argues that one develops critical thinking skills through actively performing various *mental acts*. For example, decision making is a thinking skill that requires several mental acts, such as deciding, distinguishing, or perceiving differences. He recommends that the more mental acts a student engages in the more developed the student's critical thinking ability will be. Therefore, students need to participate in various activities that are slightly above their level in order to fully develop their cognitive ability, and it is the role of the teacher to provide these opportunities.

The way teachers engage in and promote critical thinking is based on their beliefs about the purpose of education. Barak and Shakhman (2008) identified three types of teachers when researching teachers' use of critical thinking in the classroom:

1. *False users*: teachers who have an idea of how to promote deeper cognitive processes but use contradictory instruction.
2. *Instrumental users*: teachers who incorporate critical thinking into the class occasionally as a way to raise students' achievement or to meet course requirements.
3. *Intended users*: teachers who feel that developing students' cognitive abilities is one of the major goals of the course.

Barak and Shakhman (2008) found that false users tend to do the thinking for the students. These teachers synthesize the information for the students instead of allowing the students to reflect on different perspectives or trying to find the key points. If this approach is used in the class, students cannot develop higher order thinking skills, such as synthesizing, and could develop a reliance on others. However, in the early stages of students' academic careers, this might be useful as teachers can provide a model for the

students to follow. Later, however, teachers should encourage students to think independently, which can develop their disposition to become a critical thinker. Teachers who are instrumental users have the underlying belief that by teaching the content students will develop critical thinking, and thus they rarely use activities explicitly focusing on critical thinking in class (Barak & Shakhman, 2008). This is similar to the immersion approach, which puts more emphasis on the content, giving students the impression that more content knowledge will make one a better thinker. As was mentioned previously, some students might not be confident or their critical thinking ability might not be developed enough to understand how certain theories and concepts relate, which could hinder their academic development. Barak and Shakhman (2008) found that intended users were able to explain why they did a particular activity and were able to name the skills that students should develop through that activity. These teachers were more aware of how to use talk and reflection in their teaching. One of the goals of critical thinking is to be able to reflect on one's own thoughts and actions. However, it is also important that instructors reflect on their own teaching practices, identify what type of user they are, and are aware of how it influences students' critical thinking ability. Barak and Shakhman (2008) emphasize that the role of reflective thinking about classroom instruction is playing an increasingly important role in teachers' professional development. Critical thinking can undoubtedly help teachers develop reflective thinking.

Teachers or departments should not only identify what type of critical thinking user(s) they are or want to be, but also reflect on the extent to which students achieve, under achieve, or fail to achieve the goals of a course or a program. Barak and Shakhman (2008) found that when difficulties arose in the classroom, teachers tended to blame the students for the problems, whereas teachers typically took credit when a student was successful. If difficulties do arise in the classroom, it is suggested that instead of blaming the student(s), teachers should reflect on their instructional practices and try to identify the source of the difficulties. For example, when making individual presentations, if students do not have a clear and specific aim, the instructor should identify this problem, think about how much it was emphasized in class, and maybe focus on this particular aspect more explicitly in the next course. If the teacher is blaming the students for their lack of performance, this may indicate that the instructor

is not reflecting on his or her teaching with a view to improving his or her instruction.

The use of critical thinking in class is also influenced by teachers' beliefs about students' critical thinking ability. Warburton and Toriff (2005) studied teachers' beliefs about students' critical thinking abilities and found that teachers who perceived the students as having low critical thinking abilities used easier critical thinking activities. On the other hand, if the teacher's perceptions of students' critical thinking abilities were high, they tended to use more complex and challenging critical thinking activities. This way, teachers' perceptions can greatly influence students' critical thinking.

To summarize this section, teachers need to be aware of their beliefs about critical thinking and reflect if they are incorporating critical thinking into their classroom, which also includes identifying what type of thinkers they are. Teachers also need to be aware of their perceptions about students' critical thinking ability, which could influence what types of critical thinking activities they use in the classroom. These two factors are crucial for teachers to reflect on if they want to incorporate more thinking into the classroom and develop students' abilities. Teachers must also be patient with students because some students will develop faster than others, but this does not mean that students cannot develop into critical thinkers. Here it is important to remember that dispositions and skills should be taught together instead of focusing solely on skills. Barak and Shakhman (2008) emphasize that teachers' knowledge, beliefs, and instructional behavior are all related. Therefore, teachers and departments should be aware of this interrelatedness and adjust their teaching practice so that they can more effectively promote critical thinking in the classroom.

### **2.3 Foreign language learning and critical thinking**

Even though foreign language instruction is often criticized for a lack of attention to developing transferable skills in students (Pally, 2001), it is possible to argue that foreign language learning can also help students develop their critical thinking ability. For example, as Pally (1997) mentions, when a new vocabulary item is learned, students have to reflect on how to use it, identify different shades of meaning, and know how to use the word or phrase appropriately in a given situation. Similarly, it is easy to see that



thinking critically about different areas of language (pronunciation, vocabulary, grammar, language use, and cultural aspects) is almost unavoidable in the foreign language classroom, particularly in the case of English, which has become the international language of communication, and thus is extremely heterogeneous. Similarly, learning the basic oral and written language skills (reading, writing, listening, speaking) as well as more complex skills, such as translation or interpretation, are closely linked to critical thinking. Therefore, it seems that foreign language learning is naturally embedded in critical thought.

Integrating critical thinking into a foreign language classroom can also help students reflect on their native language. Pally (2001) points out that argumentation and rhetoric vary from culture to culture, which might cause difficulties for students, especially if textual and discourse norms and conventions are very different in their culture/language. For example, in English there is a strong emphasis on explicitly expressing and providing support for one's position, which might be too direct for students with a different cultural background. Therefore, teachers need to recognize this difference and encourage these students to openly expressing their ideas using valid arguments, particularly in academic settings. The teacher could also provide support to make sure that students are aware of cultural differences in text production and various forms of interaction. This can help students to develop a comparative approach to language learning, and understand that language is strongly linked to culture. Even in the case of English, which is increasingly used as a lingua franca by non-native speakers, there are certain norms and conventions that students have to follow when writing academic texts in English or interacting with others in formal situations.

Teaching critical thinking in foreign language classrooms seems to be a tool to improve students' text comprehension skills. Pally (2001) analyzed intermediate-advanced ESL students' skills related to finding and understanding the main idea and the supporting arguments in a non-academic article. She found that 60% of the students could not identify the main argument, and that 40% of those who were able to find the main argument could not identify the supporting arguments. Even though the students seemed to understand the vocabulary and grammar, they did not fully understand the main message of the article and the line of argumentation. This highlights the importance of incorporating critical thinking skills into advanced foreign language

academic reading courses, but these ideas also apply to courses focusing on academic communication skills (e.g. spoken/written interaction).

There is some concern that critical thinking reflects mainly the Anglo-American view of academic standards, and that by teaching critical thinking, teachers are advancing the idea of individualism, which is central to the Anglo-American culture (Atkinson, 1997). This is a valid concern when teaching critical thinking to a group of international students, but empirical research shows that individuals from other cultures often have similar dispositions when it comes to critical thinking. For example, McBride, Xiang, Wittenburg, and Shen (2002), using Facione's CCTDI test, found that even though there were some differences between American and Chinese students, these differences were insignificant, particularly related to truth-seeking and inquisitiveness. Similarly, Jenkins (2011) found that there were insignificant differences between American and Thai nurse instructors on their views of critical thinking. Comparing undergraduate Japanese and New Zealand students, Manalo, Kusumi, Koyasu, Michita, and Tanaka (2013) concluded that culture does not directly influence critical thinking, and that the values and skills emphasized in educational environments have a more significant impact. In short, there appears to be a cross-cultural disposition for critical thinking regardless of culture. Nevertheless, teachers need to bear in mind that openly expressing one's own position and evaluating other people's ideas is not so common in some cultures.

To sum up, the goals of advanced, academic foreign language instruction seems to be related to the development of critical thinking because teaching thinking can influence several aspects of foreign language learning (Alnofaie, 2013). Besides, as some studies have revealed, most students think that critical thinking should be integrated into language courses. For example, Yang and Gamble (2013) found that 65% of freshmen at a Taiwanese university mentioned the importance of teaching critical thinking in English courses. This research demonstrates that students recognize the importance of critical thinking in learning a foreign language course.

## **2.4 Activities that develop students' critical thinking**

There are many different activities that teachers can use to develop students' critical thinking. It is beyond the scope of this paper to provide a full list of activities that promote critical thinking. Instead, the main focus will be on two production skills: speaking/talk (with a focus on questioning) and writing. This does not diminish the importance of reading skills, but it is difficult to have access a student's reading ability unless they are asked to verbalize their understanding or thoughts during the reading process. It is important to emphasize that when discussing oral and written production skills, critical thinking skills related to receptive skills (reading and listening) are also considered to be crucial as in real-life situations these two types of skills are usually interconnected.

### **2.4.1 Critical thinking and classroom dialogue: questioning**

The effective use of talk between students and teachers is a central idea of dialogic teaching (Alexander, 2008), which emphasizes (among other aspects) the importance of asking questions. Most of the literature that focuses on critical thinking activities mention Socratic questioning as one of the most important tools to develop critical thinking. Elder and Paul (2007a, 2007b) state that Socratic questioning is beneficial to students because it allows them to differentiate between what they know and understand, what they do not know and understand, and what they think that they know and understand but actually they do not. Paul (2012) also mentions that many higher order questions (related to analysis, synthesis, and evaluation) presuppose critical thinking skills. For example, when a student is asked to identify the common points in two articles, it requires the skill of analysis and synthesis. In fact, Renaud and Murray (2008) found that higher order questioning resulted in higher gains in critical thinking. Similarly, Papastephanou and Angeli (2007) have argued that effective questioning allows students to reflect on what they take for granted and to think about situations more deeply, from different perspectives.

Forming appropriate and challenging questions can be difficult for some students, so it is important that the teacher should act as a model. Browne and Freeman

(2010) argue that students become more critical if the teachers consistently ask questions. This implies that ideas should not be taken for granted even if they originate from an expert in the field. Questioning experts has the underlying message that every idea and view should be carefully evaluated as it can be subjective, narrow-minded, their arguments might be faulty, or a different perspective might be better. Formulating the right questions can also be difficult for teachers (see Crenshaw, Hale, and Harper (2011, p. 18-20) who give a detailed description of the stages that teachers can use when promoting critical thinking through questioning. Teachers should be aware that practice improves efficiency, and that the role of the teacher should be as a participant and not a director (Flores, Matkin, Burbach, Quinn, & Harding, 2012). It is important to emphasize that this type of pedagogy not only benefits students but teachers as well. Ironside (2003) argues that engaging in Socratic questioning makes teachers think beyond simple answers and become more aware of the complexities of different situations. This method of instruction is similar to dialogic teaching, where the focus is on extended and varied classroom dialogue. Through dialogue, teachers can elicit students' initial perspectives, help them develop new perspectives and construct new knowledge, and make them aware of the limits of their own understanding (Alexander, 2008; Benesch, 1999). Through questioning, students and teachers can learn from each other and use the content to create new knowledge.

To embrace this particular pedagogy, knowledge needs to be viewed as tentative. Browne and Freeman (2010) claim that one should approach knowledge with skepticism because knowledge is always changing as new information is acquired. This means that an individual at any given time has a view on a topic, which can change if additional or different valid evidence is provided, the individual is open to new perspectives or ideas, and is aware of potential biases.

However, there are some issues with this approach that could make the teacher uncomfortable. Students might continually challenge the teacher's views or ideas if they have a different perspective, which could interrupt or slow down the course (Limach, Duron, & Waugh, 2008). Some teachers might even find it impolite, particularly in some cultures. This might be one reason why some teachers do not use Socratic questioning. Nevertheless, teachers should be confident and mature to handle these situations and embrace students' questions or challenges, seeing them as learning

opportunities for everyone involved.

Browne and Freeman (2010) argue that questioning is active learning, which increases students' critical thinking ability and awareness of biases in their own or others' arguments. Similarly, Tsui (2002) emphasizes that meaningful class discussions force students to process information more quickly. In her research, she found that university students who actively participated in classroom dialogue with the teacher tended to question other students' ideas as well, and that teachers praised these students more. Related to active learning is Lipman's (2003) idea, who pointed out that questioning allows students to reflect on their own ideas and perspectives. It also helps them to develop their questioning ability and recognize the difference between higher-order and lower-order questions as well as the appropriate time to ask a question, which is very important in interaction and negotiation.

Here it should be mentioned that there are two types of questions: *ill-structured* and *well-structured* ones. King and Kitchener (2004) define ill-structured questions as lacking context, therefore making any answer uncertain. An illustrative example is the question "Should women have the right to choose to get an abortion?" in which the context is not specified. Both types of questions are useful in the classroom depending on the aims of the particular activity, but since one of the skills of critical thinking is to express one's views clearly and accurately, ill-structured questions can be used to practice this skill if they are transformed into well-structured questions by adding more information about the situation and the situational/cultural context. If the ill-structured question mentioned above is asked, another individual can ask for clarification. For example, "What if the woman was raped?" Based on this, a better structured question might be, "Should women have the right to choose abortion after they have been raped?" Similar questions can narrow and focus the initial ill-structured question until a reasonable answer can be given.

There is evidence that Socratic questioning develops critical thinking, but little research is available on how this development happens. Browne and Freeman (2010) are one of the few researchers that have studied this phenomenon. They argue that questioning creates a healthy intellectual discomfort, which increases the chances that evaluative and reflective behavior will happen. Jarvis (2007) refers to this discomfort as *disjuncture*. He argues that individuals go through a normal daily routine, which usually

requires very little thought. It is when this disjuncture (or break in the routine) happens that an individual will learn. Questioning provides a break in one's routine, which forces the individual to reflect whether he or she truly understands the topic, takes into account the context and different perspectives, or has personal biases.

#### **2.4.2 Critical thinking and writing**

Another activity that has been investigated as a possible tool to promote critical thinking is writing. Many studies on critical thinking found that writing assignments with instructor feedback that is informative and encouraging and drives thinking forward developed students' critical thinking (Barnett & Francis, 2013; Carter & Rukholm, 2008; Tsui, 1999; Tsui, 2002). These studies emphasize the role of quality feedback, without which cognitive development might not take place. Atkinson (1997) emphasizes that the act of writing itself does not promote critical thinking if it is not accompanied by feedback. Similarly, Tapper (2004) points out that some teachers think students will automatically develop critical thinking through writing even without feedback. However, feedback, given both during the writing process and on the final product seems to play a crucial role in critical thinking development. Providing feedback on the content of the text and on the logical organization of ideas not only helps to correct misunderstandings and gaps/faults in argumentation but could foster further development on the topic by guiding students towards additional theories or ideas and encouraging them to consider different perspectives.

There are many different types of writing assignments that could be used in higher education, depending on the course and the aims of the writing activity (e.g. summary, critical review, synthesis paper, reflective learning diary, just to mention a few), and there are multiple strategies that teachers can follow when giving feedback on students' texts. For example, if a student seems to be focusing only on one perspective, the instructor should prompt the student to include additional perspectives. This could happen directly by giving different perspectives but also indirectly, by asking questions to lead students to reflect on these different views. Ideally, the instructor should also provide sources or at least the names of authors, which can make it easier for students to find these different perspectives. The instructor should also mention classic articles written on the topic if they were not used in the writing assignment. Even though the

use of recent sources is generally expected as it can prove that students are familiar with the most recent state of research on a topic, it is very important that students are aware of the development of research over time, and the sources of original ideas that motivated current research. If timely and meaningful feedback is not provided, students could continue to preserve their own ideas and conclusions, which means that no new knowledge or insights can be gained. In short, reading, writing, and oral activities promote critical thinking development only if they are done with the purpose of constructing new knowledge or re-constructing existing knowledge for everyone involved.

## **2.5 Assessing students' critical thinking**

### **2.5.1 Critical thinking tests**

Assessing the development of critical thinking has many challenges. There are several critical thinking tests that are available (see Ennis, 2009) although researchers have criticized all of them. This paper will not analyze each test individually but critique the methods used to administer these tests. Until recently, the most widely used method to assess critical thinking development was to do a critical thinking pre-test and then conduct a post-test after an intervention. It is not surprising that most research conducted in this manner had mixed results regarding students' critical thinking development (McMullen, M. & McMullen, W., 2009). There are many possible reasons behind this, mainly related to the test itself, the length of the intervention, and individual students' level of critical thinking before the intervention.

The first factor contributing to the mixed results is the test itself. Tsui (2002) noted that many of these tests use a multiple choice test, which limits the scope of critical thinking and relies on statistical analysis to demonstrate that critical thinking has developed. These tests also presuppose that the questions are well-structured, and there is a correct answer for each question. Some researchers have recognized this limitation and have included open-ended questions in an attempt to broaden the scope of the test. However, this requires trained assessors, which means more time and financial resources are needed to carry out the research. Multiple choice tests are also preferred

over more qualitative tests because the test results are easier and quicker to analyze with statistical methods. In fact, Behar-Horenstein and Niu (2011), who reviewed research on critical thinking from 1994 to 2009, found that most of the research conducted on critical thinking used quantitative methods of data collection. The authors argue that relying extensively on quantitative data does not account for behavior changes in students. This suggests that these tests are only measuring the skills of critical thinking and might not consider the dispositional changes in an individual. Similarly, Saxton, Belanger, and Becker (2012) argue that current critical thinking tests fail to measure both skills and dispositions. Measuring dispositional changes would be very important because dispositions strongly influence how skills are used in critical thinking.

Related to the use of pre-tests and post-tests, there are some important issues to consider. One of these is the way classroom instruction is organized. Behar-Horenstein and Niu (2011) noticed that only few studies provided detailed information on how the course was structured and which approach was used (immersion, infusion, general, or mixed). This information could make it easier to understand which approach promotes critical thinking more effectively in certain contexts and settings. Another factor to consider is the danger of teaching to the test that measures critical thinking at the end of the intervention. If the test is a multiple choice test, the teacher could unwittingly teach the students certain heuristics (i.e. hints or rules that can help them solve the problem), which, could turn thinking into a routine procedure (Facione, 2013). This is dangerous as it might restrict thinking and also give the students a false sense of critical thinking.

The length of the intervention is another factor contributing to the mixed research results related to using critical thinking tests. This is a crucial issue, particularly in view of the debate about the time needed for students to develop critical thinking and how researchers can control for student maturation. Behar-Horenstein and Niu (2011) mentioned that the longer the intervention, the greater the chance is that the pre-test and post-test are going to measure the effects of the natural process of maturation instead of the impacts of the intervention. Niu, Behar-Horenstein, and Garva (2013) reviewed existing quantitative research on critical thinking from 1994-2009, and found that students developed the most when critical thinking intervention was longer than twelve weeks. One limitation of this study was that the authors measured course intervention in weeks because many of the reviewed studies did not provide detailed background



information about the course(s) in question. Therefore, the authors could not take into consideration other important information about class structure, such as the total number of hours the courses had, the number of contact hours per week, the number of hours spent on assignments outside the class, or the length of each class. However, measuring course intervention in hours, accompanied with a more detailed description of the course and a list of out-of-class assignments might provide a more useful method to measure the development of critical thinking. Niu et al's study concluded that longer interventions resulted in students' development of critical thinking although according to other researchers, this development might be related to the repeated practice of using critical thinking during the course rather than to the time factor itself (Heijltjes, van Gog, Leppink, & Paas, 2014). Therefore, it seems that students' critical thinking development might be more strongly linked to the quality of teaching, students' individual characteristics, and teachers' instructional practices than to the actual length of the intervention.

The third factor that seems to be responsible for the mixed research results is individual students' development of critical thinking skills before the intervention. This is a key factor that researchers should definitely consider. Initially, individual students' critical thinking ability can be tested with a pre-test, the results of which can be compared with the results of the post-test for the same individual. Researchers, however, tend to ignore individual characteristics when conducting pre-tests and post-tests. For example, Wessel and Williams (2004) pointed out that the reason why there was a lack of development for some students from the first to the second year in their study could be because some students had strong critical thinking skills already at the beginning. In their research the authors did not consider individual factors, and grouped the participants together. They emphasize that individuals are at different developmental levels of critical thinking, and that some students with low critical thinking abilities will develop more than students who have high critical thinking abilities. If a pre-test is used to measure a student's critical thinking skills at the beginning of a course or the academic year, it is important to compare the results of the pre-test with those of the post-test in the case of each individual. McMullen, M. and McMullen, W. (2009) conducted a similar study, but they took into account students' individual development. They found that university students with low critical thinking skills developed

significantly more according to the post-test than student who had higher critical thinking skills at the beginning. Therefore, it seems that when conducting critical thinking research, it is important to consider this crucial factor. Although measuring achievements individually can make anonymous participation problematic, one advantage is that researchers can give feedback to each student on the skills and dispositions that might need to be developed.

Ideally, all the factors discussed above are considered when administering critical thinking tests. Ennis (1993) suggests that when choosing an already existing instrument to measure the development of students' critical thinking, it is important to assess whether the instrument is the most suitable for the planned research, considering as many of the above listed factors as possible in order to avoid a choice based on convenience (financial considerations, time, etc.). Finally, Behar- Horenstein and Niu (2011) emphasize that critical thinking tests should primarily focus on how students justify their answers and not only on what they answer. In other words, researchers should adopt a more qualitative approach instead of focusing only on the end product.

### **2.5.2 Self-reported critical thinking development**

Recently there has been a shift from using exclusively quantitative or qualitative research designs to adopting a mixed-method approach. Behar-Horenstein and Niu (2011) concluded in their review of the literature on critical thinking research that a mixed-method approach may more effectively assess the development of students' critical thinking skills because of the inherent complexity of critical thinking. There are a variety of ways that critical thinking can be investigated by mixing qualitative and quantitative methods, but one method that seems to attract researchers' interest today is self-reported surveys that measure students' perceived level or development of their critical thinking. According to Shim and Walczak (2012), self-reports have become widely used to measure students' behaviors and experiences.

Self-reports can provide valuable information on students' critical thinking development, and Perkins and Tishman (1998) underline that self-reports can be particularly effective to measure students' dispositions. There are three types of self-report questionnaires. The first type uses closed questions, and the participants have to make a choice between pre-determined responses (e.g. Likert scales). The second type

has open-ended questions, and the third type mixes closed and open-ended questions. Closed questions yield quantitative data that is easy to analyze, but since the questions are rather restrictive, they do not enable participants to provide in-depth insights or justifications for their choices. Open-ended questions, on the other hand, provide qualitative data and more in-depth responses, but they are more difficult, time-consuming to analyze, and the responses might not be relevant for the study. Therefore, mixing these two types of questions seems to be a good solution for researching critical thinking.

Even though validity is usually mentioned as a concern related to self-reported questionnaires, there is evidence that they are also relatively valid instruments (Anaya, 1999; Tsui, 1999). Anaya (1999) argued that there is a moderate validity of self-reports measuring cognitive growth, and that the validity of self-reports is comparable to grade point average and standardized tests. Tsui (1999) mentioned the concern that students might rank themselves higher, but she highlighted that there appears to be a relationship between self-reports and critical thinking.

Regarding the correlation between students' self-reported (perceived) and actual critical thinking ability, there appears to be some contradiction in the literature. Bensley and Spero (2014) measured American college students' self-reported ability against a critical thinking test, and found that students initially overestimated their scores by 30.6%. They concluded that students had only minimal understanding of their own critical thinking ability. This suggests that if students are self-assessing their abilities on critical thinking for the first time, and they have not been taught the skills and concepts of critical thinking, they might be overestimating their abilities. Kruger and Dunning (1999) obtained similar results when they tested American undergraduate students in logic and grammar. Their results revealed that most of the participants significantly overestimated their performance. When another test was given to the same students after teacher feedback, some students were able to calibrate their scores better, but others still overestimated their skills. Kruger and Dunning attributed this gap to the individual's lack of self-monitoring or awareness of their own abilities. This could mean that if students have not been assessed on their critical thinking before a self-report questionnaire, the research runs the risk that the students might be overestimating their abilities.

However, this initial overestimation might not necessarily be a negative factor in developing one's critical thinking ability. According to Heijltjes, van Gog, Lippink, and Paas's (2014) study, Dutch economics students who scored better on a test measuring critical thinking dispositions scored significantly higher on critical thinking tests than those who had scored lower on the disposition test. Since dispositions refer to a mental willingness to behave in a certain way or to use certain skills, this might indicate that students find critical thinking useful and might make effort to develop their abilities. Similarly, Manalo, Kusumi, Koyasu, Michita, and Tanaka (2013) found a link between self-efficacy and critical thinking when they compared Japanese and New Zealand students. The results of this research suggest that students' own critical thinking ability might be overestimated if they have not been assessed on critical thinking before, but that this overestimation actually points to a student's self-efficacy to use critical thinking. If proper individual monitoring techniques are used, this could result in the development of the student's critical thinking ability in the future.

Finally, self-reports can be a useful method to measure students' critical thinking abilities if time and financial issues are a concern for a study. Self-reports have been shown to have some validity, but caution should be used if this is the only method employed (Gonyea, 2005). Self-reports are useful to gain an initial insight into critical thinking, but in order to get more valid and comprehensive results, other methods should be used.

## 3 METHODS

### 3.1 Research aims

The main aim of this small-scale research is to explore students' perceived critical thinking skills and dispositions at a Finnish university upon completion of their compulsory English language course(s). The research aims to first quantitatively measure how students rate various skills and dispositions that are part of critical thinking, and then find out how the skills and dispositions are related to the students' gender, age, the years they have spent in university, their perception of the importance of critical thinking, and their self-reported overall critical thinking ability. The quantitative results will also be interpreted in relation to the students' definitions of critical thinking in order to provide some qualitative insights into their views on critical thinking. An additional aim of this research is to identify activities that students believe promote their critical thinking development. The results are intended to be used for improving the structure and content of compulsory academic English communication courses at the university by taking into consideration students' perceptions and needs. Motivated by these aims, the research addresses the following four questions:

- 1) How do students rate their critical thinking skills and dispositions?
- 2) Are there significant differences between students' perceived levels of their critical thinking skills and dispositions depending on their gender, age, the years they have spent in university, the importance they attribute to critical thinking, and their self-rated overall critical thinking ability?
- 3) How do students define critical thinking?
- 4) What kind of activities do students think promote the development of their critical thinking?

## **3.2 Research design**

The empirical research consisted of a questionnaire survey with a simultaneous quantitative dominant – qualitative less dominant research design (see Tashakkori & Teddlie, 1998). In this design the quantitative and qualitative phases of the research are conducted at the same time, and the qualitative data supports and provides explanation for the quantitative results (Morse, 2003; Tashakkori & Teddlie, 1998). This design was chosen because the literature on critical thinking emphasizes the importance of including both qualitative and quantitative aspects in empirical research (Behar-Horenstein & Niu, 2011). To collect data, an online self-report questionnaire was administered to students with various majors at a university in central Finland. Students who were selected to participate in the study have already completed the academic English course(s) that were mandatory for their degree (a Communication Skills course, which follows a separate compulsory Academic Reading Skills course or in the case of some faculties a combined Academic Reading and Communication Skills course). These courses are targeted primarily at second-year students, but students can complete them also at a later stage in their studies. Although several other data collection methods were considered, taking into account the overall aim of the research as well as time and financial constraints, the self-report questionnaire survey deemed the most useful and practical data-collection instrument for this study.

## **3.3 Setting and participants**

The research was conducted at a Finnish university in central Finland in the autumn of 2014. The participants in the research were students on the bachelor's or master's level. The sample consisted of 179 students enrolled in the compulsory English course(s). Out of the 179 students who received the questionnaires by e-mail, 24 (N=24) returned it, which represents an overall response rate of 13.4%. Breaking this number down to the faculty level (Table 2), 32 questionnaires were sent to business students with 8 responses (response rate: 25%), 50 questionnaires to sport and health sciences with 5 responses (10%), 19 questionnaires to information technology students with 1 response

(5.3%), 35 questionnaires to humanities students with 3 responses (8.6%), 25 questionnaires to social sciences students with 4 responses (16%), and 18 questionnaires to education students with 3 responses (16.7%). Initially, the study was also going to measure potential significant differences between the faculties, but because of the low response rate, this analysis was not performed. The possible reasons for and the effects of the low response rate will be discussed in the limitations of this study later. All the participants were Finnish by nationality, with 13 females and 11 males. The average age was 24.79 (SD =  $\pm 4.24$ ), ranging from 21 to 38 years. The average number of years the participants have spent in university was 2.77 (SD =  $\pm 1.55$ ), ranging from 1 to 8 years.

Table 2 Response rate by faculty

Faculty	Number of students who received the questionnaire	Number of students who returned the questionnaire	Response rate
Business	32	8	25%
Sport & health sciences	50	5	10%
Information technology	19	1	5.2%
Humanities	35	3	8.6%
Social sciences	25	4	16%
Education	18	3	16.6%
Total	179	24	13.4%

### 3.4 Procedure and instrument of data collection

The researcher first asked permission through e-mail from the course teacher to conduct the survey with the students in the course. This email introduced the researcher and the aims of the research, and asked for the e-mail address of each student that completed the course. The students were contacted individually through email after the course was completed, and were given a consent form (see Appendix A) that introduced the researcher and the main aims of the research, gave an estimate of the average time needed to fill in the survey, mentioned the possible benefits of participating in the research, gave the contact information of the researcher, ensured the anonymity of the data, and emphasized that participation was voluntary. The consent form included a link to the questionnaire. Two weeks after the first email, a second email was sent to the

students to remind them to complete the survey.

The questions used in the survey (see Appendix B) were partly based on Facione's (2013) model of critical thinking comprising six main skills and seven dispositions. The description of these skills and dispositions formed the basis of the closed questions constructed by the researcher. After drafting the first version of this part of the questionnaire, another researcher checked that the items matched Facione's (2013) original descriptions of the individual skills and dispositions. As a result of this, a modified version of the questionnaire items was developed, which consisted of two main parts. The first part focused on skills, containing six items related to the skill of interpretation, three related to analysis, three to evaluation, four to inferences, three to explanation, and four items to self-regulation. The second part consisted of items focusing on dispositions, which contained two items related to inquisitiveness, two to systematicity, three to analyticity, three to truth-seeking, three to open-mindedness, three to self-confidence, and three to maturity. In total, there were 42 questionnaire items related to the 13 main skills (used as dependent variables in the quantitative analysis) (see Appendix C). The questionnaire also contained four background questions (students' gender, age, faculty, years spent in university) and two closed questions (importance attributed to critical thinking and students' self-rated overall critical thinking ability), which were used as the independent variables in the analysis. In addition, the questionnaire also had two open-ended questions that asked students to describe what they mean by critical thinking and to list activities that they thought developed their critical thinking ability.

The instrument was tested for internal consistency reliability using Cronbach's alpha (Table 3). The correlation of the items for each individual skill were the following: 0.689 for interpretation, 0.717 for analysis, 0.717 for evaluation, 0.617 for inferences (after one item (4.2) was removed from the questionnaire), 0.813 for explanation, and 0.682 for self-regulation. The internal reliability of the skills was 0.858. The correlation results for the dispositions were the following: 0.882 for inquisitiveness, 0.607 for systematicity, and 0.635 for analyticity (after one item (9.3) was removed, 0.387 for truth-seeking, 0.680 for open-mindedness, 0.807 for self-confidence, and 0.672 for maturity. Due to the low internal reliability of truth-seeking, it was not included in the analysis. This gives a 0.723 internal reliability for dispositions.



Table 3 Cronbach's alpha for the variables

	Variables	Items	$\alpha$
Skills	Interpretation	6	0.689
	Analysis	3	0.717
	Evaluation	3	0.717
	Inference	3	0.617
	Explanation	3	0.813
	Self-regulation	4	0.682
Dispositions	Inquisitiveness	2	0.882
	Systematicity	2	0.607
	Analyticity	2	0.635
	Truth-seeking	3	0.387
	Open-mindedness	3	0.680
	Self-confidence	3	0.807
	Maturity	3	0.781

### 3.5 Methods of data analysis

In the analysis of the quantitative data, descriptive statistics were calculated first. After this each independent variable was analyzed in SPSS with the appropriate test (Mann-Whitney, Kruskal-Wallis, and Spearman's correlation). The qualitative data obtained from the open-ended questions was analyzed in two different manners using a theory- or data-driven thematic analysis (Boyatzis, 1998). The first open-ended question that focused on students' definition of critical thinking used a deductive theory-driven approach, whereby data was first categorized in relation to Facione's (2013) skills and dispositions. The second open-ended question used an inductive data-driven approach and explored what kind of activities students thought promoted critical thinking. Data was first categorized into major themes (based on recurring patterns), which formed the basis of the qualitative analysis.

## 4 RESULTS

### 4.1 Descriptive statistics

The results of the descriptive analysis of the skills and dispositions of all the responses are interpretation ( $M = 3.85$ ,  $SD = \pm 0.45$ ), analysis ( $M = 3.90$ ,  $SD = \pm 0.62$ ), evaluation ( $M = 3.97$ ,  $SD = \pm 0.65$ ), inference ( $M = 3.89$ ,  $SD = \pm 0.40$ ), explanation ( $M = 3.93$ ,  $SD = \pm 0.69$ ), and self-regulation ( $M = 3.78$ ,  $SD = \pm 0.52$ ). Regarding the dispositions: inquisitiveness ( $M = 4.02$ ,  $SD = \pm 0.80$ ), systematicity ( $M = 3.52$ ,  $SD = \pm 0.77$ ), analyticity ( $M = 3.74$ ,  $SD = \pm 0.54$ ), open-mindedness ( $M = 3.93$ ,  $SD = \pm 0.59$ ), self-confidence ( $M = 3.93$ ,  $SD = \pm 0.64$ ), and maturity ( $M = 3.88$ ,  $SD = \pm 0.52$ ). Results indicate that overall the participants felt quite competent in their critical thinking ability.

Table 4 Descriptive statistics

	Variable	Mean	Standard deviation
Skills	Interpretation	3.85	$\pm 0.45$
	Analysis	3.90	$\pm 0.62$
	Evaluation	3.97	$\pm 0.65$
	Inference	3.89	$\pm 0.40$
	Explanation	3.93	$\pm 0.69$
	Self-regulation	3.78	$\pm 0.52$
Dispositions	Inquisitiveness	4.02	$\pm 0.80$
	Systematicity	3.52	$\pm 0.77$
	Analyticity	3.74	$\pm 0.54$
	Open-mindedness	3.93	$\pm 0.59$
	Self-confidence	3.93	$\pm 0.64$
	Maturity	3.88	$\pm 0.52$

### 4.2 Gender

The correlation between gender and individual skills and dispositions was analyzed using the Mann-Whitney test in SPSS. According to the results of the analysis (see

Appendix D), there were no significant differences between males (n=11) and females (n=13) for individual skills ( $p > 0.05$ ). Similarly, in the cases of the individual dispositions (inquisitiveness, systematicity, analyticity, self-confidence, and maturity) no significant differences were found ( $p > 0.05$ ). However, there was a significant difference between males (mean rank = 9.45) and females (mean rank = 15.08) in open-mindedness,  $U(22) = 38.0$ ,  $Z = -1.97$ ,  $p = 0.049$ . This indicates that the female participants were slightly more open-minded than their male counterparts.

### **4.3 Critical thinking importance**

Respondents ranked the importance of critical thinking on a Likert-scale (from 1 to 5) as follows: 3 (n=1), 4 (n=8), and 5 (n=15), which indicates that in general students think critical thinking is important. The one respondent that rated the importance of critical thinking as three was removed from this analysis. The correlation between critical thinking importance and the self-rated skills and dispositions was measured using a Mann-Whitney test (using only those respondents who rated their critical thinking importance a four and five). The analysis revealed no significant differences between individual skills and dispositions ( $p > 0.050$ ).

### **4.4 Overall critical thinking ability**

The participants ranked their overall critical thinking ability on a five point Likert-scale as follows: 2 (n=1), 3 (n=5), 4 (n=17), and 5 (n=1). Since one respondent rated her ability as 2 and another one as 5, these responses were not included in this analysis. The correlation between students' overall critical thinking ability and the various skills and dispositions was measured using the Mann-Whitney test in SPSS, showing no significant difference between critical thinking ability and individual skills ( $p > 0.050$ ). Similarly, there were no significant differences between their overall critical thinking ability and the dispositions of inquisitiveness, systematicity, analyticity, self-confidence, and maturity ( $p > 0.050$ ). There was a significant difference between participants that

rated themselves three (mean rank = 17.60) and those that rated themselves a 4 (mean rank = 9.71) in open-mindedness, ( $U(22) = 12.00$ ,  $Z = -2.431$ ,  $p = 0.015$ ). This appears to show that individuals who rate themselves as better critical thinkers perceive themselves as less open-minded than individuals who do not rate their ability as high.

#### **4.5 Age**

The correlation of age and critical thinking skills and dispositions was measured using Spearman's correlation in SPSS. The age range was between 21 and 38 with no significant correlation between age and individual skills and dispositions ( $p > 0.050$ ).

#### **4.6 Years spent in university**

The correlation between the number of years spent in higher education and the critical thinking skills and dispositions were measured with Spearman's correlation test in SPSS. Twenty-three of the 24 students fell into the category of having spent between one and four years in higher education: students in their first year ( $n=4$ ), second year ( $n=11$ ), third year ( $n=3$ ), and fourth year ( $n=5$ ). One respondent spent 8 years in higher education, but this person was not included in this analysis because it was determined that his participant was an outlier. Overall, there were no significant correlation between the number of years spent in university and individual skills of critical thinking ( $p > 0.050$ ). Similarly, no significant correlation was found between years spent in university and inquisitiveness, analyticity, open-mindedness, and self-confidence ( $p > 0.050$ ). However, there was a positive correlation between years in university and systematicity ( $r_s = 0.434$ ,  $p = 0.039$ ) and maturity ( $r_s = 0.484$ ,  $p = 0.019$ ). A follow-up analysis using Kruskal-Wallis revealed no significant difference between years spent in university ( $p > 0.50$ ).

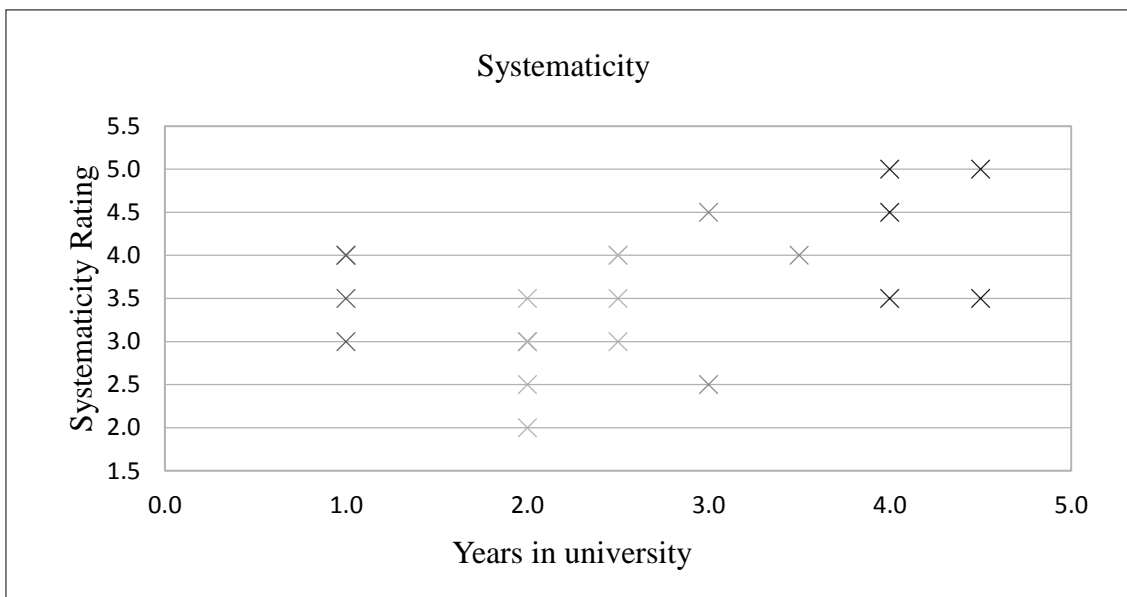


Figure 1 Systematicity

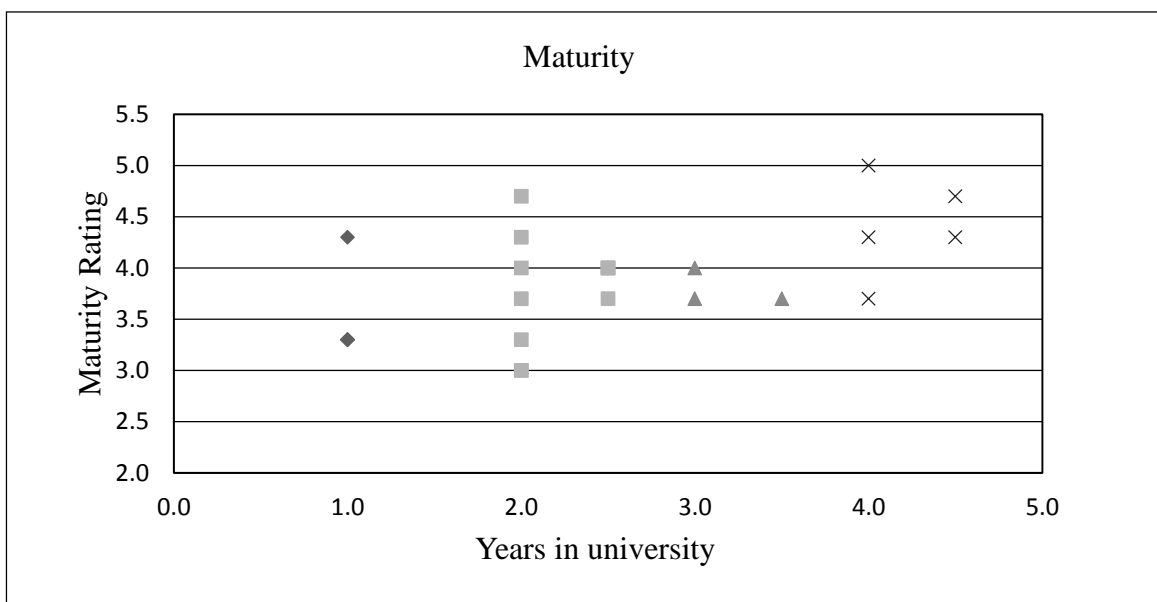


Figure 2 Maturity

## 5 DISCUSSION

This section will discuss the findings linking the results of the quantitative analysis to the participants' responses to the open-ended questions in order to provide further insights into students' understanding of critical thinking. Twenty-two of the 24 participants responded to the first open-ended question, "*What does critical thinking mean to you?*" This question was intentionally left open-ended so that the researcher could understand students' concept of critical thinking without providing any prompts. It is assumed that if certain skills or dispositions are mentioned in the open-ended question, it indicates that these are important for students, and probably use them with more or less consistency.

The second open-ended question, "*What activities developed your critical thinking ability, and what was the main ability that was developed in that activity?*" was answered by 17 of the 24 participants. This question was also intentionally left open-ended to understand the activities that students thought promoted critical thinking without being prompted. It is assumed that the activities mentioned in this question are critical thinking activities that students routinely participate in and that they perceive as developing their critical thinking ability.

The open-ended questions were analyzed following the techniques common in qualitative research (see Boyatzis, 1998). Participants' responses were read and re-read many times, and then categorized in relation to the critical thinking skills and dispositions listed by Facione (2013). It is important to note that sometimes it was possible to categorize the participants' responses into more than one category. These responses were categorized under the skill or disposition that most suited them. This also reflects the interrelatedness of the skills and dispositions constituting critical thinking, which Facione also acknowledged.

## 5.1 Students' concepts of critical thinking skills

Interpretation, as defined by Facione (2013, p. 9), is “to comprehend and express the meaning or significance of a wide variety of experiences, situations, data, events, judgments, conventions, beliefs, rules, procedures, or criteria.” The skill of understanding and interpreting information and ideas also includes understanding them from different angles by putting oneself into another person’s perspective as well as taking into account the broader (social/cultural) context in which information and concepts occur. The quantitative analysis showed that participants felt confident in their interpretation skills with an average rate of 3.85, but in terms of defining this skill in the open-ended question, only one student explicitly referred to it and its many aspects, as the following example shows:

*With critical thinking you can understand more about the motives, meaning, and purpose behind peoples' and the society's action.* (Student 10, Humanities).

Students mentioned the importance of being aware of different perspectives, but only a few of them actually emphasized the value of fully understanding other people’s perspectives, which could change their own thinking. This suggests that although students might be aware of different perspectives, they might not fully understand the perspective or lack the desire to fully comprehend a different perspective. The difference between the respondents’ concepts of critical thinking and their self-rating of that skill implies that students might not associate that skill with critical thinking or might not be aware of or use that skill unless it is prompted. This suggests that students might have a passive knowledge of the importance of different perspectives, but do not consistently apply this principle when making interpretations.

Several students referred to the skill of analysis in defining critical thinking. Analysis is defined by Facione (2013, p. 9) as the ability “...to identify the intended and actual inferential relationships among statements, questions, concepts, descriptions, or other forms of representation intended to express belief, judgment, experiences, reasons, information, or opinions.” Based on the students’ responses, it seems that the purpose of analysis is related to several other skills, as the following examples illustrate:

*Personally I think that critical thinking means regarding information from many different perspectives... (Student 24, Education)*

*It helps me to evaluate different studies... (Student 14, Sport and health sciences)*

The first student emphasizes the use of analysis to gain different perspectives on a topic, while the latter underlined the importance of analysis to assess information and ideas. In fact, the second statement includes the skill of evaluation. This indicates that students use the skill of analysis for different reasons. Although there is only limited data to make conclusive generalizations, this suggests that critical thinking skills are generic and can be used across disciplines, and that within a discipline there could be more specialized uses of these skills. Another student mentioning analysis wrote the following:

*Also I think that clearly thinking of and weighing your thoughts is part of this. (Student 22, Information Technology)*

This idea not only implies that analysis is related to self-regulation (consciously monitoring your thoughts) and evaluation, but also that the purpose of analyzing available evidence is to come to a solution (to accept a view or take a position) – not necessarily the best solution, but the best one at that moment. Smith (2002) questions if weighing up evidence should be considered a generic thinking skill because different fields might have their own specified criteria for judging evidence, for example law. Overall, the students self-rated their skill in analysis high, the average score being 3.90, and this skill was implied in several of the students' concepts of critical thinking. This suggests that most students are aware of this skill and most probably try to apply it. The responses also suggest that analysis might be a generic skill, but that it may be used for specific purposes based on individual motives or a particular discipline.

Another skill that was often mentioned by the students was evaluation, which is defined by Facione (2013, p. 9) as the ability, "...to assess the credibility of statements or other representations which are accounts or descriptions of a person's perception, experience, situation, judgment, belief, or opinion; and to assess the logical strength of the actual or intended inferential relationships among statements, descriptions, questions



or other forms of representation.” The analysis revealed slight differences between business and education students and students of sport and health sciences and social sciences. Students of sport and health sciences and social sciences appear to use analysis to make judgments on the reliability of an article than business and education students, at least based on their conceptualization of critical thinking. For example, a sport and health science student stated:

*I evaluate the source whether it is reliable or not. (Student 13, Sport and health sciences)*

This indicates that this student is making definitive decisions on the reliability and usefulness of an article. On the other hand, social sciences generally take a more open-minded approach to evaluation. An example of this is the following from one student’s response:

*Simply, for me it means that you can produce information, and understand and criticize what you are reading. (Student 12, Social sciences)*

This comment indicates that this student not only aims for understanding ideas, but also tries to make a judgment on the text by critiquing it. Business and education students appear to take a more open and nonjudgmental approach to critical thinking. A good example of this from an education student is the following idea:

*I don’t believe everything that I hear and read. (Student 2, Education)*

This comment indicates that this student does not take everything at face value, but questions the information.

According to Lizzio and Wilson (2007), one of the goals of education should be to instill professional judgment. This is especially true today, when more and more research is being conducted, which means that making judgments and evaluation is unavoidable in order to find reliable and relevant sources. This does not mean making an absolute decision on the usefulness of an article because as one researches a topic and acquires more knowledge, an initially dismissed article might provide useful

insights into the topic. Since critical thinking is based on forming tentative conclusions, some evaluation should always be used, but forming absolute evaluations could hinder open-mindedness to new ideas or perspectives. Some of the comments suggest that some students might be forming absolute, no, or not balanced evaluations, which might be related not only to individual dispositions, but also to how much importance a particular faculty/department is placing on evaluation.

Inference, as defined by Facione (2013, p. 9), is “To identify and secure elements needed to draw reasonable conclusions, to form conjectures and hypotheses; to consider relevant information and to deduce the consequences flowing from data, statements, principles, evidence, judgments, beliefs, opinions, concepts, descriptions, questions, or other forms of representation” This skill was only mentioned by a few students, such as in the following example:

*...critical thinking is vital to producing an answer of any kind. (Student 9, Humanities)*

Not all students mentioned that critical thinking was important for drawing conclusions, which could be related to the different purposes of using evaluation and analysis by individuals. This difference could be linked to the two types of critical thinking that were identified by van der Wal (1999): situational and epistemological critical thinking. It appears that some students tend to see critical thinking as situational thinking, or in other words as a means to solve problems or make decisions, as illustrated by the example above. On the other hand, epistemological critical thinking seeks to uncover truth instead of solving particular problems or decisions in a given situation. This type of thinking also appeared in some responses. Typically, the responses implied only one of these types of thinking, which suggests that there is a tendency to prefer one over the other. Related to this idea is Prawat's (1991) argument that stressing ideas over skills or processes should be the top priority in the classroom. Solving specific problems and the ability to make decisions in (field-specific) situations is undoubtedly important, but the ability to make inferences about the truth value of ideas and to see the implications of ideas should also be emphasized, particularly in higher education. Since few students mentioned the importance of making inferences in their concept of critical thinking,

probably only a few of them consistently investigate the implications and practical applications of ideas. This skill is vital when trying to understand how ideas or research results could be applied in practice. This skill is particularly important in leadership positions.

The next skill, explanation, is defined by Facione (2013, p. 9) as “...being able to present in a cogent and coherent way the results of one’s reasoning”. This skill is an important productive skill, but interestingly, references to this skill appeared very rarely in students’ concepts of critical thinking. One exception is the student who wrote the following:

*...one can stand behind his arguments and point to references rather than feelings or hear say. (Student 22, Humanities)*

This description demonstrates that this student seems to understand that critical thinking is not only about analysis and evaluation but justifying your reasoning and presenting them as logical arguments. Smith (2001) mentions that ideas that are not clearly expressed are difficult to assess and improve. Surprisingly, students generally self-rated themselves as being competent in this skill, with an average of 3.93, but typically they did not mention this skill when they had to describe what they mean by critical thinking. This suggests that they might not consider explanation a key skill of critical thinking or they might not consistently apply this skill. Since clear presentation of ideas is strongly linked to language use, this might also mean that students do not recognize the important role language plays in critical thinking. Therefore, it seems that teachers should pay more attention to making students aware of how language use influences content, particularly if in a foreign language class. The clarity of language is related not only to the logical organization of ideas, but also to such aspects of language as vocabulary, cohesion, or textual or interactional norms and conventions in a given language/culture.

Finally, similarly to explanation, self-regulation was also rarely mentioned by students as part of critical thinking. Self-regulation as defined by Facione (2013, p. 9) as “...self-consciously monitor one’s cognitive activities, the elements used in those activities, and the resulting educated, particularly by applying skills in analysis, and evaluation to one’s own inferential judgments with a view toward questioning,

confirming, validating, or correcting either one's reasoning or one's results." This skill may be used with all the other skills during the critical thinking process, particularly with the aim of recognizing and reducing personal biases. Paul (2012) mentions that monitoring one's thinking while assessing others is one of the most important skills in critical thinking, which was also expressed by the following student:

*...reflecting on [information] on the basis of [my] previous knowledge.* (Student 8, Social Sciences)

The response indicates that this particular student finds reflection important although there seems to be more focus on how new information fits into his or her existing schemas instead of critically monitoring thought processes. Some examples of questions that students can ask themselves when monitoring their thoughts are: "Does this contradict my current belief?" or "Do I have enough background knowledge to make a conclusion?" Not monitoring one's thoughts is risky as it could lead to belief preservation (van Gelder, 2005). This implies that students who are not monitoring their thoughts might not be open to new evidence and will hold onto their own beliefs even if a better alternative view is presented. Thus, the skill of reflection seems to be strongly related to the disposition of open-mindedness. Students' self-rated their open-mindedness quite high, on average 3.93, and they referred to it several times in their descriptions of critical thinking. This suggests that even though students try to be open to new ideas, they might not consistently monitor their thoughts consciously. King and Kitchener (2005) emphasized that reflective thinking generally increases with age, and that only doctoral students consistently use reflective thinking. Since most of the students who participated in this research have spent less than five years in university, King and Kitchener's argument might be valid, and could explain why students did not mention monitoring their thoughts in their definitions of critical thinking. However, according to the quantitative results of this research, no significant correlation was found between years spent in university and the skill of self-regulation, the rating of which on average was 3.78. This suggests that some students either overestimated their self-regulation skill, but it could also mean that the university, the students' department, or the course teachers put considerable emphasis on reflective thinking in the first few

years. Nevertheless, since there were only few students who explicitly referred to this skill as a means to change or reconstruct their existing knowledge, there should be even more emphasis put on this type of reflection.

It seems that critical thinking skills could be taught even more directly in the classroom throughout a program. This also implies that students' development of critical thinking should not be investigated only in the context of one single course, but rather throughout their studies. Such longitudinal research could shed more light on whether students really become more critical thinkers, and whether they consistently apply all the skills discussed above in order to regularly revise and improve their thinking.

## **5.2 Students' concepts of critical thinking dispositions**

Generally, dispositions were not explicitly mentioned in the students' descriptions of critical thinking, but they could be inferred from the skills that were listed if there was an indication of a tendency to use that skill. However, caution should be used because an individual can possess a skill, but it does not mean that he or she will consistently use the skill unless prompted. On the other hand, it is emphasized in the literature that individuals who have a particular disposition will subconsciously use a skill without outside influences.

The disposition of inquisitiveness, which refers to the desire to learn and curiosity in one's field (Facione, 2013), was not directly mentioned in students' descriptions of critical thinking, but often occurred in relation to information seeking. The students often made reference to the process of evaluating information that they passively receive or sometimes to information that they themselves actively seek. This process was described by such phrases as:

*...evaluating the information I receive...* (Student 8, Social sciences)

*...evaluating and processing information you get...* (Student 20, Business)

*...when I get new information.* (Student 21, Sport and health science)

In these examples, the key words ‘receive’ and ‘get’ suggest that the student might not be actively seeking information, but rather critically evaluating the evidence that is given to them. This can be compared to the phrase ‘when I read’, which could mean either that an individual is processing information given to them or that he or she is trying to find new information actively. The implication is that some students might rely on the teacher or others too much as the provider of the information or the source of information. This could hinder students’ development of becoming autonomous learners.

The most common disposition that was mentioned by the students was truth-seeking, which refers to the willingness to ask questions (Facione, 2013). Since his disposition is closely linked to open-mindedness, they will be discussed together. It should be noted that due to its low internal reliability, truth-seeking ( $\alpha = 0.387$ ) was not included in the quantitative analysis. Truth-seeking was described by some of the students as:

*Questioning the information.* (Student 3, Sport and health science)

*I don't just read them and agree with all that [is] written in the text. Instead I challenge the outcomes...* (Student 21, Sport and health science)

Related to truth-seeking, students often made references to open-mindedness, which was described by one student as:

*Not to take things for granted.* (Student 5, Business)

This comment appears to imply that some students consistently question sources of evidence and even accepted norms.

According to the quantitative analysis, there was a difference in open-mindedness between males and females ( $p = 0.049$ ), with females being statistically more open-minded than males. According to Shim and Walczak (2012), gender should not have a significant effect on a person’s critical thinking skills. However, a study by Giancarlo and Facione (2001) found that female American university students were more open-minded than males on the California Critical Thinking Dispositions

Inventory test. Another study by Christofiedes, Hoy, and Ling (2009) found that Canadian females tended to seek help in their academic studies from others more than males did. The fact that females were significantly more open-minded in the present study probably does not allow any broad generalizations about gender differences in critical thinking due to the small number of participants, so more research should be conducted on this.

There was also a significant difference between participants who rated their critical thinking ability a 3 (on a scale of 1-5) and those that rated themselves a 4 ( $p = 0.015$ ), the former being more open-minded. It is not easy to find possible explanations for this difference. One reason might be that students who rated their critical thinking ability a 3 view critical thinking as including the ability to monitor their biases and being more tolerant of different views. It might be that these participants took this more into account before marking their ability than those who rated their ability a 4 although this was not explicitly shown by their descriptions of critical thinking. One respondent who rated her critical thinking ability a 3 made the following comment:

*I understood in this [questionnaire] that critical thinking also includes social skills and metacognitive perspectives. (Student 24, Education)*

This comment indicates that this student was open-minded, and tried to learn new things even from the questionnaire.

Another explanation for the difference outlined above might be that some students think that the more knowledge one has the better critical thinker one will become. This view is reflected in the comments made by one male student, who rated his critical thinking ability a 4:

*... I think that knowledge increases your ability to justify your views properly and to question other opinions. (Student 18, Business)*

However, it is important to emphasize that one can have extensive knowledge in one's field without being open to other ideas (Ennis, 1989). The comment above implies that the student is not using knowledge to revise or change his or her own views only to question others' ideas or positions. This may increase one's belief preservation and

restrict one from being open-minded.

Another possible reason for the difference mentioned above are students' view of knowledge, which was not measured or discussed in this study. Dhal, Bals, and Turi (2005) researched Norwegian university students from the first to the fourth year in a variety of different disciplines to explore how students' view of knowledge shaped their learning strategies. They found that students who viewed knowledge as simple and concepts as being unrelated used more rehearsal strategies and had more difficulties connecting concepts than those students who saw knowledge as complex, consisting of interconnected concepts. They also found that students who viewed knowledge as absolute (fix and unchanging) used critical thinking skills less often. Students who viewed knowledge as simple and absolute were also found to use less metacognitive monitoring. The authors suggest that one's view of knowledge can affect one's dispositions, and therefore can influence the use of critical thinking skills. Based on this argument, those student who rated their critical thinking ability a 3 might have a more sophisticated view of knowledge than those who rated themselves a 4. However, it is important to emphasize again that there is little data or evidence to make a confirmatory statement about this issue.

Other dispositions were rarely mentioned in the students' descriptions of critical thinking except for analyticity, which was already discussed in relation to the skill of analysis. Systematicity was not mentioned in the students' definition of critical thinking, but there was a significant correlation between years spent in university and the self-ratings of systematicity ( $p = 0.039$ ), indicating a trend that the more time a student has spent in university, the more systematic his or her thinking becomes. This correlation, however, does not seem to exist between age and systematicity ( $p > 0.050$ ), indicating that university might have a stronger influence on this disposition, which might not develop naturally with age. One explanation for the increase of systematicity with the number of years spent in university could be related to the requirement of writing a bachelor's thesis in their third year. Writing a bachelor's thesis definitely requires time management and organization. However, it is important to point out that the follow-up analysis that measured significant differences between the number of years spent in university and the development of systematicity did not reveal any difference. This is one possible area that could be further researched.



Maturity is a disposition that refers to the awareness of the plausibility of claims and arguments, the possibility of multiple answers to a question, multiple perspectives and multiple options when making decisions, as well as to the willingness to make more informed and judicious decisions considering the possibility of different options in different contexts (Facione, 2013). This disposition positively correlated with years spent in university ( $p = 0.019$ ), but there was no correlation between age and maturity ( $p > 0.050$ ), which suggests that the more years a student spends in university the more mature they become regardless of age. The exact reasons for this could not be explained by this study, so only further research could help clarify this relationship. As mentioned previously, many students appear to be aware of multiple perspectives, which could also mean that they are aware of multiple answers to questions and multiple options when making decisions (one of the sub-skills of maturity). However, their willingness to make judicious decisions was not so prevalent in their conceptual views of critical thinking.

Self-confidence was explicitly mentioned only by one student, who said that critical thinking also includes:

*Security when evaluating arguments, theories, and phenomena.* (Student 17, Business)

This student seems to recognize that critical thinking means being confident in one's thinking ability. Self-confidence is strongly related to the skill of explanation in the sense that the ability to clearly present one's ideas and arguments usually has a positive effect on self-confidence, particularly if the clarity of the presentation of ideas is mentioned in the feedback. As mentioned earlier, clear explanation, in turn, is influenced by one's language abilities as language affects the understanding and interpretation of the content. The fact that self-confidence was mentioned only by one student suggests that the importance of language in critical thinking should get more attention in education.

Overall, it appears that students tend to associate critical thinking with skills rather than with dispositions. The research results also imply that students generally view critical thinking as questioning everything or looking at topics from multiple

perspectives, and in some cases using sources to evaluate other sources. This is slightly different from what has been found in previous studies on students' views of critical thinking. For example, according to Tapper's (2004) results, Australian students' conceptions of critical thinking appeared to be taking a topic and supporting it through written sources. The research done by Blath, English, Connors, and Beveridge (1999) revealed that for American students, critical thinking is the ability to present a logical argument, identify different strategies and techniques in arguments, and challenge sources. These two studies emphasize the ability to form an argument related to a topic and to be able to defend it. Students in the studies mentioned above use critical thinking mainly to support their own views and arguments, while the students participating in this study generally defined critical thinking as using sources to analyze a topic rather than defending their positions. Phillips and Bond (2007) had similar results in their study, in which Australian students defined critical reflection (they used this term instead of critical thinking) as evaluation using analysis, looking at a topic from multiple perspectives, and inferring what is not directly stated in the argument. The participants in this study seem to share the views of the participants in Phillip and Bond's study in that there appears to be more emphasis on critical reflection and not necessarily forming and defending a position. This does not mean that one approach is better than the other, but indicates that students tend to emphasize certain dispositions and use critical thinking skills for different purposes. Since students' dispositions might be influenced not only by their school environments but also by their family background and the culture in which they grew up, these ideas would deserve further research attention.

The analysis also revealed that students had different individual views emphasizing different skills, which is also common when scholars from different fields attempt to define critical thinking. While most students mentioned quite a few critical thinking skills, others seem to have narrower views of critical thinking, typically mentioning one skill or disposition.

Many researchers argue that critical thinking skills are one of the core skills required in today's workplaces (Hart Research Associates, 2013). When Hodge and Lear (2011) compared American students' and teachers' conceptions of useful workplace skills, they found significant differences. They concluded that students might not even

be aware of these skills, and that it is the responsibility of teachers to call students' attention to the importance of critical thinking. This suggests an infusion approach to teaching (linking critical thinking to a particular subject, and making explicit references to various aspects of critical thinking that the class activities aim to develop, as discussed in Section 2.2.1). In this research, the students' lack of awareness of the complexity of critical thinking was evident. While quantitatively this could not be shown, the analysis of the open-ended question revealed that some students have very limited notions of the skills and dispositions that constitute critical thinking, and they might realize the different aspects of critical thinking only after being prompted. This limited awareness could indicate that some teachers are not making it explicit what critical thinking skills and dispositions a particular activity aims to develop, suggesting that an immersion approach is generally being used by the teachers. However, it is believed that by giving students activities and specifying what skill(s) are practiced, especially at the undergraduate level, will help students develop more awareness, which can help them in monitoring their critical thinking processes as well as in developing critical thinking dispositions.

### **5.3 Students' perceptions of activities that develop critical thinking**

Understanding students' skills and dispositions is important, but so is understanding how students can improve those skills. When analyzing the responses to this open-ended question, two main activities were identified as contributing to the development of students' critical thinking: oral interaction and reading. Interestingly, writing was only mentioned by one student. It is important to emphasize that the word 'activity' was deliberately left general and not specified further (such as classroom activities related to formal education or everyday activities related to informal learning environments) as the researcher was interested to see which types of activities students mention. Among the other activities that students thought promoted critical thinking were watching TV and searching for information. Only 17 of the 24 participants responded to this question, which might indicate that some students are not aware of the activities that promote critical thinking skills and dispositions, or are unaware of what skills they are using

when working on a particular activity, or simply that they did not want to answer this question.

Interacting with others orally was the most commonly mentioned activity that students thought promoted critical thinking. The place of interaction and the interaction partner(s) were also stressed in some of the responses. Two students had the following comments:

*Open discussion about critical thinking at home and with friends, hearing out other people's opinions and see the issue from as many points of view as possible.*  
(Student 16, Business)

*General discussions with my family (all highly educated) and friends* (Student 17, Business)

These students indicated the importance of informal learning, such as talking with friends and family. These students appear to feel safer to engage in critical discussions in a comfortable, safe environment outside of school, with people that they know very well. Some students also emphasized the importance of talking to individuals that have different views, as the following example illustrates:

*In my opinion discussion with people who have different opinions about some topic is one of the best ways to develop your critical thinking because you have to take other opinions into account when stating your own opinion.* (Student 18, Business)

On the basis of these examples, there appears to be two types of personalities: those that are more comfortable discussing with people close to them and those that deliberately seek different views. Friends and family members certainly can have different views, and might even disagree, but since they most probably try to give support, they might not always openly express their opinion (which is not necessarily good). In contrast, people who one knows less might be inclined to defend their positions and not necessarily strive for support and understanding (although it is important to emphasize that ideally common understanding and reaching a common agreement is the main point of negotiation between strangers). These two types of preferred communication

situations also seem to be related to personality types, particularly introversion and extroversion. It is beyond the scope of this paper to discuss how personality affects critical thinking, but it is important to recognize that certain personalities might benefit from being in a particular environment when engaging in a critical discussion. Introverts might be more comfortable discussing with friends, while extroverts, who are more sociable, might seek outside views from strangers, trying to defend their argument and improve their critical thinking by seeing different perspectives. According to some empirical studies, there is a positive correlation between several personality traits (including extroversion) and critical thinking skills (Kreber, 1998; Nosratinia & Sarabchian, 2013; Taube, 1997).

There are various aspects of interaction, but one key element that appears in the literature but not in the students' responses is asking questions. One participant did mention asking questions, but not being asked questions. Browne and Freeman (2010) mention that appropriate questions can help to elicit more details and bring out personal biases, so they are central to critical thinking development. Shim and Walczak (2012) also found that when teachers asked challenging questions, this also contributed to students' self-reported growth in critical thinking. This paper did not aim to find out whether challenging or thought provoking questions are asked in class, but if questions are not being directed to students, it might hinder their development of open-mindedness, which might explain the significant individual differences found in this study regarding open-mindedness. It should also be noted that the types of questions peers ask can be important indicators of how clearly they understood the message, whether they have really paid attention to the content, or the peers' overall critical thinking ability.

The other major activity that students thought promoted critical thinking was reading. Although the majority of the respondents stressed reading academic articles, others also mentioned other sources, such as in the following example:

*Reading news from different producers. (Student 20, Business)*

This example is very interesting because news reports are definitely a very good way to develop critical thinking. Even though news reports are supposed to be objective, in

many cases different news agencies and journalists interpret and/or present the news in different ways using various strategies (this is further complicated if the news report was originally produced in a foreign language but has been translated, which is common practice in the media today). Nevertheless, it is interesting that this individual mentioned only this text type, and nothing related to academic studies. The reason for this might be that this respondent was a 22-year-old business student, who has spent 2.5 years at university. In business, news reports that discuss and analyze real-life issues are undoubtedly important, but so are academic texts, which are necessary for writing a high quality bachelor's thesis. It would be interesting to know, for example, to what extent this person finds academic articles reliable and whether he reads them with a critical eye. In an interesting article, Terry (2012) discussed the benefits of using articles from popular science magazines in order to increase students' ability to identify claims, and assess the validity of the supporting evidence. This technique can make students more aware of how arguments are constructed. Students can also become aware of the nature of an acceptable (valid and sound) argument in their discipline, and they can understand the difference between nonacademic and academic sources. If students are not made aware of the important distinction between valid arguments based on evidence and subjective opinions, it could hinder their development in critical thinking. Reading as an activity is also beneficial if it is used to compare and contrast different sources. Shim and Walczak (2012) found that when students engaged in comparing and contrasting ideas and topics, their self-reported critical thinking increased by 45.4%. The results of this research suggest that most students are aware of the crucial role of reading in the development of critical thinking. It should be noted, however, that simply making students read a text is not sufficient, the most important point is to analyze and evaluate the text (including the writer's arguments, the structure of the text, and its context). The role of the teacher in this process is crucial, but peers can also contribute to the development of others' critical thinking ability. Therefore, the teacher should pay attention to using diverse activities to promote a deep and meaningful discussion and analysis of the text.

The third activity that was mentioned was related to the students' academic studies and to the way the university (and individual teachers) promoted critical thinking. There was one student (aged 38) who mentioned that she had ten years of

work experience and this contributed to her critical thinking development. Interestingly, this respondent did not mention any activities done at university as effective ways of promoting her critical thinking ability although it might be because the student has only spent one year in higher education. This may suggest that some students with prior work experience might not feel that they are developing their critical thinking ability at university. On the other hand, there was another older student (aged 36), who thought that university did contribute to her critical thinking development, but she did not mention her work experience. In an interesting study, Tynjälä, Slotte, Nieminen, Lonka, and Olkinuora (2006) studied graduates from a Finnish university and found that 64% of the workplace skills were in fact learned in the workplace, 14% were learned in university, and 10% mentioned that workplace skills were learned both at work and in university. These results suggest that students with previous work experience in their field might have a more developed critical thinking ability because they might have been engaged in solving challenging real-life problems that require critical thinking. These experienced individuals who enroll in a university program might find the activities less authentic or less engaging because they are used to working in a specific context. This does not mean that the activity does not engage students in critical thinking, but for an individual who has encountered similar or more advanced problems at work, this engagement would become routine, not requiring too much effort, while a student with no or little relevant work experience facing a similar problem for the first time might find the activity engaging and interesting. This suggests that students with practical work experience in their field might need different activities or a different approach at university, focusing more on theoretical knowledge and different perspectives. Although sometimes difficult to implement in class, this differentiation might engage experienced workers more. Another way to deal with the problem is if the teacher uses the experienced individuals to share their views, which can provide interesting information about the relationship between the world of academia and real life.

One major activity that is commonly associated with critical thinking in the literature is writing. Interestingly, this was only mentioned by one student who stated the following:

*Writing about new ideas as I learn of them, as it forces you to form your own opinion about the topic and produce clear arguments for it. (Student 9, Humanities)*

This is in contrast to Tapper's (2004) findings, according to which most students associate critical thinking with writing assignments. The reason for this might be the strong emphasis placed on oral communication skills in Finland foreign language teaching already in high school (Meriläinen, 2010). In Tapper's study, writing literature reviews, which definitely requires synthesizing skills, was very often mentioned as an activity promoting critical thinking. Another reason why the respondents in this research did not mention writing activities might be that teachers do not use writing tasks effectively. The effectiveness of various writing activities is strongly connected to the use of feedback. Several researchers mention that writing without providing meaningful feedback will not develop students' critical thinking (Atkinson, 1997; Tapper, 2004). In fact, Shim and Walczak (2012) found that the more feedback students received from the teacher, the higher they self-rated their critical thinking development. Receiving no, very little, or very general feedback might be one reason why writing was not viewed as an activity promoting critical thinking. Teachers should bear in mind that writing activities should also be interactive, which means that there should be regular (and meaningful) feedback between the writer and the reader (the teacher or peers). Teachers' lack of time for giving effective feedback on students' written work, and peers' potential lack of skills in providing honest and meaningful feedback for others are concerns that require attention.

Another activity that is believed to promote critical thinking but was not mentioned by the students is oral presentations. This is important for the context of this research because the compulsory English courses in the university where the research was conducted typically require students to make an individual (or group) academic oral presentation. However, none of the respondents referred to this classroom activity in the open-ended responses. According to Shim and Walczak's (2012) findings, student presentations do not help in developing students' critical thinking ability. However, Shim and Walczak's study did not mention the type of presentation that students were expected to prepare or whether students were given feedback on the presentations or not. It is believed that if students are expected to give an academic (or a simulated



conference) presentation with a clear argument, and are given detailed, timely, and informative feedback afterwards, this might contribute to the development of their critical thinking. On the other hand, if students are giving descriptive presentations focusing mainly on presenting content and are not encouraged to evaluate the information and use the evidence to voice their views, this activity might not contribute to the development of critical thinking, especially if questions are not asked at the end of the presentation or if feedback is not provided.

To summarize, students identified oral interaction and reading activities as the main instruments of developing their critical thinking ability. If used together, these activities can promote deeper learning. Focusing on the use of collaborative writing and group discussion in higher education in Finland, Nykopp, Mattunen, and Laurinen (2014) concluded that combining individual reading and summarizing with group discussion and writing a joint essay can engage students in deep learning. Writing an individual summary of a text can help students to arrive at their own understanding and make their own evaluation, while during the group discussion and the collaborative writing they can work on understanding and acknowledging different viewpoints and opinions.

There are several collaborative learning tasks that require higher-level cognitive processing (King, 2002, p. 33). Some examples are working together to solve ill-structured problems or problems with multiple solutions, analyzing, evaluating, and integrating ideas to construct new knowledge, making decisions in groups, providing peer feedback, and peer tutoring. These activities are believed to generate an exchange of ideas and the negotiation of views, encourage group members to ask questions if something is not clear or if they do not agree with someone, and help them come to a common understanding or make a decision that everyone agrees with. Although peer interaction is definitely useful to promote critical thinking, expressing the ideas in writing (individually or collaboratively) is also important, as pointed out by many studies. In short, combining various individual and group reading, discussion, and writing activities with teacher or peer feedback seems to be a very useful way of developing critical thinking.

## **6 CONCLUSION**

### **6.1 Overview and implications for practice**

The analysis has shown that students participating in the research seem to be quite confident in their critical thinking ability, but they appear to have a slightly limited view of critical thinking. This implies that they do not necessarily apply certain skills consistently or are not aware of using these skills. The reason for this might be that in the classroom, an immersion approach is used, which presupposes that students will develop their critical thinking skills naturally, even without paying explicit attention to their development. In order to make students more conscious critical thinkers, it is suggested that teachers should make students more aware of the skills and dispositions that are required in different tasks and activities by directly making references to them. This would also make teachers more aware of the complexity of critical thinking, and they could also reflect on the skills and dispositions that are being taught in the course.

Besides having a narrow view of critical thinking, students also appear not to apply these skills in a systematic and consistent way. Generally, students associate critical thinking with being open-minded and using different sources to get different perspectives, which suggests that students try to reflect on different views, but they do not always aim for expressing their own arguments or think about the implications or applications of certain ideas.

### **6.2 Limitations and recommendations for future research**

It is important to admit that there are some limitations to this study. The first limitation is that the researcher is an instructor at the university where the research was conducted, which might have influenced the interpretation of the results although all possible precautions were used to avoid any bias. On the other hand, this limitation can also be interpreted as a factor that eased the interpretation of ideas, given the teaching

experience and insider perspective that the researcher had. The second limitation was the low response rate for the online survey. The researcher recognized that this would be an issue and tried to administer a paper survey in class, but since some of the course teachers mentioned that it would take up too much class time, an online survey was chosen instead. The exact reasons behind this low response rate are hard to determine. After completion of the study, the researcher asked some colleagues to e-mail the questionnaire to their future students to increase the response rate. However, out of 75 students, only 4 completed and returned the questionnaire, who were not included in the study. The issue of low response rates might be related to students' willingness to participate in online surveys. Another possible reason for the low response rate might be that students do not feel comfortable with the topic of critical thinking. Indeed, critical thinking is a very personal issue, and even though the researcher emphasized the confidentiality of the data collected, some students might have found this topic too personal or risky. Another possible explanation for the low response rate is that university students are typically very busy and do not have time for completing surveys unless it is required of them (even though it was pointed out that filling in the questionnaire would not take up too much of their time). Another reason might be the language of the questionnaire. Since the research targeted university students who have completed the compulsory academic English courses, the researcher assumed that using English would not be an issue. Besides, since the researcher does not speak Finnish, it would have been more difficult and time-consuming to analyze the responses given to the open-ended questions. Unfortunately, it might be that some students decided not to complete the questionnaire because they thought it would have required more effort to understand and answer the questions in English. Using English to express abstract ideas is not easy although the students who filled out the survey managed to successfully convey their thoughts. Finally, the low response rate could be related to the fact that the English phrase 'critical thinking' might have negative connotations for Finnish students. This is a linguistic issue that deserves further attention as the word 'critical' is often associated with negative criticism.

A further limitation was related to the items on the questionnaire. Some of the questions could have been formulated better, which points to the importance of a pilot study to test the instrument, especially because it is not always easy to judge what is

difficult for students in terms of language and the formulation of ideas. After the analysis, it became clear that some additional questions might have been useful. For example, students' views of knowledge were not explored, which could also influence their critical thinking skills and dispositions. Also, including a background question related to the participants' amount (and nature) of work experience would have been useful as it is related to critical thinking. Similarly, it would have been interesting to relate students' perceptions about their critical thinking abilities to how they rate this ability in their parents and close friends.

Another limitation is related to the participants of the study, including only Finnish students from one university. In the future, it would be interesting to conduct similar research studies that include other Finnish (and even international) students studying at various levels (exchange students, and international masters and doctoral students).

Finally, the study focused only on students' perceived level of critical thinking, but did not include an objective test. In the future, these two methods could be used in combination, and ideally with a longitudinal research design, in order to obtain more comprehensive data. Individual departments could conduct such research regularly (every year or semester), which could provide deeper insights into the development of students' critical thinking in different fields.

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## 8 APPENDIX

### Appendix A

#### Consent Form

Title: Individual factors that influence students' perceived level of competence in critical thinking

#### **I. Purpose**

This research is being conducted to fulfill the requirements for the International Master's Degree in Education at the University of Jyväskylä. The purpose of this research is to investigate how individual factors influence students' perceived level of competence in critical thinking. You are asked to participate in this study because you are currently enrolled or just completed the course XEN\_003 or XEN\_002. The survey will take about 20 minutes of your time.

#### **II. Benefits**

This survey can benefit you personally because it could give you different views and perspectives on critical thinking. It could also help you assess your own critical thinking development.

#### **III. Data**

All information will be kept private and will only be accessible to Aaron Orszag. However, the data can be shared to ensure that the study maintains academic integrity.

#### **IV. Contact**

Please contact Aaron Orszag with any concerns or complaints at [aaron.a.orszag@jyu.fi](mailto:aaron.a.orszag@jyu.fi).

#### **V. Consent**

Participation is voluntary. By clicking on the link below, you consent to participate in the research.

[https://docs.google.com/forms/d/149\\_B6uFBfYfVnwgUfILcqDxYrg8RUp7TsY5O-DhSo3E/viewform?usp=send\\_form](https://docs.google.com/forms/d/149_B6uFBfYfVnwgUfILcqDxYrg8RUp7TsY5O-DhSo3E/viewform?usp=send_form)

## Appendix B Instrument

### Students' Perceived Level of Competence in Critical thinking

1. Gender

Male

Female

2. Date of birth

3. Nationality

4. How many years have you studied in higher educational?

6. How important is critical thinking to you?

	1	2	3	4	5	
Not important	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Very important

7. How would you rate your critical thinking ability?

	1	2	3	4	5	
Very poor	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Excellent

8. What does critical thinking mean to you?

---

### Development of Critical Thinking

9. How would you rate your ability to:

	Not Competent	Somewhat Competent	Uncertain	Competent	Highly Competent
See the significance in ideas	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Distinguish between main ideas and sub ideas	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Describe the problem	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Organize ideas logically	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Rewrite other people's ideas using your own words	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Understanding graphs/charts	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

10. How would you rate your ability to:

	Not Competent	Somewhat Competent	Uncertain	Competent	Highly Competent
Compare and contrast ideas	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Understand your own or someone else's ideas	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Identify unstated assumptions	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

11. How would you rate your ability to:

	Not Competent	Somewhat Competent	Uncertain	Competent	Highly Competent
Evaluate the credibility of a source of information	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Determine if an argument is sound/acceptable	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Judge if given evidence supports a claim	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

12. How would you rate your ability to:

	Not Competent	Somewhat Competent	Uncertain	Competent	Highly Competent
Identify someone else's position/view	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Predict future events based on evidence	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Identify gaps in your knowledge and seek information on it	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Consider various options to solve a problem	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

13. How would you rate your ability to:

	Not Competent	Somewhat Competent	Uncertain	Competent	Highly Competent
Clearly present your argument	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Defend your position	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Justify your conclusions	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

14. How would you rate your ability to:

	Not Competent	Somewhat Competent	Uncertain	Competent	Highly Competent
Recognize your personal biases	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Understand other people's ideas before presenting your own	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Monitor your understanding of ideas	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Change your conclusion when presented with new valid information	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

15. How would you rate your

	Very low	Low	Moderate	High	Very High
Desire to learn	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Curiosity in your field	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>







16. How would you rate your

	Very low	Low	Moderate	High	Very High
Inclination to being organized	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Ability to focus on a task	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
















17. How would you rate your

	Very low	Low	Moderate	High	Very High
Willingness to thoroughly analyze a topic	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>


















Willingness to use evidence to solve problems					
Ability to anticipate potential difficulties in solving problems					
















18. How would you rate your

	Very low	Low	Moderate	High	Very High
Willingness to find the most current information in your field					
Willingness to ask questions					
Willingness to follow academic norms when doing research					











19. How would you rate your






	Very low	Low	Moderate	High	Very High
Openness to new ideas					
Tolerance of different views that contradict yours					
Awareness of your personal biases					

20. How would you rate your

	Very low	Low	Moderate	High	Very High
Confidence in expressing your ideas					
Confidence in your reasoning ability					
Confidence in your own conclusions					

21. How would you rate your

	Very low	Low	Moderate	High	Very High
Awareness of multiple answers to questions					
Motivation to make more informed decisions					

Ability accept that your decisions are not always the best					
------------------------------------------------------------------	-----------------------------------------------------------------------------------	-----------------------------------------------------------------------------------	------------------------------------------------------------------------------------	-------------------------------------------------------------------------------------	-------------------------------------------------------------------------------------

**Activities**

22. What activities developed your critical thinking ability and what was the main ability that was developed in that activity?

## Appendix C

## Variables and questionnaire items

## Skills

Variables	Questionnaire items
Interpretation	1.1 See the significance in ideas 1.2 Distinguish between main ideas and sub ideas 1.3 Describe the problem 1.4 Organize ideas logically 1.5 Rewrite other people's ideas using your own words 1.6 Understanding graphs/charts
Analysis	2.1 Compare and contrast ideas 2.2 Understand your own or someone else's ideas 2.3 Identify unstated assumptions
Evaluation	3.1 Evaluate the credibility of a source of information 3.2 Determine if an argument is sound/acceptable 3.3 Judge if given evidence supports a claim
Inferences	4.1 Indent someone else's position/view 4.2 Predict future events based on evidence*** 4.3 Identify gaps in your knowledge and seek information on it 4.4 Consider various options to solve a problem
Explanation	5.1 Clearly present your argument 5.2 Defend your position 5.3 Justify your conclusions
Self-regulation	6.1 Recognize your personal biases 6.2 Understand other people's ideas before presenting your own 6.3 Monitor your understanding of ideas 6.4 Change your conclusion when presented with new valid information

## Dispositions

Variable	Items
Inquisitiveness	7.1 Desire to learn 7.2 Curiosity in your field
Systematicity	8.1 Inclination to being organized 8.2 Ability to focus on a task
Analyticity	9.1 Willingness to thoroughly analyze a topic 9.2 Willingness to use evidence to solve problems 9.3 Ability to anticipate potential difficulties in solving problems***
Truth-seeking	10.1 Willingness to find the most current information in your field*** 10.2 Willingness to ask questions*** 10.3 Willingness to follow academic norms when doing research***
Open-mindedness	11.1 Openness to new ideas 11.2 Tolerance of different views that contradict yours 11.3 Awareness of your personal biases
Self-confidence	12.1 Confidence in expressing your ideas 12.2 Confidence in your reasoning ability 12.3 Confidence in your own conclusions
Maturity	13.1 Awareness of multiple answers to questions 13.2 Motivation to make more informed decisions 13.3 Ability accept that your decisions are not always the best

\*\*\* removed from the study due to low Cronbach's alpha

Appendix D  
Gender differences

	Females (N=13)	Males (N=11)				
	Mean Rank	Mean Rank	df	U	Z	p
Interpretation	11.85	13.27	22	63.0	-0.502	0.616
Analysis	12.66	12.32	22	69.5	-0.119	0.905
Evaluation	11.81	13.32	22	62.5	-0.529	0.597
Inference	11.65	13.50	22	60.5	-0.663	0.507
Explanation	10.88	14.41	22	50.5	-1.24	0.215
Self-Regulation	12.73	12.23	22	68.5	-0.176	0.860
Inquisitiveness	13.23	11.64	22	62.0	-0.566	0.572
Systematicity	14.12	10.59	22	50.5	-1.24	0.214
Analytical	13.50	11.32	22	58.5	-0.777	0.437
open-mindedness	15.08	9.45	22	38.0	-1.97	0.049**
Self-confidence	10.58	14.77	22	46.5	-1.466	0.143
Maturity	12.65	12.32	22	69.5	-0.118	0.906

\*\* Significant at the p=0.050 level