

Improving Students' Critical Thinking Skills through Flipped Classrooms

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Abstract

Improving Critical Thinking Skills Through Flipped Classrooms

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Flipped classrooms are generally characterized by its course structure comprising in-class and out-of-class activities. It uses classroom time for students to actively engage in interactive learning activities. In other words, a flipped classroom means that students take responsibility for their own learning process. In flipped classrooms, students have more time and opportunity to engage in different activities (reading, writing, debating, etc.) which results in improving their critical thinking skills in general.

The course that has been investigated in this study is “Great thinkers, Great ideas, Great debates: Big ideas that shape and have shaped modern civilization”. Students could register under one of the following course codes: LBCL 298 /SCOL 398. The class was conceived by Prof. Calvin Kalman principal of the Science collage; at that time, and Eric Buzzetti and Jarrett Carty, principal and vice-principal respectively, of the Liberal Arts College.

This study attempts to answer the following question: What are the changes that occurred to students’ Critical Thinking skills throughout the course? The data collected includes open-ended questions interviews with both students and TAs, class observations, student writing products. After qualitatively coding the student interviews, the remaining data sources were analyzed. These were then triangulated with the interviews and each other in order to corroborate the themes that emerged, as well as to enrich or expand the results.

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Chapter 1: Theoretical Context

1.1 Introduction:

As a mother and a teacher my major concern was and still is how to bring up both my children and students into higher orders of thinking basically Critical Thinking.

I always believe that in order to improve their thinking skills, the education system in general and the classroom specifically need a fundamental change. This change is necessary since we have different learning styles and abilities among students in every class.

One of the changes that could be applied in the classroom is to flip the class and help the students to be active learners and be responsible for their own learning process.

I have been in flipped classrooms as a teacher and as a student and I like it in both situations. Since it gives me an opportunity to share the experience with my students; it also opens my eyes as a student through involving in the required activities.

Designing flipped classrooms is not an easy process at all; many aspects and skills need to be considered. More importantly creativity and inspiration are required while building flipped classrooms in order to keep the students involve before, after and during the class time.

1.2. Purpose of the study:

The purpose of this study is to examine the capability of a flipped classroom to improve students' Critical Thinking (abbreviated as CT) skills as active learners. Specifically what are the changes that occurred to students' critical thinking skills throughout the course?

The course which has been investigated is "Great thinkers, Great ideas, Great debates: Big ideas that shape and have shaped modern civilization". Students could register under either of the following course codes: LBCL 298 or SCOL 398. The class was conceived by Prof. Calvin Kalman principal of the Science collage; at that time, respectively, and Eric Buzzetti and Jarrett Carty, principal and vice-principal respectively, of the Liberal Arts College.

This course is an introduction to the pleasures and challenges of thinking about fundamental questions facing us as human beings and citizens of democratic societies enlightened by natural and social science. It is also an introduction to questions of enduring interest as they are explored, represented and brought to life in literature, poetry, history, philosophy, the natural and social sciences, mathematics and the fine arts. Its pedagogical goal includes introducing students to the scholarship and original thinking of faculty members drawn from the entire Faculty of Arts and Science.

The course contains thirteen weekly modules. Each module is presented by two faculty members working in collaboration one from Science College and the other ones

from the Liberal Arts College. Each week students would use a Reflective Writing procedure (see section 1.3.1) to examine and reflect on these readings. The classes begin with an introduction by the two faculty members followed by a discussion between the two of them for maximum ten minutes then a full in-class discussion with the students (see section 1.3.3). At the end of the week students would write a one-page essay (critique- see section 1.3.2) based on the reading and the class discussion. There is no exam; students must produce Reflective Writing and a one-page essay (Critique) every week to pass the course. The course pack is the only textbook for the course.

1.3. Proposed Strategies to Address the Problems:

Flipped classrooms and its tools may help to improve students' critical thinking skills. Recently, educators have been trying to implement different tools and methods in order to design flipped classrooms that serve a variety of purposes. Empirical studies on the effectiveness of using active learning through flipped classroom (e.g., Chu and Libby, 2010; Khanam and Kalman, 2017; Khazaei et al. 2018) have emphasized that active learning and flipped classrooms have shown improvement on students' performance. Different studies have demonstrated that students were more satisfied with a flipped classroom than the traditional classroom. (Minnaert, Boekaerts, and de Brabander, 2007; Müller and Louw, 2004; Smit et al., 2014).

In order to improve students' critical thinking and argument skills, different tools of active learning were used in LBCL 298 / SCOL 398. These methods were Reflective Writing, Critique writing (one page essay) and full in-class discussion in the class.

1.3.1. Reflective Writing:

Reflective Writing is a tool that has been applied to enable students to be active learners and be responsible for their learning process (Kalman, 2008). In addition, Reflective Writing has been used in flipped classrooms to enable students to understand general concepts and be aware of their misconceptions (Khanam and Kalman, 2014).

Table 1 Rubric to correct Reflective Writing
Marking criteria for reflective writing

Features present in the reflective-writing product	Meets criteria fully (100%)	Meets most of the criteria (65%)	Minimally meets the criterion (35%)	Does not meet criterion at all (0%)
Presenting the key concepts of the subject as understood by the student.	Complete -Does not copy the lesson.	Covers all concepts but not really in own words	Partial coverage of concepts	
Describing the relationship between the various concepts	-Qualitative interpretation used to compose the relationship in the words of the student. -	-Surface description of Qualitative interpretation used to compose the relationship . -	-Some attempt to compose the relationship .	Not able to interpret.
Student relates key concepts to his/her own life experiences	Shows clear understanding of how the concepts occur in everyday situations	Shows partial understanding of how the concepts occur in everyday situations	Mention of everyday situations without any explanation of how they relate to concepts under study in current sections	No relationships to his/her own life experiences are given.
Student formulates his/her own question(s).	Student realizes that there are concepts in the textbook that s/he does not understand and elaborates a clear question	Student sets out a question that is not clearly formulated	Student notes the difference between the students' own ideas and the versions found in the textbooks without any discussion	No questions given

In LBCL 298 / SCOL 398, students need to do a Reflective Writing essay before the class. This Reflective Writing is based on the readings that will be discussed in class in following week. In the writing, students need to link the assigned texts and its ideas to their own life and experience. To guide the students in their writings, they were provided with a rubric (see Table 1) that describes the main steps to complete RW. The rubric highlighted the parts that should be included in the RW.

1.3.2. Critique Writing:

After the class discussion, students have to provide a one page essay to summaries the discussion that take place in the two classes of the week.

In writing the essay the students pick one or two of the most important concepts that were discussed in the class discussion between students themselves and the professors and then critically analyze those concepts in the rest of the paper.

1.3.3. Full in-class discussion:

Empirical research on classroom practices emphasizes that for instructors it is very significant to connect previous knowledge and academic knowledge (Bransford and

Schwartz, 1999; Cornelius-White, 2007; Littleton and Mercer, 2013; Erstad and Sefton-Green, 2012).

Group discussion is very beneficial to make these connections and encourage students to evaluate the texts and the new information critically. In LBCL 298 / SCOL 398, after reading the texts and providing a Reflective Writing students would be familiar with the topic and would be able to get involved in the discussion. In the class, the professors would lecture only for ten minutes and then an in-class discussion would take a place.

Each week there was a new topic, such as Love, Beauty and Quantum mechanics. In addition, every week the class had two new professors one from humanities and the other one from the sciences. The professors would give a brief talk for ten minutes maximum and then engage in a full in class discussions with the students. Students could ask questions or reflect on what has been said. Intensive engagement occurred in all the 13 weeks of observation in each class. The organization of the course is shown in Figure 1.

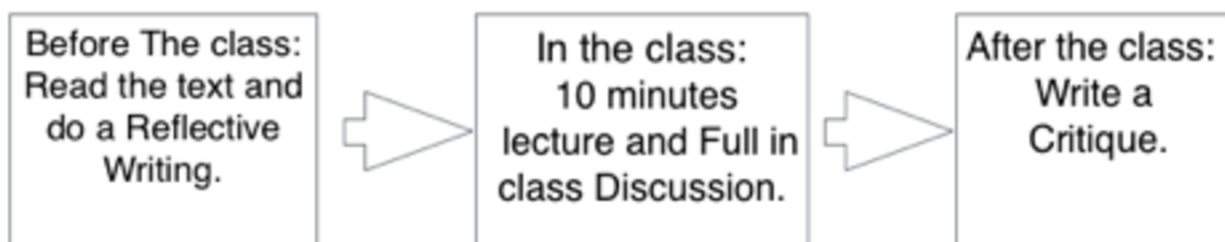


Fig.1: The Organization of the Course.

1.4. Critical Thinking CT:

There has been a big debate between educators about defining Critical Thinking. As a result, nowadays there are many definitions of CT. One of them is “ Critical thinking (CT), or the ability to engage in purposeful, self-regulatory judgment ” (Abrami et al, 2008). Another definition, “the use of those skills or strategies that increase the probability of a desirable outcome. It is used to describe thinking that is purposeful, reasoned, and goal directed” (Halpern, 1997, as cited in Kalman, 2008). Additionally, Willingham (2007) defined Critical Thinking as considering different views of the problem, being open-minded to new proofs that refutes your opinions and perspectives, being unemotionally reasonable, making conclusions based on data and information that one has, and so on.

“The Delphi Committee who identified six skills (interpretation, analysis, evaluation, inference, explanation, and self-regulation), 16 subskills, and 19 dispositions (including inquisitiveness, open-mindedness, understanding other, and so on) that they associated with CT” (Abrami et al, 2008). Bailin et al. (1999) pointed out Critical Thinking skills that could be taught; some of these skills are open mindedness, being respectful, considering different perspectives and reasoning (Lai, 2011).

1.5. Flipped Classroom:

According to (Song et al, 2017) a flipped classroom is “ generally characterized by its course structure comprising in- class and out- of- class activities, it uses classroom

time for students to actively engage in interactive learning activities". Since flipped classrooms are custom-build classes, students there are responsible for their learning and the teacher is a facilitator; this allows teachers and student to interact more together (Uzunboylu, & Karagozlu , 2015).

Design principles for a flipped classroom recommended by Kim, Kim, Khera & Getman (2014) are as follows:

- Providing an opportunity for students to gain preliminary information before the class activity,
- Encouraging students to watch online lectures and be prepared before the class activity,
- Organizing methods of assessment,
- Linking in-class activities with out-of-class activities,
- Supplying clearly stated and well organized guidance,
- Providing sufficient time for the completion of assignments,
- Promoting students to build a learning community,
- Providing immediate feedback on individual or group works,
- Providing the use of familiar technologies which can be accessed easily by students." (Uzunboylu, & Karagozlu , 2015).

One of the aims of applying a flipped classroom model in different disciplines of education is to give students and their teacher more time to interact (Uzunboylu, & Karagozlu , 2015). In a flipped classroom, different methods of learning are presented in

the class and outside the class. Students will utilize in-class activities, for instance group discussion, and the assignments that have to be done out side the class such as online video lessons (Santikarn & Wichadee, 2018).

1.6. Theoretical Framework:

1.6.1 Active Learning:

In the last few years educators have paid a lot of attention to active learning methods. Some have been skeptical about the effectiveness of active learning while others are supportive. What is active learning and does it differ from traditional learning (Prince, 2004).

“There is no universally agreed upon definition for active learning, though many researchers agree that it includes students engaging in talking and listening, writing, reading, and/or reflecting” (Hsieh, 200). Bonwell and Eison (1991) gave a definition which is any strategies that "involves students in doing things and thinking about the things they are doing”. Additionally, Active learning means to involve student in the learning process by any pedagogical way (Prince, 2004). The difference between traditional and active learning is that students do not just listen to the lecture but they participate in the learning process. Students’ participation includes engaging in pedagogical activities and that is the major pillar of the active learning (Prince, 2004).

Bonwell and Eison (1991) explained “some general characteristics are commonly associated with the use of strategies promoting active learning in the classroom:

1. Students are involved in more than listening.
2. Less emphasis is placed on transmitting information and more on developing students' skills.
3. Students are involved in higher order thinking (analysis, synthesis, evaluation). Students are engaged in activities (e.g., reading, discussing, writing).
4. Greater emphasis is placed on students' exploration of their own attitudes and values”.

Khanam and Kalman (2017) implemented a type of flipped classrooms based on the Course Dossier method trying to improve students' comprehension of scientific concepts. In this particular class, students need to provide Reflective Writing on text before the class, a one-page essay at the end of the week, and a final essay at the end of the semester. Using the Course Dossier method showed a notable improvement in students' understanding of scientific concepts.

Chu and Libby (2010) showed through their case study in using active learning in the classroom by mini-case assignment that active learning could improve students' performance.

Claims are made that teachers talk too much in the classroom, and that it is essential to minimize teacher talk and increase learner talk. It is often suggested that teacher-talk

does not reflect real language and so is inappropriate input, whereas if learners are negotiating more meaning, this will lead to more comprehensible input (Kennedy, 1996 as cited Haidari, 2018).

Studies have demonstrated that students were more satisfied with a flipped classroom than the traditional way. (Minnaert, Boekaerts, and de Brabander, 2007; Müller and Louw, 2004; Smit et al., 2014).

With the intention of improving students' critical thinking and argumentative skills, a combination of flipped classroom instruction methods was used in LBCL 298 / SCOL 398, including required readings, Reflective Writing, whole-class discussion, and writing Critiques (one page essay).

Chapter 2: Methodology:

This chapter explains the methodology for this research. The qualitative methods that were used are interviews and students' writing products (Creswell, Plano, Clark, 2007; Greene, Caracelli, Graham, 1989). The data was collected from students in the courses LBCL 298 / SCOL 398 and analyzed with qualitative methods, outlined in this chapter.

2.1 Multiple case study:

2.1.1 Overview:

Case studies are frequently used in qualitative research in psychology, history, education (including science education), and medicine (Starman, 2013). According to Flyvbjerg, 2006 "Much of what we know today about the empirical world has been produced by case study research, and many of the most treasured classics in each discipline are case studies" (Flyvbjerg, 2006, p. 302)

One of the definitions of case study is "It is a description and analysis of an individual matter or case [...] with the purpose to identify variables, structures, forms and orders of interaction between the participants in the situation (theoretical purpose), or, in order to assess the performance of work or progress in development (practical purpose)" (Mesec, 1998).

Case-study research builds a detailed understanding of the case, based on various sources (Yin, 2014). Also, Yin (2014) stated, "You would want to do case study research

because you want to understand a real-world case and assume that such an understanding is likely to involve important contextual conditions pertinent to your case” (p. 16).

In a case study, the researcher chooses one topic to clarify the issue or to present different perspectives on the issue (Creswell, Hanson, Clark Plano, & Morales, 2007).

The number of participants in case studies is limited to gain better understanding of each participant’s perspective about the issue under study. Fewer details would be used for each of them if the number of participants is high (Creswell et al., 2007).

2.2 An overview of the study:

The goal of this study was to examine the use of a flipped classroom to improve students’ Critical Thinking skills. It targets the perspective of different participants following their experience in the course. There are four types of data that were collected:

- 1-The students’ answers to the interview questions.
- 2- Critiques
- 3- Mini Writings.
- 4- The TAs’ answers to the interview questions.

2.3 Participants:

In this multiple case study participants were randomly selected for interviews from students enrolled in LBCL 298 / SCOL 398 (titled Great thinkers, Great ideas, Great debates: Big ideas that shape and have shaped modern civilization).

There were two levels of participation:

First level of participation for all students. Participants were asked to agree to be observed in the classroom by the investigator. They were asked to agree to have their essays and Reflective Writings analyzed by the investigator after they have been graded by the TAs.

Second level of participation for students who agreed to be interviewed. Students who had agreed were interviewed for approximately forty minutes by the investigator at the beginning and also at the end of the course. Also, these interviewees provided a mini writing at the beginning and at the end of the semester.

There were three types of data collected for every participant:

- (a) their answers to questions in the interviews
- (b) Mini writing provided by the interviewees.
- (c) RW and Critique produced by all the students.

To get the results, as suggested by Yin (2018), representative students were selected as interview participants. Interview participants in this study were 6 students; 4 males and 2 females. All the participants were taking from LBCL 298 / SCOL 398.

2.4 Interviews:

Semi-structured interviews (Merriam, 1998) were conducted for collecting the qualitative data for this study. There were 6 students; all the participants were taking

LBCL 298 / SCOL 39. Two interviews were taken for each participant in this research. One (pre-interview) took place at the beginning of the course and another (post interview) was conducted end of the course. The two sets of interview questions (see Appendix C) were designed to identify the changes in students' critical thinking skills throughout the semester. All interviews were audio recorded and transcribed. To preserve anonymity, students' code names (BR, TE... etc.) were used.

Once the transcriptions were completed the 'within case analysis'; recommended by Stake (1995), was followed to analyze the data and common themes were identified within the cases (Creswell, 2007). The analyzed data was classified based on examining the changes in students' Critical Thinking Skills at the end of the course compared to early in the semester.

Additionally, before each interview interviewees were asked to provide a Mini Writing to answer the question: "What is your definition of critical thinking?" and this Mini Writing was also analyzed by the within case analysis method for each individual case.

2.5. Validity and reliability of the research:

Triangulation methods were employed to insure credibility. Triangulation means to use multiple methods or data sources in qualitative research to develop a comprehensive understanding of the issue (Patton, 1999). Furthermore, Triangulation is a qualitative

research strategy that has been used to test validity through the convergence of information from different sources. Denzin (1978) and Patton (1999) identified four types of triangulation:

- (a) method triangulation.
- (b) investigator triangulation.
- (c) theory triangulation.
- (d) data source triangulation.

This study used data source triangulation.

Five sources of data were used:

- 1-The students' answers to the interview questions.
- 2- Critiques.
- 3- Mini Writings.
- 4- The TAs' answers to the interview questions.

Moreover, the results of the analysis of Mini Writing and Critiques were compared to the results of the interview analysis to assess whether they corresponded or conflicted with each other.

2.6. Ethical Considerations:

In terms of confidentiality; Potential participants were invited to participate in the study by means of a recruitment letter distributed in the class. The letter described the

study as well as both levels of participation. Interested students were asked to sign and give the letters back. In this way the researcher will know the participants' real identity, but it will not be disclosed (Appendix A).

2.7. Conclusion:

To sum up, in this study, the interviewed participants were 6 students; 4 males and 2 females who were taking from LBCL 298 / SCOL 398. Also, a within case analysis was used to analyzed all the types of data including, interviews, writing products.

Additionally, triangulation methods were employed to insure credibility.

Chapter 3: Results of the Qualitative Data Analysis:

3.1. Introduction and Overview:

This chapter reports the analysis of the answers to the open-ended interview questions about the course and CT skills. This qualitative data provides in-depth understanding of the students' improvement in CT skills. Section 3.2 describes the aspects of the answers for the open-ended questions about CT skills for both pre and post interviews. The analysis for the interviews is divided into three major themes. The major point of the interviews was to explore the students' views about the course and identify the impact of this flipped classroom in their CT skills. Section 3.3 indicates the analysis of the mini writing for each students. The reason behind this section is to identify the changes in the students' conception about Critical thinking. Section 3.4 contains the data analysis of the written assignments (critiques) during the semester and this section aims to show the improvement of their CT skills throughout the semester. Section 3.5 contains 15 comparisons between the mini writings of the six interviewed students; the purpose of this section is to describe the similarities and the differences in undergraduate students' conceptions of critical thinking at the start and end of the course. Section 3.6 presents the comparison of the analyzed data of the written assignments for interviewed vs non-interviewed students. The last section 3.7 includes three tables that summarize the qualitative data analysis and restate the main findings that relate to the research questions.

3.2. Responses to the interview Questions

3.2.1. Case 1 BE:

Pre-interview:

1-Views about the course:

The transcription of the pre-interview shows that at the beginning of the semester he was expecting to improve his argumentative and analytical skills, critical thinking skills and reading and writing skills through this course. Additionally, he stated that he is hoping to get many different perspectives on issues presented in the course. He also believed one of the objectives of this course is to get students to think more about issues and to realize that it is not necessary to have an answer to every questions.

About the impact of the course in his life, he explained that it hopefully would help him to improve his argumentative skills, so he could deal with issues, for example, with his girlfriend and family because they have different political opinions.

He also thought that students would benefit from presenting two different views in the class because people tend to just look at information and read articles that reaffirm their own opinion. He believed that this has caused a lot of polarization in political and social opinion. Consequently, he thought that looking in both sides of an issue will allow us to understand where people are coming from even if we still disagree with them.

2-Critical Thinking Skills:

He acknowledged that when he hears other opinions that disagree with his views, he gets upset a little bit and he needs to practice more. He mentioned an example of an opinion that he heard in the class and bothered him a little which is the class of Canadian citizenship. He said “I consider myself to be a proud Canadian and when people kind of criticize the function of this country, it provokes me in the wrong way a little bit”.

He did not think he is a good arguer and consequently he tries to stay out of arguments. He thought that arguments usually have emotional attachment so it is not productive but more combative. Also, he believed that to be a sound arguer you need critical thinking skills, and analytical and communication skills. These help you to be persuasive and to give reasons why you believe in a certain opinion. Moreover, he thought that in arguments, people should not be too aggressive.

3-Perspectives about the world:

He thought that the course may change his ideas about the world. He mentioned that it is easy just to read news and articles that express views that you already believe, but when he is exposed to other sources with other viewpoints; that does certainly affect his opinion.

Post-interview:

1-Views about the course:

In the post-interview he noted that he is happy that he took the course “I thought it was very interesting. I'm happy I took the course and I would probably recommend this”.

Additionally, he said that the class discussions were his sources to write his critiques; he explained sometimes he chose ideas that might be too specific and not really relevant to the topic to write about.

2- Critical Thinking Skills:

He acknowledged that the opportunity was there to express his ideas during the discussions and the environment was very comfortable to share ideas but because of his personality he preferred to listen most of the time. Even though he said the course has helped him to argue better due to its components including the reading, the writing and the formulation of arguments that happened during the course. Besides, he thought having different perspectives presented gives him a better understanding of his own views and occasionally an opportunity to change his views if he hasn't experienced that perspective before. For example, he liked the class on Health a lot; he explained that students were a little bit more divided in their opinions so that stood out for him and that was a fun class.

About being a good arguer he said in the post-interview that he considers himself as a good arguer. He believed that it is better to remain calm and just analyze the situation a little more than just flat out arguing because some arguments become defensive and then it's just not productive. Also, all that he wants from arguments is for the other person to understand his point of view. He also explained that it is not necessarily that one rival is right and the other one is wrong because for the most part arguments are subjective so it

depends on the person and the facts they present. Of equal importance, he explained that the way to identify if there is a miscommunication in an argument is when people get emotional because the argument goes off track. Additionally; he illustrated that the qualifications of being a good arguer are to understand both sides of the argument, yet being calm and not aggressive towards the other person, being passionate and believe in the cause, and have good reasons for his beliefs. Besides, he felt that the course helped him to analyze a point of view a little better and to look at the reasons behind that opinion more thoroughly.

3- Perspectives about the world:

Additionally, he believed the class had an impact on his life; a lot of the ideas he has already known but to hear them again helped him get more understanding of people with different opinions. More importantly, he said that the class helped him as a new student because it gave him a few ideas about what he would want to study in the future and the class has a good sampling of different disciplines which was the perfect course for being a new student.

The student has confirmed that the course made him question his own views; he gave an example saying the class in Love is Biology made him think more about Love as biological so his ideas about this particular topic changed. However, he thought that he had not any profound belief changes but more enlightening perspectives. For example, gender biases in science, he said that's something he was not really aware of as a male so

it was interesting to be exposed to it. He also felt that in the case of discussions in which he did not have a prior opinion the discussions helped him to frame his opinions better. He gave an example, the class about Capitalism clarified that whatever he buys or spends his money on isn't really going to make him happier.

3.2.2. Case 2 BR:

Pre-interview:

1-Views about the course:

From this course, she was expecting to get new perspectives on different subjects and also on concepts or ideas that she never thought of questioning. She gave an example, of a question: what is a just society? She thought it was a given but she never thought of the meaning of justice and society. She expected to yell at people who she disagreed with, instead she would take a moment to think about it and come up with her argument. In this way, she looked forward to being more reflective than reactive.

She was surprised to see a physics or a biology professor there and she was excited to hear their scientific perspectives because she does not have a scientific background. She believed that the reason behind presenting different views in the class was to challenge the students, because some students might agree more with one professor over the other, or they might have a completely different view or opinion on the subject. Furthermore,

she thought the course would have an impact on her daily life but she was not sure what type of impact.

2-Critical Thinking Skills:

The student considered herself to be a good arguer most of the time. She also believed that she argues better on paper because she has time to step back and think about it even if she is angry. In addition, she thought the skills of a sound arguer are to be a good listener, have humility, and be willing to ask questions and receive clarifications to get a better understanding.

3-Perspectives about the world:

She was hoping to learn new methods of viewing the world in different concepts. Also, she wanted to have a new appreciation of a diversity of opinions. More important she thought that the course could change her ideas and opinions about the world because she did not really have an opinion about some of the topics. She discussed Beauty as an example, saying that she did not have any perspective about Beauty before.

Post-interview:

1-Views about the course:

After asking her about the course in general, she responded by saying: "I'm happy I took this course. I got a better appreciation between the interactions of humanities and science". Her biggest difficulty was listening to other students, because when she tried to make an argument or a claim, she asked them, "Please consider other people's view."

Then she would get really frustrated as a lot of them would not, because they focused on their perceptions and their experiences.

She mentioned that the discussions in the class were useful in terms of writing the critique. Writing the critique always depended on the professor and how he or she handled the class. It helped if there were a lot of discussions otherwise she found it hard to write the critique. She said “it partially depended on who was giving the lecture that week. If it was a teacher who did a lot of lecturing and explaining, and there was not a lot of discussion in class, it was more difficult writing my critique”. Also, she explained that she favoured small group discussions rather than a big discussion.

Moreover, she discussed the classes that stood out for her. The first one was Canadian citizenship, it made her rethink different aspects of the procedure of accepting immigrants and who makes the decision. The second one was Human environment partially because of the lively debates. Finally, she enjoyed Beauty because she never thought: "what is beauty?" and after the class she developed a good appreciation of beauty.

When she was asked about the reason behind presenting different views in the class, she responded that it provided us with different ways of thinking, and different perceptions. She realized that people with different experiences have different points of view. Additionally, she believed that it made her aware of certain limitations in her

thinking, or at least made her reframe or reconstruct her argument so that she would consider other elements.

2- Critical Thinking Skills:

She explained that she was open to discuss and share her ideas in the class discussion and nothing prevented her from doing that except in Quantum Mechanics because she did not understand the topic.

In addition, she admitted that the class has helped her to argue better saying: "it made me a lot more aware of how emotions and debates will naturally rise up and they shouldn't be an obstacle to discussing". She emphasized that if there are emotions, you cannot debate correctly. Also, she said it made her more aware of her limitations when it comes to debating.

Furthermore, she stated that she was comfortable to explain her ideas in the discussions. More importantly, she explained "I do admit there was a difference between the start and the end". Also, she said the course has improved the scientific side of her argumentative skills. Moreover, she said it is hard to answer if she is a good arguer or not. She explained that she will never know all the facets of a certain topic, and will never make a good argument without omitting something.

From an argument she wants to get a different perception, a different interpretation of the subject and to question her knowledge. In addition, in arguments generally, she does not believe in the dichotomy of right and wrong because it depends on the context and

someone's experience. She illustrated that what makes one opinion right for someone, could makes it wrong for somebody else.

Her way to identify any miscommunication in an argument was to question the other party; for instance, asking "Are you trying to imply that people who gain weight are ignorant of their decisions? or Is this what you're really saying?"

In her opinion, a good arguer should have both good eloquence, written and speaking, and good knowledge of the subject. Additionally, have the ability to explain clearly what their arguments are and to admit lacking of knowledge "I did not think of that." Or "You bring a good point". Also, a good arguer in her opinion handles any miscommunication, by asking for clarifications like What do you mean by this?

3-Perspectives about the world:

After asking her if the course had any impact in her daily life, she explained that she was able to learn different perceptions on different topics. She gave an example of how her perspective about Beauty has totally changed "they might make my appreciation of beauty more nuanced". Also, she said that now she thinks more of the context than of the actual object.

Additionally, she believed that the course changed her position, and the result of that was that the course introduced different concepts that she did not think of or did not know before. More importantly, the course made her question herself "Why do I believe this

way?” and she discussed that the class about Human Environment made her question some of her own points of view.

She explained that the course made her doubt some of her opinions, and also helped her framing new opinions; for example, the class of Canadian citizenship and the class of Beauty.

3.2.3. Case 3 LE:

Pre-interview:

1-Views about the course

He expected to approach a variety of subjects, re-evaluate new evidences and gain knowledge about some issues. Also, he was looking for exercising his ability to listen to others, argue with reason and gain a better understanding about some issues. In addition, he assumed the class would change students’ ideas and opinions about the world.

He thought the reason behind presenting different views in the class was that people grow up in different places, and different environments. The class would expose students to different ideas.

2- Critical Thinking Skills:

He believed that avoiding miscommunication is the most important skill for an arguer. Furthermore, he thought a sound arguer has to have good research skills and reading and writing skills. About being a good arguer, he said “among the sea of arguers I class myself as mediocre, among most people I would classify myself as a good arguer”.

3-Perspectives about the world:

The student was not sure that the class would have any impact in his daily life.

However, he expected to enrich his general knowledge.

Post-interview:

1-Views about the course:

He said the class was a good experience but the biggest difficulty that faced him was Reflective Writing because some of the readings were from ancient texts like Great Works, Canons, so the type of writing was unfamiliar. However, he believed the discussions in the class were useful in the writing of critique because it brought up some points that he did not think of before.

During the discussions, he had the chance to express himself. And he was comfortable enough to explain his ideas in the class. Also, he said that the discussions clarified his thoughts and put new ones into thinking. Moreover, he explained that the discussions helped him to frame an opinion about things he didn't have an opinion or view about. He gave an example, "Like, the class on health. I don't know why I remember it so well, but I didn't have much of an opinion on health, but then with all of the discussions I created just like a train of thought, which is, depending on the level that you're looking at health and obesity ...".

The class about health stood out for him because he loved it and it was the standard class that he signed up for. He assumed that different views were presented because people lived different lives and saw different things.

The class impact in his life was to share and discuss these issues with his friends outside the class without the pressure of a class. Also, he mentioned that the course made him very conscious about how to say things.

2- Critical Thinking Skills:

He thought the course made him argue better because it was about sharing ideas and less about being right or wrong. In being a good arguer, he said “more and more that I am reading and that I know stuff or that I meet people, the less and less I think that I can argue better”. The reason he thought that way because he realizes that he is always missing a piece.

Moreover, from an argument he wanted to get something closer to truth for the reason that as an individual we don't have access to truth, but through arguments we can access something closer to the truth.

In arguments he believed that none of the rivals is right since when they're arguing they are speaking different languages and they are seeing the issue through different lenses. Additionally, he explained how to identify if there is a miscommunication in an argument by saying, “When you start having a headache. The moment people are shouting at each other or just repeating or saying, ‘You don't get it’”.

He stated that a good arguer has to have a body of knowledge, good tone of voice, and a good arguer has to know the anatomy of an argument; he said “it's all appearances in some ways”.

3-Perspectives about the world:

He was not sure if he heard anything in the class that made him reconsider his personal beliefs. He said “I never had an (epiphany) or a moment like that with the class. I think all of those happened outside [encounters with] friends or [other] people,”.

However, he mentioned that he questioned himself about his views and beliefs. His examples were "Why do I believe in a God?", “What came before God?”.

3.2.4. Case 4 TE:

Pre-interview:

1-Views about the course:

He thought the class would provide a healthy confrontation where students can learn more about other people who think differently; and understand where they are coming from. Furthermore, he explained that he is expecting to get a good experience, a good exchange and good grades.

He explained the reason behind having different views presenting in the class was to have people from different backgrounds exchange ideas.

2-Critical Thinking Skills:

About being a good arguer, he claimed that he is open to others and he listens so he thought if one can listen and ask questions we could make the person see our point of view.

The qualifications of a good arguer are to listen, to ask questions, to be ready to see opinions that are not necessarily yours.

3-Perspectives about the world:

He did not think that the class could change his ideas and opinions about the world because his opinions have been validated so far! Also, he was not sure if the class would have any impact on his life but he believed that he would have the opportunity to observe different types of arguers.

Post-interview:

1-Views about the course:

He said about the course “I was a bit disappointed with class because I felt the debates aspect was not neglected but wasn't seen to its full potential”. However, he thought the class in general was interesting. He gave an example, “one of the subjects that interested me the most was the physics part and the string theory, I thought that was extremely interesting how there could be a different approach than the one that's purely driven by calculation but rather one by broad understanding of the theories. I thought that was really interesting”.

The biggest difficulty for him was to write when he did not like the text; his example was Pedestrian Art Environmentalism. He emphasized that writing 26 assignments per semester is too much. On the other hand, he explained that the discussions gave him ideas to write the critiques.

Additionally, he said that the format of the class discussion would be better if it is small groups “this way is the closest to we got to debates and that's the closest we got to expressing our opinions”.

The discussion that stood out for him was “when we were having the debate about weight loss and a guy was saying how he lost a ton of weight just through his own tools on the internet. And then a girl got really outraged and saying that, “He had his white male privilege that allowed him to have access to such information.” That's the kind of things that I was really expecting to happen and as soon as that happened, the teacher really tried to mute it and say, “No, no, no this is not what we should have. We should have very direct conversations and not personal ones”. Also, he mentioned the Beauty class when “one of the students in the class said that, “Education, although is accessible, is daunting. It's just going to the museum and being educated or trying to educate oneself is a big thing.” The professor completely disagreed and said that, “There was a complete ... that there's nothing scary in pursuing higher education.” I think that was something I very much disagreed with and that's something that stood out is that maybe the professor didn't remember how it felt to be a student a long time ago.”

He thought the reason behind presenting different views in the class was because this is how life is.

2-Critical Thinking Skills:

He directly stated that the class did not help him to argue better he explained “Because we didn't argue. There is no opportunity to practice my argumentative skills so I didn't get better at it. That's pretty straight forward”. However, in another question he stated that the course helped him to argue his points and he gave an example, “first one on being a good conversationalist”. Nonetheless, he said the he was comfortable enough to explain his ideas in the discussion but with a professor being there, it brought too much rigidity and not enough free flowing.”

He did not consider himself to be a good arguer; he explained his approach by saying “If I'm going to have my opinion and I'm going to present it but I'm not going to become emotional about it, I'm going to be very detached”. Furthermore, a better understanding is his desire from any argument.

In an argument, he thought the rival who could defend his point in a better way is the right party. More importantly, he believed that there is a miscommunication in an argument if people don't listen to each other and if they think that a debate is just about winning. He explained “debates are to actually understand where the other person is coming from. How their set of values constructs their opinions and their beliefs”.

The qualifications that a good arguer has to have for him are listening to the other, having an introspection to what's important, knowing oneself and being ready to learn.

3-Perspectives about the world:

He did not think that the discussions made him question his views or reconsider his personal beliefs. However, in another question he stated that the class made him change his opinions or question them; he gave an example, the class about Addiction. Also, he did not believe that the discussion helped him to frame an opinion about something he didn't have an opinion or view about but the readings did help him.

3.2.5. Case 5 AD:

Pre-interview:

1-Views about the course:

She thought that the course would put people from different departments together; and make them read material so they can converse and discuss it and engage together since the students have different knowledge and different backgrounds. She explained that the objectives of the course are to argue better but think more critically about the topics that they had to write about and to be able to engage with different texts.

In addition, she said arguments in the class would happen if they touch on personal beliefs and opinions.

2-Critical Thinking Skills:

She believed that she is a good arguer on paper because she is not a very vocal person but more of a listener. Also, she thought a good arguer has to be a good listener because one needs to listen to the opposing view so afterwards they can deconstruct the argument then they can use it to their own advantage. A good arguer also for her has to be eloquent and think critically.

3-Perspectives about the world:

She explained the topics that they got a glimpse of made make her do more research until she found the opinion that she inclines to. She was not sure if the course would have any impact on her daily life but she thought it may become an interest.

Post-interview:

1-Views about the course:

She said the biggest difficulty she faced in this course was writing a one page essay because it is a completely different way of writing than English literature essays where there's a way of formatting it and getting your ideas across. She found that in one page, it was hard to say anything meaningful or to even have weight in her argument because it is strict to one page.

She said that she could express herself and her ideas during the discussion but she was not comfortable in a big classroom. She mentioned that in the class on feminism she was comfortable to make a comment on this because it was her topic in literature.

She said that this kind of learning environment was more interesting for the teachers than it was for the students.

She thought the idea of having different views represented in the class was to push your point across and to make the other person understand what you're trying to say.

She confirmed that the discussions made her question her own views; she gave an example, “what is a just society? Well, what kind of person do I want to be in society with feminism? How do I perceive equality of rights? Am I equal? What can I do to be equal?”. In addition, the course made her reconsider her personal beliefs. For instance, the class about God since she is an atheist, she explained “I just started wondering about what's the difference between a spiritual life and seeing the world in this lens and me and my position”.

More important, she said the discussions helped her to frame an opinion about something she didn't have an opinion or a view about like the class about Galileo.

2-Critical Thinking Skills:

She believed that the course helped her to argue better in her own writing because she is not very vocal. She said “I find that it was easier for me to find the counterpoint to an argument. If I was writing, I was like, "Huh. I didn't take that into account. Maybe I should write something about it or find some research about it because it's not my argument, but it pertains to it”.

From an argument, AD wanted to learn a perspective that she hadn't considered. She did not necessarily want to win an argument. Also, about being wrong or right in an argument, she said it depends on the situation. She gave an example by saying “you can't really say that the Nazis did a good thing, right? You just can't say that”.

She believed that miscommunication happens if the person is not taking the time to listen to you.

The qualifications of a good arguer for her are listening skills, being vocal, knowledge, open-minded, and to be aware of other points of view.

3-Perspectives about the world:

She said the class might have an impact on her daily life but because she is changing all the time that is why she is not aware of it.

3.2.6. Case 6 GR:

Pre-interview:

1-Views about the course:

He expected the course to have heavy discussions about grand philosophical concepts and to have more debating among classmates.

He believed that it would not be much interesting if it was presented in one side of the ideology and that is why there are different views presenting in the class.

2-Critical Thinking Skills:

He described himself as decent arguer. He said “I can win an argument against some people but not against other people who better in arguing, I think I am a decent arguer when it is a subject that I am really familiar with but most subjects I am not familiar enough with to adequately argue them and I do not like arguing the subjects that I am not very familiar with”.

He also explained that a good arguer has to be able to articulate their ideas very well, to be able to explain your ideas clearly, to be a good listener and to be able to understand what the person is saying and to be a quick thinker to analyze very quickly.

3-Perspectives about the world:

He thought that course could change his ideas and opinions about the world because there might be some interesting topics that he did not think about before. Furthermore, he did not think that the course would have any impact in his daily life because he does not spend a lot of time arguing.

Post-interview:

1-Views about the course:

He explained that the course wasn't quite what he expected. He expected to have more debates and he found the course wasn't as interactive as he expected it.

His biggest difficulty was responding to things he didn't understand. For example, scientific topics because he didn't understand them. He also, said the discussions in the

class were not useful to him in writing the critique because there was not enough participation.

He explained during the discussion, he had the chance to express himself and his ideas but he did not take it because he is not someone who speaks up in class.

When he was asked about what stand out in the class, he said a few professors were quite good; for example,” The guy who did Adam Smith, I thought he was very talented. I feel like he's trained professionally in almost stand-up comedy or something, because he entertains in a way that I've never seen a professor do before. Because I'm not even very interested in Adam Smith, but that one had me... I was paying attention the whole time and I was really absorbed in it the whole time. And that's just how you get a good professor, is someone who can really keep your attention, even if the material's not interesting”.

When he was asked about having two professors each class, he said” I kind of expected it to be more differing in their views, and I found that was something that kind of surprised me in the end, was how they often didn't have contrasting viewpoints very much”.

In addition, he explained the course did not have any impact in his daily life. He believed that everything that was said in the class, he already knew it; nothing was new for him. Similarly, he thought the discussions and the course in general did not make him question or reconsider his beliefs.

2-Critical Thinking Skills:

He did not think that the course made him argue better; he said “ it does give you the opportunity to argue, but it does not encourage the improvement of your arguments”. Also, all what he wanted to get from an argument is to get a person to understand his point of view.

He believed that to judge if one rival or party is right and the other one is wrong, it depends on what they are arguing about. He said “I mean some things are subjectively true, and some things are matters of opinion”.

The qualifications that a good arguer has to have in his opinion are to be calm and level headed, to be able to see how people's views from their point of view, to be able to organize his/her thoughts and to understand why he /she holds these opinions.

3-Perspectives about the world:

He thought the discussions and the course in general did not make him question or reconsider his beliefs.

3.3 Data analysis of Mini Writings (student’s knowledge of critical thinking):

3.3.1. Case BE:

-In the pre-interview he wrote “ Critical thinking: analysis, a good way to be informed, considering both sides of the issue, a skill which our society lacks”.

-In the post-interview he wrote “Ability

- To analyze, deliberate on a specific topic.
- To look at things from many perspectives.
- To be skeptical of information provided, to not simply take something at face value.
- To give reasonable justifications for your beliefs.
- To investigate claims.”

By comparing what he had said in the pre- and post-interviews, it is clear that the student’s perspective about critical thinking has expanded and become more precise. He understands that looking at issues has to be from different perspectives not only from one angle. In addition, he learned to be skeptical about the information he reads or hears and to investigate claims.

3.3.2. Case BR:

-In the pre-interview she wrote “Critical thinking:

*To question my beliefs, convictions, what are the foundations or core principals that support my opinions?

*To question arguments made by either myself or others.

*To not believe everything I see/read/hear, simply because of the authority or because I agree with the claim also known as to be cynical of any claims made about whatever subject.

The goal of critical thinking is to not be duped by “phony” claims made by others and to live a life as true to my principles (myself, my values) as possible (i.e to not hold opinions or beliefs that are in contradiction with my values)”.

-In the post-interview she wrote “Critical thinking:

-Question my assumptions, beliefs, positions on several topics.

-Check my biases, prejudices, ‘gaps’ in my knowledge.

-Be willing, open to different perception, takes on a subject.

-If I become defensive to someone’s opinion, I should question why their position angered me, what components are the basis of their opinion (components that I might have over looked or been ignorant of).

-Overall, critical thinking is still meant to be used to make claims based on solid arguments, but to be open to different interpretations that might contradict my positions so as to learn new information and/or perceptions that I might not have known, in order to build a better, more solid argument”.

In the beginning of the semester, critical thinking for her was a way to not to be fooled, and she wanted to find the evidence that support her perspectives. More importantly, she refused the idea of holding any opinion that she might think is pseudo.

On the other hand, in the post-interview, she changed the core of her understanding of critical thinking. She became willing to check her lack of knowledge and she admitted to being more open-minded and accepting different points of view. In addition, she believed that being open to different interpretations would help her build a better argument.

3.3.3. Case LE:

In the pre-interview he wrote “Critical thinking: a skill that is both praised and discouraged. We have the bad habit of looking up to the dead mavericks while ignoring the living. Ostensibly, critical thinking seems to be highly desirable, but often, when pushed toward criticizing the axiomatic values of our contemporary society, this becomes less desirable.”

In the post-interview he wrote “Critical thinking is the ability to decipher and understand information both factual and biased in ways that take to account its fallibility, no matter the type of information, to practice critical thinking is to critique it, in order to get a better grasp of what you lack when absorbing ‘sad’ info. It must be practiced and must be done not only to outside sources but also to ourselves.”

In the first interview he did not define critical thinking at all. He was merely explaining the position of critical thinking in the society.

However, in the post-interview, he defined critical thinking from his point of view. Most importantly, he took fallibility and bias into account. It is clear that he developed his own definition of critical thinking during the semester.

3.3.4. Case TE:

-In the pre-interview he wrote” “Asking questions, challenge opinions, confrontation, conflict, exchange of point of views , question sources of information and self-aware”.

-In the post-interview he wrote” Critical thinking: Different opinions, diverging. scrutiny and questioning self-information”. When asked about critical thinking: “I immediately think about questioning the information we are presented and making our own research of the information and often determining a stance that concords to our values and what we know about the subject”.

His ideas about critical thinking did not change that much but they expanded in some ways. He emphasized questioning the information that he is exposed to from different sources. Furthermore, he related his stances to his values which means improving self-awareness.

3.3.5. Case AD:

-In the pre-interview she wrote “Critical thinking: Think of the material thoughtfully, carefully, to analyze the words said or written, to understand different positions of an argument, to think without bias of one’s beliefs , opinions, to engage with the material and its ideas, to be a part of the discussion, as would be the case in a philosophical argument or any type for that matter. Of course to be able to criticize the content and understand the positive and negative elements of it. “

-In the post-interview she wrote “-Reflecting about the way you think; thinking about your thinking. Being able to hear all sides of an argument and process the information as open-minded as you can.”.

. In the first mini writing, she explained the process of thinking critically. She mentioned most of the required tasks. However, In the post-interview AD was late and she rushed through the mini writing which resulted in a short definition. She focused on reflecting and being able to consider the issue from different sides. In addition, she wrote “thinking about your thinking” which is a metacognitive skill.

3.3.6. Case GR:

-In the pre-interview he wrote” “Rationality, skepticism, examining what one hears and examining one’s own beliefs for validity.”

-In the post-interview he wrote” Thinking analytically, questioning assumptions, examining evidence, keeping an open mind. Open to new ideas, trying to see where the other side is coming from, but touting claims made without any evidence”.

It is clear that the student expanded his definition of critical thinking. Rather than just examining one's beliefs and what one hears, in the post-mini writing, he added questioning assumptions and examining evidence. Also, he mentioned open-mindedness to understand the other party.

3.4. The correspondence between their conceptions of critical thinking, and critical participation in course written assignments (One-page essay):

3.4.1. Case BE:

Most of his critique writings earlier in the semester showed that he was primarily presenting and explaining the issue from two different angles but without any analysis or evaluation. However, around the middle of the semester, his critiques became more coherent and much clearer. For example, in his fifth critique "How Do We Acquire Knowledge?", he explained in detail the two main schools of thought (Rationalism and Empiricism) each in a separate paragraph. Through the essay he analyzed both sides of the argument then he concluded with this statement "Empirical data can be used to confirm rational ideas and vice versa". The final statement showed clearly that he did not just pick a side and argue about it, instead he opened his mind for both sides and tried to make a reasonable conclusion. That matches most of the skills he mentioned in his post-mini writing.

Also, in the seventh critique “How Differing Religious Views Enrich Society?” he came up with the key point of CT “If we understand each other’s beliefs, we will understand ourselves better”.

In addition, in his ninth essay “Gender Diversity in a Group Setting” he presented his experience and acknowledged his lack of information saying “Having personally worked in the male dominated construction industry. I can say that the lack of diverse perspectives had, at times, limited our ability to accomplish goals in a more dynamic way.” After this directly he explained how to come up with the right solution “Simply put, the more varying perspectives you have conceded with a specific issue, the more likely you will be able to come up with a novel solution”. Moreover, he supported his ideas by presenting specific studies that confirm the points he arguing about “One such study from Harvard Kennedy school shows that”

Therefore, in his tenth essay he emphasized the importance of experience to make the most of our time “It is essential to seek novel experiences in order to make the most of our time and...”.

In his 12th critique “What is Beauty?” BE concluded his essay by saying “The fact that we do not all have a shared perception of what is beautiful should not deter us from sharing and celebrating it.” in this statement he demonstrated the necessity of accepting each other even if we are different as he mentioned in his post mini writing.

3.4.2. Case BR:

Her earlier critiques were mostly presenting ideas from the readings or explaining the professors' points of view. For instance, her first critique just presented Mill and Plato's ideas without any questioning of them, or even presenting her own ideas.

After several of weeks, she started picking up the idea of critical thinking and she tried to apply it in her assignments. In the critique of "Was Galileo the progenitor of science?", she showed some analytical and reasoning skills. For example, she gave reasons from her perspective about why Galileo drew condemnation. In addition she has criticized Galileo's book "Dialogue" because it lacked the evidence to support his claims by saying, "he did not include his observations made with his telescope".

Furthermore, in her critique of "What is Addiction?" she evaluated different perspectives of the issue, then she identified the errors that they made as in, "The problem with either approaches - psychology and philosophy/ theology - is that both try to find "the" cause of addiction, without considering individual differences". Here she applied one of the skills that she mentioned in her post mini writing which is to consider different perceptions.

A critical thinker always tries to determine if the ideas and the arguments present the entire picture; and that is what she successfully did in her critique "A place for the divine" (Religion). She considered other people and their ideas on the issue and presented

the issue in a fair way, then she concluded “There [is] a chance to better understand the other, to highlight how different religions are more alike than different”.

Additionally, in “Is love merely biology?” she questioned the professor’s statement, “this claim raises several questions and inquiry into human behaviour ...”. This showed the fundamental skill of critical thinking, which is the ability to question which she mentioned in the post mini writing. At the end, she concluded by stating her own perspective about the issue, and she gave logical reasons for that.

Moreover, her essay “Feminism and its critics” is considered to be one of her best assignments because she showed some essential skills of critical thinking. She started it with presenting multiple claims of women participating in the STEM, then she questioned these claims and analyzed the whole situation with examples from her observations. In the end, she discussed the possible solutions to this disparity.

3.4.3. Case LE:

His ideas at the beginning were not that clear; he could not deliver them in the right way. However, the student showed a quick improvement in his work in terms of critical thinking.

In the essay “The reasons for untrue knowledge” he had a whole paragraph explaining and criticizing the Aristotelian model, he tried to analyze and understand the

model and its aspects. He defined critical thinking in the post interview: “Critical thinking is the ability to decipher and understand information both factual and biased”.

One feature of critical thinking is to analyze the issue from different angles and to consider both sides of it. LE applied this feature on his essay “Addiction as a moral failing: the behaviourist scope” he started his critique by writing “both statements on the nature of addiction reveal important insights on the issue...”. Then he analyzed both of them separately. And he concluded by stating his perspective about addiction.

Additionally, in the essay “Beginnings of a transhumanist manifesto” he began with explaining the issue and after that he started questioning. He even presented the problems by saying “the problems are obvious: what are we to do with the remains of an old way of conceptualizing our live? Identifying the problem is a fundamental key of critical thinking”.

More importantly, his way of presenting the issue changed drastically. He started using his own experience of the issue; he gave examples and stories from his life that related to the discussion. For example, he began “The expression of love: from causality to experience” with a story that happened to him and his friend Joseph. Then he stated the argument and started evaluating the argument from different angles.

3.4.4. Case TE:

The student asked many questions in his assignments through the semester and tried to evaluate, analyze, and explain them; and these are the skills he mentioned in post mini writing. For instance, he named one of his essays “Are Nobel Prizes biased against woman?” he got the idea from the class of Quantum Mechanics. In this essay, he started with the questions then provided some statistics after that he began to evaluate and explain the issue from different angles. This is exactly how he defined critical thinking in the mini writing.

Additionally, in the essay “Can science lie?” he was questioning the information and the sources in term of scientific knowledge. He tried to analyze the way that people deal with science and how they interpret the data. He mentioned that we could have the accurate data that is manipulated to obtain inaccurate conclusions. In this essay, he showed questioning, analysis, evaluation, interference and explanation.

In “The fight for Time”, he divided his essay into three paragraphs. The first one was a presentation of the dilemma, the second paragraph was analysis and explanation, and in the third one, he proposed a logical reasonable solution. Additionally, he provided some examples through this essay. This essay was organized and exhibited some of critical thinking skills.

3.4.5. Case DA:

In her 4th essay “The historiography of scientific knowledge and Galileo”, she divided the essay three paragraphs. The first one was an introduction where she presented the argument that she will discuss in this essay by saying “I will argue that Galileo’s recognition as a scientific hero relies on our modern scientific standards”. Then in the second paragraph, she analyzed the Galileo era and the third one was about modern scientific standards. Throughout the essay she evaluated both sides of the discussion; we could link this to her second mini writing and the way she explained the critical thinking. She wrote all her late essays in the same way. This relates to her mini writing when she said analyzing, reflecting and considering different sides.

In addition, she tried to infer in many of her essays. For example, in her 7th essay “Technology” she presented facts about how many people were killed by the nuclear bomb in Hiroshima in 1945. Also, she shared her own experience as inference in the essay about Beauty; she talked about a course that she had and brought examples from that particular course.

She mentioned in the interview that when she knows the topic very well, she could construct a better argument. This is manifested in the essay concerning “Feminism” which is her area of study. She wrote one of her best essays during the course; she presented the issue then started to explain, evaluate, and analyze all the aspects of the topic from different angles. Also, she provided inferences when it is needed through the essay.

3.4.6. Case GR:

Despite the fact that his answers in the interviews showed that he did not believe that the course had any impact in his way of thinking or argumentative skills. His critiques improved through the semester in different ways.

His first couple of essays did not show any questioning or analyzing; even his grade was not that good. However, after that his way of writing changed gradually to become more accurate and to involve critical thinking skills.

In the essay concerning “Science or Pseudoscience?”, he started with questioning by saying” How are we to know that our scientific beliefs are correct?. Then he divided the essay into two paragraphs to analyze the answer from two different angles. This relates to his new definition of critical thinking.

One of the skills that he mentioned in his post-mini writing is open to new ideas; and that is what he wrote about in this essay: “Does it matter that quantum mechanics is weird?”. He wrote” I believe that it is still hugely important for people to know these things”. Also, his writing showed an open mind and how he accepts other ideas like when he wrote in the essay concerning Religion: “ Of course people can believe whatever they want”. Then he emphasized that all the evidence needs to be examined by saying “ Any belief, including religion should be rigorously examined”.

Likewise, he showed improvements in other critical thinking skills rather than the ones he mentioned in the mini writing. For example, in the essay “Should we fear technological advancement?” he identified the problem then started analyzing all the aspects of it from different angles.

3.5. The similarities and the differences between undergraduate students conceptions of critical thinking at the start and end of the course:

3.5.1 Case 1 BE vs Case 2 BR :

Table 3.1 : Case 1 BE vs Case 2 BR

	Pre- interview	Post-Interview
Case 1 BE	Critical thinking: analysis, a good way to be informed, considering both sides of the issue, a skill which our society lacks.	<p>Ability - To analyze, deliberate on a specific topic.</p> <ul style="list-style-type: none"> -To look at things from many perspectives. -To be skeptical of information provided, to not simply take something at face value. -To give reasonable justifications for your beliefs. -To investigate claims.
Case 2 BR	<p>Critical thinking: *To question my beliefs, convictions, what are the foundations or core principles that support my opinions. *To question arguments made by either myself or others.</p> <p>*To not believe everything I see/read/ hear, simply because of the authority or because I agree with the claim also known as to be cynical of any claims made about whatever subject.</p> <p>The goal of critical thinking is to not be dupe by “phony” claims made by others and to live a life as true to my principles (myself, my values) as possible (i.e to not hold opinions or beliefs that are in contradiction with my values).</p>	<p>Critical thinking: - Question my assumptions, beliefs, positions on several topics.-Check my biases, prejudices, ‘gaps’ in my knowledge.</p> <ul style="list-style-type: none"> -Be willing to be open to different perception, takes on a subject.-If I become defensive to someone’s opinion, I should question why their position angered me, what components are the basis of their opinion (components that I might have over looked or been ignorant of). -Overall, critical thinking is still meant to be used to make claims based on solid arguments, but to be open to different interpretations that might contradict my positions so as to learn new information and/or perceptions that I might not have known, in order to build a better, more solid argument.

	Pre- interview	Post-Interview
Differences	<p>BE has a simple view where he names only three skills of CT without any description. The skills he mentions:</p> <ol style="list-style-type: none"> 1- Analysis. 2- Open mindedness. <p>BR has a well-developed description. She explains the skills in details and gives examples for each one. The skills she points out:</p> <ol style="list-style-type: none"> 1- Questioning. 2-Skepticism. 	<p>BE is now more developed but still not as much as BR; he points out five skills of CT which covers the main components of CT. The skills he mentions:</p> <ol style="list-style-type: none"> 1-Skepticism. 2-Reasoning. <p>BR conception of CT is even more developed than in her pre-interview; she indicated the most important skill of CT with examples. The skills she mentions:</p> <ol style="list-style-type: none"> 1-Check biases.
Similarities	No similarity.	<p>Both of the students now gain a better insight of CT. They mention more skills than in the pre-interview with enough explanation and examples. The skills they both mention:</p> <ol style="list-style-type: none"> 1-Questioning. 2-Open mindedness. 3-Analysis.

For the rest of the comparisons see (Appendix B)

3.6. Analyzed Data of the critique (Non-Interviewed students):

By looking at these students, who were chosen randomly, it shows that in general the students had different levels of CT at the beginning, they all ended up with some improvements in term of CT skills. All these students developed their CT skills throughout the semester in different ways. The skills are found in most of their critiques are questioning, analyzing and being open-minded.

3.6.1. Case DH:

Most of his critique writings earlier in the semester showed that he was primarily presenting and explaining the issue from two different angles but without any analysis or evaluation. However, around the middle of the semester, his critiques became more coherent and much clearer. For example, in his sixth essay about addiction; he presented different views about the issue and tried to analyze each view separately.

Additionally, the seventh essay about technology contains questioning and analyzing. For example, “It is also time for us to start questioning the process by which our health data is acquired, stored and employed”.

More importantly, in his critique (Expanding the Debate About God), he was open to other opinions. He wrote, “I do not personally believe in god, but remain open to hearing arguments and am generally interested in learning from the debate between the two sides, believers and non-believers”.

3.6.2.Case SL:

She started the semester with simple essays, then gradually improved her critiques. In the seventh essay, she began with this question “ Is technology more beneficial or detrimental to society?” Then she analyzed both sides of the issue in details.

In the essay (What Love Is?), she tried to look at this question from different aspects. She wrote four paragraphs to cover the topic. This essay was thoughtful and she got an A.

Furthermore, she developed research skills since her late essays toward the end of the semester contained some statistical facts. For instance, in the tenth essay, she indicated “Looking through a statistical point of view”.

3.6.3. Case MB:

Most of his critique writings earlier in the semester showed that he was only presenting and explaining the issue from two different views without any analysis or evaluation. However, by the sixth week, he grasped the idea of the critique. In the essay of (Addiction: Habit or Disease?), he questioned the issue and analyzed from different angles.

Additionally, he developed research skills since he indicated some studies in his late essays in the semester. For instance, in the essay of Capitalism and Us, he indicated “This week a study was released stating”.

3.6.4. Case NA:

The student showed a quick improvement in terms of her writing. By the fourth essay, she started questioning and analyzing not only her ideas but also the ideas which were

introduced in the class. For example, In the eighth essay, she wrote: “Could such varying interpretations of God influence a curious individual into potentially never finding the true meaning that best fits their lifestyle?”. Then she analyzed the issue from different perspectives.

Besides, she adapted more of CT skills like open-mindedness and research skills. In the essay of feminism, she was open to different points of view and she analyzed it on account of these perspectives.

3.6.5 Case EO:

EO had some CT skills from the beginning of the semester because of this he was able to improve his critiques in a short time. From the third essay, he started questioning, analyzing, accepting different points of view.

For example, in the essay about Addiction, he presented four opinions about addiction and then analyzed them separately and understood the differences between them. Furthermore, his essay of (Is Love Merely Anything?) he questioned his ideas about love and another idea which was introduced in the lecture. He was successfully able to analyze the topic taking into account others opinions.

3.6.6. Case CM:

At the beginning, CM found some difficulty adapting CT skills in her writing; however, she began to question and analyze hers and others opinion before the seventh essay.

In one of her essays (What is Beauty?), she presented some ideas about beauty using her ideas or other derived from the class discussion. Then, she analyzed them separately and neutrally; she was open-minded and accepted different ideas.

3.7. TA's Interviews:

3.7.1. First TA's Interview:

The TA liked the class in general; she said it is different because of the interdisciplinary aspect; It is special to see different professors from different departments interact with each other.

About the benefits that students gained she explained that class discussion has felt intimate and helped students to engage with the material more actively. In addition, It forces them to be more reflexive in their assimilation of the material.

More importantly, she believed the course has helped in improving student CT skills and one of the students said this to her explicitly. Moreover, she stated that the class has changed some of the students' ideas and opinions about the world. She explained “certainly for students who were, maybe, at the science college, not really used to, or not really in the habit of engaging with the social sciences or the humanities”.

She noticed positive changes in the students' assignments through the semester and she emphasized that they use the class discussion to write their one-page essay correctly. She gave an example "One woman told me that she would start rough drafting her essay in class once she understood that this is not the kind of course where there's going to be any kind of quizzes or exams, that the essays are the centre of the course. She would immediately come into class with the mindset of, "I have to produce an essay." They would already start thinking in that kind of mode in class, which I think is good and interesting".

3.7.2. Second TA's Interview:

The TA described the course "It is an innovative course which designed to accommodate students in variety of discussions including philosophy, science, politics... I think the idea was successful to have students' attention and tickle their curiosity! Almost all the students were participating in debates after the first two weeks".

She emphasized that the interesting aspect was to make students think about an idea from different perspectives since in every week there were two professors from different departments discussing a particular concept and giving students different way of thinking about the same idea.

About the benefits that students gained she explained having students listening to a lecture is good but having them thinking and challenging them to reflect on the lessons is the key to have them perceive an idea fully. Additionally, she believed the course has

helped in improving student CT skills. Also, she stated that the class could change some of the students' ideas and opinions about the world.

Furthermore, she has seen some changes in the students' assignments through the semester and she emphasized that they use the class discussion to write their one-page essay correctly.

3.8. Overview:

This section is the overview of the previous sections (3.1,3.2, 3.3,3.4,3.5 and 3.6). Table 3.1 is the summary of the analyzed data of the interviewed students; Table 3.2 is the summary of the analyzed data of the mini writings; Table 3.3 is the summary of the analyzed data of the written assignments (critique); Table 3.4 is a comparison of the analyzed data of the written assignments for interviewed vs non-interviewed students.

Summary of the Interviews:

Case	Beginning of the course	End of the course
BE	<ol style="list-style-type: none"> 1. He expected the course could improve his CT skills. 2. He believed the course might positively affect his daily life. 3. He acknowledged that he did not have argumentative skills. 	<ol style="list-style-type: none"> 1. The course met his expectations. 2. The course had an impact on his daily life and his ideas. 3. He showed an accurate knowledge of CT skills.
BR	<ol style="list-style-type: none"> 1. She expected to get new perspectives on different subjects. 2. She thought the course could change her ideas and opinions about the world. 3. She had some knowledge about argumentative skills and CT. 	<ol style="list-style-type: none"> 1. She was happy that she took it and she got a better appreciation between the interactions of humanities and science. 2. The course changed her ideas and opinions about the world. 3. Her conception of CT and argumentative skill improved.
LE	<ol style="list-style-type: none"> 1. He expected to approach a variety of subjects, reevaluate new evidences and gain knowledge about some issues. 2. He was not sure that the class would have any impact in his daily life. 3. He thought the course might help improve CT skills. 	<ol style="list-style-type: none"> 1. He said “the class was a good experience”. 2. The course made him question his ideas and opinions about the world. 3. He showed an accurate knowledge of CT skills.
TE	<ol style="list-style-type: none"> 1. He thought the class would provide a healthy confrontation. 2. He did not think that the class could change his ideas and opinions about the world. 3. He had some knowledge about argumentative skills and CT. 	<ol style="list-style-type: none"> 1. He was disappointed because the debates aspect did not reach its full potential. However, he thought the class in general was interesting. 2. He emphasized that the class did not have any impact in his daily life. 3. He showed proper knowledge of CT skills.

Case	Beginning of the course	End of the course
AD	<ol style="list-style-type: none"> 1. She thought the course would put people from different departments together and engage in discussions. 2. She believed the course could change her ideas and opinions about the world. 3. She had some knowledge about argumentative skills and CT. 	<ol style="list-style-type: none"> 1. She faced difficulty writing critique because it is completely different way of writing than English literature essays. 2. The course changed her ideas and opinions about the world. 3. She believed the course improved her written CT skills since she is not very vocal.
GR	<ol style="list-style-type: none"> 1. He expected the course to have heavy discussions. 2. He thought that course could change his ideas and opinions. 3. He had some knowledge about argumentative skills and CT. 	<ol style="list-style-type: none"> 1. He explained that the course wasn't quite what he expected. 2. He thought the discussions and the course in general did not make him question or reconsider his beliefs. 3. He did not think that the course improved his CT or argumentative skills.

Table 3.2: summary of the analyzed data of the interviewed students.

The table presents the students' answers about the course in general. Four students out of six believed the course changed their ideas and opinions about the world. However, the two students ; TE and GR who said the course did not have any impact on their ideas, showed an improvement in their CT skills on the mini writing and the critiques.

Summary of the Mini Writing :

Table 3.3: summary of the analyzed data of the mini writings.

Pre-interviews:	Post-interviews:
<ol style="list-style-type: none"> 1. One student could not provide a definition at all. 2. Most of the students had a simple and incomplete conception about CT. 3. They did not indicate any examples or further details except BR. 4. They mentioned two skills of CT maximum. 	<ol style="list-style-type: none"> 1. All the students succeeded in providing an accurate definition of CT. 2. They all provided at least four fundamental skills of CT . 3. All of them wrote more than in the pre-interviews with enough details and examples except AD . 4. Five students mentioned Questioning. 5. Five students mentioned Open-mindedness.

As the table shows all the students started the course with a simple incomplete conception of CT. They all wrote a short paragraph of 60 words to answer the question; except BR who wrote 106 words. They did not give any examples or details.

However, in the post interviews, they succeeded in providing a more accurate definition of CT with enough details and explanation. All of the six students wrote a longer answer to the question except AD. AD wrote a short but very accurate conception; the reason why her answers short was that she was in a hurry on the day of the interview.

Summary of One Page Essay (Critique) :

CASE	CT SKILLS AT THE BEGINNING	IMPROVED CT SKILLS AT THE END
BE	LITTLE	YES
BR	MEDIUM	YES
LE	MEDIUM	YES
TE	MEDIUM	YES

CASE	CT SKILLS AT THE BEGINNING	IMPROVED CT SKILLS AT THE END
AD	MEDIUM	YES
GR	LITTLE	YES

Table 3.4: summary of the analyzed data of the written assignments (critique).

All the participants showed an improvement in the CT skills through the semester. Most of their first essays were regular essays; just presenting the issue. After some time they started presenting the issue with questioning, analyzing and open mindedness. There are some examples of the students' writing in The Data Analysis of the Critique.

Summary the Comparison of the Analyzed Data of the critique between Non-Interviewed students VS Interviewed students:

Table 3.5: comparison of the analyzed data of the written assignments for interviewed vs non-interviewed students.

INTERVIEWED CASES	CT SKILLS AT THE BEGINNING	IMPROVED CT SKILLS AT THE END
BE	LITTLE	YES
BR	MEDIUM	YES
LE	MEDIUM	YES
TE	MEDIUM	YES
AD	MEDIUM	YES
GR	LITTLE	YES
NON-INTERVIEWED CASES	CT SKILLS AT THE BEGINNING	IMPROVED CT SKILLS AT THE END
HD	MEDIUM	YES
SL	LITTLE	YES
MB	LITTLE	YES
NA	LITTLE	YES
EO	MEDIUM	YES
CM	LITTLE	YES

By looking at these samples which were chosen randomly, it shows that the six cases in this study are representative of the class in general. All these students developed their CT skills throughout the semester in different ways. The skills that found in most of their critiques are questioning, analyzing and being open-minded.

Chapter 4: Conclusions and summaries:

Flipped classrooms in general have helped students in different ways to achieve various of goals. And this class in particular and its pedagogical activities has been

shown to positively change students CT skills: no comparison to traditional teaching was done in this study.

Again, the purpose of this study was to examine the capability of a flipped classroom in improving students' Critical Thinking (abbreviated as CT) skills. By answering this question: What are the changes that occurred to students' critical thinking skills throughout the course as active learners? Specifically what are the changes that occurred to students' critical thinking skills throughout the course?

The interviews with the participants as well as the results of their writing products have clearly shown advantages to the use of flipped classrooms in improving students' Critical Thinking skills. The combination RW, Critique and all in class discussion were effective in improving students' critical thinking skills.

First: Summary of the Interviews:

Table 4.1: Summary of the Interviews

Case	Beginning of the course	End of the course
BE	<ol style="list-style-type: none"> 1. He expected the course could improve his CT skills. 2. He believed the course might positively affect his daily life. 3. He acknowledged that he did not have argumentative skills. 	<ol style="list-style-type: none"> 1. The course met his expectations. 2. The course had an impact on his daily life and his ideas. 3. He showed an accurate knowledge of CT skills.
BR	<ol style="list-style-type: none"> 1. She expected to get new perspectives on different subjects. 2. She thought the course could change her ideas and opinions about the world. 3. She had some knowledge about argumentative skills and CT. 	<ol style="list-style-type: none"> 1. She was happy that she took it and she got a better appreciation between the interactions of humanities and science. 2. The course changed her ideas and opinions about the world. 3. Her conception of CT and argumentative skill improved.
LE	<ol style="list-style-type: none"> 1. He expected to approach a variety of subjects, reevaluate new evidences and gain knowledge about some issues. 2. He was not sure that the class would have any impact in his daily life. 3. He thought the course might help improve CT skills. 	<ol style="list-style-type: none"> 1. He said “the class was a good experience”. 2. The course made him question his ideas and opinions about the world. 3. He showed an accurate knowledge of CT skills.
TE	<ol style="list-style-type: none"> 1. He thought the class would provide a healthy confrontation. 2. He did not think that the class could change his ideas and opinions about the world. 3. He had some knowledge about argumentative skills and CT. 	<ol style="list-style-type: none"> 1. He was disappointed because the debates aspect did not reach its full potential. However, he thought the class in general was interesting. 2. He emphasized that the class did not have any impact in his daily life. 3. He showed proper knowledge of CT skills.

Case	Beginning of the course	End of the course
AD	<ol style="list-style-type: none"> 1. She thought the course would put people from different departments together and engage in discussions. 2. She believed the course could change her ideas and opinions about the world. 3. She had some knowledge about argumentative skills and CT. 	<ol style="list-style-type: none"> 1. She faced difficulty writing critique because it is completely different way of writing than English literature essays. 2. The course changed her ideas and opinions about the world. 3. She believed the course improved her written CT skills since she is not very vocal.
GR	<ol style="list-style-type: none"> 1. He expected the course to have heavy discussions. 2. He thought that course could change his ideas and opinions. 3. He had some knowledge about argumentative skills and CT. 	<ol style="list-style-type: none"> 1. He explained that the course wasn't quite what he expected. 2. He thought the discussions and the course in general did not make him question or reconsider his beliefs. 3. He did not think that the course improved his CT or argumentative skills.

The table presents the students' answers about the course in general. Four students out of six believed the course changed their ideas and opinions about the world. However, the two students ; TE and GR who said the course did not have any impact on their idea, showed an improvement in their CT skills on the mini writing and the critiques.

Second: Summary of the Mini Writing:

Pre-interviews:	Post-interviews:
<ol style="list-style-type: none"> 1. One student could not provide a definition at all. 2. Most of the students had a simple and incomplete conception about CT. 3. They did not indicate any examples or further details except BR. 4. They mentioned two skills of CT maximum. 	<ol style="list-style-type: none"> 1. All the students succeeded in providing an accurate definition of CT. 2. They all provided at least four fundamental skills of CT . 3. All of them wrote more than in the pre-interviews with enough details and examples except AD . 4. Five students mentioned Questioning. 5. Five students mentioned Open-mindedness.

Table 4.2: Summary of the Mini Writing

As the table shows all the students started the course with a simple incomplete conception of CT. They all wrote a short paragraph around 60 words to answer the question; except BR who wrote 106 words. They did not give any examples or details.

However, in the post interviews, they succeeded in providing a more accurate definition of CT with enough details and explanation. All of the six students wrote a longer answer to the question except AD. AD wrote a short but very accurate conception; the reason why her answers short was that she was in a hurry on the day of the interview.

Third: Summary of One Page Essay (Critique) :

Table 4.3: Summary of t One Page Essay (Critique)

CASE	CT SKILLS AT THE BEGINNING	IMPROVED CT SKILLS AT THE END
BE	LITTLE	YES
BR	MEDIUM	YES
LE	MEDIUM	YES
TE	MEDIUM	YES
AD	MEDIUM	YES
GR	LITTLE	YES

All the participants showed an improvement in the CT skills through the semester. Most of their first essays were regular essays; just presenting the issue. After some time, they started presenting the issue with questioning, analyzing and open mindedness. There are some examples of the students' writing in The Data Analysis of the Critique.

Appendix A

Recruitment Letter

Dear Science College/ Liberal Art college students registered in (SCOL 398/ LBCL 298),

I am a graduate physics student at Concordia University completing a thesis under the supervision of Dr. Calvin Kalman. I am talking to you today in order to encourage you to participate in my research. SCOL 398/ LBCL 298 is a special course that designed by Liberal Arts College and Science College. We are very interested in investigating how this non-traditional course could improve your critical thinking and argumentative skills. In order to conduct this study, I need to observe the class weekly, to examine your reflective writing and essays after they have been graded, and to interview some students face to face. The interviews will be at the beginning and the end of the fall semester. The interview will last approximately forty minutes and will remain confidential.

If you are interested in taking part in the interview and you are 18 years old or older or prefer NOT to participate at all in the study, please contact me by email at norah-alodiby@hotmail.com

Please note that your course grade will not be affected in any way.

Thank you,
Norah Alodiby.

Appendix B Comparisons

3.5.2. Case 1 BE vs Case 3 LE :

	Pre- interview	Post-Interview
Case BE	Critical thinking: analysis, a good way to be informed, considering both sides of the issue, a skill which our society lacks.	<p>Ability - To analyze, deliberate on a specific topic.</p> <ul style="list-style-type: none"> -To look at things from many perspectives. -To be skeptical of information provided, to not simply take something at face value. -To give reasonable justifications for your beliefs. -To investigate claims.
Case LE	Critical thinking: a skill that is both praised and discouraged. We have the bad habit of looking up to the dead mavericks while ignoring the living. Ostensibly, critical thinking seems to be highly desirable, but often, when pushed toward criticizing the axiomatic values of our contemporary society, this becomes less desirable.	Critical thinking is the ability to decipher and understand information both factual and biased in ways that take to account its fallibility, no matter the type of information, to practice critical thinking is to critique it, in order to get a better grasp of what you lack when absorbing 'sad' info. It must be practiced and must be done not only to outside sources but also to ourselves.
Differences	<p>BE has a simple view where he names only three skills of CT without any description. The skills he considers:</p> <ol style="list-style-type: none"> 1-Analysis. 2-Open mindedness. <p>LE does not provide a definition of CT he just explains the need for critical thinking in general.</p>	<p>BE points out five skills of CT which covers the main components of CT. The skills he mentions:</p> <ol style="list-style-type: none"> 1-Skepticism. 2-Reasoning. 3-Questioning. <p>LE now has a clear picture of CT; he provides a proper definition where he names four skills of CT. He mentions:</p> <ol style="list-style-type: none"> 1-Understanding sources and ourselves. 2-Fallibility.

	Pre- interview	Post-Interview
Similarities	Both of them do not provide proper description.	Both of the students show a better development in their perception of CT. They both mention: 1-Analysis. 2-Open minded.

3.5.3. Case 1 BE vs case 4 TE:

	Pre- interview	Post-Interview
Case BE	Critical thinking: analysis, a good way to be informed, considering both sides of the issue, a skill which our society lacks.	Ability - To analyze, deliberate on a specific topic. -To look at things from many perspectives. -To be skeptical of information provided, to not simply take something at face value. -To give reasonable justifications for your beliefs. -To investigate claims.
Case TE	Asking questions, challenge opinions, confrontation, conflict, exchange of point of views , question sources of information and self-aware.	Critical thinking: Different opinions, diverging scrutiny and questioning self-information". When asked about critical thinking: "I immediately think about questioning the information we are presented and making our own research of the information and often determining a stance that concords to our values and what we know about the subject.
Differences	BE has a simple view where he names only three skills of CT without any description. The skills he mentions: 1-Analysis. TE just mentions a few skills without any details. He focuses on: 1-Questioning.	BE points out five skills of CT which covers the main components of CT. He mentions: 1- Analysis. 2- Skepticism. TE provides a proper definition of CT and gives acceptable explanation. The skills he points out: 1-Research. 2-Judgment.

	Pre- interview	Post-Interview
Similarities	Both of them wrote a simple perspective of critical thinking. The skills they both mention: 1-Open mindedness.	Both of them gain a better perspective of CT and they both indicate more skills and explanation than their previous interviews. The skills they both mention: 1-Questioning. 2-Open mindedness. 3-Reasoning.

3.5.4. Case 1 BE vs case 5 AD:

	Pre- interview	Post-Interview
Case BE	Critical thinking: analysis, a good way to be informed, considering both sides of the issue, a skill which our society lacks.	Ability - To analyze, deliberate on a specific topic. -To look at things from many perspectives. -To be skeptical of information provided, to not simply take something at face value. -To give reasonable justifications for your beliefs. -To investigate claims.
Case AD	Critical thinking: Think of the material thoughtfully, carefully, to analyze the words said or written, to understand different positions of an argument, to think without bias of one’s beliefs , opinions, to engage with the material and its ideas, to be a part of the discussion, as would be the case in a philosophical argument or any type for that matter. Of course to be able to criticize the content and understand the positive and negative elements of it.	Reflecting about the way you think; thinking about your thinking. Being able to hear all sides of an argument and process the information as open-minded as you can.

	Pre- interview	Post-Interview
Differences	<p>BE has a simple view where he indicates three skills of CT without any description. AD has a more complete description where she provides enough details. She points out:</p> <ol style="list-style-type: none"> 1-Check biases. 2-Engage in discussions. 	<p>BE has a more complex and detailed conception than his first interview. He mentions:</p> <ol style="list-style-type: none"> 1-Analysis. 2-Skepticism. 3-Reasoning. 4-Questioning. <p>AD has shorter version than her 1st interview with less details. Although she writes “thinking about your thinking” which is a metacognitive skill. The skills she mentions:</p> <ol style="list-style-type: none"> 1- Reflecting. 2- A metacognitive skill
Similarities	<p>AD’s description of CT is more complete comparing to BE’ description. They both mention:</p> <ol style="list-style-type: none"> 1-Analysis. 2-Open mindedness. 	<p>BE provides a better definition and exceeds AD. Both mention:</p> <ol style="list-style-type: none"> 1-Open mindedness. 2-Questioning.

3.5.5. Case1 BE vs Case 6 GR:

	Pre- interview	Post-Interview
Case BE	<p>Critical thinking: analysis, a good way to be informed, considering both sides of the issue, a skill which our society lacks.</p>	<p>Ability - To analyze, deliberate on a specific topic.</p> <ul style="list-style-type: none"> -To look at things from many perspectives. -To be skeptical of information provided, to not simply take something at face value. -To give reasonable justifications for your beliefs. -To investigate claims.

	Pre- interview	Post-Interview
Case GR	Rationality, skepticism, examining what one hears and examining one's own beliefs for validity.	Thinking analytically, questioning assumptions, examining evidence, keeping an open mind. Open to new ideas, trying to see where the other side is coming from, but doubting claims made without any evidence.
Differences	BE has a simple description; he indicates only three skills of CT without any description. The skills he mentions: 1-Analysis. 2-Open mindedness. GR mentions only three skills of CT without any details. He says: 1-Rationality. 2-Skepticism. 3-Examining information.	BE is now more developed. He points out five skills of CT which covers the main components of CT. The skills he mentions: 1-Skepticism. 2-Reasoning. GR shows an improvement in his vision of CT. He provides more skills and details. GR points out: 1-Examining evidences.
Similarities	Both of them have a simple description of critical thinking.	Both of them have more developed description than in pre-interviews. They both name the fundamental skills of CT. The skills they both indicate: 1-Questioning. 2-Analyzing. 3- Open mindedness.

3.5.6. Case 2 BR vs Case 3 LE

	Pre- interview	Post-Interview
Case 2 BR	<p>Critical thinking: *To question my beliefs, convictions, what are the foundations or core principles that support my opinions.</p> <p>*To question arguments made by either myself or others.</p> <p>*To not believe everything I see/ read/hear, simply because of the authority or because I agree with the claim also known as to be cynical of any claims made about whatever subject.</p> <p>The goal of critical thinking is to not be dupe by “phony” claims made by others and to live a life as true to my principles (myself, my values) as possible (i.e to not hold opinions or beliefs that are in contradiction with my values).</p>	<p>Critical thinking: - Question my assumptions, beliefs, positions on several topics.-Check my biases, prejudices, ‘gaps’ in my knowledge.</p> <p>-Be willing, open to different perception, takes on a subject.-If I become defensive to someone’s opinion, I should question why their position angered me, what components are the basis of their opinion (components that I might have over looked or been ignorant of).</p> <p>-Overall, critical thinking is still meant to be used to make claims based on solid arguments, but to be open to different interpretations that might contradict my positions so as to learn new information and/or perceptions that I might not have known, in order to build a better, more solid argument.</p>
Case 3 LE	<p>Critical thinking: a skill that is both praised and discouraged. We have the bad habit of looking up to the dead mavericks while ignoring the living. Ostensibly, critical thinking seems to be highly desirable, but often, when pushed toward criticizing the axiomatic values of our contemporary society, this becomes less desirable.</p>	<p>Critical thinking is the ability to decipher and understand information both factual and biased in ways that take to account its fallibility, no matter the type of information, to practice critical thinking is to critique it, in order to get a better grasp of what you lack when absorbing ‘sad’ info. It must be practiced and must be done not only to outside sources but also to ourselves.</p>

	Pre- interview	Post-Interview
Differences	<p>BR has more detailed perception about critical thinking than LE. The skills he mentioned: 1-Questioning. 2-Skepticism. LE does not give a definition of CT. He just explained the need for CT in general.</p>	<p>BR's conception of CT is even more developed than in her pre-interview; she indicates the most important skill of CT with examples. The skills she mentions: 1-Open mindedness. 2-Check my biases. 3-Questioning. LE now has a clear picture of CT; he provides a proper definition where he indicates four skills of CT. He mentioned: 1-Fallibility. 2-Analysis. 3-Understanding information.</p>
Similarities	No similarity.	Both of them have written a developed description of CT with acceptable explanation.

3.5.7. Case 2BR vs case 4TE:

	Pre- interview	Post-Interview
Case 2 BR	<p>Critical thinking: *To question my beliefs, convictions, what are the foundations or core principles that support my opinions.</p> <p>*To question arguments made by either myself or others.</p> <p>*To not believe everything I see/ read/hear, simply because of the authority or because I agree with the claim also known as to be cynical of any claims made about whatever subject.</p> <p>The goal of critical thinking is to not be dupe by “phony” claims made by others and to live a life as true to my principles (myself, my values) as possible (i.e to not hold opinions or beliefs that are in contradiction with my values).</p>	<p>Critical thinking: - Question my assumptions, beliefs, positions on several topics.-Check my biases, prejudices, ‘gaps’ in my knowledge.</p> <p>-Be willing, open to different perception, takes on a subject.-If I become defensive to someone’s opinion, I should question why their position angered me, what components are the basis of their opinion (components that I might have over looked or been ignorant of).</p> <p>-Overall, critical thinking is still meant to be used to make claims based on solid arguments, but to be open to different interpretations that might contradict my positions so as to learn new information and/or perceptions that I might not have known, in order to build a better, more solid argument.</p>
Case 4 TE	<p>Asking questions, challenge opinions, confrontation, conflict, exchange of point of views , question sources of information and self-aware.</p>	<p>Critical thinking: Different opinions, diverging scrutiny and questioning self-information”. When asked about critical thinking: “I immediately think about questioning the information we are presented and making our own research of the information and often determining a stance that concords to our values and what we know about the subject.</p>

	Pre- interview	Post-Interview
Differences	<p>BR has a detailed perception about CT. She explains the skills in details and gives examples. The skills she points out:</p> <p>1-Skepticism.</p> <p>TE has written a simple description of CT focused on:</p> <p>1-Open mindedness.</p>	<p>BR's conception of CT is even more developed than in her pre-interview; she indicates the most important skill of CT with examples. The skills she mentions:</p> <p>1-Check my biases.</p> <p>TE provides a proper definition of CT and gives acceptable explanation. The skills he points out:</p> <p>1-Research.</p> <p>2-Judgment.</p>
Similarities	<p>The skills they both mention:</p> <p>1-Questioning.</p>	<p>Both of them gain a better perspective of CT and they both write more skills and explanation than their previous interviews. The skills they both mention:</p> <p>1-Open mindedness.</p> <p>2-Questioning.</p>

3.5.8. Case 2 BR vs case 5 AD

	Pre- interview	Post-Interview
Case 2 BR	<p>Critical thinking: *To question my beliefs, convictions, what are the foundations or core principles that support my opinions. *To not believe everything I see/ read/hear, simply because of the authority or because I agree with the claim also known as to be cynical of any claims made about whatever subject. The goal of critical thinking is to not be dupe by “phony” claims made by others and to live a life as true to my principles (myself, my values) as possible (i.e to not hold opinions or beliefs that are in contradiction with my values).</p>	<p>Critical thinking: - Question my assumptions, beliefs, positions on several topics.-Check my biases, prejudices, ‘gaps’ in my knowledge.</p> <p>-Be willing, open to different perception, takes on a subject.-If I become defensive to someone’s opinion, I should question why their position angered me, what components are the basis of their opinion (components that I might have over looked or been ignorant of).</p> <p>-Overall, critical thinking is still meant to be used to make claims based on solid arguments, but to be open to different interpretations that might contradict my positions so as to learn new information and/or perceptions that I might not have known, in order to build a better, more solid argument.</p>
Case 5 AD	<p>Critical thinking: Think of the material thoughtfully, carefully, to analyze the words said or written, to understand different positions of an argument, to think without bias of one’s beliefs , opinions, to engage with the material and its ideas, to be a part of the discussion, as would be the case in a philosophical argument or any type for that matter. Of course to be able to criticize the content and understand the positive and negative elements of it.</p>	<p>Reflecting about the way you think; thinking about your thinking. Being able to hear all sides of an argument and process the information as open-minded as you can.</p>

	Pre- interview	Post-Interview
Differences	<p>BR has a detailed perception about CT. She explains the skills in details and gives examples. The skills she points out:</p> <ol style="list-style-type: none"> 1-Questioning. 2-Skepticism. <p>AD has a proper description where she provides enough details. She points out:</p> <ol style="list-style-type: none"> 1-Check my biases. 2-Analysis. 3-Understanding information. 4-Open mindedness. 	<p>BR has a detailed perception about CT with enough explanation. She mentions:</p> <ol style="list-style-type: none"> 1-Check my biases. <p>AD writes a short description than her first interview. She points out:</p> <ol style="list-style-type: none"> 1- Reflecting. 2- A metacognitive skill.
Similarities	No similarity.	<p>They both indicate:</p> <ol style="list-style-type: none"> 1-Questioning. 2-Open mindedness.

3.5.9. Cases 2 BR vs case 6 GR:

	Pre- interview	Post-Interview
Case 2 BR	<p>Critical thinking: *To question my beliefs, convictions, what are the foundations or core principles that support my opinions.</p> <p>*To question arguments made by either myself or others.</p> <p>*To not believe everything I see/ read/hear, simply because of the authority or because I agree with the claim also known as to be cynical of any claims made about whatever subject.</p> <p>The goal of critical thinking is to not be dupe by “phony” claims made by others and to live a life as true to my principles (myself, my values) as possible (i.e to not hold opinions or beliefs that are in contradiction with my values).</p>	<p>Critical thinking: - Question my assumptions, beliefs, positions on several topics.-Check my biases, prejudices, ‘gaps’ in my knowledge.</p> <p>-Be willing, open to different perception, takes on a subject.-If I become defensive to someone’s opinion, I should question why their position angered me, what components are the basis of their opinion (components that I might have over looked or been ignorant of).</p> <p>-Overall, critical thinking is still meant to be used to make claims based on solid arguments, but to be open to different interpretations that might contradict my positions so as to learn new information and/or perceptions that I might not have known, in order to build a better, more solid argument.</p>
Case 6 GR	<p>Rationality, skepticism, examining what one hears and examining one’s own beliefs for validity.</p>	<p>Thinking analytically, questioning assumptions, examining evidence, keeping an open mind. Open to new ideas, trying to see where the other side is coming from, but touting claims made without any evidence.</p>
Differences	<p>BR has a well-developed description. She explains the skills in details and gives examples. The skills she points out:</p> <p>1-Questioning.</p> <p>GR mentions only three skills of CT without any details. He said:</p> <p>1-Rationality.</p> <p>2-Examining information.</p>	<p>BR’s conception of CT is even more developed than in her pre-interview; she indicates the most important skills of CT with examples. The skills she mentions:</p> <p>1-Check my biases.</p> <p>GR shows an improvement in his vision of CT. He provides more skills and details. GR points out:</p> <p>1-Analysis.</p> <p>2-Examining Evidence.</p>

	Pre- interview	Post-Interview
Similarities	They both say: 1-Skepticism.	Both of them adapt a better understanding of CT; however, BR provides much more developed view of CT. They both mention: 1-Questioning. 2-Open mindedness.

3.5.10. Case 3 LE vs case 4 TE:

	Pre- interview	Post-Interview
Case LE	Critical thinking: a skill that is both praised and discouraged. We have the bad habit of looking up to the dead mavericks while ignoring the living. Ostensibly, critical thinking seems to be highly desirable, but often, when pushed toward criticizing the axiomatic values of our contemporary society, this becomes less desirable.	Critical thinking is the ability to decipher and understand information both factual and biased in ways that take to account its fallibility, no matter the type of information, to practice critical thinking is to critique it, in order to get a better grasp of what you lack when absorbing ‘sad’ info. It must be practiced and must be done not only to outside sources but also to ourselves.
Case TE	Asking questions, challenge opinions, confrontation, conflict, exchange of point of views , question sources of information and self-aware.	Critical thinking: Different opinions, diverging scrutiny and questioning self-information”. When asked about critical thinking: “I immediately think about questioning the information we are presented and making our own research of the information and often determining a stance that concords to our values and what we know about the subject.

	Pre- interview	Post-Interview
Differences	<p>LE does not provide a definition of CT he just explains the need for critical thinking in general. TE just mentions a few skills without any details. He focused on:</p> <ol style="list-style-type: none"> 1. Questioning. 2. Open-mindedness. 	<p>LE now has a clear picture of CT; he provides a proper definition where he names three skills of CT. He mentions:</p> <ol style="list-style-type: none"> 1-Understanding sources and ourselves. 2-Fallibility. 3-Analysis. <p>TE provides a proper definition of CT and gives acceptable explanation. The skills he points out:</p> <ol style="list-style-type: none"> 1. Open-mindedness. 2. Questioning. 3. Judgment. 4. Research.
Similarities	No similarity.	Both of them gain a better perspective of CT and they both indicate more skills and explanation than their previous interviews.

3.5.11. Case 3 LE vs case 5 AD:

	Pre- interview	Post-Interview
Case LE	<p>Critical thinking: a skill that is both praised and discouraged. We have the bad habit of looking up to the dead mavericks while ignoring the living. Ostensibly, critical thinking seems to be highly desirable, but often, when pushed toward criticizing the axiomatic values of our contemporary society, this becomes less desirable.</p>	<p>Critical thinking is the ability to decipher and understand information both factual and biased in ways that take to account its fallibility, no matter the type of information, to practice critical thinking is to critique it, in order to get a better grasp of what you lack when absorbing 'sad' info. It must be practiced and must be done not only to outside sources but also to ourselves.</p>

	Pre- interview	Post-Interview
Case AD	Critical thinking: Think of the material thoughtfully, carefully, to analyze the words said or written, to understand different positions of an argument, to think without bias of one's beliefs , opinions, to engage with the material and its ideas, to be a part of the discussion, as would be the case in a philosophical argument or any type for that matter. Of course to be able to criticize the content and understand the positive and negative elements of it.	Reflecting about the way you think; thinking about your thinking. Being able to hear all sides of an argument and process the information as open-minded as you can.
Differences	LE does not provide a definition of CT he just explains the need for critical thinking in general. AD has a more complete description where she provides enough details. She points out: 1-Check my biases. 2-Analysis. 3-Understanding information. 4-Open mindedness.	LE now has a clear picture of CT; he provides a proper definition where he names three skills of CT. He mentions: 1-Understanding sources and ourselves. 2-Fallibility. 3-Analysis. AD writes a shorter description than her first interview. Although she writes "thinking about your thinking" which is a metacognitive skill. She points out: 1- Reflecting. 2- A metacognitive skill. 3-Open mindedness.
Similarities	No similarity.	Both of them provide a better definition of CT; even though AD writes a short description. The skills they both mention: 1-Questioning

3.5.12. Case 3 LE vs Case 6 GR:

	Pre- interview	Post-Interview
Case LE	Critical thinking: a skill that is both praised and discouraged. We have the bad habit of looking up to the dead mavericks while ignoring the living. Ostensibly, critical thinking seems to be highly desirable, but often, when pushed toward criticizing the axiomatic values of our contemporary society, this becomes less desirable.	Critical thinking is the ability to decipher and understand information both factual and biased in ways that take to account its fallibility, no matter the type of information, to practice critical thinking is to critique it, in order to get a better grasp of what you lack when absorbing 'sad' info. It must be practiced and must be done not only to outside sources but also to ourselves.
Case GR	Rationality, skepticism, examining what one hears and examining one's own beliefs for validity.	Thinking analytically, questioning assumptions, examining evidence, keeping an open mind. Open to new ideas, trying to see where the other side is coming from, but doubting claims made without any evidence.
Differences	LE does not provide a definition of CT he just explains the need for critical thinking in general. GR mentions only three skills of CT without any details. He says: 1-Rationality. 2-Skepticism. 3-Examining information.	LE now has a clear picture of CT; he provides a proper definition where he names four skills of CT. He mentions: 1-Understanding sources and ourselves. 2-Fallibility. GR shows an improvement in his vision of CT. He provides more skills and details. GR points out: 1-Examining evidences. 2- Open mindedness.
Similarities	No similarity.	Both of them have more developed description than in pre-interviews. They both name the fundamental skills of CT. The skills they both indicate: 1-Analysis. 2-Questioning.

3.5.13. Case 4 TE vs case 5 AD :

	Pre- interview	Post-Interview
Case TE	Asking questions, challenge opinions, confrontation, conflict, exchange of point of views , question sources of information and self-aware.	Critical thinking: Different opinions, diverging scrutiny and questioning self-information". When asked about critical thinking: "I immediately think about questioning the information we are presented and making our own research of the information and often determining a stance that concords to our values and what we know about the subject.
Case AD	Critical thinking: Think of the material thoughtfully, carefully, to analyze the words said or written, to understand different positions of an argument, to think without bias of one's beliefs , opinions, to engage with the material and its ideas, to be a part of the discussion, as would be the case in a philosophical argument or any type for that matter. Of course to be able to criticize the content and understand the positive and negative elements of it.	Reflecting about the way you think; thinking about your thinking. Being able to hear all sides of an argument and process the information as open-minded as you can.
Differences	TE just mentions a few skills without any details. He focuses on: 1. Questioning. AD has a more complete description where she provides enough details. She points out: 1-Check my biases. 2-Analysis. 3-Understanding information.	TE provides a proper definition of CT and gives acceptable explanation. The skills he points out: 1. Judgment. 2. Research. AD has shorter version than her 1st interview with less details. Although she writes "thinking about your thinking" which is a metacognitive skill. The skills she mentions: 1- Reflecting. 2- A metacognitive skill.

	Pre- interview	Post-Interview
Similarities	Both of them write a simple perspective of critical thinking. The skills they both mention: 1-Open mindedness.	Both of them mention more skills than the pre-interviews. More importantly they both gain a better understanding of CT. The skills they indicate: 1-Questioning. 2-Open mindedness.

3.5.14. Case 4 TE vs case 6 GR :

	Pre- interview	Post-Interview
Case TE	Asking questions, challenge opinions, confrontation, conflict, exchange of point of views , question sources of information and self-aware.	Critical thinking: Different opinions, diverging scrutiny and questioning self-information". When asked about critical thinking: "I immediately think about questioning the information we are presented and making our own research of the information and often determining a stance that concords to our values and what we know about the subject.
Case GR	Rationality, skepticism, examining what one hears and examining one's own beliefs for validity.	Thinking analytically, questioning assumptions, examining evidence, keeping an open mind. Open to new ideas, trying to see where the other side is coming from, but doubting claims made without any evidence.
Differences	TE just mentions a few skills without any details. He focuses on: 1. Questioning. 2. Open-mindedness. GR mentions only three skills of CT without any details. He says: 1-Rationality. 2-Skepticism. 3-Examining information.	TE provides a proper definition of CT and gives acceptable explanation. The skills he points out: 1. Judgment. 2. Research. GR shows an improvement in his vision of CT. He provides more skills and details. GR points out: 1-Examining evidences.

	Pre- interview	Post-Interview
Similarities	Both of them write a simple perspective of critical thinking.	Both of them gain a better perspective of CT and they both indicate more skills and explanation than their previous interviews. The skills they both mention: 1-Questioning. 2- Open mindedness.

3.5.15. Case 5 AD vs Case 6 GR:

	Pre- interview	Post-Interview
Case AD	Critical thinking: Think of the material thoughtfully, carefully, to analyze the words said or written, to understand different positions of an argument, to think without bias of one’s beliefs , opinions, to engage with the material and its ideas, to be a part of the discussion, as would be the case in a philosophical argument or any type for that matter. Of course to be able to criticize the content and understand the positive and negative elements of it.	Reflecting about the way you think; thinking about your thinking. Being able to hear all sides of an argument and process the information as open-minded as you can.
Case GR	Rationality, skepticism, examining what one hears and examining one’s own beliefs for validity.	Thinking analytically, questioning assumptions, examining evidence, keeping an open mind. Open to new ideas, trying to see where the other side is coming from, but doubting claims made without any evidence.

	Pre- interview	Post-Interview
Differences	<p>AD has a more complete description where she provides enough details. She points out:</p> <ol style="list-style-type: none"> 1-Check my biases. 2-Analysis. 3-Understanding information. 4-Open mindedness. <p>GR mentions only three skills of CT without any details. He says:</p> <ol style="list-style-type: none"> 1-Rationality. 2-Skepticism. 3-Examining information. <p>AD's description of CT is more complete comparing to GR' description.</p>	<p>AD has shorter version than her 1st interview with less details. Although she writes "thinking about your thinking" which is a metacognitive skill. The skills she mentions:</p> <ol style="list-style-type: none"> 1- Reflecting. 2- A metacognitive skill. <p>GR shows an improvement in his vision of CT. He provides more skills and details. GR points out:</p> <ol style="list-style-type: none"> 1-Examining evidences. 2-Analyzing.
Similarities	No similarity.	<p>GR provides a better definition and exceeds AD. Both mention:</p> <ol style="list-style-type: none"> 1-Questioning. 2- Open mindedness.

Appendix C

Interview Questions

Pre-interview

Mini Writing: What comes to your mind when you hear “Critical thinking”?

Questions :

- 1.How did you hear about this course?
- 2.What are your expectations for this course?
- 3.What are the objectives of this course?
- 4.What do expect to obtain from this course?
- 5.Why do you think different views are presenting in the class?
- 6.Do you think that the course can change your ideas and opinions about the world? Why? Could you please give me an example?
- 7.Do you classify yourself as a good arguer? Why?
- 8.What are the skills that a sound arguer has to have?
- 9.What are the argumentative skills for you?
- 10.Do you think the course will have any impact on your daily life? Probe: explain? Could you please discuss an example?

Post-Interview

Mini Writing: What comes to your mind when you hear “Critical thinking”?

Questions:

How do you feel about the course right now?

Probe: what’s your emotional reaction to the course? Why do you have this reaction?

What was the biggest difficulty or challenge you’ve faced in this course? Why?

Were the discussions the class useful to you in writing your critique? in what way?

During the discussions, did you have the chance to express yourself and your ideas? Was anything preventing you from doing it?

Did you think this course made you argue better? In what way?

Did you feel comfortable enough to explain your ideas in the discussions? Why did you feel this way?

Did anything in the class stand out? Could you please give me examples,

Why did you think different views are presented in the class?

Did this course have any impact on your daily life?

Prob: Could you please discuss an example?

Do you classify yourself as a good arguer? Why?

What do you want to get from an argument?

In an argument do you think that one rival is right and the other one is wrong? Why?

Did the discussions make you question your own view? Could you discuss an example?

Did anything you hear in the course make you reconsider your personal beliefs ? How did you deal with it?

Prob, Have you asked your self why do I believe this way? could you discuss an example?

How could you identify that there is a miscommunication in an argument?

Have you come to the class with an opinion and left with a different opinion? or at least you doubted yours?

Did the discussions help you to frame an opinion about something you did not have an opinion or view about?

What are the qualifications that a good arguer has to have?

Do you think the course has helped you to argue your point of view. In what way?

TA's Interview Questions:

Interviewer: What do you think of the course in general?

Interviewee(TA):

Interviewer: What is your favourite aspect about the course?

Interviewee(TA):

Interviewer: How do you think the students benefit from the class discussion?

Interviewee(TA):

Interviewer: Do you think that students enhance their critical thinking ability because of this course?

Interviewee(TA):

Interviewer: What do you think about the students engaging in the discussions in the class? Is it beneficial?

Interviewee(TA):

Interviewer: Do you think having two professors present in the class each week is useful, and why?

Interviewee(TA):

Interviewer: Do you think that the course changed some of the students' ideas and opinions about the world?

Interviewee(TA):

Interviewer: What are the differences that you have noticed in the class between this year and last year?

Interviewee(TA):

Interviewer: Do you have any ideas that you believe could improve the course?

Interviewee(TA):

Interviewer: Have you noticed any changes in the students assignments through the semester?

Interviewee(TA):

Interviewer: Did the students use their class discussion to write their one-page essay, and how?

Interviewee(TA):

Interviewer: Do you have anything to add?

Interviewee(TA):

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