

## Critical Thinking Annotated Student Artifacts

The following artifacts are from students enrolled in 12 to 15 and 30+ college credit hours. The artifacts were collected from the fall 2017 and spring 2018 semesters. The collection demonstrates how students apply Critical Thinking skills in a variety of topics, contexts, and assignment formats. When evaluating students' application of these skills it is important to know how well students handle these complex skills when writing a reflective essay, explaining a scientific or mathematical process, interpreting abstract topics, defending a point of view among others. It is also important to know that grammar, spelling, and punctuation are not to be considered when rating application of these skills; unless, they significantly inhibit comprehension of the text.

The annotated artifacts will help raters understand how students' writings were rated for each category while holistically considering the entire writing sample and/or collection of writings.

### **Student 1: CT-B (Pay it Forward Service Project)**

In this writing collection the student has identified a problem with a friend and has outlined several goals the student wants to complete by a projected date. The student explains and reflects on how he/she planned, initiated, and guided the conversation to learn more about his/her friend's problem using the concept of Interpersonal Communication. The student also explains how he/she used Mindful Listening to learn more about the problem, and reflects on he/she used the skill of paraphrasing to help him/her better understand the experiences of his/her friend. The student further explains how he/she used Communication Climate while he/she observed his/her friend's body language change while they were having a conversation about her underage drinking and reflects on how this strategy benefited the communication by giving his/her friend a better idea about how her actions affect her and others around her. In the last two essays the student explains how he/she used Emotional Expression to show disappointment and anger towards his/her friend for attempting to drive after drinking and discusses how emotions can cause reactions. The student reflects on the overall impact the project had on him/her and notes that paraphrasing was the skill that best helped him/her in the project.

For the **Analysis** category, the student received a score of **3 Meets Expectations**. This rating was based on the holistic review of all the essays in this collection. Although the student fully identifies the problem by highlighting possible reasons for his/her friend drinking problem and notes observations he/she made while meeting with his/her friend, the writing collection, collectively, lacks in-depth perspectives and details from his/her friend's own summarization of the problem.

For the **Inquiry** category, the student received a score of **2 Partially Meets Expectations**. Again, although the student makes full use of ideas, skills, and strategies, the writing collection as a whole, lacks in-depth ideas, perspectives and/or alternate perceptions from his/her friend whose problem he/she was trying to solve.

For the **Evaluation** category, the student received a score of **2 Partially Meets Expectations**. The lack of presenting his/her friend's experiences, ideas, perceptions, and perspectives in depth with details and examples impacted the use of relevant arguments to support a holistic, comprehensive conclusion.

For the **Synthesis** category, the student received a score of **2 Partially Meets Expectations**. Although the student makes full use of ideas, skills, and strategies, concluding paragraphs were not well supported with in-depth details and examples.

For **Creativity/Innovation** category, the student received a score of **3 Meets Expectations**. The student used many ideas and strategies relevant to the concepts and although the collection included several reflective paragraphs, they were brief and lacked detail.

Overall, this writing collection displayed some strong elements of critical thinking; however, the content predominately focused on the student's own perceptions, experiences, and point of views. As a result, 3 out of the five categories received a score of **2 Partially Meets Expectations**. Scores across the five categories would have been stronger if the student would have applied analytical, inquiry, and evaluative skills to further develop and detail the problem and solutions from his/her friend's experiences, perceptions, and/or point of view.

CT-B

I have chosen my best friend. We have been friends for about five years now, went to the same schools from middle school up until our senior year of highschool. Though she goes to a different college than I, we have maintained that connection due to her being an hour away. The reason I've chosen her is she has been having issues with Alcohol, Which i found to be very shocking as she was never the party type in high school. I have had mutual friends tell me details about what she is doing mainly because they are aware of the close bond we share and are worried that if she continues this behavior she will be making further decisions she would soon come to regret.

My goal is to be able to help her understand the choices she is making and the possible consequences that come from those choices. I also want to try to understand why her personality changed so drastically in two short years. I am planning on being able to talk to her without the sense of interrogating her. Though i want to help my friend, i want her to realize she is responsible for her own actions as well as she needs to take the consequences she may receive. Another one of my goals through the course of this time is to try to find out if she is okay, mentally and physically.

My Objectives are to be able to understand what she is going through, This would be the first time since high school we did not go to the same school so i am unable to witness first hand what her dilemmas are, but I want her to understand that she can still rely on me to handle and help her when she is unable to do it on her own. I want to "pick" at her to see if she is making poor choices because of the crowd she is hanging around with, or because of something more personal.

I hope to complete my objectives by May 1st 2018. If I have not reached all the goals set by this date; The ones i hope to reach the most is to understand why she is chooses to do what she does. Due to our close relationship, I will make an attempt to help her until she realizes that her actions don't only affect her, but everyone that cares for her as well. I will know i have completed all my goals once I finally understand her choices, and she learns what her limit is, what excessive drinking can do to someone, as well as the consequences that follow.

Reflective Summary

Date: 3/10/18

Part I- Description of the Communication Interaction.

One of the goals for the project was to better understand some of the choices my best friend is making. Today was the first time we have spoken in a few days and I felt as if this would be a good time to have a sincere conversation with her to let her know how much her drinking had affected the individuals around her. What slowly started off as a FaceTime about Sociology homework converted towards triggers about some choices both her and I make. As the conversation went on, I found myself asking questions about her school and work life. How she managed to maintain a full course load and working thirty plus hours a week. As the conversation escalated, more evidence pointed towards stress from school work. She explained how for the past few weeks she had been under a enormous amount of pressure from classmates to complete a group project, along with issues coming from work. With seeing the amount of emotion expressed I could instantly tell how difficult it was to discuss this and chose to end the questioning. As the conversation came to a close and goodbyes were said, I felt as if this conversation would lead towards a successful outcome.

Part II- Identification/Discussion of the Concept and Skill

Before starting the conversation, I felt like this would be a good time to break the ice and to work towards my goal of helping my long time friend. The Interpersonal Communication concept shows how to develop empathy for others while learning how to communicate to solve problems. I felt like this concept applied to this conversation because it gave me a chance to better understand my friend, to give empathy during later conversations. As well as it helped me “pick” at her to gather information I need to complete my goal. During the conversation I used the skill of questioning, which is a way to explore ideas to receive and develop answers and insight.

Part III- Benefit of the Service

After the conversation, I felt this strategy benefited myself as well as her because it allowed me to get a better insight of what was going on, as well as it showed my genuine concern for her without giving her the impression I was demanding information rather than trying to support her.

Part IV- Outcome of the Service

I felt like the starting conversation led to a successful ending, because I was able to show my concern without the feeling of interrogation, as well as have several questions answered. I

also felt that the first conversation will lead towards a deeper conversation as well as a conversation where more questions will be answered.

Reflective Summary

Date : 3/14/18

Part I-Description of the Communication Interaction.

During this conversation my goal was to go deeper into the answers my friend shared for my questions. She was on Spring break and intown when we decided to meet up at the local Starbucks. This was the first of two face to face conversations. She went into the details of work, trying to get a promotion while maintaining her GPA. Without much responding I chose to absorb what she was telling me. She continued on towards the friends she was making, and the choices they made; though she is more than capable of making her own choices, she explained how she chooses to “follow” actions behind displayed. She went into parties she attended, and the mornings afterwards on how she felt. Without saying much, I felt as if she understood my concern through my expressions. To better absorb the information she was sharing with me, I reworded the statements to better clarify anything I was confused on. We ended the conversation shortly after and agreed to meet in the following two days.

Part II- Identification/Discussion Of the Concept and Skill

After the first conversation, I felt like this would be a time to practice Mindful Listening, which is the act of being fully present without being judgemental. I chose to do this by understanding the details of what she was telling me, and absorbing it rather than allowing it to wander. In this Conversation I used the skill of paraphrasing. Which is the matter of expressing the meaning of a speakers sentence by rewording. I felt this necessary to use in order to absorb what she was telling me.

Part III- Benefit of the Service

I felt this strategy benefited both my friend as well as myself because it allowed her to explain her actions, reasons behind said actions, as well as it allowed me time to focus and listen, rather than talk. The use of paraphrasing helped me better understand and comprehend the experiences shared.

Part IV- Outcome of the Service

This conversation led to a successful outcome because I better understood what my friend was sharing with me. It was out first face to face conversation which made it that much better. Though I mostly listened, I am confident she understood why I was there and what I hope to complete by the end of this project.

Reflective Summary

Date: 3/17/18

Part I- Description of the Communication Interaction.

For the Third conversation, we again met at the local Starbucks. This would be our last face to face conversation as she was heading back to school the following day. Because it was our last face to face, we chose to talk about previous choices she had made specifically. As the conversation progressed we came to the topic of her underage drinking. Though it seemed to come with the territory of attending what has a reputation of being a party school, I wanted to address the possible consequences if she were to ever be caught, or even if she chooses to continue with it. I expressed my concern, and how I wanted what was best for my friend as well as just wanting her to be careful.

Part II- Identification/Discussion Of the Concept and Skill

For the third conversation the Communication climate seemed to fit throughout the meeting. The emotional tone of the Communication climate, along with the skill set of Assertiveness appeared to best direct the conversation in the way that made the points clear. The skill of assertive is having or showing confidence and forceful personality.

Part III-Benefit of the Service

felt as if this strategy benefited my friend because it allowed her to better understand where I was coming from. How hearing the actions she chose to make impacted me, and how I felt about them. The conversation allowed me to express myself just as the previous allowed her to do the same. The assertiveness played a part in the conversation as I saw the body language change, as well as hints as to if she agreed or disagreed with what I was saying

Part IV- Outcome of the Service

This interaction lead to a successful outcome because I was able to make my point clear across, my friend was able to understand, absorb and acknowledge where I was coming from and why I feel the way I do. The conversation gave my friend a better idea of how her actions affect those around her not just herself.

Reflective Summary

Date: 3/20/18

Part I-Description of the Communication Interaction

For the fourth meeting, my friend and I resorted back to FaceTime. Like the other previous conversations this one I believe was successful. My friend shared a moment to when she made the ultimate mistake of attempting to drive after she has been drinking. Though the people she were with stopped her from making this unbelievably poor choice, the news was shocking and I was left utterly disappointed. I expressed this emotion by giving advice, and showing somewhat anger. Though the relief was she realized the choice she was attempting to make was the wrong decision, she had remorse and it showed. We continued to talk about what led her to believe it was the right decision, what drove her to that state and what she would have done differently and what she will continue to work on.

Part II- Identification/Discussion Of the Concept and Skill

During the conversation I found myself using emotional expression. Though it was not the one wanted, after hearing the news, it was the best of the bunch that fit. The skill used during this conversation was advising. Though it was one I did not want to apply at the beginning of the project, I felt it necessary after hearing what my friend thought about doing, and what she needed. The term advising is to offer suggestions about the best course of action to take.

Part III- Discussion Of the Benefit

I felt this strategy was the most beneficial of the conversations because she knew what she did was wrong and the sincerity in the way she expressed herself was far beyond previous conversations. As with myself as well, the emotion in the conversations were High and I believe she understood fully of how much her actions affected everyone.

Part IV- Outcome of the Service

For the final conversation of the project, I believe all the conversations that led to this were successful. I believe this conversation was success for because she was able to see how emotions in someone changes when they hear about poor choices their loved ones make. As a result; she indicated change in her behavior going forward.



### Personal Evaluation

The “Pay It Forward” Service project is a challenging, yet rewarding task. I found a great deal of learning experience from this project as well as a great depth of responsibility to the individual I chose to work upon. Though believing my relationship would change over night would be unrealistic, the time spent, I found the answers I seeked and the friendship slowly taking a turn for the better. As time progressed I realized this wasn’t just about a simple grade in a class, but trying to help someone better their live for their future; as well as my own.

Choosing to Work With my best friend was one of the best decisions I made when it came to school related responsibilities. With the years following high school she chose to make some drastic choices that were not approved by friends and family. Though I would never change the opinion I have of her, I wanted to help her realize the potential danger she could cause. I have tried several different skills within the last few weeks and I found myself working with paraphrasing the best. I believe this is because it allowed me to better absorb what she was telling me, exactly how she wanted me to know the information given. When I decided to choose my friend for this project I was under the impression she was the one who needed to change her actions first. Though not the case; it was I who needed to better my listening and responding skills before I tried to help anyone. I found myself showing expressions of dislike, discomfort without meaning to, and thankfully I did not offend her.

I feel I made this project a priority not because of wanting a good grade, but because I wanted to help her realize what she was doing and I wanted her to know that someone cared and was thinking of her when she thought no one did. Though the project has ended, the task is still in place and I know it will be a long commitment well past the due date of the assignment.

The project has been demanding, entertaining, and full of surprises. Throughout the past few weeks I have seen myself changing in the ways I react, I have seen improvement in my relationship with my friend, and I have seen improvements in my friends life. I feel as if I can express my opinion without making it too aggressive, as well as I can be sincere when need be. This project has given me the confidence to not only help my friend but anyone who appears to need help.

## Student 2: CT-D Mathematical Process

In this writing sample the student is asked to use all five categories to explain a mathematical process.

For the **Analysis** category, the student received a score of **3 Meets Expectations**. The student met the expectation of the task by describing the problem and providing two different approaches for solving the problem; however, the explanation and details are brief and lacked in-depth analysis. This may be due, in part, to the instructions of the task which asked the student to 'write at least two complete sentences'.

For the **Inquiry** category, the student received a score of **2 Partially Meets Expectations**. The student essentially re-phrased the question and provided limited explanations on how the two particles touching would imply that the particles collide.

For the **Evaluation** category, the student received a score of **2 Partially Meets Expectations**. The student did not show evidence on the exact time in which the particles collide. Graphing the response would have supported the evidence needed to show the exact time. The equation alone does not demonstrate this.

For the **Synthesis** category, the student received a score of **2 Partially Meets Expectations**. The concluding statement lacks clarity and detail.

For the **Creativity/Innovation** category, the student received a score of **2 Partially Meets Expectations**. The student explains the process in a simple manner. The response lacks detail and does not provide new approaches nor ideas for showing how the particles may 'drift' apart as time goes by.

While the student responds to all the prompts and/or questions, the responses lack details and clarity to fully present the mathematical process. Typing the responses may have contributed, in part, to the limited details and errors noted in the equations as well as the inability to present the data in graphs. Pictures and/or scanned documents would have perhaps strengthen the students' overall ratings.

CT-D

Math 2412 Spring 2018

CORE OBJECTIVE ASSESSMENT TEAM (COAT) assessment instrument. : Math 2412 Precal Critical Thinking

PROBLEM SITUATION: Determine if particle A and particle B collide if

- particle A moves according to the parametrically defined plane curve on the specified time interval
- and particle B moves according to the parametrically defined plane curve on the same specified time

1. (Analysis) Write at least two complete sentences describing the problem and your approach to determining if the particles collide, be sure to state what would have to be true for the particles to collide in the context of the problem

The question asks if the corresponding A and B particles touch or cross each other. This means that the  $X_a$  and  $X_b$  interception will have to be found. The two approaches to solving this problem are showing the comparison of the A and B formulas to figure out if they're equal, proving they touch or intercept. Another way would be to graph both on a calculator and see whether the lines cross each other.

2. (Inquiry) If the paths of the particles do cross or touch does this imply the particles collide? Explain your reasoning in complete sentences and then mathematically determine if the particles paths cross or touch.

If two lines cross this implies that the particle collided, or come in contact with each other meaning they would have been in the same place, at the same moment. Comparing both equations and finding out which time they'd intercept.  $t=2n+1$ , also  $Y_a=Y_b$  when  $t=-1$  and  $5$ , but since it needs to be bigger than  $2$  the answer is  $5$ .

3. (Evaluation) If the particles do collide find the exact time(s) in which this happens if the particles do not collide explain why not.

Particle X is  $t=2n+1$  Particle Y is  $t=5$ . The particles collide since they'll be in the same spot, at the same moment.

4. (Synthesis) Write at least two complete sentences communicating a cohesive conclusion based on your evaluation of this problem situation. :

To conclude the problem we were asked to find the collision point, with two particles A and B for X and Y. The point of collision for if you graphed it will be where the two formulas A and B are to intercept, touch or come out giving the same results for the value of T, which are the same. Solving the problem it is written the equation  $X_a = X_b$  solved for T which gives the answer  $2n+1$ . Y it was done  $Y_a = Y_b$   $t=5$ .

5. ( Creativity / Innovation ) How might you go about showing the particles "drift" apart as time goes by?

If the particles drifting apart are to be shown as time goes on, then it would be necessary to type an equation on a graph. This will show the particles drifting and collision point as well as the particles drifting apart.

## Student 2: CT-E Mathematical Process

In this writing sample the student is asked to use all five categories to explain a mathematical process.

For the **Analysis** category, the student received a score of **3 Meets Expectations**. The student met the expectation of the task by describing the problem and explaining how the problem may be solved; however, the explanation and details are brief and lacked in-depth analysis. Again, this may be due, in part, to the instructions of the task which asked the student to 'write at least two complete sentences'.

For the **Inquiry** category, the student received a score of **3 Meets Expectations**. The student responds to the question by demonstrating the mathematical process to solve the problem. Although the mathematical process is correct, the computation/solution is not accurate and lacks in-depth explanation and details.

For the **Evaluation** and **Synthesis** categories, the student received a score of **3 Meets Expectations**. Once again the student meets the expectation of the task and demonstrates the mathematical process, but the responses and explanations lack in-depth details.

For the **Creativity/Innovation** category, the student received a score of **3 Meets Expectations**. The student meets the expectation of the task with basic details the student extrapolated from the overall assignment.

Overall, the student was able to answer the questions and demonstrate the mathematical processes necessary to support his/her responses. The consistent score of **3 Meets Expectation** in all categories was clearly due to the lack of in-depth explanations, thorough thinking of ideas, and suggestions for alternate solutions and/or approaches.

# CT-E

Math2412 Spring 2018 NAME \_\_\_\_\_

CWID \_\_\_\_\_

CORE OBJECTIVE ASSESSMENT TEAM (COAT) assessment instrument. : Math2412 Precal Critical Thinking

**PROBLEM SITUATION:** Determine if particle A and particle B collide if

particle A moves according to the parametrically defined plane curve on the specified time interval:

$$x_A(t) = t - 1 \quad y_A(t) = \sqrt{2t^2 - 1} - 2 \quad t \geq \frac{\sqrt{2}}{2}$$

and particle B moves according to the parametrically defined plane curve on the same specified time

interval:  $x_B(t) = \cos(\pi t) + t \quad y_B(t) = t \quad t \geq \frac{\sqrt{2}}{2}$

limitation

- 1) (Analysis) Write at least two complete sentences describing the problem and your approach to determine if the particles collide, be sure to state what would have to be true for the particles to collide in the context of the problem

In order to determine if the particles collide we need to solve for  $t$ , and keep in mind  $t$  limitations. In this case we can use particle B's solved  $t$  and plug it into particle A's  $y_A(t)$  equations. By setting  $y_B$  equal to  $y_A$  we can find  $t$  and plug that into the  $x$ -coordinates. Once we check that  $t$  satisfies the  $x$ -coordinate we can find the point of intersections. From the point of intersection we can determine if particles A & B collided.

- 2) (Inquiry) If the paths of the particles do cross or touch does this imply the particles collide? Explain your reasoning in complete sentences and then mathematically determine if the particles paths cross or touch.

If the particles cross this most likely implies the particles collided because it shows a point of intersection. At a point of intersection both particles A & B were once together, implying they collided. In order to find this we must find  $t$  and check if it satisfies the  $x$ -coordinates.

Particle A:

$$y_A(t) = \sqrt{2t^2 - 1} - 2$$

Particle B:

$$y_B(t) = t$$

$$x_A = (1) - 1 \quad x_B = (\cos(\pi(1))) + (1)$$

$$x_A = 0 \quad x_B = -1 + 1 = 0$$

$$0 = 0$$

$$x_A = x_B \checkmark$$

limitations:

$$t \geq \frac{\sqrt{2}}{2} \approx 0.707$$

$$\sqrt{2t^2 - 1} - 2 = t$$

$$(\sqrt{2t^2 - 1})^2 = (t - 2)^2$$

$$2t^2 - 1 = (t - 2)(t - 2)$$

$$2t^2 - 1 = t^2 - 4t + 4$$

$$-t^2 + 4t - 4 - t^2 + 4t - 4$$

$$t^2 + 4t - 5 = 0$$

$$(t + 5)(t - 1)$$

$$t = -5$$

$$t = 1$$

X

plug  $t$  into  $x$  equation of both A & B. If  $t$  satisfies both equations and they equal each other. The particles collided.

- 3) (Evaluation) If the particles do collide find the exact time(s) in which this happens, if the particles do not collide explain why not.

The particles collide when coordinates for x of both particles A and B is 4; and y for both particles A & B is 5. At the point of intersection (4,5) t is equal to 5.

Red			Blue		
T	X	Y	T	X	Y
1.5	1.5	1.5	1.8	0.0	3.4
2.6	2.29	2.6	2.6	1.6	1.54
3.3	2.71	3.3	3.3	2.3	2.5
5	4	5 ✓	5	4	5 ✓

- 4) (Synthesis) Write at least two complete sentences communicating a cohesive conclusion based on your evaluation of this problem situation. :

Based on my observations I found that particles A and B collided at point (4,5). In looking at the graph it was at this point that both particles A & B have the same x, y coordinates, and t values. From this information we can conclude the particles collided because they were on the same point before continuing on their lines.

- 5) (Creativity / Innovation) How might you go about showing the particles "drift" apart as time goes by?

You can show the particles drifting apart by the coordinates after a collision, or point of intersection. The coordinates after a collision should move in opposite directions; such as one particle can increase positively, while the other particle can decrease towards negative, in the x values.