MAPPING REASONING FOR CRITICAL THINKING INSTRUCTION ACROSS DISCIPLINES AND INSTITUTIONS

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QUESTIONS

1. What word do you associate with critical thinking?

2. To whom do you think critical thinking is important?

   a) Employers
   b) Instructors
   c) Students
   d) All of the above

3. How effectively is critical thinking taught at institutions of higher learning?

   a) Very effectively
   b) Somewhat effectively
   c) Somewhat ineffectively
   d) Very ineffectively

4. What challenges face critical thinking instruction at institutions of higher learning?

   a) Insufficient instructor training
   b) Lack of consistent learning objective and assessment measures
   c) Student resistance
   d) Lack of student preparation and exposure

University of Wisconsin
Stevens Point

"The General Education Program seeks to develop … qualities of global citizenship in four distinct ways. After completing the general education curriculum, students will:

- **Demonstrate critical thinking, quantitative, and communication skills necessary to succeed in a rapidly changing global society.**
- Demonstrate broad knowledge of the physical, social, and cultural worlds as well as the methods by which this knowledge is produced.
- Recognize that responsible global citizenship involves personal accountability, social equity, and environmental sustainability.
- Apply their knowledge and skills, working in interdisciplinary ways to solve problems."

https://www.uwsp.edu/gep/Pages/mission.aspx

CRITICAL THINKING AT UW-STEVENS POINT

Fall 1995

- Argument mapping introduced in the Philosophy Department.

Summer 2015

- Faculty from English, French, History, and Communication collaborated to explore the potential of argument mapping to facilitate critical thinking instruction in those disciplines.

Academic Year 2015 – 2016

- UW-Stevens Point selected argument mapping as the focus of its Quality Initiative in support of its continued accreditation through the Higher Learning Commission.

CRITICAL THINKING AT UW-STEVENS POINT

Academic Year 2016 – 2017

- Faculty Exploration Groups formed to discuss how argument mapping could be used to teach and assess critical thinking across the curriculum.

Summer 2017

- Faculty from UW-Stevens Point conducted workshops in argument mapping for instructors at Mid-State Technical College and Gateway Technical College and extended the discussion of critical thinking to include dialogue mapping.

Fall 2017

- We held additional critical thinking luncheons, broadened the focus from "argument" to "reasoning," began meetings with local employers, and drafted critical thinking pilot for Fall 2018.

CRITICAL THINKING AT UW-STEVENS POINT

Where we are Now

CT Pilot Fall 2018: 72 Sections, at 100, 200, 300 and 400 Levels

- Art
- Biology
- Business
- Computer Information Systems
- Computing and New Media Technologies
- Communication
- Education
- English
- Food and Nutrition
- Forestry

- French
- Geography
- Human Development
- History
- Health Promotion and Wellness
- Health Science
- Interior Architecture
- Library Resources
- Philosophy
- Religious Studies
- Sociology

CRITICAL THINKING AT UW-STEVENS POINT

Our Goals

- Overarching framework for critical thinking instruction that
  - ✓ Encompasses critical thinking as it appears across the curriculum and in the workplace
  - ✓ Identifies specific competencies
- Critical thinking instruction throughout the curriculum that is
  - ✓ Scaffolded
  - ✓ Situated within larger framework
- Ongoing assessment of critical thinking learning outcomes.

SESSION OUTCOMES

Upon completion, participants will be able to

1. explain the difference between concept maps, argument maps, and dialog maps.

2. identify how graphical representations of reasoning can be applied across disciplines to teach and assess critical thinking skills.
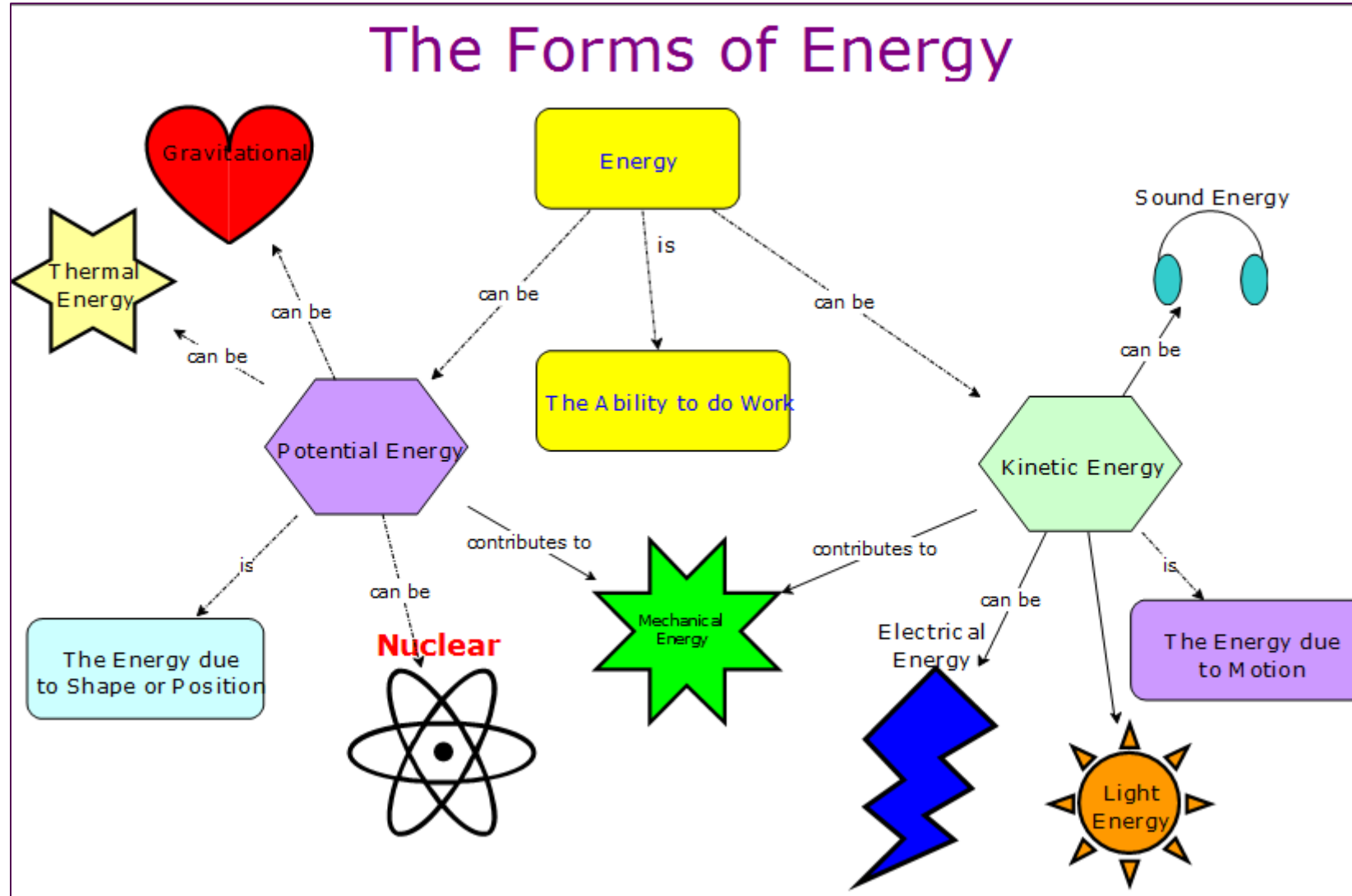
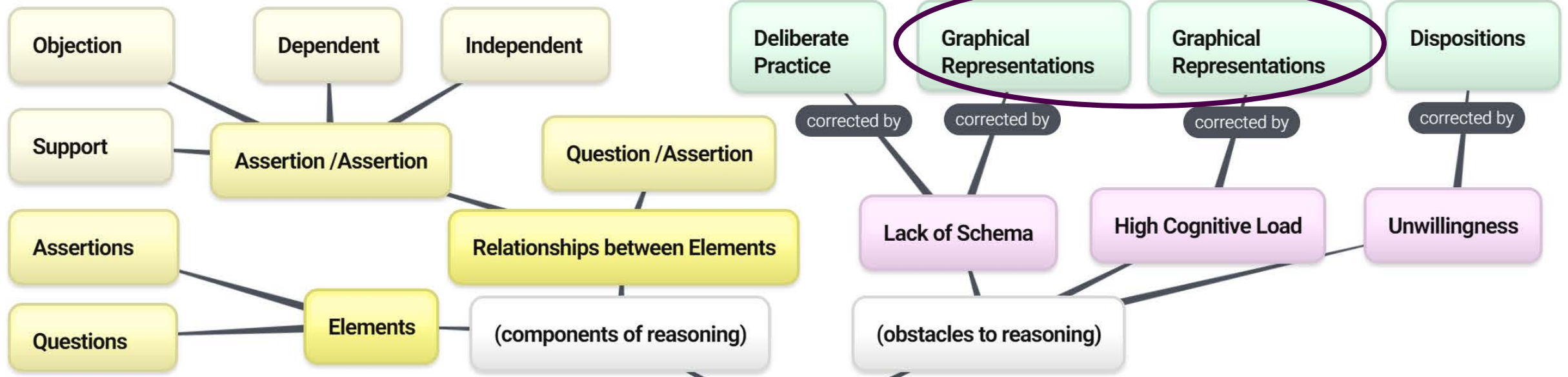3. identify some ways to use graphical representations of reasoning at their institution.

Upon completion, participants will be able to explain the difference between concept maps, argument maps, and dialog maps.

Concept Maps

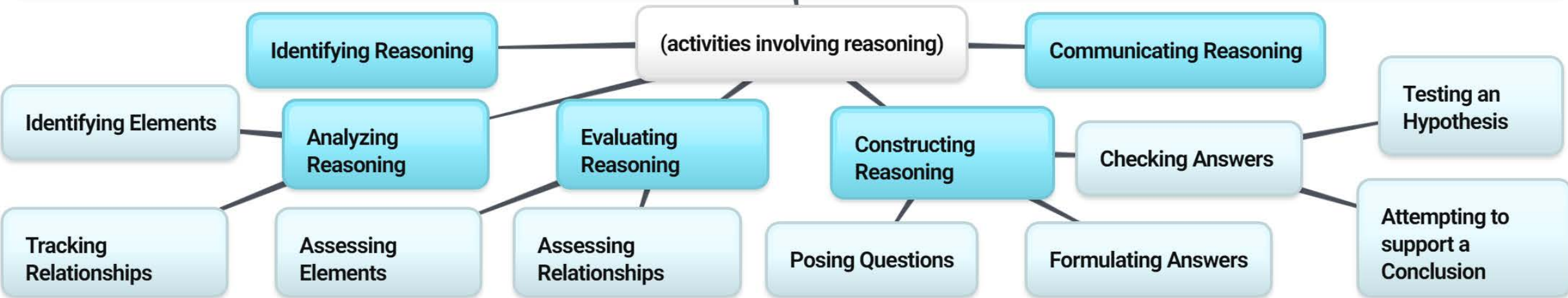

The Forms of Energy

http://mrslagunasclass.wikispaces.com/

Critical Thinking

Objection

Dependent

Independent

Deliberate Practice

Graphical Representations

Graphical Representations

Dispositions

Support

Assertion /Assertion

Question /Assertion

corrected by

corrected by

corrected by

corrected by

Assertions

Relationships between Elements

Lack of Schema

High Cognitive Load

Unwillingness

Questions

Elements

(components of reasoning)

(obstacles to reasoning)

CRITICAL THINKING IS PURPOSEFUL, REFLECTIVE REASONING ABOUT WHAT CONCLUSIONS TO DRAW OR ACTIONS TO TAKE.
(adopted from Facione, "Critical Thinking: What It Is and Why It Counts")

(activities involving reasoning)

Identifying Reasoning

Communicating Reasoning

Identifying Elements

Analyzing Reasoning

Evaluating Reasoning

Constructing Reasoning

Checking Answers

Testing an Hypothesis

Tracking Relationships

Assessing Elements

Assessing Relationships

Posing Questions

Formulating Answers

Attempting to support a Conclusion

Argument Maps – Support

"Learning a second language requires students to focus upon things like conjugation, grammar, and sentence structure so familiarity with a second language improves students' understand of their first language. Therefore, we should require all students at our institution to take (or test out of) two semesters of a second language."

"We should require all students at our institution to take (or test out of) two semesters of a second language because familiarity with a second language improves students' understand of their first language since learning a second language requires students to focus upon things like conjugation, grammar, and sentence structure."

We should require all students at our institution to take (or test out of) two semesters of a second language.

Familiarity with a second language improves students' understanding of their first language.
supports

Learning a second language requires students to focus upon things like conjugation, grammar and sentence structure.
supports

Argument Maps – Evaluating Reasoning

"Learning a second language requires students to focus upon things like conjugation ~~~~~~ sentence structure so familiarity ~~~ language improves students' un~~~ first language. Therefore, we sh~~~ students at our institution to ta~~~ two semesters of a second languag~~~"

"We should require all students~~~ take (or test out of) two semest~~~ language because familiarity w~~~ language improves students' un~~~ first language since learning a second language requires students to focus upo~~~ conjugation, grammar, and se~~~"

We should require all students at our institution to take (or test out of) two semesters of a second language.

Am I given good reasons to believe this?

If a perfectly rational person believes the idea at the bottom, will that person believe the idea at the top?

supports

Familiarity with a second language improves students' understanding of their first language.

Am I given good reasons to believe this?

If a perfectly rational person believes the idea at the bottom, will that person believe the idea at the top?

Is this true?

Is this acceptable to people who don't already believe the conclusion?

Learning a second language requires students to focus upon things like conjugation, grammar and sentence structure.

supports

Argument Maps – Dependent Reasons

"We should require all students at our institution to take (or test out of) two semesters of a second language because familiarity with a second language enhances intercultural competence and because we should do what we can to enhance our student's intercultural competence."

We should require all students at our institution to take (or test out of) two semesters of a second language.

Familiarity with a second language enhances intercultural competence.

We should do what we can to enhance our students' intercultural competence.

support

Argument Maps – Independent Reasons

"Learning a second language requires students to focus upon things like conjugation, grammar, and sentence structure so familiarity with a second language improves students' understand of their first language. Therefore, we should require all students at our institution to take (or test out of) two semesters of a second language. Additionally, familiarity with a second language enhances intercultural competence and we should do what we can to enhance our students' intercultural competence"
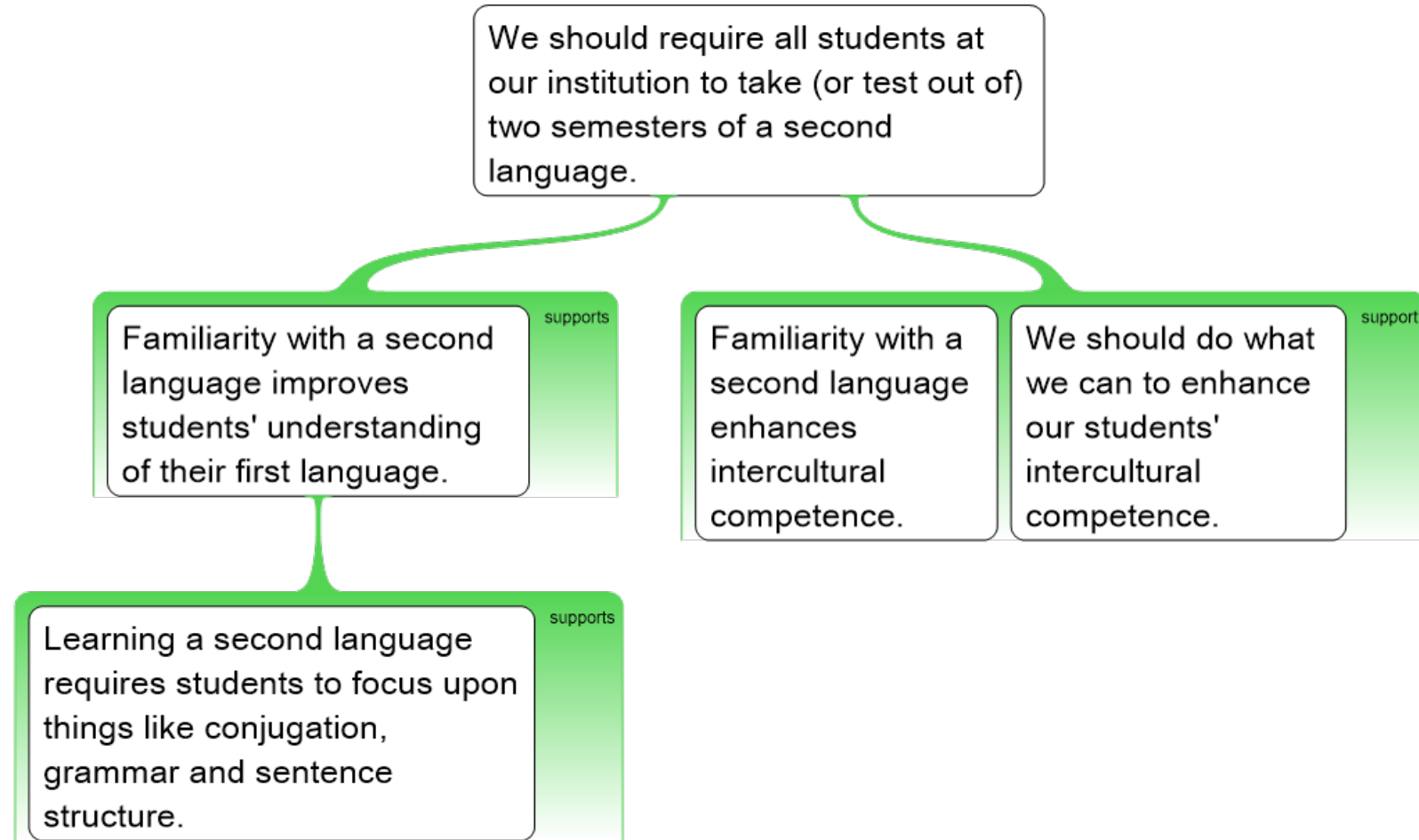
Argument Maps - Objection

"We should require all students at our institution to take (or test out of) two semesters of a second language. Some people disagree, maintaining that students will resent a language requirement. In fact, however, students appreciate the importance of knowing a second language. And even if they didn't, we can be justified in instituting requirements that students resent."

We should require all students at our institution to take (or test out of) two semesters of a second language.

Students will resent a language requirement. — opposes

Students appreciate the importance of knowing a second language. — rebuts

We can be justified in instituting requirements that students resent. — rebuts

Argument Maps - Analyzing

"Learning a second language requires students to focus upon things like conjugation, grammar, and sentence structure so familiarity with a second language improves students' understand of their first language. Therefore, we should require all students at our institution to take (or test out of) two semesters of a second language. Additionally, familiarity with a second language enhances intercultural competence and we should do what we can to enhance our students' intercultural competence. Some people maintain that students will resent a language requirement. In fact, however, students appreciate the importance of knowing a second language. And even if they didn't, we can be justified in instituting requirements that students resent."
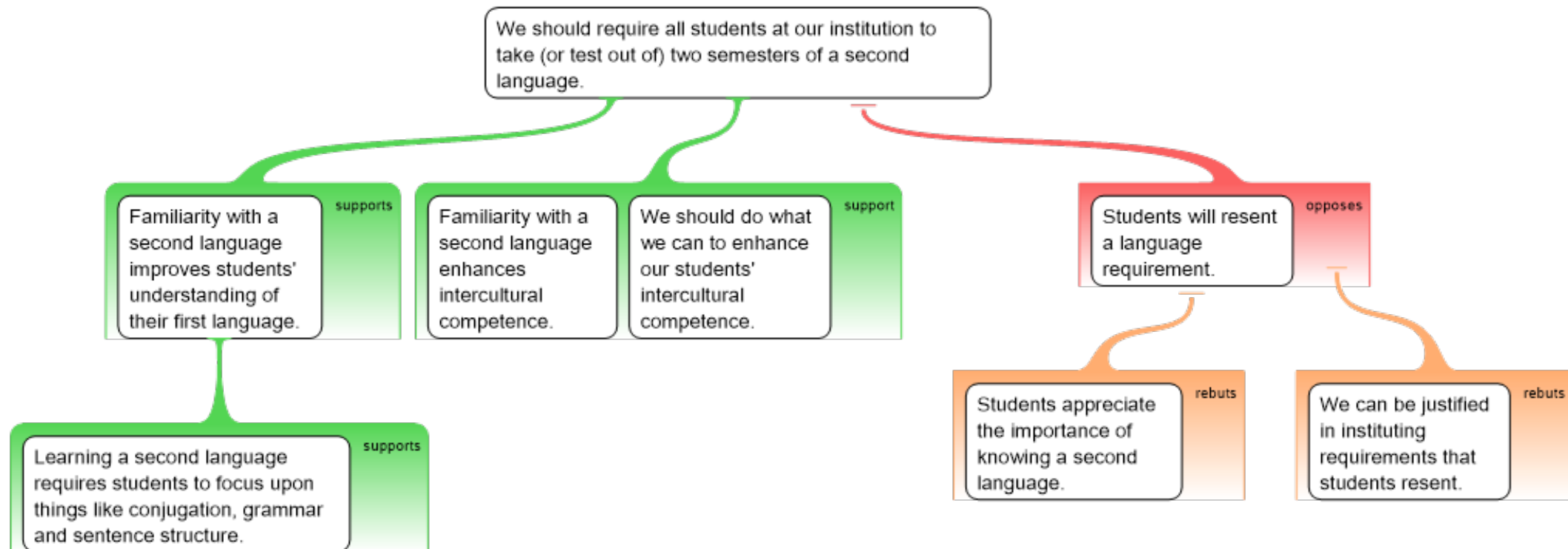
Argument Maps - Construction

Argument Maps – Hypothesis Generation
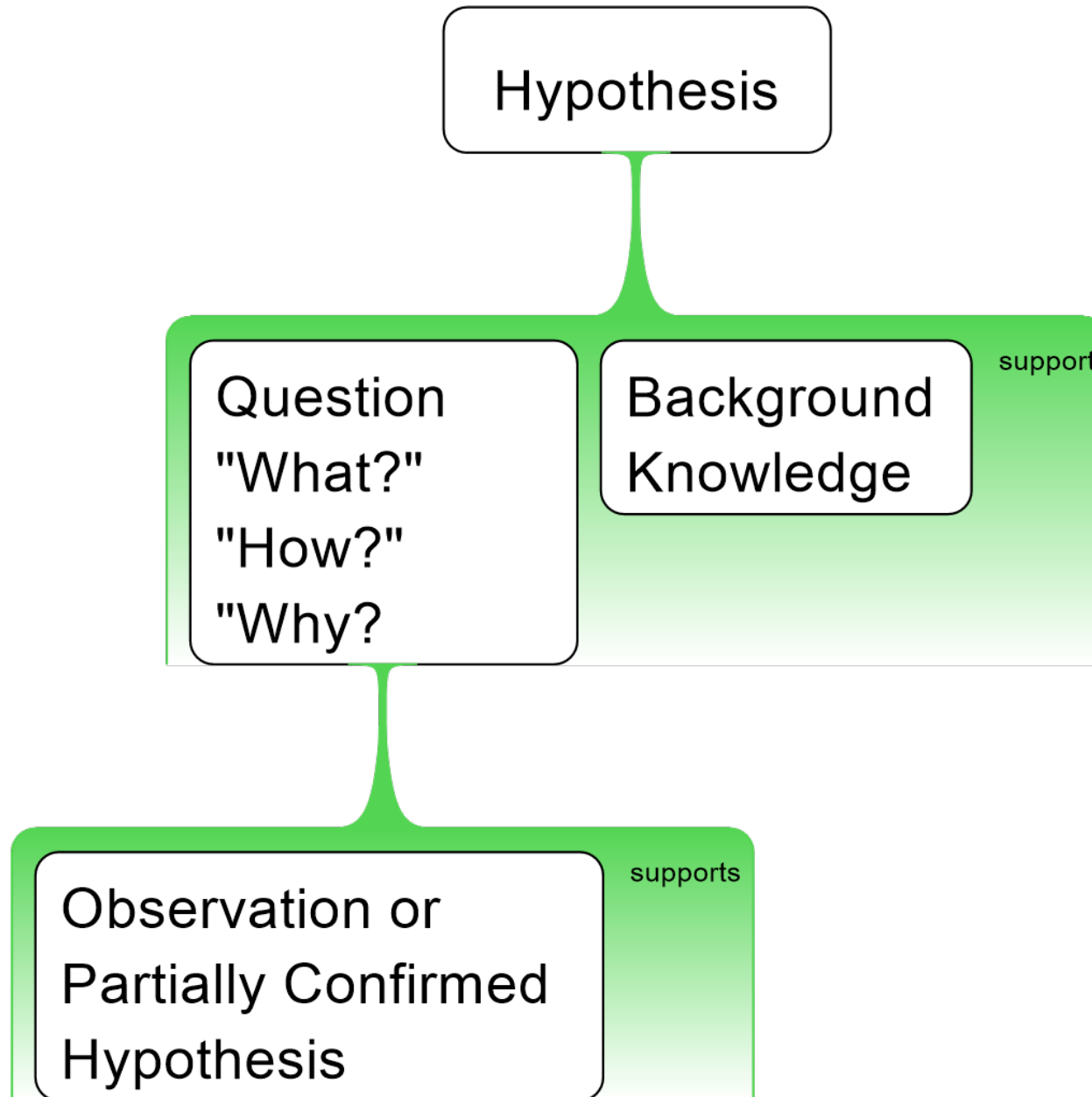
Argument Maps – Hypothesis Testing

Hypothesis H is Partially Confirmed.

- or-

Hypothesis H is Disconfirmed.

support

Experimental Prediction:

If H is true then under conditions C, X will happen.

Experimental Result:

X happened under conditions C.

-or-

X did not happen under conditions C.

Dialog Maps – Problem Solving

Dialog Maps – Problem Solving

Dialog Maps – Problem Solving
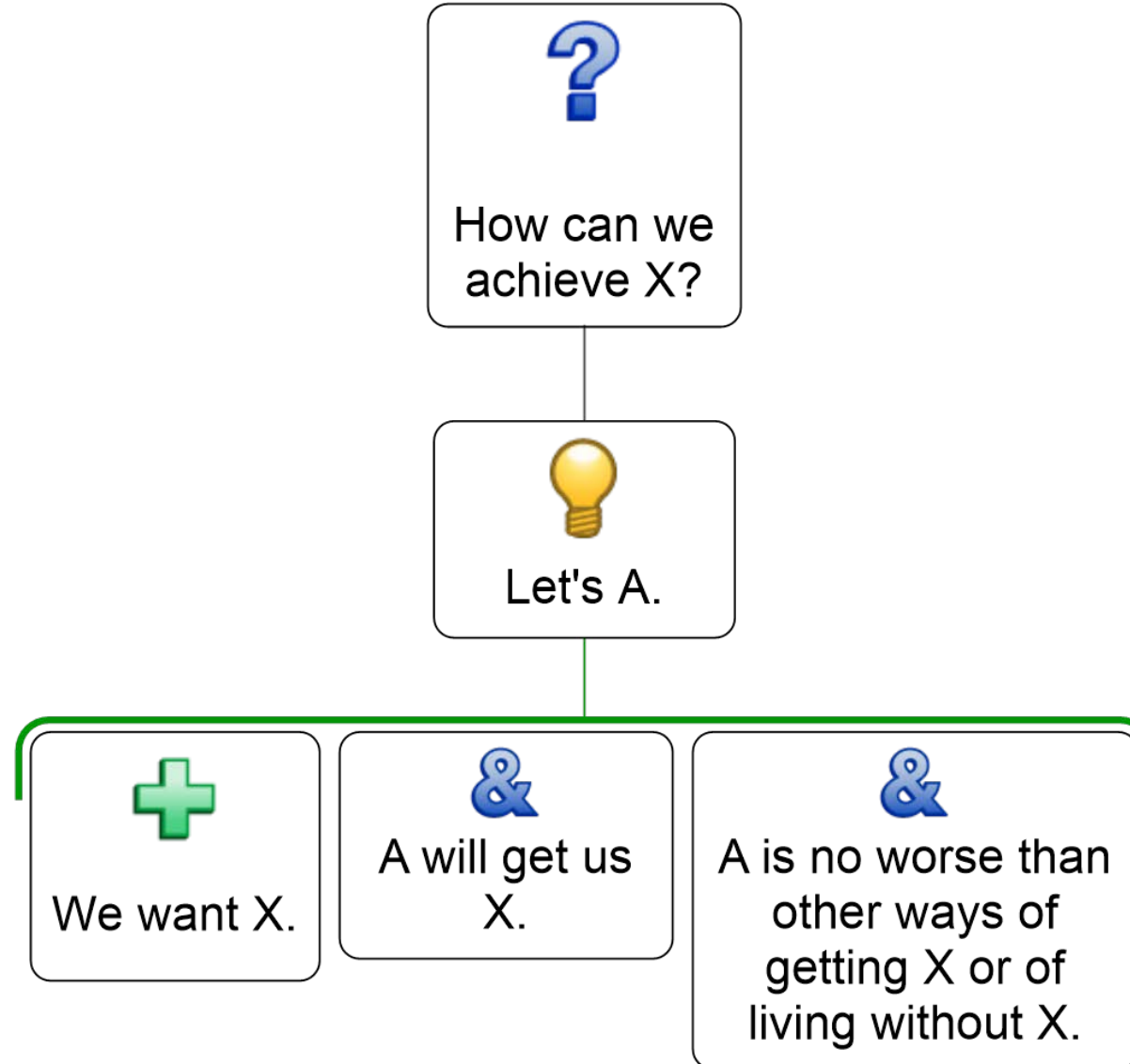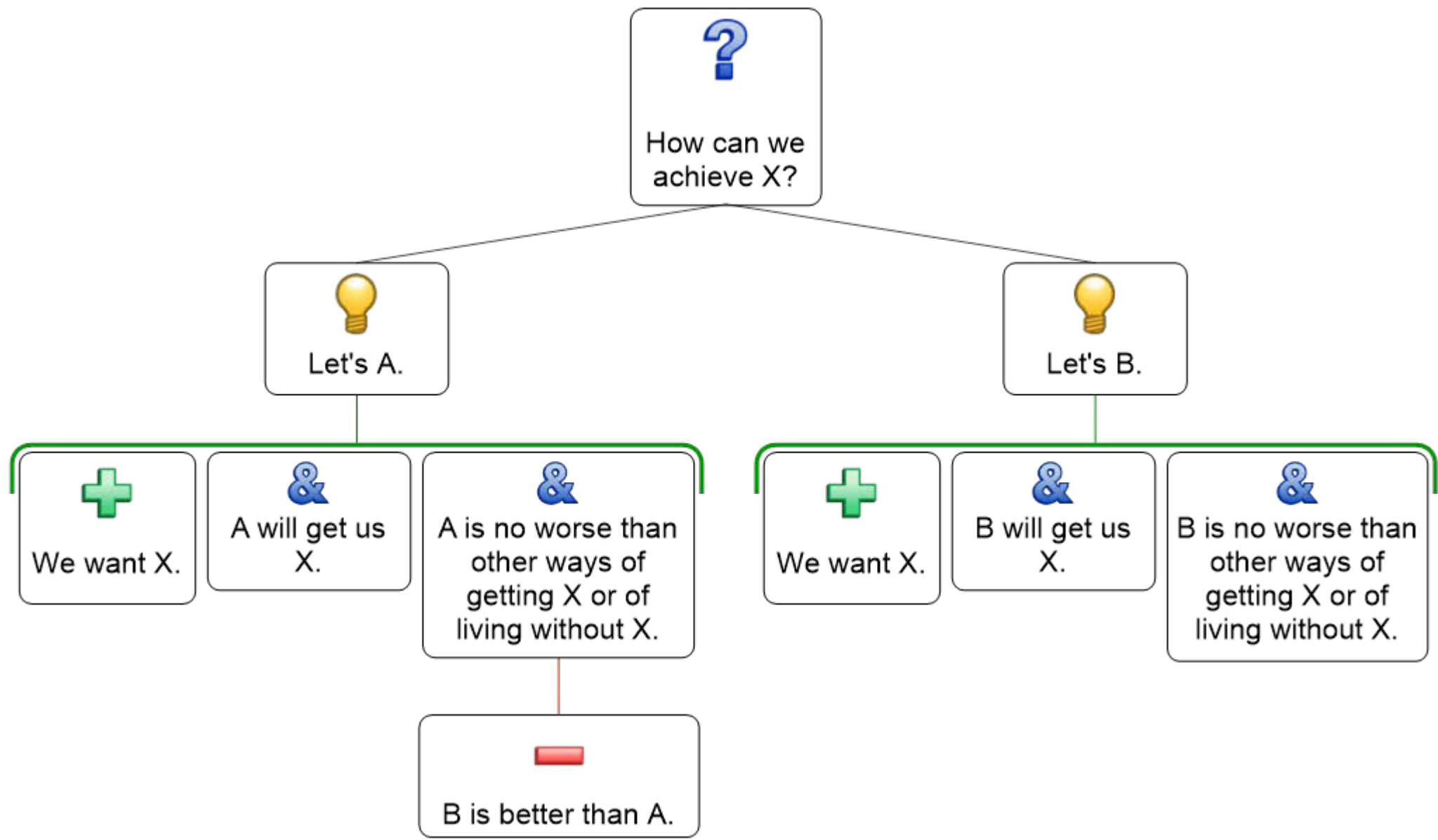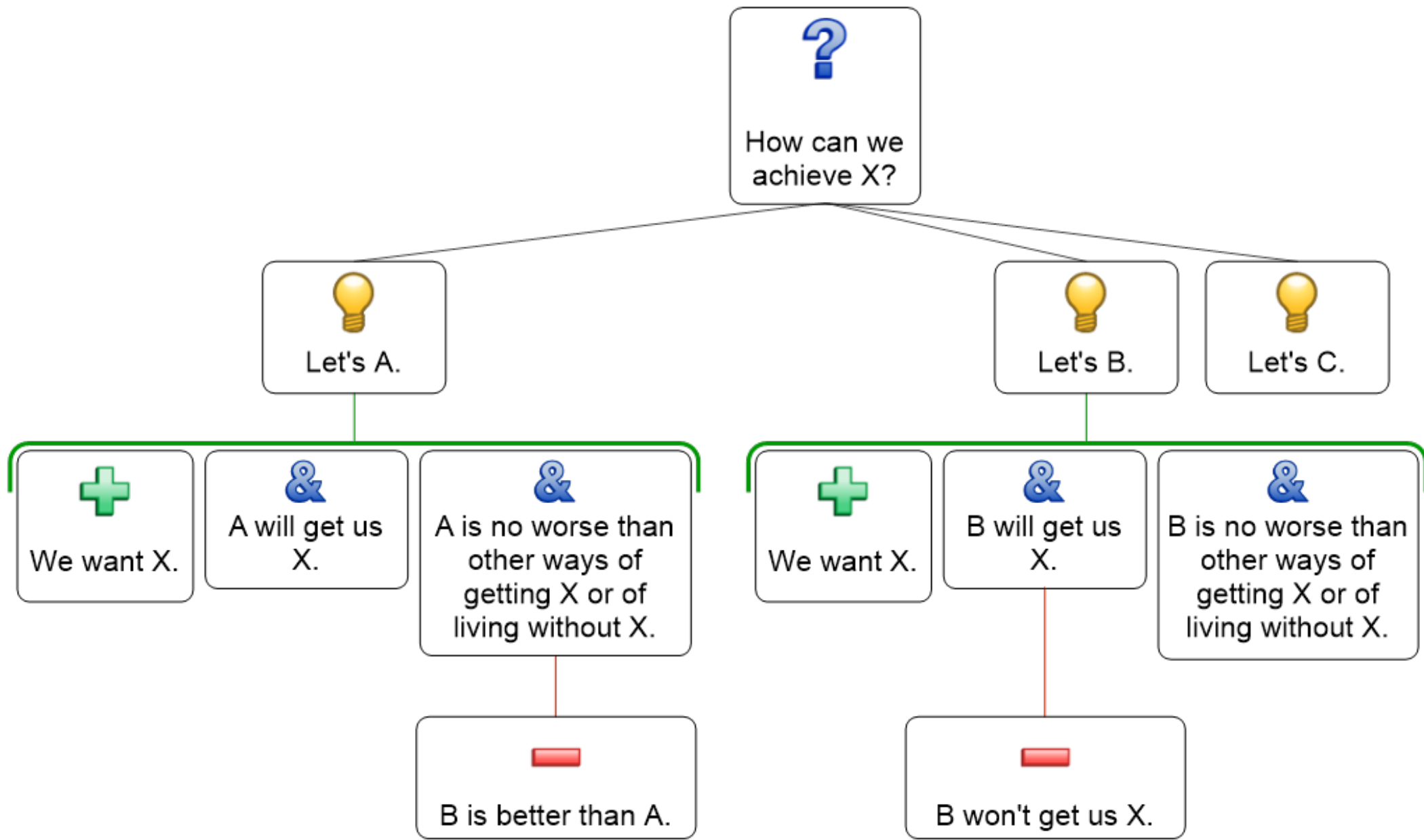
Dialog Maps – Problem Solving

Dialog Maps – Problem Solving

Upon completion, participants will be able to identify how graphical representations of reasoning can be applied across disciplines to teach and assess critical thinking skills.

French Literary Seminar

Available Brain Looking for Critical Mind

Source

- Teaching critical thinking (*la pensée critique*) as visual thinking (*la pensée visuelle*) at all levels of instruction in Francophone world
  - 2016-2017 Wisconsin Teaching Fellow Scholarship of Teaching and Learning (SoTL) Project

Different Maps – Different Functions

- In "Visual Mapping to Enhance Learning and Critical Thinking Skills" (2011), Héctor C. Santiago examines multiple tools and visual maps to capture different types of thinking processes:

    "picturing the thinking process (mind mapping), exploring the structure of knowledge (concept mapping), developing premises, counter arguments and conclusions around a contention (argument maps), exploring the learner's own thinking process (®Thinking Maps)" (125).

MIND, CONCEPT & ARGUMENT MAPS
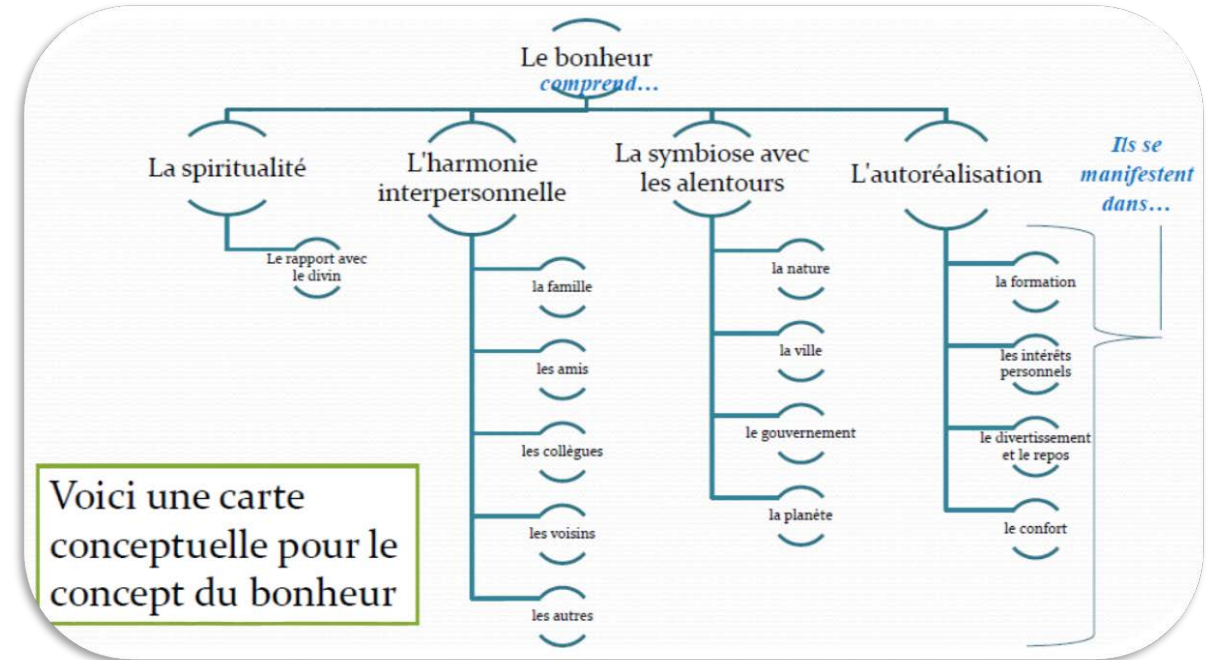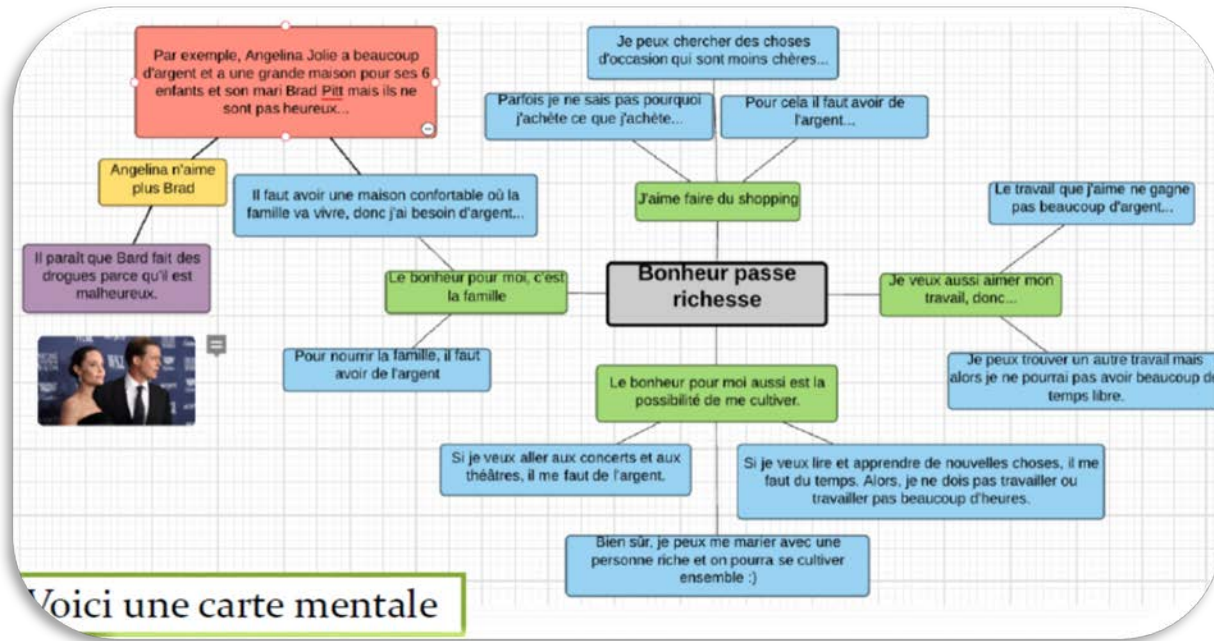
Instructor's maps exemplify differences between mind and concept maps.

STUDENT WORK

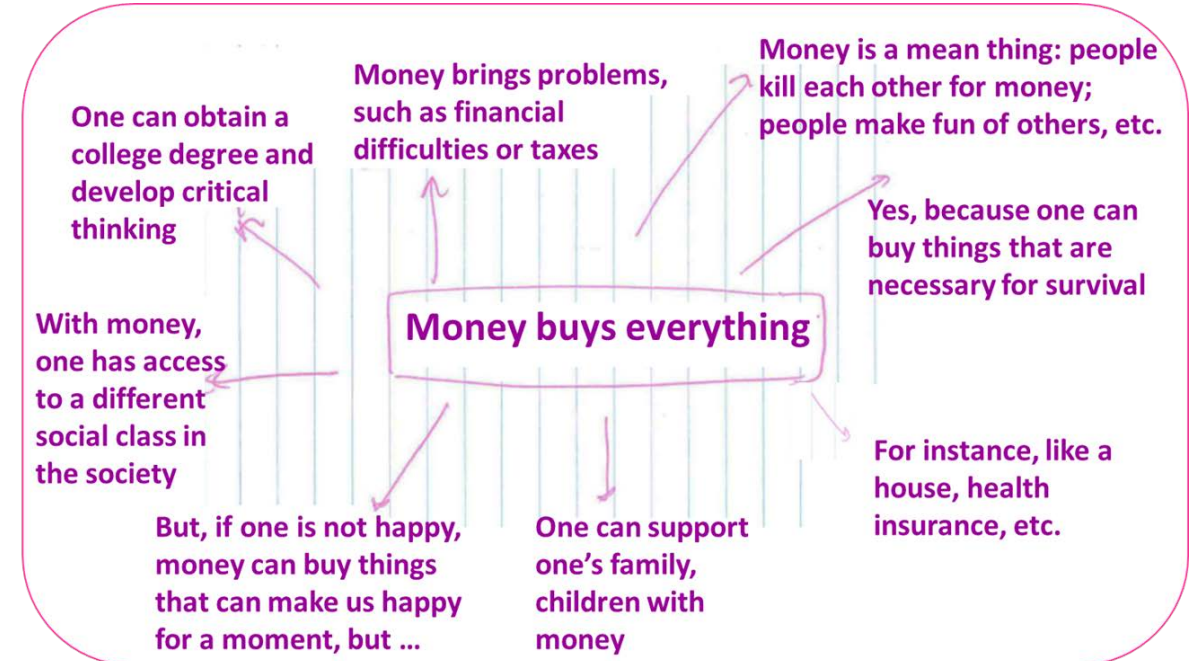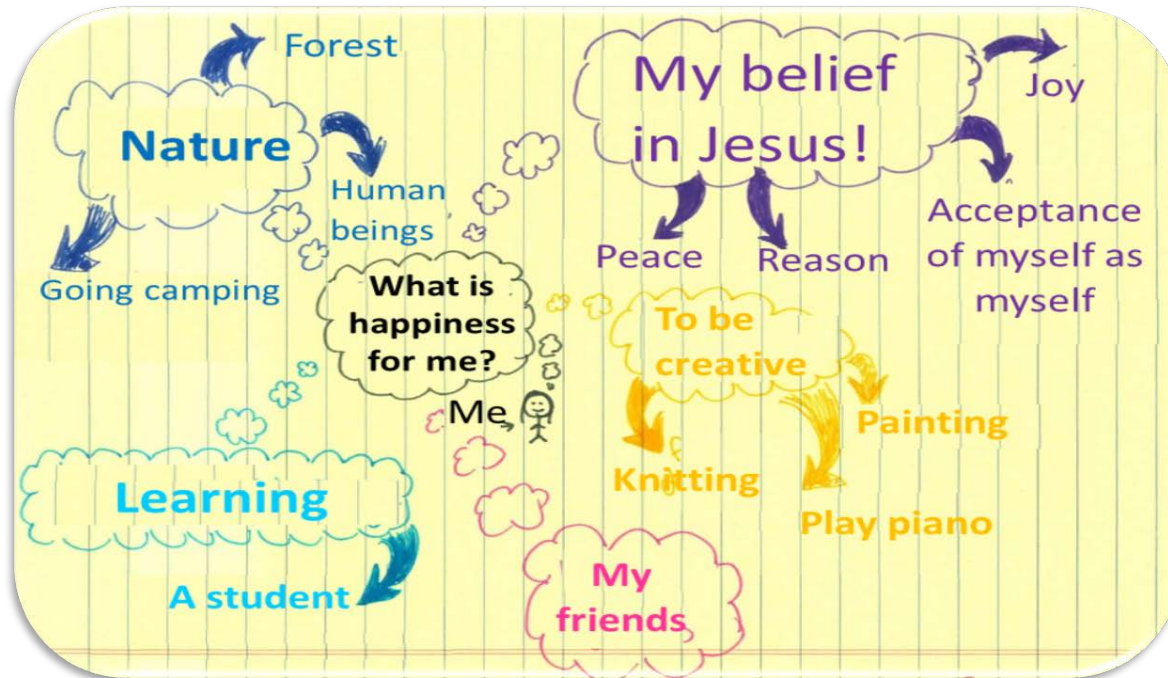- First Class Debate based on Molière's play *Le Bourgeois gentilhomme*: Two Concepts Maps – "Happiness prevails over fortune" & "Money buys everything"

Students 1 & 2 (originals in French, translation is mine): Logical connectors are not present; information is ordered by color or position; associative flow prevails.

STUDENT WORK

- Second Class Debate on Françoise Sagan's novel *Bonjour Tristesse*: One Argument Map – "We are always responsible for our actions"

We are always responsible for our actions.

because

We can think for ourselves

but

However, there are still many decisions that we make ourselves.

Society and the circumstances of our lives dictate our thoughts and they control us.

Example: If someone says that one needs to do something, one can decide if s/he will do it.

but

When one is a child, s/he does not know the difference between good and bad and cannot think of consequences.

Figure of authority

Example: If I was born at the time when everybody thought that women were inferior, I would think it too.

Are they responsibility of their parents?

Student 3 (original in French, translation is mine): This map shows logical flow. It also included logical connectors for supporting claims (**because**), objections (**but**) and even a rebuttal (**however**).

STUDENT WORK

- Final Research Project on the Future of Reading: Students had a choice of visual mapping types/ tools to use

Student 4: Original French is preserved to illustrate this exemplary work produced in the target language. The argument map includes several supporting claims with different types of evidence (citations from peer-reviewed articles, personal experiences, etc.) as well as complex counter-claims (objections and rebuttals). The logical flow is immediately visible and can be easily evaluated for its accuracy. This map was prepared with Rationale, an online argument mapping software, which supports several languages.

www.rationaleoneline.com
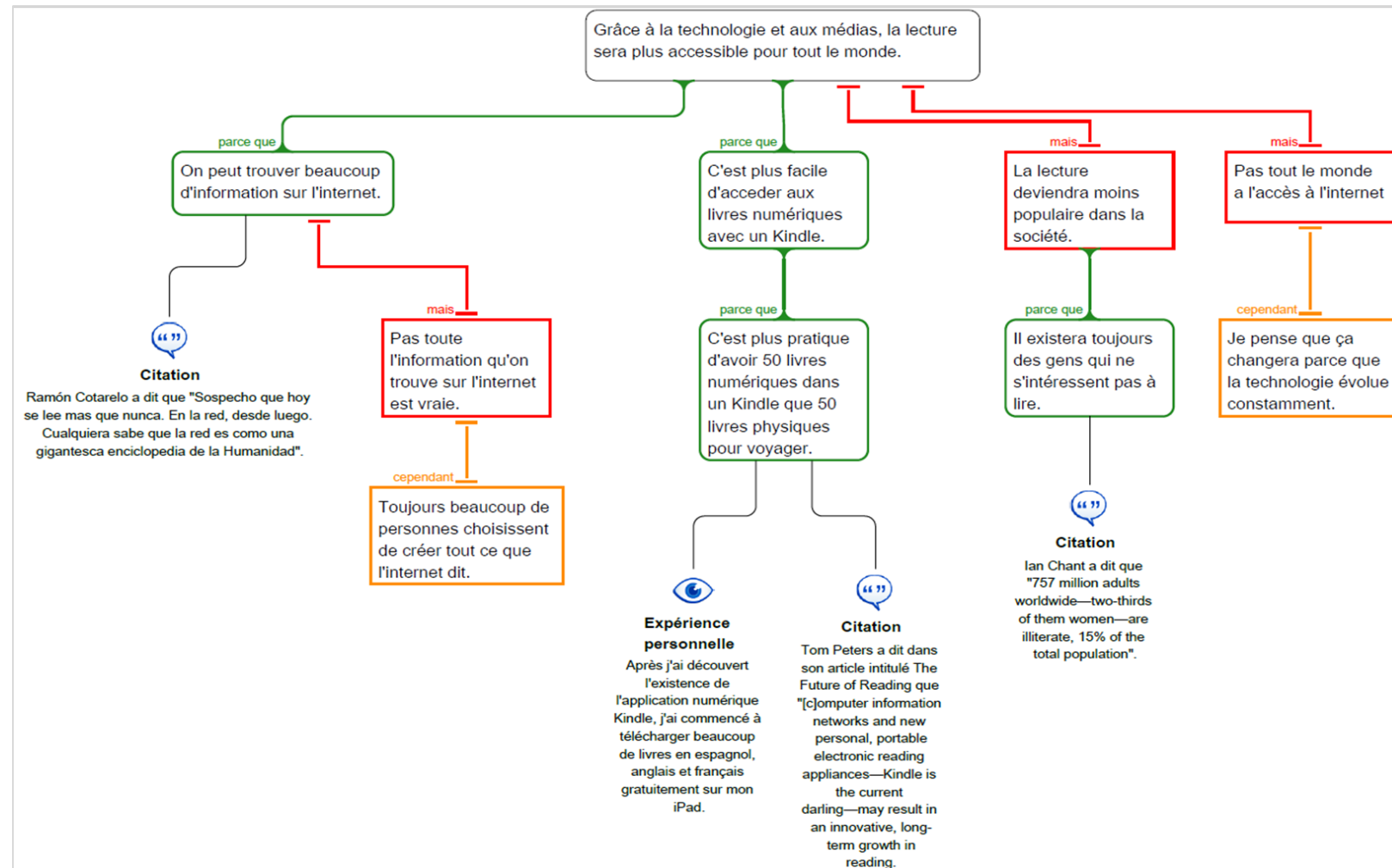
French Literary Seminar

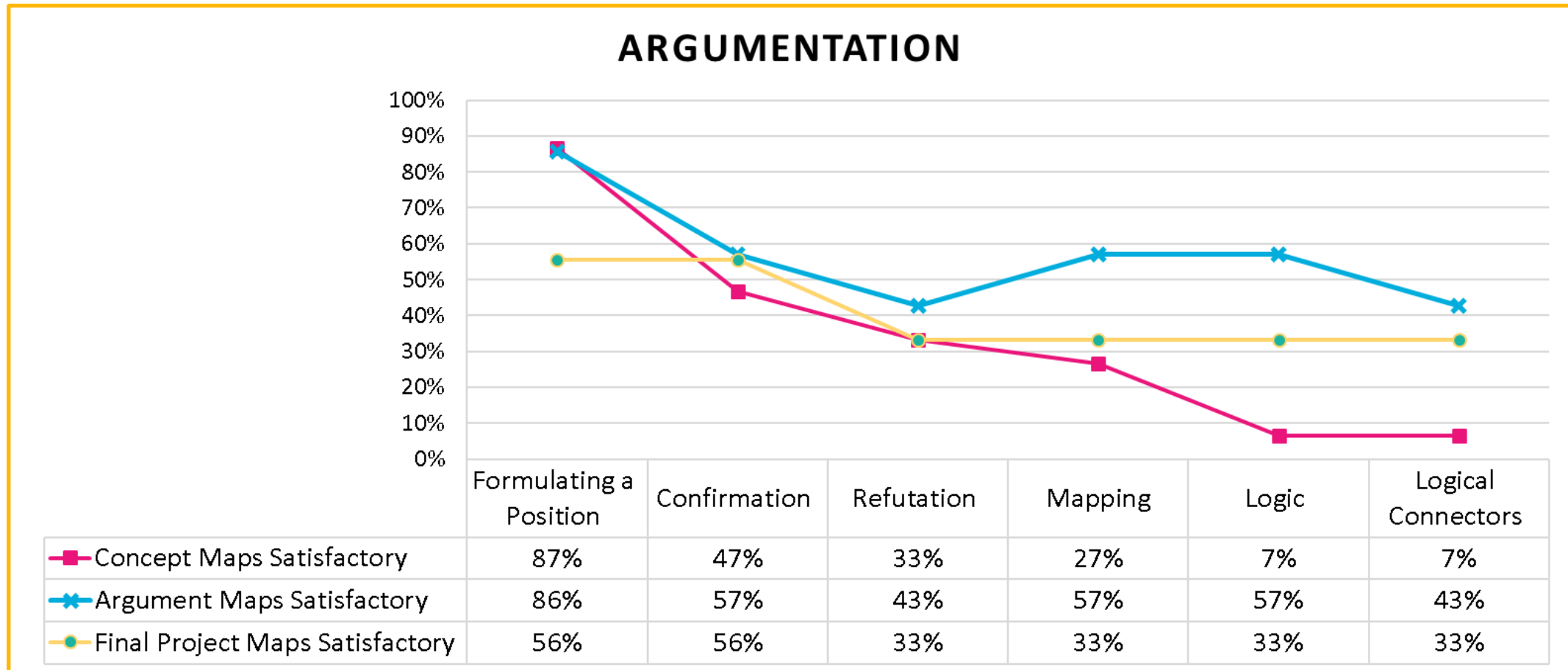| Criteria	DOES NOT MEET EXPECTATIONS	DEVELOPING TOWARDS MEETING EXPECTATIONS	MEETS EXPECTATIONS	EXCEEDS EXPECTATIONS
FORMULATING A POSITION	Position (i.e. ultimate conclusion) is stated, but is simplistic and obvious.	Position is vague.	Position is clearly stated.	Position is clearly stated and thought-provoking.
CONFIRMATION	Supporting claims and evidence are minimal.	Supporting claims and evidence are present but not fully developed or only a few points are considered.	Supporting claims and evidence are discussed and several points are considered.	Supporting claims and evidence are discussed at length and various points help reveal the complexity of the issue.
REFUTATION	No refutation is provided.	One type of counterclaims (i.e. objection[s]) is provided.	Two types of counterclaims (i.e. an objection and a rebuttal) are provided and help consider different sides of the issue.	More than two counterclaims (i.e. objections and rebuttals) are provided and help reveal the complexities of the issue.
MAPPING	No mapping is provided or little effort is evident in the visual arrangement of the argument.	The visual arrangement of the parts of the argument is somewhat confusing and does not indicate always if the claims are used to confirm or refute the previous claims.	The visual arrangement of the parts of the argument facilitates understanding and evaluation of the argument. It is logically arranged, indicating clearly if the claims are used to confirm or refute the previous claims.	The visual arrangement of the parts of the argument is aesthetically pleasing and facilitates understanding and evaluation of the argument. It is logically arranged, indicating clearly if the claims are used to confirm or refute the previous claims.
LOGIC	Reasoning contains some faulty premises or illogical connections between claims (i.e. faulty inferences)	Reasoning contains some weak premises and/or some of the connections are not logically sound.	Reasoning mostly contains strong premises and the logical relationships between various claims are sound.	Reasoning contains strong premises and the logical relationships between various claims are sound, strengthening the epistemic force of the whole argument
LOGICAL CONNECTORS	No logical connectors are used or some connectors are used incorrectly.	Only a few logical connectors are used.	Logical connectors as well as the syntactic progression of the argumentation are used to make apparent the argument logic.	Varied logical connectors along with the syntactic progression of the argumentation are used to help make apparent the argument logic.

French Literary Seminar

RESULTS

- Basic Argument Construction and Mapping Rubric

ARGUMENTATION

	Formulating a Position	Confirmation	Refutation	Mapping	Logic	Logical Connectors
Concept Maps Satisfactory	87%	47%	33%	27%	7%	7%
Argument Maps Satisfactory	86%	57%	43%	57%	57%	43%
Final Project Maps Satisfactory	56%	56%	33%	33%	33%	33%

Number of students = 9

RESULTS

- Mind maps were easier to complete and were met with greater enthusiasm by students than argument maps.
  - 56% of students used mind maps for their final research project over 44% who used argument maps.
- Proper concept maps were not produced by students.
  - Only 11% of maps were concept maps over 89% of mind maps.
- Associative flow of mind maps lacks rigor and logical connections.
  - In concept/ mind maps, 7% used logical connectors
 - In argument maps, 43% used logical connectors.

RESULTS

- Clarity of argumentation is mostly achieved in argument maps.
  - **Argument maps outperformed mind/ concept maps**:
    - **43%** over 33% in refutation, **57%** over 27% or 33% in clarity of visualizing of the argumentation, **57%** over 7% or 33% in logical representation and **43%** over 7% or 33% in the use of logical connectors.

- Use of color in mapping seems to assist students to group ideas that are related. However, it does not make student reflect on the nature of inferences or links between ideas.
  - 52% used color in their maps (16 maps out of 31 total maps)

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RESULTS

Student Feedback Survey - Weighted Averages
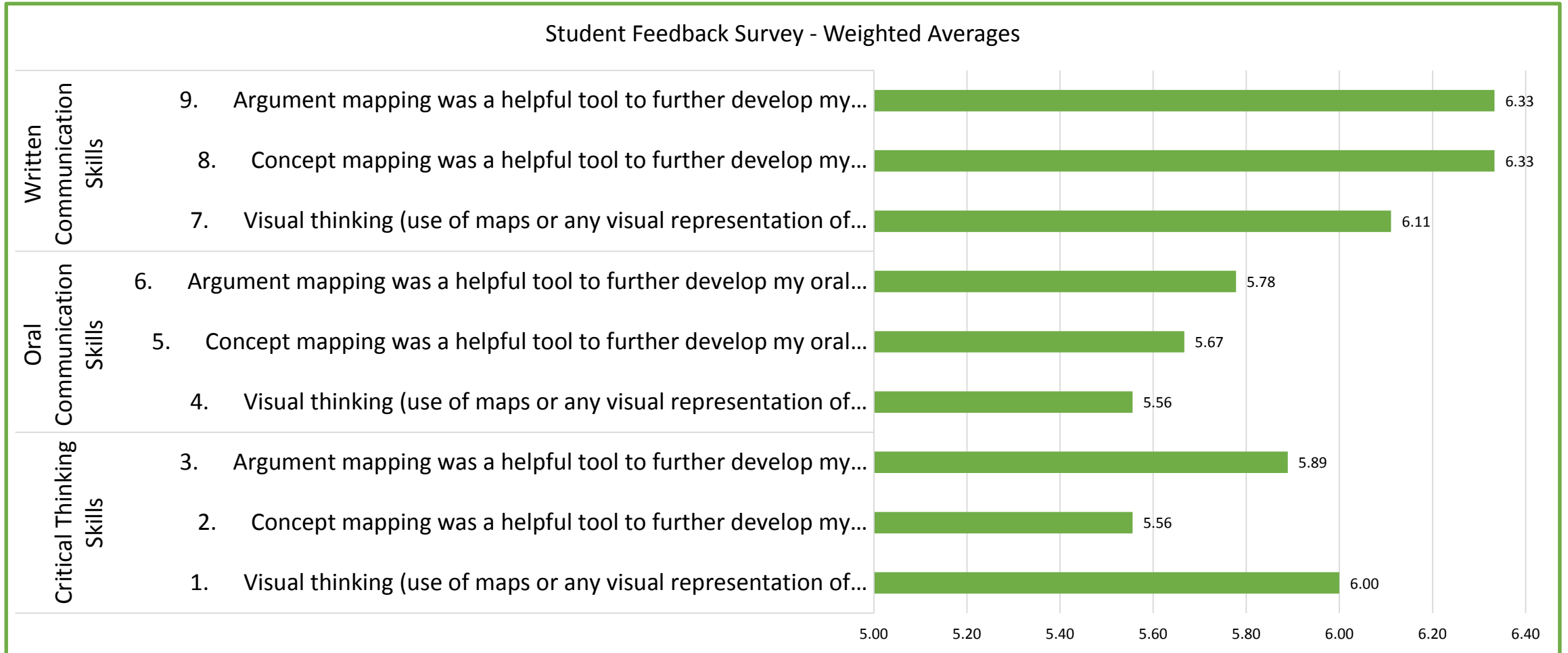
Feedback questionnaire used the Likert scale (1-7), 7 indicating
strongly agree. Number of students = 9

French Literary Seminar

RESULTS

- Argument maps were judged by students as more difficult and were less well-produced. However, in the qualitative portion of the student feedback survey, they reported that they would use argument maps to structure their arguments in the future.
    - **79% (7 out of 9 students) felt that argument maps were the most helpful to develop critical thinking skills (SFS).**
    - *Student Comments: "[Argument maps] seem to be more in depth, and challenged my opinions"; "[They] make you think about ideas from multiple perspectives. Concept maps, it's kind of just your perspective."*
    - *"[In] classes where there is too much data & too many arguments to consider, I already find myself referencing back to the theories we learnt here."*

MID-STATE TECHNICAL COLLEGE

"**EMPLOYABILITY SKILLS -** In addition to specific job-related training, Mid-State has identified a set of employability skills which are transferable and go beyond the content of a specific course.

- Act with Integrity
- Communicate Effectively
- **Demonstrate Effective Critical and Creative Thinking**
- Demonstrate Global Social Awareness"

http://www.mstc.edu/employability-skills

- **learner uses a structured problem-solving approach**
- learner demonstrates open-mindedness
- learner organizes information
- learner works successfully in a climate of ambiguity and change
- learner applies previously acquired knowledge to new tasks

Critical and Creative Thinking

- Focus of the 2019-2020 academic year

- College-wide initiative
  - Assessment in multiple programs
  - Building a common rubric to assess critical thinking
  - Argument mapping as common strategy

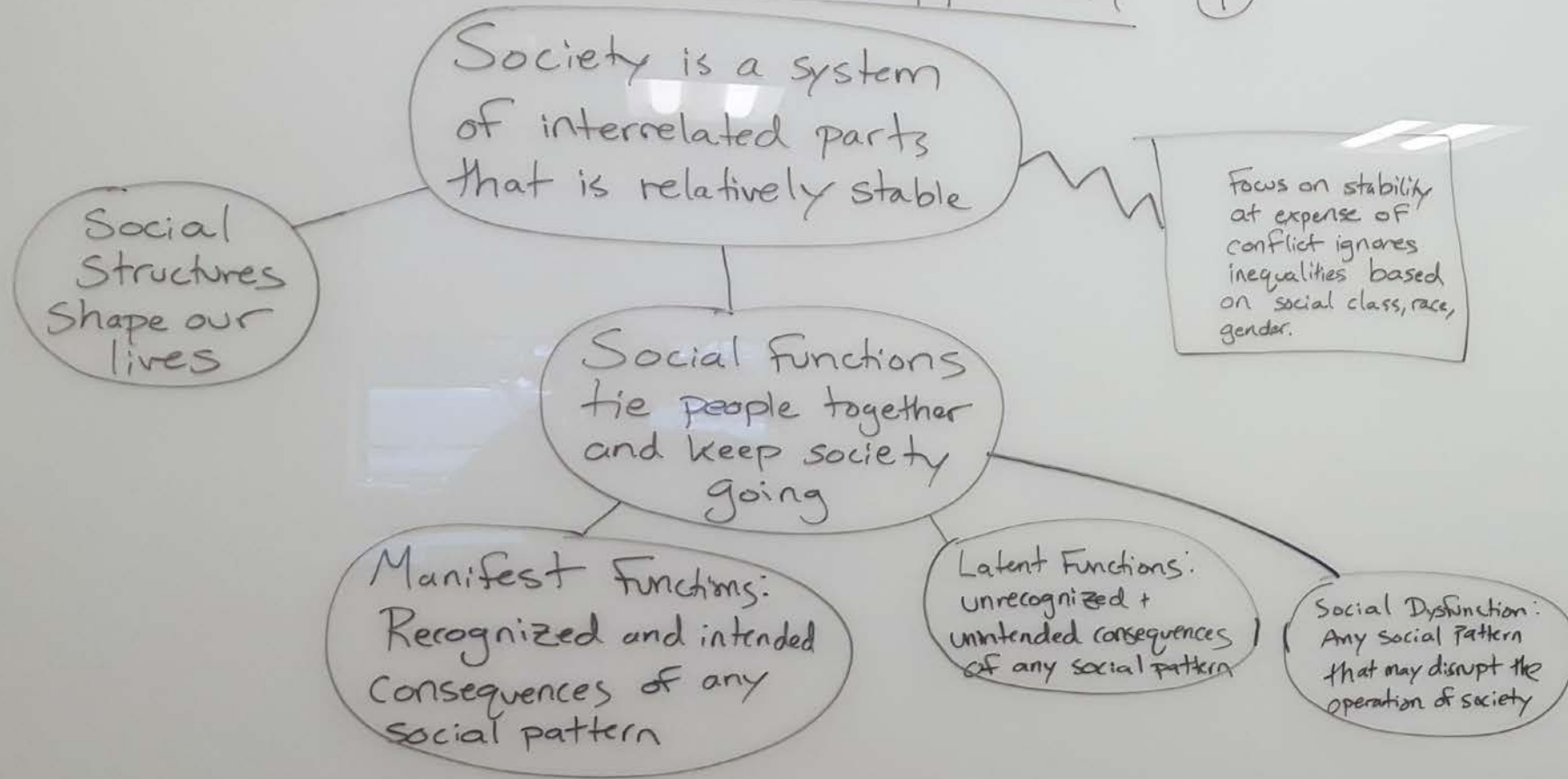# Critical and Creative Thinking

- Practicing simple maps with MindMup each week
  - Reason-conclusion
  - Independent reasons
  - Dependent reasons
- Conducting a debate through Truthmapping
  - Assigning a current issue to research and argue for or against
  - Critiques and rebuttals

Used argument mapping to represent the three theoretical approaches of sociology.
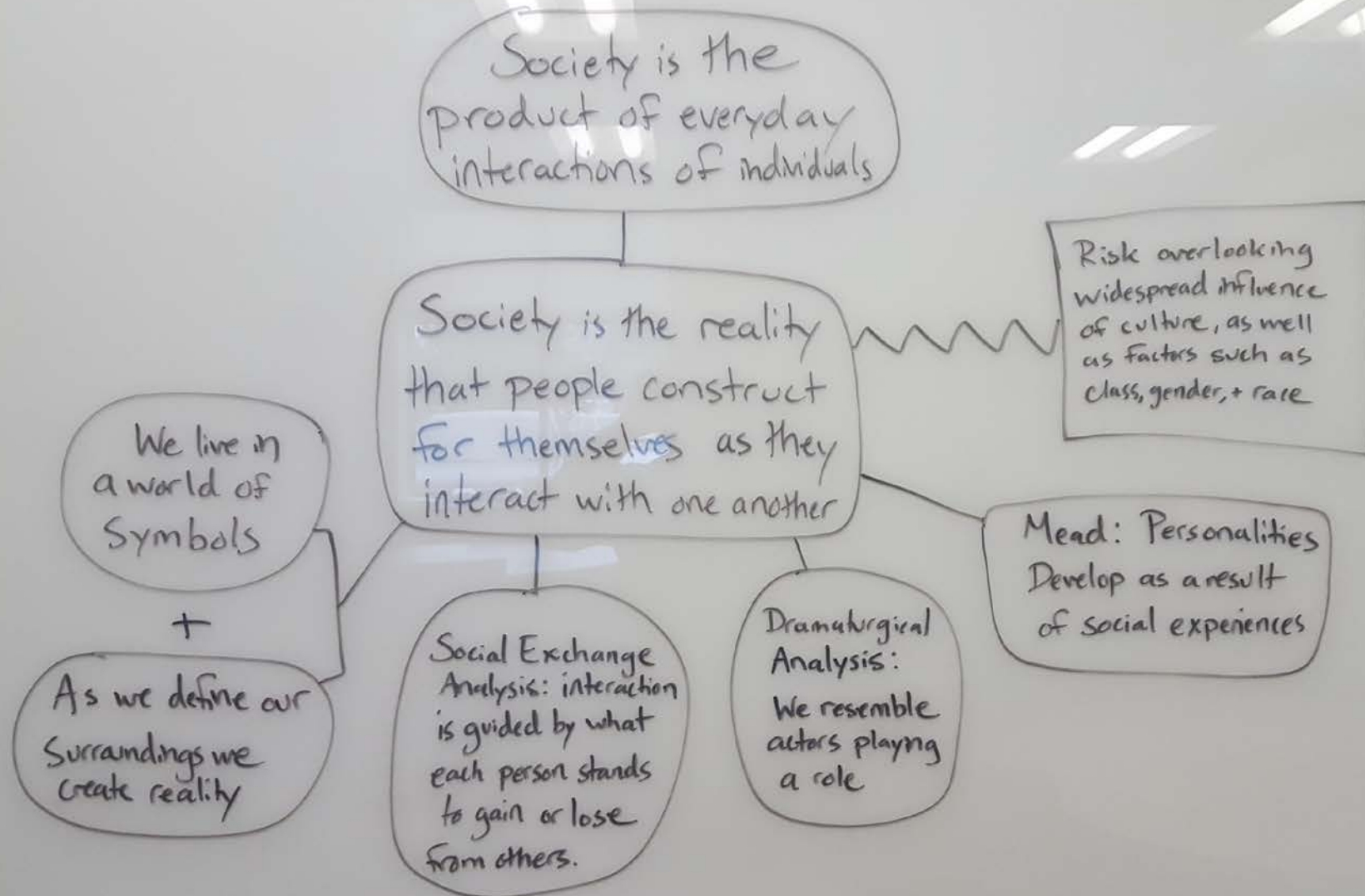
Sociology

Structural Functional Approach ①

Society is a system of interrelated parts that is relatively stable

Social Structures Shape our lives

Focus on stability at expense of conflict ignores inequalities based on social class, race, gender.

Social functions tie people together and keep society going

Manifest Functions: Recognized and intended consequences of any social pattern

Latent Functions: unrecognized + unintended consequences of any social pattern

Social Dysfunction: Any social pattern that may disrupt the operation of society

Sociology

Social Conflict Approach ②

Society is an arena of inequality that generates conflict + change

Pursues social Change: Political

Cannot claim Scientific objectivity

Race, class, gender, ethnicity, age linked to inequality in terms of Money, Power, + social prestige.

People who benefit from current social structures try to protect privileges while disadvantaged try to gain more for themselves

All Theoretical Approaches have political consequences

Gender Conflict theory

Race Conflict Theory

Feminism

Any social pattern benefits some while hurting others

Ignores how shared values and interdependence can unify members of society

Sociology

- Argument mapping works well in any class that deals with theory.
- The theory is the conclusion and you can break down the reasoning behind the theory by mapping it.
- This is helpful for students who have a hard time understanding the reasons behind a theory.

Adult Basic Education

- Argument mapping can be used in Adult Basic Education to help students who have trouble deriving meaning from a text.

Upon completion, participants will be able to identify some ways to use graphical representations of reasoning at their institution.
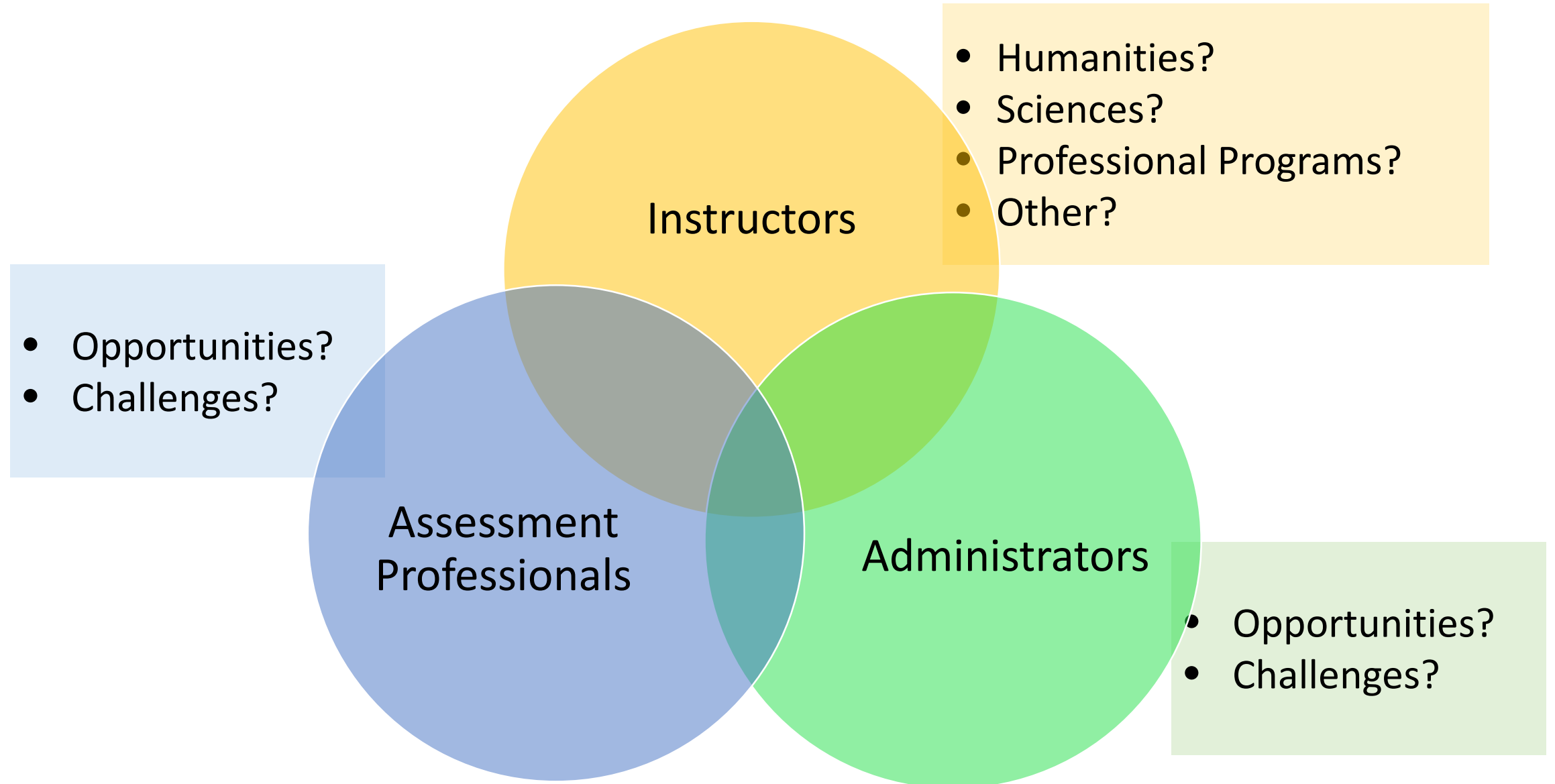
- What are the important assertions?
- How are these assertions related to each other?

"I'm confident that my house will sell within six months. For one thing, my asking price is within $10,000 of what I paid for the house so it's certainly priced reasonably and reasonably priced houses always sell quickly. For another thing, my house is in really good shape. My sister-in-law thinks that the siding needs to be replaced, but that's not true. The siding is designed to look distressed. Finally, and maybe best of all, my house is on a river. Of course, my sister-in-law says this doesn't mean that my house will sell quickly. 'Lots of people are worried about flooding,' she says. But how can that be? People buy waterfront property all the time."
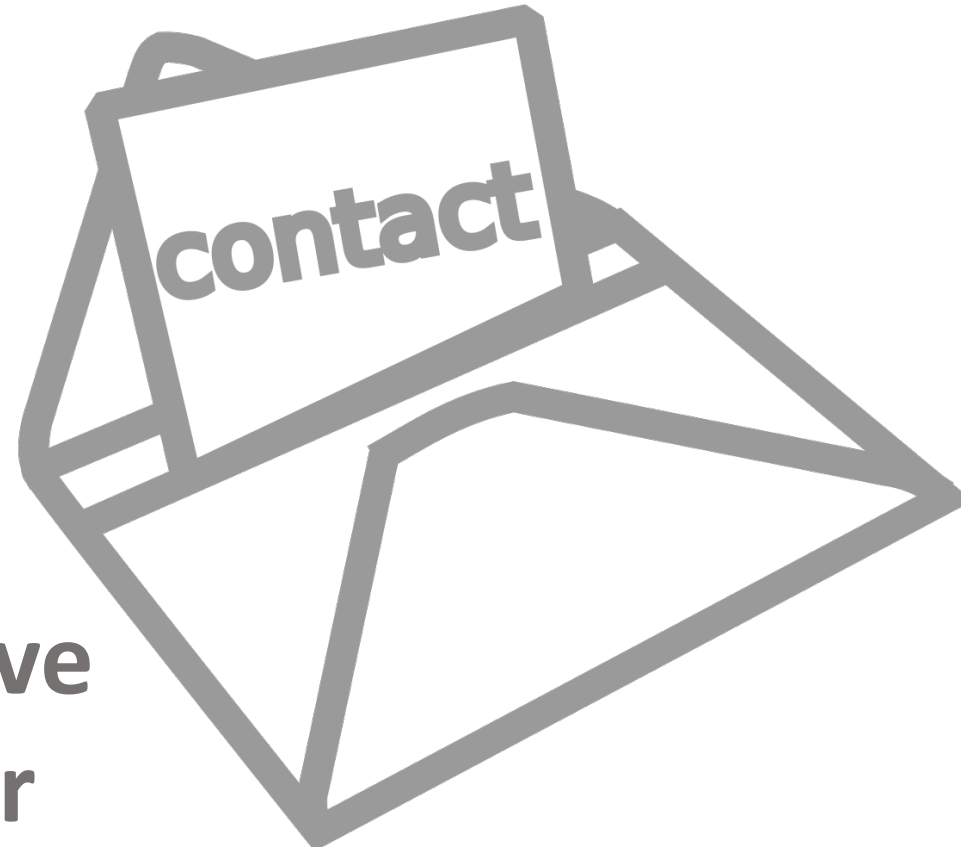
Try it Out
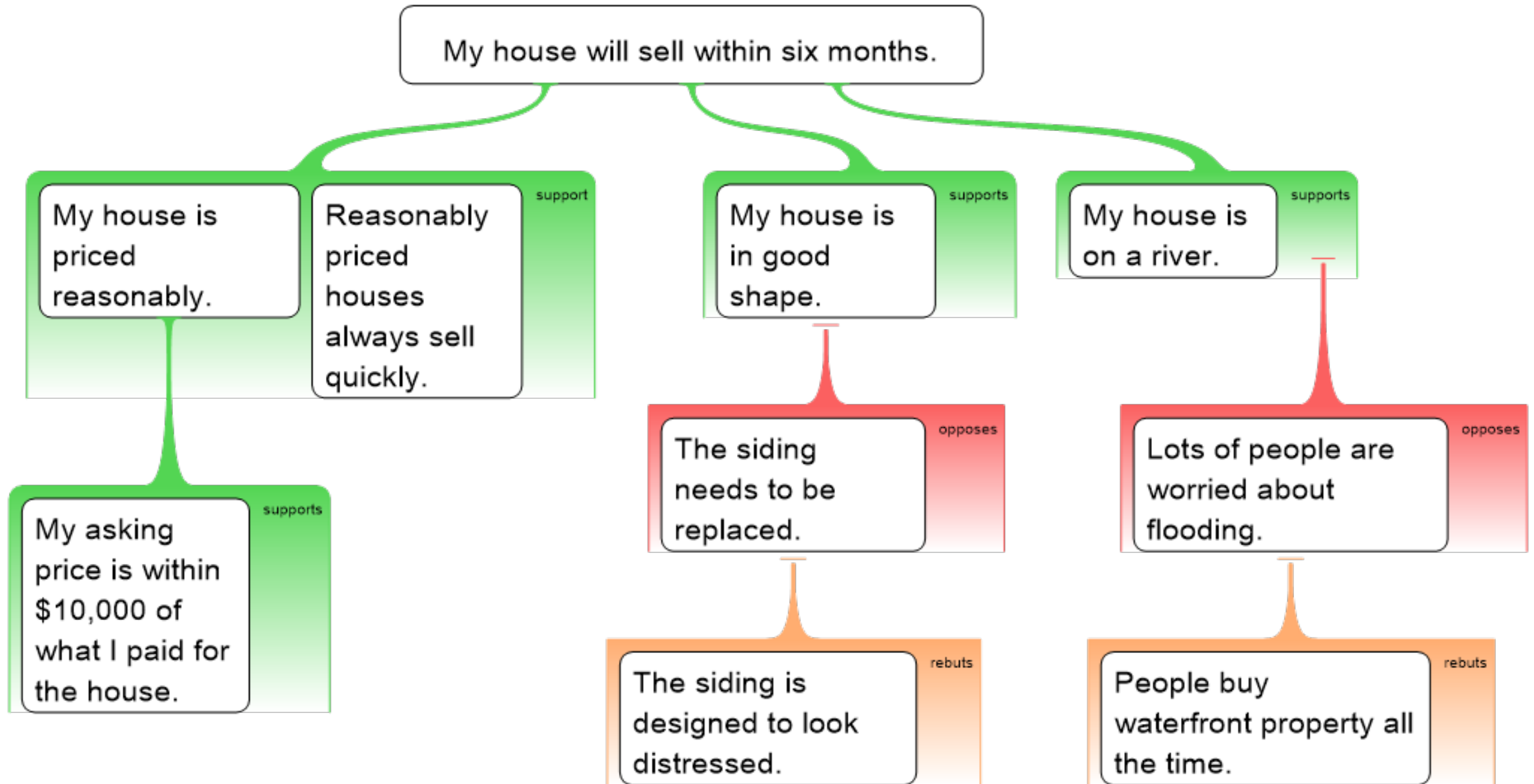
Graphical Representations of Reasoning at Your Institution

We'd love
to hear
from you!

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- MindMup https://www.mindmup.com/tutorials/argument-visualization.html?orig=/
- Rationale https://www.rationaleonline.com/
- Truthmapping https://www.truthmapping.com/#cat=3