CONSTRUCTING
AND
COMMUNICATING
ARGUMENTS

Dona Warren
UW – Stevens Point
The Pedagogical Challenge

Arguments can be difficult for students to construct because
It involves
• generating ideas that bear particular logical relationships to each other, and
• adopting a properly critical posture to those ideas, revising them if necessary.
It’s often difficult for people to
• explicitly consider the logical relationships between the ideas that they are generating, and
• adopt a properly critical posture to their own claims.

Arguments can be difficult for students to communicate because
It involves
• expressing ideas in a way that makes their logical relationships easy for the audience to track.
It’s easier for people to
• express ideas in the order in which the ideas occurred to them.
How Mapping can Help

Students first **construct** an argument by mapping it.
- Using skills developed when they learned how to **analyze** (or extract) arguments to generate and record ideas in a way that captures the logical relationship between these ideas.
- Using skills developed when they learned how to **evaluate** arguments to adopt a properly critical posture to their own claims.

Students then **communicate** their argument by
- expressing those ideas in a way that makes their logical relationships easy for the audience to track, making informed choices about the order in which they want to state their claims, which claims they want to leave unstated, and so on.

Graphically representing an argument (i.e. argument mapping) is an excellent way to helps students separate the process of constructing an argument from the process of communicating it.
How this Works

We can help students **construct** their own arguments by:
1. Using a template.
2. Referring to a generative procedure.

We can help students to **communicate** their own arguments by:
1. Using a template.
2. Referring to a set of principles.
Goal

1. What is the problem you want to solve, or the need you want to meet?

Means

5. What course of action will allow me to meet your goal?

Justification of Goal

2. Why is this an important problem or a significant need?

Recommendation

9. This is explicit recommendation that people engage in the course of action recommended in the means.

Justification of Means

6. How could you convince someone that this course of action will be effective in meeting your goal?

Objection to Goal

3. How might someone deny that this is an important problem or a significant need?

Rebuttal of Objection to Goal

4. Why is that objection incorrect?

Objection to Means

7. How might someone deny that this course of action will be effective in meeting your goal?

Rebuttal of Objection to Means

8. Why is that objection incorrect?

Constructing an Argument: Template

• In the order indicated, fill in the boxes with one and only one complete idea.
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“[RECOMMENDATION]. After all, [GOAL] because [JUSTIFICATION OF GOAL]. Of course, some might object to [GOAL] by saying [OBJECTION TO GOAL], but in fact, [REBUTTAL OF OBJECTION TO GOAL], so we may safely conclude that [GOAL].

[MEANS] because [JUSTIFICATION OF MEANS]. Some might disagree that [MEANS], asserting [OBJECTION TO MEANS]. Actually, though, [REBUTTAL OF OBJECTION TO MEANS]. In conclusion, because [GOAL] and [MEANS], [RECOMMENDATION].”
Constructing an Argument: Generative Procedure

1. Formulate a research question
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2. Explore various answers and decide which one you like the best. This is your ultimate conclusion.

3. Construct one Line of Reasoning
   a. What's a reason to believe your ultimate conclusion?
   b. What needs to be assumed in order for the conclusion to follow from this reason?
   c. Consider the claims identified in '3a' and '3b'. Are these claims true? If not, revise them, ensuring that the conclusion still follows. Note: If you can't do this, this line of reasoning fails. If all lines of reasoning fail, the argument fails. If the argument fails, you may want to reconsider your answer. If all answers fail, you might want to reconsider your question.
   d. Consider the possibly revised claims identified in '3a' and '3b'. Are these claims acceptable to the audience? If a claim is unacceptable to the audience, provide a reason to believe it. Return to '3b.'

4. Construct another Line of Reasoning
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Constructing an Argument: Generative Procedure

1. Formulate a research question
2. Explore various answers, decide which answer you think is right, or formulate your own answer. This is your ultimate conclusion.

Question: Blah blah blah blah?
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Communicating an Argument: Referring to a set of principles

General Principle: Write your argument in a way that would make it easy for somebody else to map.

Subsidiary Principles:
1. Put your conclusion at the front of your argument, unless it's controversial. In that case, lead with a premise that your audience will accept.
2. Finish one line of reasoning before turning to another.
3. If ideas are close to each other in the map, place them close to each other in your paper or speech.
4. Signal inferences with expressions like "therefore" and "because."
5. Repeat an idea if that will help your audience to see how it relates to the ideas you're introducing.
6. If an assumption is obvious to your audience, you don't need to state it. Failing to state an assumption seldom makes an argument harder to follow.
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REVIEW AND NEXT STEPS

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Tracking the Reasoning as you Encounter it

1. What’s the main conclusion?
2. What’s being asserted here?
   • This may involve dividing sentences into parts.
   • This may involve summarizing multiple sentences into a single claim.
3. Is that idea important?
4. If so, how is that idea related to what’s gone before (other than the ultimate conclusion)?
   i. **Reason / Conclusion**
      • Inference indicator expressions help.
   ii. **Dependent Reason** (Ask “What follows from these ideas?” and fill in the subconclusion if it’s missing.)
      • The Puzzle Piece Test helps.
   iii. **Independent Reason**
      • Identifying distinct themes helps.
   iv. **Objection to a Claim**
   v. **Objection to an Inference** (Objection to an Implicit Claim)
5. Return to 2.
“2. Online classes allows students to learn at times that are convenient for them. Therefore 1. they’re perfect for working adults.”

“1. Traditional college students should be discouraged from taking online courses. After all, 2. online courses retard social integration because 3. they can be completed without meeting other students in the class.”

“2. Online classes allow students to work at their own pace and 3. students tend to learn better when they can work at their own pace so 1. online courses can enhance student learning.”

“2. Online classes are apt to engage the students so 1. they’re a good choice for most colleges. 3. They tend to attract students, too.”

“2. Online classes don’t teach higher level thinking skills. 3. College classes should teach higher level thinking skills. And 4. only college classes should transfer in. Therefore, 1. online classes shouldn’t transfer in.” (a = Online classes shouldn’t be college classes.)

“1. Online classes are apt to engage the students because 2. they lend themselves to gamification.” (a = Students are engaged by gamification.)

“Some people argue that “1. online classes are apt to engage the students because 2. such courses lend themselves to gamification. That’s clearly mistaken, though, because 3. nothing that’s graded can really be gamified.”

“The fact that 2. online classes lend themselves to gamification is taken to show that 1. online classes are apt to engage the students. But this argument fails because 3. students are insulted by the gamification of education.” (a = Students are engaged by gamification.)
Evaluating an Argument as you Encounter It

If there is a claim you disagree with, ask:

1. “Is that claim part of the argument?” If not, ignore it.
2. “Is that claim taken for granted or is it supported by other claims?”
3. If the claim is taken for granted, ask
   3.1. “Is it true?”
       ➢ Note: Be open to changing your mind about the claim by deciding, after reflection or investigation, that it’s true.
       • If you don’t think it’s true, and this is a premise, say “P is false because [evidence for P’s falsity].”
       • If you don’t think it’s true, this is a missing assumption in an inference, and you believe the stated reasons, say something like, “Just because R it doesn’t follow that C because [explain why the missing assumption is false].”
       • If you don’t think it’s true, this is a missing assumption in an inference, and you don’t believe stated reasons, say something like, “Even if R were true, it wouldn’t follow that C because [explain why the missing assumption is false].”
   3.2. “Is it acceptable to the audience?”
       • If not, say “People encountering this argument probably won’t accept P because [explain why P would be rejected by the audience].”
4. If the claim is supported by other claims, ask
   4.1 “What reasons support the claim I disagree with?”
   4.2. “Do I agree with these reasons?”
       • If not, return to 2.
       • If so, there might be an inference problem. Identify the missing assumption and return to 3.1.

If there isn’t a claim that you disagree with, ask:

1. “What claims are being taken for granted by this argument? Are they true? Are they acceptable to the audience?”
2. “What claims are taken to follow from those assumptions? Do they really follow?”
“1. Stealing is morally wrong. For one thing, 2. we have laws on the books against stealing which means that 3. our culture thinks that stealing is morally wrong. For another thing, 4. stealing tends to produce unhappiness because 5. it involves taking people’s property without their permission and because 6. people don’t like to have their property taken away. Finally, 7. stealing increases the probability of natural disasters because 8. it angers the storm gods.”

We have laws against things that we think are morally wrong.

Our culture is the final arbiter of morality.

c = Whatever produces unhappiness is morally wrong.
Constructing an Argument

1. Formulate a research question
2. Explore various answers, decide which answer you think is right, or formulate your own answer. This is your ultimate conclusion.
3. Construct one Line of Reasoning
   a. What's a reason to believe your ultimate conclusion?
   b. What needs to be assumed in order for the conclusion to follow from this reason?
   c. Consider the claims identified in ‘3a’ and ‘3b’. Are these claims true? If not, revise them, ensuring that the conclusion still follows.
      ➢ Note: If you can’t do this, this line of reasoning fails. If all lines of reasoning fail, the argument fails. If the argument fails, you may want to reconsider your answer. If all answers fail, you might want to reconsider your question.
   d. Consider the possibly revised claims identified in ‘3a’ and ‘3b’. Are these claims acceptable to the audience? If a claim is unacceptable to the audience, provide a reason to believe it. Return to ‘3b.’
4. Construct another Line of Reasoning
   a. Identify the theme(s) of your existing line(s) of reasoning. Is there another sort of reason to believe your ultimate conclusion? If so, identify that reason. Return to 3b.
Communicating an Argument

General Principle: Write your argument in a way that would make it easy for somebody else to map.

Subsidiary Principles:

1. Put your conclusion at the front of your argument, unless it’s controversial. In that case, lead with a premise that your audience will accept.

2. Finish one line of reasoning before turning to another.

3. If ideas are close to each other in the map, place them close to each other in your paper or speech.

4. Signal inferences with expressions like “therefore” and “because.”

5. Repeat an idea if that will help your audience to see how it relates to the ideas you’re introducing.

6. If an assumption is obvious to your audience, you don’t need to state it. Failing to state an assumption seldom makes an argument harder to follow.

7. If a subconclusion obviously follows from the reasons supporting it, you don’t need to state it. But be careful here because failing to state a subconclusion can make an argument harder to follow.
Highly Defeasible Realizations

• Critical thinking is enhanced by mastering key mapping skills, including
  • Recognizing the relationships between the ideas in an argument.
  • Distinguishing between evaluating a reason and evaluating an inference (“That’s not true.” vs. “That doesn’t matter.”)
  • Identifying missing conclusions and missing assumptions (The Puzzle Piece Test).
  • Conceptualizing the structure of an argument before communicating it.
  • Internalizing a series of important questions.

• Key mapping skills can be developed without requiring students to map very much on their own, as long as instructors use mapping to model the critical thinking process.

• Reasoning “up” (procedurally starting with a conclusion, attempting to construct an argument in its support, and changing one’s mind if necessary) is different than reasoning “down” (procedurally starting with premises and attempting to reason properly from those premises).

• Both reasoning up and reasoning down can be mapped.
Future Investigation

- Can the process of decision making, problem solving, and hypothesis formation be identified with reasoning down, and the process of justification be identified with reasoning up?

- Can we find a way of mapping reasoning down and reasoning up that is
  - specific enough to help students gain proficiency in the type of reasoning that characterizes a discipline
  - general enough to apply across disciplines and so help students to transfer their learning from one subject to another
  - flexible enough to accommodate reasoning of various complexity
  - accurate enough to illuminate aspects of the reasoning that might otherwise go unnoticed?
Observation
1. Amphipods carry sea butterflies on their backs.
2. Amphipods who lost their sea butterfly would quickly find another sea butterfly
3. Amphipods carrying sea butterflies move much slower than amphipods without sea butterflies

Question
Why do amphipods carry sea butterflies, especially given that sea butterflies slow down the amphipods thus making them more vulnerable to predators?

Hypothesis
The sea butterflies makes the amphipods less attractive to predators.

Background Knowledge
Behaviors often help a species avoid predators.

Constructing an Argument
1. Formulate a research question
2. Explore various answers, decide which answer you think is right, or formulate your own answer. This is your ultimate conclusion.
Conclusion

Our hypothesis is partially confirmed. We have reason to believe that carrying sea butterflies makes the amphipods less attractive to predators.

Specific Experimental Prediction

- If sea butterflies do make the amphipods less attractive to predators then under the following conditions [Describe experiment] the toothfish will eat amphipods that don’t carry sea butterflies but won’t eat amphipods that do carry sea butterflies.
- If sea butterflies don’t make the amphipods less attractive predators then under the following conditions [Describe experiment] the toothfish will eat amphipods regardless of whether or not they carry sea butterflies.

Experimental Result

The toothfish did eat the amphipods without sea butterflies but not the amphipods with sea butterflies.

Constructing an Argument

3. Construct one Line of Reasoning
   a. What’s a reason to believe your ultimate conclusion?
   b. What needs to be assumed in order for the conclusion to follow from this reason?
   c. Consider the claims identified in ‘3a’ and ‘3b’. Are these claims true? If not, revise them, ensuring that the conclusion still follows.

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4. Construct another Line of Reasoning
   a. Identify the theme(s) of your existing line(s) of reasoning. Is there another sort of reason to believe your ultimate conclusion? If so, identify that reason. Return to 3b.
We have reason to believe that carrying sea butterflies makes the amphipods less attractive to predators.

How do sea butterflies make amphipods more vulnerable to predators?

The sea butterflies exert a chemical, rather than mechanical deterrence.

Deterrence can be chemical or physical. There are many examples of chemical deterrence in marine organisms.

Formulate a research question
2. Explore various answers, decide which answer you think is right, or formulate your own answer. This is your ultimate conclusion.
Our hypothesis is partially confirmed. The sea butterflies exert a chemical, rather than mechanical deterrence.

Specific Experimental Prediction
- If the sea butterflies exert a chemical, rather than mechanical deterrence then under the following conditions [Describe experiment,] the toothfish will eat the control pellets but not eat the experimental pellets.
- If sea butterflies exert a mechanical, rather than chemical, deterrence then under the following conditions [Describe experiment] the toothfish will eat both the control pellets and the experimental pellets.

Experimental Result
The toothfish ate the control pellets but didn’t eat the experimental pellets.

Conclusion
Our hypothesis is partially confirmed. The sea butterflies exert a chemical, rather than mechanical deterrence.
Discovery (Reasoning Down)

Observation or Partially Confirmed Hypothesis

Question

Background Knowledge

Constructing an Argument
1. Formulate a research question
2. Explore various answers, decide which answer you think is right, or formulate your own answer. This is your ultimate conclusion.
Justification (Reasoning Up)

Specific Experimental Prediction
- If the hypothesis is true then under the following conditions [Describe experiment,] X would happen.
- If the hypothesis is false then under the following conditions [Describe experiment,] Y would happen.

Experimental Result
X happened.

Conclusion
Our hypothesis is partially confirmed.

Constructing an Argument

3. Construct one Line of Reasoning
   a. What's a reason to believe your ultimate conclusion?
   b. What needs to be assumed in order for the conclusion to follow from this reason?
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   a. Identify the theme(s) of your existing line(s) of reasoning. Is there another sort of reason to believe your ultimate conclusion? If so, identify that reason. Return to 3b.
The earth orbits the sun, not the other way around.

**Generalizations Pro**
- Laws of Physics
- Mathematical Calculations

**Specifics Pro**
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- Things are the way they look.

**Specifics Con**
- It looks like the sun is orbiting the earth.

**Response**
- Appearances can be deceiving.

**Conclusion**
The earth orbits the sun, not the other way around.
REVIEW AND NEXT STEPS

Dona Warren
UW – Stevens Point
Tracking the Reasoning as you Encounter it

1. What’s the main conclusion?
2. What’s being asserted here?
   - This may involve dividing sentences into parts.
   - This may involve summarizing multiple sentences into a single claim.
3. Is that idea important?
4. If so, how is that idea related to what’s gone before (other than the ultimate conclusion)?
   i. **Reason / Conclusion**
      - Inference indicator expressions help.
   ii. **Dependent Reason** (Ask “What follows from these ideas?” and fill in the subconclusion if it’s missing.)
      - The Puzzle Piece Test helps.
   iii. **Independent Reason**
      - Identifying distinct themes helps.
   iv. **Objection to a Claim**
   v. **Objection to an Inference** (Objection to an Implicit Claim)
5. Return to 2.
2. Online classes allow students to learn at times that are convenient for them. Therefore 1. they’re perfect for working adults.

1. Traditional college students should be discouraged from taking online courses. After all, 2. online courses retard social integration because 3. they can be completed without meeting other students in the class.

3. College classes should teach higher level thinking skills. And 4. only college classes should transfer in. Therefore, 1. online classes shouldn’t transfer in.” (a = Online classes shouldn’t be college classes.)

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2. Online classes are inexpensive to run so 1. they’re a good choice for most colleges. 3. They tend to attract students, too.”

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\[ a + b \]
\[ c = \text{Whatever produces unhappiness is morally wrong}. \]

\[ 1 \]
\[ 2 + a \]
\[ 3 + b \]
\[ 4 + c \]
\[ 5 + 6 \]
\[ 7 \]
\[ 8 \]
Constructing an Argument

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  and changing one’s mind if necessary) is different than reasoning “down” (procedurally starting with premises
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Future Investigation

• Can the process of decision making, problem solving, and hypothesis formation be identified with reasoning down, and the process of justification be identified with reasoning up?

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Observation
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3. Amphipods carrying sea butterflies move much slower than amphipods without sea butterflies

Question
Why do amphipods carry sea butterflies, especially given that sea butterflies slow down the amphipods thus making them more vulnerable to predators?

Hypothesis
The sea butterflies makes the amphipods less attractive to predators.

Background Knowledge
Behaviors often help a species avoid predators.

Constructing an Argument
1. Formulate a research question
2. Explore various answers, decide which answer you think is right, or formulate your own answer. This is your ultimate conclusion.
Our hypothesis is partially confirmed. We have reason to believe that carrying sea butterflies makes the amphipods less attractive to predators.

Experimental Result
The toothfish did eat the amphipods without sea butterflies but not the amphipods with sea butterflies.

Conclusion
Our hypothesis is partially confirmed. We have reason to believe that carrying sea butterflies makes the amphipods less attractive to predators.

Specific Experimental Prediction
- If sea butterflies do make the amphipods less attractive to predators then under the following conditions [Describe experiment] the toothfish will eat amphipods that don’t carry sea butterflies but won’t eat amphipods that do carry sea butterflies.
- If sea butterflies don’t make the amphipods less attractive predators then under the following conditions [Describe experiment] the toothfish will eat amphipods regardless of whether or not they carry sea butterflies.

Constructing an Argument

3. Construct one Line of Reasoning
   a. What’s a reason to believe your ultimate conclusion?
   b. What needs to be assumed in order for the conclusion to follow from this reason?
   c. Consider the claims identified in ‘3a’ and ‘3b’. Are these claims true? If not, revise them, ensuring that the conclusion still follows.
      ➢ Note: If you can’t do this, this line of reasoning fails. If all lines of reasoning fail, the argument fails. If the argument fails, you may want to reconsider your answer. If all answers fail, you might want to reconsider your question.

4. Construct another Line of Reasoning
   a. Identify the theme(s) of your existing line(s) of reasoning. Is there another sort of reason to believe your ultimate conclusion? If so, identify that reason. Return to 3b.
Partially Confirmed Hypothesis
We have reason to believe that carrying sea butterflies makes the amphipods less attractive to predators.

Question
How do sea butterflies make amphipods more vulnerable to predators?

Hypothesis
The sea butterflies exert a chemical, rather than mechanical deterrence.

Background Knowledge
Deterrence can be chemical or physical. There are many examples of chemical deterrence in marine organisms.

Constructing an Argument
1. Formulate a research question
2. Explore various answers, decide which answer you think is right, or formulate your own answer. This is your ultimate conclusion.
Justification (Reasoning Up)

**Specific Experimental Prediction**
- If the sea butterflies exert a chemical, rather than mechanical deterrence then under the following conditions [Describe experiment,] the toothfish will eat the control pellets but not eat the experimental pellets.
- If sea butterflies exert a mechanical, rather than chemical, deterrence then under the following conditions [Describe experiment,] the toothfish will eat both the control pellets and the experimental pellets.

**Experimental Result**
The toothfish ate the control pellets but didn’t eat the experimental pellets.

**Conclusion**
Our hypothesis is partially confirmed. The sea butterflies exert a chemical, rather than mechanical deterrence.

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**Constructing an Argument**

3. **Construct one Line of Reasoning**
   a. What’s a reason to believe your ultimate conclusion?
   b. What needs to be assumed in order for the conclusion to follow from this reason?
   c. Consider the claims identified in ‘3a’ and ‘3b’. Are these claims true? If not, revise them, ensuring that the conclusion still follows.
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4. **Construct another Line of Reasoning**
   a. Identify the theme(s) of your existing line(s) of reasoning. Is there another sort of reason to believe your ultimate conclusion? If so, identify that reason. Return to 3b.
Discovery (Reasoning Down)

Observation or Partially Confirmed Hypothesis

Question
“How Much?”

Hypothesis

Background Knowledge

Constructing an Argument
1. Formulate a research question
2. Explore various answers, decide which answer you think is right, or formulate your own answer. This is your ultimate conclusion.
Our hypothesis is partially confirmed.

**Conclusion**

**Specific Experimental Prediction**
- If the hypothesis is true then under the following conditions [Describe experiment,] X would happen.
- If the hypothesis is false then under the following conditions [Describe experiment,] Y would happen.

**Experimental Result**

X happened.

**Constructing an Argument**

3. Construct one Line of Reasoning
   a. What’s a reason to believe your ultimate conclusion?
   b. What needs to be assumed in order for the conclusion to follow from this reason?
   c. Consider the claims identified in ’3a’ and ’3b’. Are these claims true? If not, revise them, ensuring that the conclusion still follows.

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   a. Identify the theme(s) of your existing line(s) of reasoning. Is there another sort of reason to believe your ultimate conclusion? If so, identify that reason. Return to 3b.
The earth orbits the sun, not the other way around.

**Generalizations Pro**
- Laws of Physics
- Mathematical Calculations

**Specifics Pro**
- Astronomical Observations
- Geological Observations

**Generalizations Con**
- Things are the way they look.

**Specifics Con**
- It looks like the sun is orbiting the earth.

**Response**
- Appearances can be deceiving.

**Conclusion**
The earth orbits the sun, not the other way around.
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</table>

5/2/2017