**Supplementary Material (SM)**

1. **Description for the implementation of** **ADI instructional model (Sampson, Enderle, & Grooms, 2013)**



Figure 1. Description of phases of ADI instructional model

1. **Sample Questions of Reflections from the PD Program**
2. How would you describe argumentation as it relates to the science classroom?
3. What experiences have you had with teaching using argumentation in your classroom?
4. What is evidence? What makes evidence high quality?
5. What is justification? What makes a justification high quality?
6. What kinds of evidence do you expect from your students? Do you think some types of evidence are better than others? Explain your reasoning.
7. What kind of support do you think your students will need to help understand evidence and justification?
8. **Sample Questions Guiding to Post-lesson Reflections**
9. How many ADI instructional model activities have you taught so far? Could you please tell us about the process of implementation of ADI instructional model activities?
10. What is your overall impression of how successful the implementation of argumentation was in aiding your students’ learning? What was the most successful moment for students’ learning during the instruction? Why?
11. What major challenges did you experience with implementing argumentation?
12. What will you do differently next time you implement argumentation or teach any argumentation lesson?
13. How do you define knowledge? How do individuals acquire knowledge?
14. How does science knowledge develop? What are the main characteristics of scientific knowledge?
15. What are the sources of knowledge that you consider for the students or in general?
16. **Sample Final Interview Questions**
17. How do you support your students when they are engaged in verbal argumentation?
18. How do you help students deal with competing claims? How do you help them, again, not necessarily resolve, but perhaps come to a consensus in some way? What do you do?
19. How do you help your students learn how to evaluate the quality of evidence? What are some indicators of high-quality or low-quality evidence for you?
20. How do you support students to listen and build off each other’s ideas? Does that something naturally occur or are there ways that you can facilitate that?
21. How do you help students understand how to critique? What do you think has to happen to help them understand what is appropriate critique and what is not appropriate critique in those situations?
22. **Rubric for coding PCK of argumentation (McNeill et al., 2017)**

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| **Category** | **Description of High-quality code** |
| **Argument Structure** | * Describes an argument structure as a claim or explanation that is supported or critiqued using evidence and reasoning.
* Describes key terms such as a claim is a conclusion, evidence is the interpretation of scientific data, and reasoning is the justification for why the evidence supports the claim using scientific principles.
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| **Dialogic Process** | * Describes argumentation as including:
* Convincing the people about the strength of a claim compare to other claims
* Addressing student-to-student interactions including students listening to each other, building on each other’s ideas and critiquing ideas, debating ideas
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