

Appendix B. Analytic and Holistic Frameworks

Quality of argument	Criteria	Scoring matrix				
		0	5	10	15	
Analytic of Argument (element component)	<b>Question</b>	Can the question be answerable after carrying out the lab experiment?	*One question *Not testable *Inappropriate	*One question *Testable	*Two or more questions *testable and meaningful *Show an understanding of what lab could result in	*Two or more questions *Testable and meaningful *Demonstrate understanding of dependent and independent variable or appropriate application
	<b>Claim</b>	*Are the claims a direct result of the data and observation? *Are the claims adequate and accurate?	*One claim *Not based on any data/observation *Invalid and inaccurate	*One claim *Based on only a portion of data/observation *May not be valid or accurate	*Two or more claims *Based on all data but does not grasp big picture *May be valid and sound	*Two or more claims *Based on all data and graphs big picture *Valid, sound, accurate
	<b>Evidence</b>	How well are the data and observation used in the evidence? *Is evidence valid, accurate, and strong?	*Referred to some of the data *Invalid, inaccurate, and unreliable	*Restate data/observation *May not be accurate, valid, and reliable	*Interpret data/observation *May be valid, accurate, and reliable	*Explain and interpret data/observation *Use proper Turkish with logical statements *Accurate, valid, rich
	<b>Reflection</b>	*How well are reading and reflection connected? *Do students reflect how the evidence did or did not support the claim?	*One source *Linked poorly *Very weak explanation for how ideas changed or did not change	*One source *Linked well *Weak explanation for how ideas changed or did not change	*More than one source *Linked well to evidence *Explains most of the evidence and discuss initial questions *Moderate understanding for how ideas changed or not	*More than one source *Linked directly claims and evidence *Writes using proper Turkish with logical statements, explains most of the evidence, and discuss initial questions *Strong understanding for how ideas changed or didn't change
	<b>Holistic Framework (relationship component)</b>	*How well are question, claim, evidence, reading, and reflection connected? *Does SWH flow smoothly from one area to another area? *How strong are the arguments developed by the student?	*Very weak connection *Does not fit *Do not flow smoothly *Very weak argument	*Weak connection *Fits loosely *May not flow smoothly *Weak argument	*Moderate connection *Fits reasonably *May flow smoothly *Moderate argument	*Strong connection *Fits strongly *Flows smoothly *Strong argument