

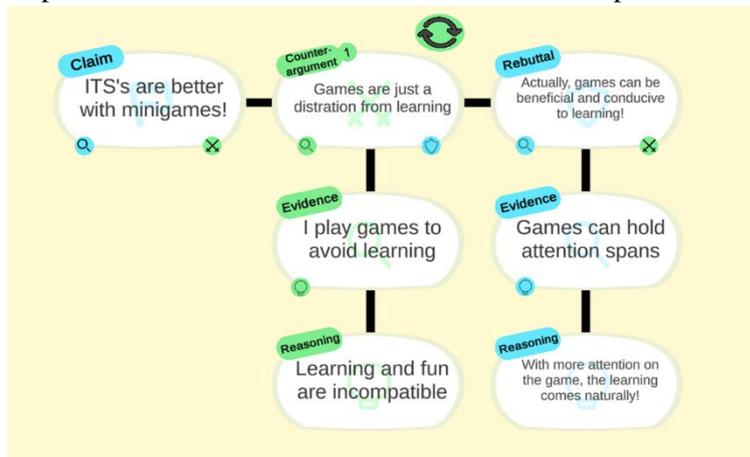
# ALAST: A Scientific Argumentation Tool for Middle School Students

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*Topic and domain.* The Argue like a Scientist with Technology (ALAST) web-based collaborative argumentation system supports the development of middle school students' argumentation skills in making claims from evidence, as advocated by the US Next Generation Science Standards (National Research Council, 2012).

*Pedagogical activity and feedback.* Students work in small teams, each team playing against another. The figure below shows an example of a session in progress. Students add shapes representing the essential elements of argumentation: claim, evidence, reasoning, counterargument, and rebuttal. In the example shown, the blue team has made the initial claim. The symbols at the bottom of each symbol show which responses are available to each team; in this example, the blue team could add evidence to their claims



while the green team could provide a counterargument. The circular arrows above the green team's counterargument shows that they have made more than one counterargument, allowing users to cycle through them. The system helps students learn the basics of scientific argumentation by showing them a graphical representation of their joint argumentation plan. The inner loop of the system prevents the student from creating an incorrect tree, while the outer loop allows students to start over with a new claim.

*Instrumentation and evaluation.* The backend student model contains the nodes each team has created, their relationship to each other, and the text that students have entered into each node. These data will permit us to conduct an offline evaluation after each round of in-school use.

*Implementation and novel technologies.* We are using the Unity game engine (Unity, 2021) because it provides the concurrent programming features we need as well as gamification features we would like to add in future phases. Our current demo shows the features of the front end while the system plays the opposing team, popping up a content-neutral response for the student. We are planning to add networking using Unity's Photon package before collecting data in schools.

*Related work.* We developed this tool because most tools for teaching argumentation were designed for college students or were outdated, e.g., CoFFEE (De Chiara, Manno, & Scarano, 2018) and Belvedere (Suthers et al., 2008).

*Plans for availability.* We have completed two rounds of front-end usability testing in middle schools and plan to beta test a prototype in an upcoming semester. We would be pleased to share our experience with Unity as a platform for ITS development with other researchers.

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