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INVOLVING UNDERGRADUATE STUDENTS IN THE RESEARCH OF ASSESSING AND IMPROVING THE SCIENTIFIC EXPLANATION ABILITY OF AMERICAN UNDERGRADUATE STUDENTS IN GENERAL CHEMISTRY CLASSES

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Despite the call by the US National Research Council for college students to construct and defend their explanations, many college students are unable to construct sufficient scientific explanations even for concepts they feel they understand. This SoTL research involves current undergraduate students and seeks to answer the following research questions in the setting of General Chemistry I lectures in a medium sized public university in US: 1) What are some good methods of instructing students to construct sufficient scientific explanations? 2) How does the practice of constructing scientific explanations affect the students understanding of the concepts involved? The pilot study conducted in Fall 2017 suggested that, teaching students a systematic way of constructing scientific explanations through short online video assignments based on Toulmin's Argumentation Pattern, together with the consistent practice of constructing scientific explanations in daily homework assignments, had a positive and statistically significant impact on students' overall understanding of course materials. It was measured by multiple assessment tools, including the ACS standardized exam where the treatment group scored an average of 71st percentile as opposed to the average of 32nd percentile scored by the control group. To continue this study at a larger scale, a series of short video assignments can be designed and administered to a larger size of treatment group. If these interventions continue to bring positive impacts, they can be administered to general chemistry classes in other universities. Similar videos can be designed to improve students' understandings in upper level chemistry classes as well.

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