

## 1 - Learning Science: Conceptual Understanding | Empirical

### SP - (16107) - TWO APPROACHES TO ANALYZING FLUIDITY OF STUDENT REASONING ON A MULTIPLE CHOICE SURVEY ABOUT HALF-LIFE

Michael M. Hull (Austria)<sup>1</sup>; Alexandra Jansky (Switzerland)<sup>2</sup>; Martin Hopf (Austria)<sup>1</sup>

1 - University of Vienna; 2 - CERN

#### Short Abstract

*For several years, we have been studying the conceptual understanding of high school students about radioactivity, particularly regarding half-life. Although it is considered to be random when an individual atom undergoes the sudden process of fission, half-life is a duration of time within which half of a radioactive sample fissions. It is difficult for learners to grapple with the idea that random behavior of individual atoms can give rise to predictable patterns in the collective, and many students have said both in interviews and surveys that, if you are looking at an individual atom, half of the atom will have fissioned after one half-life. This finding is consistent with prior work in mathematics education research showing that students struggle with understanding randomness in general. Our findings have indicated, however, that this idea (of individual atoms fissioning in a predictably continuous manner) is often not a robust and intact mental structure; rather, in other contexts, the same students correctly discuss fission as being instantaneous and unpredictable. We are exploring this context-dependency via a survey that contains problems that are isomorphic (that is, the questions require the same physics principles to be answered correctly). In cases where student ideas have not yet crystallized, we would expect to see variety in answering patterns across the prompts. Since adding isomorphic prompts to a survey naturally increases the survey length, we are also considering the use of a surrogate measure to determine fluidity of student reasoning; namely, our survey also asks respondents to rate their confidence after each item. Our research question is "to what extent does student confidence correlate with consistency across the isomorphic prompts?" Our preliminary research findings have suggested that there is no significant correlation, suggesting that more (less) confident students are **not** more likely to be (in)consistent.*