







Consider the excerpt from Julie's explanation (see Table I) as another example. As can be seen the focus here is on the transfer of heat energy involved in the phenomenon. In addition to tracing the flow of energy, she also alludes to the principle of conservation of energy. Later in the interview she further clarifies her explanation by making the following argument: *'...the egg originally inside before it's cooked is runny but as you transfer heat from the stove to the water, the water transfers heat to the egg which makes the liquidy bonds inside to be more solid bonds'*. Textbook analysis reveals that the notion of heat as energy, the transfer of heat and conservation of energy are covered by all the three disciplines. Chemistry and physics covers additional details associated with these topics compared to biology. However, since the ideas involved in the excerpt shown in Table I are present in all three textbooks, we code the argument to be equally grounded in chemistry, physics and biology. In addition to energy and entropy, other ideas invoked by the students include mechanisms of heat transfer, structure of proteins, protein denaturation, bond breaking and formation, Gibbs free energy, ice-water phase transition etc.

Textbook analysis as described above becomes difficult if the student response lacks precision and certainty regarding the words used. For example, consider the following response to the egg phenomenon: *'So there is solidification and maybe some denaturing or hardening. Denaturing... I don't know if that's what's going on but that is this chemistry word there. Denaturing of enzymes. Or like, I don't know it's solidification of...'*. The student in her struggle to come up with an explanation, is invoking a seemingly random bunch of vocabulary. Identification of knowledge elements is not possible and as such the response

cannot be mapped to any discipline.

#### IV. OTHER CRITERIA FOR ASSESSING INTERDISCIPLINARITY: CONCLUDING REMARKS

In this paper we discussed analyzing the extent to which students invoke different disciplines as one criterion for assessing interdisciplinarity. As we delve deeper into the data we will be exploring further criteria to develop a framework for assessing interdisciplinarity of student explanations of everyday phenomena. Other criteria in the literature include the strength of disciplinary grounding, degree of advancement achieved through integration of disciplines and critical awareness regarding clarity of purpose and limitations [9]. We maintain that assessment criteria should be true to where students are in their thinking, rather than ideals that are rarely achieved. As such appropriateness of the criteria present in the literature will be critically examined in the light of available data. An explanatory framework to characterize student reasoning of interdisciplinary phenomena, which is under development, is also expected to contribute valuable insights [10].

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