QUESTION-SOLUTION-REFLECTION: A FRAMEWORK FOR ENCOURAGING REFLECTION THROUGH LINEAR MULTIMEDIA

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KEYWORDS: Physics Multimedia, Reflective Thinking, Online Learning

It is agreed upon in the literature that reflection is a vital part of learning, yet it is seldom explicitly studied in physics education research (PER) (Boyd & Fales, 1983). Relatedly, while the study of effective multimedia learning is an active area of research within PER, there is a lack of research on promoting reflective thinking using multimedia treatments (Moreno & Mayer, 2005). In this presentation I will summarise three studies which make up my thesis on reflective thinking and linear physics multimedia. These studies were conducted in 2017, 2018 and 2019, with over 3000 respondents. The first of these studies was conducted with members of the "general public" in the online, social-media education context. The second and the third study were conducted with first year students at The University of Sydney.

The three multimedia treatments mirrored the phases of reflection as outlined by Dewey (1933) and Rogers (2002).
- A perplexing experience
- A spontaneous interpretation of that experience
- The articulation of the problem or question that arises out of the experience
- The generation of possible explanations
- The explanations need to be examined and tested

In the first video, an experience was shown, time was given for the students to interpret that experience. Then a question was asked. The students wrote down their answers to the question, reported their confidence on a Likert-like scale. Students then watched the second video, which contained the solutions. Then they were prompted to write down if they changed their answers, and the reasons for doing or not doing so. The data were analysed with a mixed-methods approach. The qualitative data were inductively coded, and student responses were placed in these codes. The students' reflection matched closely with the ideas of Jack Mezirow (1998), ranging from deep inner reflection on the student's thoughts, ideas, and assumptions, to more surface reflections on the external information presented. The data from the three studies suggest that this framework, which we dubbed the "questions-solution-reflection" framework, is an effective way of promoting reflective thinking in students via linear multimedia.

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