Methodological considerations of clinical interviews on physics problem solving

Enrique Andrés COLEONI, Laura María BUTELER

Instituto de Física Enrique Gaviola, CONICET – FAMAF (UNC) Medina Allende y Haya de la Torre. CP 5000, Córdoba, Argentina

Abstract. This is a methodological study of clinical interviews as instruments for producing data on students' learning. Since interviews are events of social interaction, and the interviewer is a particularly relevant actor who conducts the interview, our focus is placed on the analysis of her/his actions. Scrutiny of available data sets allowed to identify different intervention patterns and to analyze how these articulate with more or less rich data sets obtained during the interview

1 Problem Context and Theoretical Background

This work is inspired on an episode that occurred during a clinical interview in which we were studying three students' conceptual learning paths as they solved a problem on hydrostatics [1]. Although certainly affected by the interviewer, that clinical interview resulted in a methodologically powerful instrument, providing varied and thorough evidence of students' conceptual learning instances. Our purpose here is to unveal the complex task of conducting an interview in order to respect students' conceptual ecology while eliciting learning.

Many studies assume that the cognitive phenomenon captured during clinical interviews occurs within the mind of the interviewee [2,3,4,5]. Data is interpreted as the result of subjects' available knowledge. The underlying paradigm is that cognition is an individual phenomenon[6].

Other researchers conceive interviews as both an individual, as well as a social phenomenon [7,8,9,10,11,12]. Thus, it is possible that interviewees and interviewer interpret the activity at hand in different ways. As Goffman [13] points out, people frame social situations in order to answer the implicit question "what am I supposed to do here?" or "what is this about?" These frames carry various meta messages and implicit assumptions that regulate students' answers as well as interviewers' questions.

Locating interviews within this last perspective (an individual and also a social phenomenon) we are in better conditions to understand how the moves of an interviewer can foster or hinder the production of a rich data set.

2 Method and Results

The data base for this study were audio-video records of clinical interviews that served to study students' conceptual and epistemic learning during Physics Problem Solving. The methodological approach started by locating (in time) the different interviewer participations. With no categories assumed a-priori, these participations were found to pertain to either of two large groups: *neutral* or *perturbative interventions*.

Neutral Interventions. Those in which the interviewer does not interact with students' reasonings. Some of these appear at the beginning of the interviews when the problem is posed and directions are given asking students to agree on their answers. Also, neutral interventions tipically correspond to nodding (either verbal or by gestures) so as to reinforce the interest in students' utterances.

Perturbative Interventions. Located in specific moments, they present a change in intonation as compared to neutral interventions. The interviewer abandons neutrality and becomes involved to either introduce an idea (*introduction interventions*), or to focus on particular ideas

(*focalizing*). We also placed in this group a kind of intervention that the interviewer used to return a particular idea and put it under students' consideration: *delivering back*.

After locating the different kind of interventions, further scrutiny of the interviews allowed to identify different ways in which these interventions articulated with students' productions. On one hand, less fruitful episodes in which perturbative interventions introduce elements that sutents are not able to efficiently incorporate into their reasonings and cause a halt in their learning progessions. On the more fruitful end, interventions are organized in Perturbative Intervention Sequences, characterized as follows: after a considerable time of neutrality, the interviewer draws on perturbative interventions to introduce and/or focus on particular elements, and this brings up new considerations in students' reasonings. To end the sequence, the interviewer, instead of expressing any position on their thoughts, delivers their considerations back to them, (i.e. "... so, does it make more sense to you now?")

3 Conclusion

Attending to characteristics of interviewer's participations, such as intonation, gestures, types of information provided or suggested, we were able to differentiate ways in which the interviewer can navigate clinical interviews. The study, of an exploratory nature, advances on the knowledge of a particularly powerful, but also complex methodological tool that has been and will most probably continue to be of extended use within Physics (and Science) Education Research.

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