Some theories from abroad for AI interaction literacy

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Abstract

I have become rather 'het up' about the use of AI applications in teaching and learning. I am worried that the digital divide will widen rather than narrow with the increasing use of this technology. A question that bothers me is, "Why are some of our students better at using the output from AI applications than others?", and what can we do about this? I want to get us all thinking and talking about this issue. In this keynote, I will be rather self-indulgent and share my two favourite theories from 'abroad', as they are from general education and sociology. Also, I have presented about these theories 'abroad' at various international conferences and can show some related photos at the keynote. I propose that the two theories, the Semantics dimension of LCT and feedback literacy, can help us explore and think more deeply about AI interaction literacy.

CCS Concepts

• **Social and professional topics → K-12 education**.

Keywords

AI education, K-12 education, AI interaction literacy

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1 Rationale

Attempts are being made to define the competencies needed to be 'AI literate', each with a different and sometimes conflicting view (e.g. [9, 10, 15, 19]). Irrespective of what view is taken, what is certain is that users will need to interact in some way with AI applications. What this interaction will look like is also debated, with research on hybrid interaction systems between humans and systems suggesting that both the person and the technical product will influence each other [14]. But again, what format this interaction and influence will take is yet to be decided, with early research looking to the dialogic roles of human and AI applications during the co-construction of explanations [8].

To develop the theory related to the co-construction of explanations within the dialogic process of hybrid interaction systems, including AI applications, there may be an opportunity to reuse existing and related general education theories. I introduce and suggest two theories that may be useful for this: the Semantic dimension of Legitimation Code Theory (LCT), a framework for analysing any sociological interaction; and feedback literacy, a set of interconnected general education theories for knowledge building. I have researched these theories in numerous studies with many other researchers and in different contexts, and it is clear that there is enormous potential in using these theories to better investigate AI interaction literacy.

2 The Semantic dimension of LCT

Maton has proposed a conceptual toolkit called Legitimation Code Theory (LCT) that can be used to analyse sociological interactions [11]. Semantics, one dimension of LCT, analyses semantic gravity and semantic density. Semantic gravity analyses how meaning relates to its context and can be stronger or weaker along a continuum. For example, if an explanation is a generalised, abstract definition, then semantic gravity is weaker than if the explanation was provided in a specific context. Semantic density relates to the complexity of meaning. If an explanation has a condensed meaning, say with complex technical terms, then semantic density is stronger than if everyday language was used with fewer encapsulated meanings. These strengths can be drawn on a 'semantic profile' where the y-axis shows semantic gravity and semantic density, and the x-axis represents time [11]. A flat-line profile indicates the strengths stay the same over time, while other profiles can represent 'semantic waves' with strengths that move up and down. Moves reflect how complex meanings are built or broken down and how examples are generalised or made concrete [11].

The idea of linking the abstract and concrete is not new in CS (e.g. [6]), but semantic profiling formalises this. Semantic profiling has been used in unplugged CS education research, in the exploration of introductory programming tasks, and in creating feedback when students answer multiple choice questions suggesting that semantic waves can enrich learning experiences and improve knowledge acquisition [4, 17, 18]. Semantic profiling has also been utilised to analyse knowledge building in many other disciplines, including in dialogic investigation, e.g. to analyse physics question answers [5], to improve academic writing through students being introduced to Semantics [7] and to explore talk between teachers and second language learners in history lessons and why such learners may make less progress than their peers [13]. In the teaching of undergraduate writing, semantic gravity has been applied to investigate tutors' 'feedback literacy', with the finding that written feedback is often too context-bound and not generalised, so it does not reach up the semantic profile. Hence, students can not easily use feedback

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to 'feed-forward' into their next writing activity in a new context [16].

3 Feedback literacy

Turning to feedback literacy, for a hybrid interaction system where AI systems are part of the co-construction of an explanation dialogue, there is an opportunity to consider three interrelated conceptual frameworks. These frameworks are student feedback literacy, teacher feedback literacy, and feedback types.

Student feedback literacy includes four interrelated student capabilities and dispositions required to help students usefully understand and use feedback: i) appreciating the process of feedback; ii) making judgements about the feedback; iii) taking action; and iv) managing their emotional response to the feedback [1]. Teacher feedback literacy concerns three dimensions: 1) teachers' design of feedback learning materials; 2) teachers' nurturing relationships with students, calling on emotional sensitivity, empathy and trust; and 3) teachers' decision-making, where they make pragmatic compromises to manage feedback [2]. Feedback has been categorised into four types, each with different roles and processes for students to follow: a) Telling, a one-way transmission of 'correct' answers, where students are passive; b) Guiding, where students are pointed in the right direction to help them apply knowledge in practice; c) Developing understanding, where students are active as they construct and adjust what they know; and d) Opening up a different perspective, where students are active to interpret and evaluate knowledge [12].

4 Open questions

In hybrid interaction systems, feedback is not just supplied by the teacher; therefore, in the design of any integrated AI application, the type of feedback created by that application becomes significant. Is the output telling or guiding? How accurate is the feedback? How should the human act upon the output? Middle school teachers, in their review of large language model augmented IDE program error messages, requested such systems should guide rather than tell and that they and their students needed professional development and learning resources to help them navigate such interactions [3]. Also, can AI applications be adapted to produce explanations with a specific semantic profile? What impact might student understanding of LCT Semantics and feedback literacy have on their AI interaction literacy? Do those students better at using the output from AI applications than their peers have some increased implicit understanding and use of LCT Semantics and feedback literacy?

I call for discussion and opportunities for collaboration to explore the role of LCT Semantics and feedback literacy within the research of AI interaction literacy for both AI and human dialogue contributions. I suggest there is an important and useful opportunity to investigate these theoretical frameworks in AI education research from the standpoint of the student, the teacher, and the AI system designer.

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