

Investigating Learner Trust in Open Learner Models Using a 'Wizard of Oz' Approach

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Abstract. Open learner models (OLM) are learner models which are accessible to the learner, allowing them to view, and sometimes modify, their model. This openness may raise questions of learner trust in their learner model: if users do not agree with, or trust the information they can see about themselves, their trust in the interaction will likely be reduced. Using a Wizard-of-Oz approach, we consider learner trust and possibilities for developing trust in OLMs.

1 Introduction

Open learner models (OLM) externalise the learner model contents to the user. Thus OLMs assist learners in tracking their knowledge, and promote independent learning by offering information about their knowledge that the learner would not usually see (e.g. a breakdown of concept understanding or descriptions of misconceptions held) which may allow learners to identify areas to target their study. Opening the model to the learner raises issues of learner trust in their learner model, and hence trust in the system. Lack of trust in the inferences of a learner model may discourage system use, and is therefore an important issue to address.

Gaining students' trust in their learner models has been explored using a multi-agent system with agents cooperating on behalf of learners in a collaborative context [1]. In psychology, trust may relate to personal traits that deal with belief and expectation or feelings [2]. In decision aid systems trust may be defined as the extent to which a user is confident in, and willing to act on the basis of, the recommendations of the system [3]. These definitions may also apply to OLM.

Learners may have more or less control over their learner model contents [4], although there may be risks when control is given to learners [4], [5]. Research suggests students may be uncomfortable with directly editing the model, and prefer an OLM where they have less direct control, such as one they can negotiate [6]. Negotiated OLMs facilitate maintenance of the model through collaborative student-system negotiation of the represented beliefs. The fact that students are willing to give some control to the system suggests that they may trust an OLM or, at least, may have greater confidence in the system assessing their knowledge than in their self-assessments. Similarly, allowing learners some control over the model (such as in negotiated OLMs) may help to increase learners' trust as they are able to influence the model contents if they disagree with it. Given the user preferences for some level of system

control, we adopt a negotiated OLM approach to explore trust issues. We present a Wizard-of-Oz study (where part of the system behaviour is simulated by a human 'wizard' – the experimenter) of negotiating the learner model, to identify some of the trust issues in OLM systems, as perceived by learners.

2 Investigating Student Trust in Open Learner Models

The participants were 40 students in the Electronic, Electrical and Computer Engineering Department at the University of Birmingham, UK. Participants interacted with Flexi-OLM [6], modified to provide (by the 'wizard') a simulated chatbot for negotiation of the learner model [7], for a minimum of 20 minutes (mean 28.79 minutes). Participants completed a questionnaire with a five-point Likert scale, and further free response elements, designed to investigate issues relating to trust in OLM.

Table 1. Summary of questionnaire responses

	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
I was frequently convinced by the Chatbot's arguments	4	19	14	2	1
The negotiation changed my view of my understanding	7	17	11	5	0
I always challenged the Chatbot when I disagreed (or I would)*	15	15	6	2	0
I was happy to accept the Chatbot's opinions when I disagreed	2	18	12	6	2
I liked the Chatbot when it disagreed with me	4	21	10	3	2
I liked the Chatbot when it agreed with me *	7	22	10	0	0

* 38 responses.

As shown in Table 1, 23 of the 40 users agreed they were frequently convinced by the chatbot's (wizard's) arguments in negotiation; 14 remained neutral. 34 said the negotiation changed their view of their understanding. These are key issues for negotiated learner modelling as if learner and system are to be equal in the negotiation then each must be prepared to consider the other's arguments. The level of trust in the system will influence the user in whether they follow the system's advice. However, different OLM designs suit different users, and we would not expect any single system to suit (or engender trust from) all users.

A common theme in responses was the ability of the system to provide reasoning, e.g. "It gives me objective reasoning", "I could see why it was disagreeing", and "when it disagreed it was justified". If transparency of the OLM can help to support trust, then these comments are consistent with the dimension of interpretive transparency in [5] and suggest the building of some level of trust in this system.

30 users agreed they would always challenge the system if they disagreed with it. Users will gain most benefit from a negotiated OLM if they are willing to initiate discussion where their own and the system's assessments of their knowledge differ. A

user must feel that challenging the system can be effectual or they may not attempt it. This suggests that the users who would challenge the system believe their inputs will be considered, and trust their ability to affect the system's behaviour.

Mayer et al.'s definition [2] does not imply reciprocity of trust; it does not require both parties be vulnerable to the other. However, if the user may influence the system, then the system's willingness to vulnerability may develop users' trust in the system.

It might be expected that users will like the chatbot (wizard) when it agrees with them; it is perhaps surprising that 28 users agreed they liked the chatbot when it disagreed with them. Users appeared to demonstrate some level of trust in the system's beliefs, stating "it explained its reasoning", and "seemed to understand exact misconception and how to get rid of this". Without trusting the system's assessments and arguments of the system it is unlikely that users would claim to like the chatbot.

While it is difficult to measure trust directly, user comments about their interaction suggest trust in the OLM. Given these findings using a Wizard-of-Oz simulation, there are now further issues to consider relating to trust in open learner modelling. It will be interesting to investigate how trust develops in an OLM over time, in a real learning setting. It is also likely that different users have different demands and expectations of what the OLM will offer them, and so it may be that different facilities are required by different users to enhance trust in the learner model.

3 Summary

This paper explored some of the trust issues in learner modelling, including trust in the relationship with the system, in the OLM evidence, in the user's ability to influence the system, and in the purpose of negotiated learner modelling. The users appeared to demonstrate trust in all of these areas. Further investigation will consider issues affecting trust in wider OLM contexts, and will seek to develop strategies to support the development and enhancement of user trust in open learner modelling.

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