Do Students Trust Their Open Learner Models?

Norasnita Ahmad and Susan Bull

Electronic, Electrical and Computer Engineering
University of Birmingham, Edgbaston, Birmingham, B15 2TT, UK
{nxa707,s.bull}@bham.ac.uk

Abstract. Open learner models (OLM) enable users to access their learner model to view information about their understanding. Opening the learner model to the learner may increase their perceptions of how a system evaluates their knowledge and updates the model. This raises questions of trust relating to whether the learner believes the evaluations are correct, and whether they trust the system as a whole. We investigate learner trust in various OLM features: the complexity of the model presentation; the level of learner control over the model contents; and the facility to release one's own model for peer viewing.

1 Introduction

Student self-knowledge is essential for self-directed learning [1]. Opening the learner model (LM) to the user provides opportunities to encourage reflection, independent learning and formative assessment/monitoring [2]. In this paper we consider three features of open learner models (OLMs): (i) complexity of model presentation; (ii) learner control over the learner model; (iii) releasing the learner model to other users.

(i) LMs can be externalised using simple or detailed representations of knowledge. Simple displays often show the LM using skill meters. OLMlets is an example of a simple OLM with five views of the learner model, including skill meters [2] (see Fig. 1). The second example, Flexi-OLM, is an OLM that includes complex model presentations in seven formats [3]. Fig. 1 illustrates the structure of the concept map and hierarchical tree. Both OLMlets and Flexi-OLM use colour to indicate knowledge levels, problematic areas and misconceptions; and misconceptions are stated textually (e.g. "you may believe that the '=' operator can be used for comparison").

(ii) OLMlets and Flexi-OLM offer different levels of learner control over the LM. In OLMlets it can be viewed, but the learner cannot change the LM contents. Flexi-OLM allows students to edit or try to persuade it if they disagree with its representations [3]. Students can edit their LM by changing the knowledge to the desired level. Persuading the LM requires students to convince the system (about their skill) before the representations will be altered. In both cases Flexi-OLM offers evidence for its beliefs, but in persuasion, the learner has to demonstrate their belief in a short test.

(iii) OLMlets allows students to release their LM (named or anonymously) to instructors and peers [4]. All peer models accessible to a user can be viewed together. Students can also access data on the group's knowledge of each topic, and how their LM compares to instructor expectations for that stage of the course (see [2]).

W. Nejdl et al. (Eds.): AH 2008, LNCS 5149, pp. 255–258, 2008.

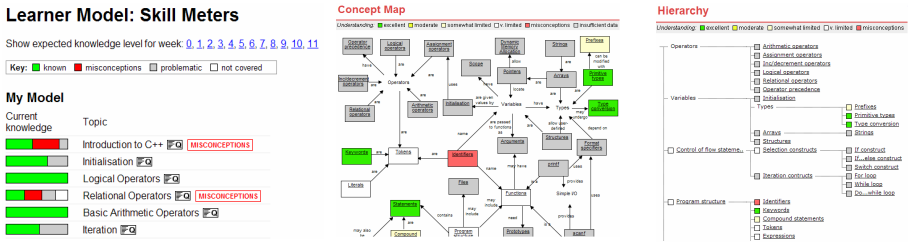

Fig. 1. OLMlets simple skill meter [2]; Flexi-OLM detailed concept map and tree structure [3]

OLMs raise questions of user trust that may not arise as strongly in other environments, as students do not usually see inferences about their knowledge. Trust is an important issue when there may be potential risks [5], and the topic has been of interest in many fields [5],[6],[7]. In human-computer interaction, a key question is the extent to which a user has sufficient confidence in a system's actions, decisions or recommendations, in order to act on these [8]. Minimum system performance is necessary for the development of trust; and the level of trust in a system may affect user decisions (manual or automated control) and whether they follow the system's advice [9]. In OLMs, risks could result from learner control over their model. For example, the learner may under/overestimate their knowledge in a self-assessment, and so provide incorrect information to their LM [10]. The validity of the model can be affected by model tampering [11]. However, it has been suggested that students may be less comfortable with editing the model: they may prefer an OLM that offers less direct control [3]. It seems that some learners may trust a system to infer their knowledge more than they trust themselves to assess it. We suggest, therefore, that persuading the LM may be a more 'trustable' feature than direct editing of it. With inspectable LMs, students can view the information (without altering it). Trust in the accuracy of the LM may be even more important if learners have no control over its contents. A different aspect of trust is relevant when considering whether users may be likely to release their LM to others. Here, trust not only concerns the representations in the LM, but also the manner in which other people might use this information.

We define trust in the learner model as *the individual user's belief in, and acceptance of the system's inferences; their feelings of attachment to their model; and their confidence to act appropriately according to the model inferences*. This paper describes an initial questionnaire investigation into features of an OLM that might make a system more 'trustable', as a starting point for future work on trust in OLMs.

2 Students' Trust in Open Learner Models

18 users (9 Masters, 9 beginning PhD) were instructed to answer questions, explore the LM views and system-specific features in the two OLMs, then continue to use them as best suits their approach to learning. Questionnaire responses are in Table 1.

(i) Two thirds of learners claimed to understand the detailed views, but only half stated they understood the overviews. Given that learners may have different preferences for model presentations [3], it is perhaps not surprising that not all rated the

Table 1. Learner trust in open learner models

		Agree	*Neutral*	*Disagree*
Complexity of Presentation	Understand simple overview of knowledge level	9	9	0
	Believe simple overview to be accurate	9	5	4
	Trust simple overview model information	14	4	0
	Understand detailed model information	12	5	1
	Believe detailed model to be accurate	14	3	1
	Trust detailed model information	10	7	1
Learner Control	Trust because can edit model	4	7	7
	Edited attributes believed to be correct	8	4	6
	Edited attributes believed to be incorrect	3	5	10
	Trust because can try to persuade model to change	10	4	4
	Tried to persuade attributes believed to be correct	9	5	4
	Tried to persuade attributes believed to be incorrect	6	7	5
Peer Models	Trust because can compare to peers	9	8	1
	Trust because can compare to instructor expectations	11	6	1
	Believe model to be correct and opened it to peers	12	6	0
	Believe model to be correct and opened it to instructor	12	4	1
	Believe model to be incorrect and opened it to peers	7	5	5
	Believe model to be incorrect and opened it to instructor	6	5	6

OLMs understandable in general - they may have used a subset of views, but felt less comfortable with the others. This is worth further investigation. However, more surprising, given previous findings regarding usage levels [2],[4], is that the simple views of OLMlets were rated harder to understand. This may be because users can more easily see the model update in simple views. As OLMlets models knowledge over the last five responses on a topic, with heavier weighting on the most recent, the views change in noticeable ways. Therefore it may be that users did understand that a 'more filled' skill meter (or equivalent) represented greater understanding of a topic, but did not realise that the recency of responses affected weightings in the model. Perhaps the complexity of the detailed views of Flexi-OLM, although fostering confidence in the model, made it harder to actually *use* than the simple views, and therefore trust in the utility for supporting one's own learning might be reduced.

(ii) Congruent with previous findings [3], learners do not simply trust their own amendments to the LM, but appear to have greater trust in a method requiring them to demonstrate their skill before the model is changed. Particularly interesting is that users edited and attempted to persuade attributes they considered correct, more than those they believed incorrect. This may have been in part due to curiosity in this experimental setting. However, it may instead be because students thought there was little point in interacting about their LM if it was inaccurate: perhaps they considered it a waste of time to try to change the model if the system was likely to continue making what they perceived as incorrect inferences. Indeed, users may have gained trust in the persuade feature by observing that Flexi-OLM would not change an accurate representation to an inaccurate one. Interesting further work could be undertaken here.

(iii) Half the users claimed to gain trust in the LM by being able to compare it to peer models. Perhaps this is because they could identify their position in the group matched with their expectations. Previous users have used peer models extensively

[4], but some prefer not to consult this information. It is unlikely that the latter would consider the ability to use peer models as increasing their trust in the system. The figure for the facility to compare to instructor expectations was a little higher. It would be interesting to discover whether this generally gave users a greater sense of where they should be, and trust was related to this feeling of understanding what their progress meant (e.g. defined as milestones). Most learners were willing to open their LM to other users if they believed the model was accurate, and some released what they considered an inaccurate model (as they could release their LM anonymously). Perceived inaccuracies in the modelling process may affect use of peer models for initiating or supporting collaboration. Trust in what colleagues might do with information about an individual is also particularly important in this kind of context.

3 Summary

This paper has undertaken an initial investigation of trust in OLMs, focusing on complexity of LM presentation, level of learner control over the LM, and the facility to release the LM to others. Many questions remain, but initial results suggest different users may find different features of OLMs important for developing trust. A key question, therefore, is how to design an OLM that might be trustable for a variety of users.

Acknowledgement. We thank Andrew Mabbott for providing Flexi-OLM.

References

1. Kay, J.: Learner Know Thyself: Student Models to Give Learner Control and Responsibility. In: International Conference on Computers in Education, AACE, pp. 17–24 (1997)
2. Bull, S., Quigley, S., Mabbott, A.: Computer-Based Formative Assessment to Promote Reflection and Learner Autonomy. Engineering Education 1, 8–18 (2006)
3. Mabbott, A., Bull, S.: Student Preferences for Editing, Persuading and Negotiating the Open Learner Model. In: Intelligent Tutoring Systems, pp. 481–490. Springer, Heidelberg (2006)
4. Bull, S., Britland, M.: Group Interaction Prompted by a Simple Assessed Open Learner Model that can be Optionally Released to Peers. In: PING Workshop, User Modeling (2007)
5. Mayer, R.C., Davis, J.H., Schoorman, F.D.: An Integrative Model of Organizational Trust. The Academy of Management Review 20, 709–734 (1995)
6. Lewis, J.D., Weigert, A.: Trust as Social Reality. J. Social Forces 63, 967–985 (1985)
7. McKnight, D.H., Chervany, N.L.: What Trust Means in E-commerce Customer Relationships: an interdisciplinary conceptual typology. Int. J. Electronic Commerce 6, 35–59 (2002)
8. Madsen, M., Gregor, S.: Measuring Human-Computer Trust. In: Gable, G., Viatle, M. (eds.) 11th Australasian Conference on Information Systems, p. 53 (2000)
9. Muir, B.M.: Trust between Humans and Machines and the Design of Decision Aids. J. Man-Machine Studies 27, 527–539 (1987); Fox, J.E.: The Effects of Information Accuracy on User Trust and Compliance. In: Conference on Human Factors in Computing Systems, pp. 35–36. New York (1996)
10. Kay, J.: Learner Control. User Modeling and User-Adapted Interaction 11, 111–127 (2001)
11. Tanimoto, S.: Dimensions of Transparency in Open Learner Models. In: LeMoRe Workshop, AIED 2005, pp. 100–106 (2005)