Can Students Edit Their Learner Model Appropriately?

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Abstract. We investigate whether students can edit their learner model appropriately considering: (i) evidence about the model contents; (ii) accuracy of self-assessment; (iii) type of information in the model; (iv) level of knowledge.

1 Introduction

Some systems open the learner model to the user, and some also allow users to provide data directly to their model (e.g. [1],[2]), giving learners greater responsibility and control over their learning (see [1]). However, little work has investigated users' ability to edit their model accurately. We address some of the initial questions using three simple learner modelling systems: DataEvidence (data structures), BusinessAssess (accounting & finance), NLPInfo (natural language processing).

1. Does evidence for model contents affect ability to edit the model appropriately?
2. Does accuracy of self-assessment affect ability to edit the model appropriately?
3. Does type of information displayed affect ability to edit the model appropriately?
4. Does level of knowledge affect ability to edit the model appropriately?

2 Do Users Accurately Edit Their Learner Model?

Users may not notice if adaptation is incorrect based on preferences [3]. If users also do not notice errors in their learner model, they will not be able to correct them. To explore whether users notice and correct errors, errors were automatically inserted in the models (e.g. knowledge→misconception), with a balance of positive/negative changes (4-6 errors for most users). We investigate how learners edited their models.

Multiple-choice questions are used to elicit learner beliefs. The learner models are presented textually, describing concepts/misconceptions, e.g. in DataEvidence: 'You may believe the queue adds items at one end and removes items at the other' for a belief modelled with uncertainty (uncertainty shown by 'you *may* believe'). Model editing is by selection from a belief list - see Fig. 1 (BusinessAssess). NLPInfo has two model presentations: skill meters showing knowledge level (Fig. 1); and the concept model (as above, but without misconceptions). Editing skill meters has to allow students to change knowledge level rather than select a belief. Radio buttons give 3 levels of knowledge: good, moderate, unsatisfactory. For consistency, to edit a concept students select whether they believe, may believe, or do not believe it. Users of each system were volunteers taking relevant degrees. Sessions lasted 30 minutes. Logs, learner models and questionnaires were analysed.

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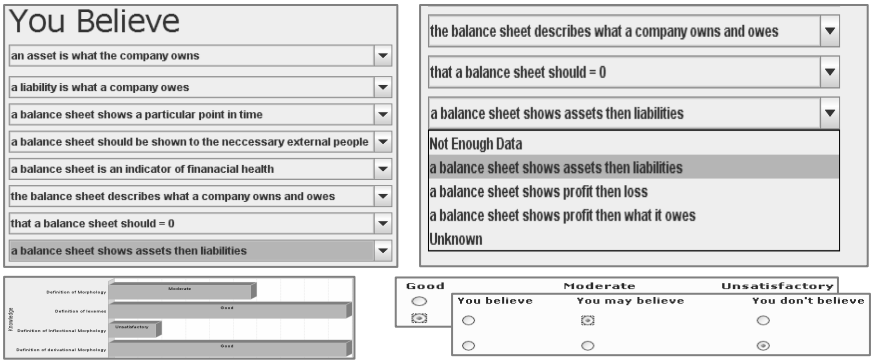

Fig. 1. Editing the learner model

Table 1. Editing the learner model

DataEvidence (n=24)	*Errors Noticed*	*Correct Edits*		*Incorrect Edits*		*Evidence Useful*
		Concept	*Miscon*	*Concept*	*Miscon*	
(i) no evidence (n=8)	6 users	5 users	1 user	2 users	3 users	-
(ii) evidence (n=8)	6 users	6 users	0 users	2 users	1 user	7 users
(iii) ev. optional (n=8)	5 users	5 users	1 user	0 users	3 users	3 users

BusinessAssess (n=16)	*Errors Noticed*	*Correct Edits*		*Incorrect Edits*		*Would Edit*
		Concept	*Miscon*	*Concept*	*Miscon*	
(i) accurate (n=8)	7 users	0 users	7 users	0 users	0 users	7 users
(ii) overestimate (n=5)	5 users	0 users	3 users	0 users	1 user	5 users
(iii) underestim. (n=3)	3 users	0 users	2 users	0 users	0 users	2 users

NLPInfo (n=20)	*Errors Noticed*	*Correct Edits*	*Near Correct Edits*	*Incorrect Edits*	*Confident to Edit*
(i) concept (n=20)	18 users	8 users	10 users	2 users	13 users
(ii) skill m (n=20)	14 users	5 users	7 users	5 users	3 users

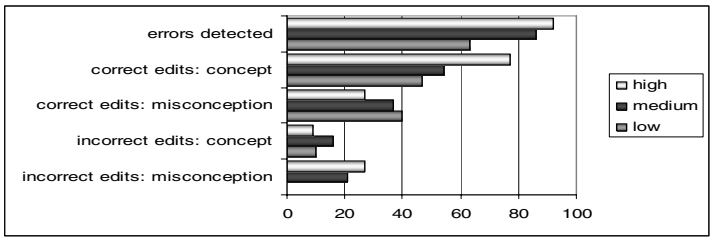

Fig. 2. Editing the learner model according to knowledge level - percent (n=60)

1. DataEvidence explains its inferences, e.g. 'You chose to output the last inserted element first in questions about the output sequence to a certain input'. There were 24 users in 3 groups of 8: no access to evidence; requirement to read evidence; optional access to evidence (3 of the 8 read the evidence). Results are given in Table 1.

2. Viewing the learner model can have positive effects on self-assessment [4]. In contrast, BusinessAssess investigates whether students who assess their knowledge accurately also edit their model accurately. Of 16 users, 3 had high knowledge; 7 medium; 6 low. Although often suggested that competent learners may more likely underestimate, and less able learners overestimate themselves [5], no relationship was found. Table 1 gives results for model editing in relation to self-assessment accuracy.

3. NLPInfo shows skill meters and beliefs on 3 levels. Errors were inserted on the extremes (e.g. good→unsatisfactory; believe→do not believe). 20 users took part: half viewing belief statements, and half skill meters first. There were no differences relating to sequence. ('Near correct edits' are *towards* correct edits.) See Table 1.

4. To consider knowledge level we use all data: 60 users. 13 had a high knowledge level; 28 medium; 19 low. NLPInfo does not model misconceptions, so the maximum number who could have edited misconceptions is 40. Of these, 11 had high knowledge; 19 medium; 10 low. As 'near correct edits' indicate an edit that moves closer to a correct representation, we include them in 'correct edits'. Results are in Table 1.

3 Conclusions

Learner involvement in learner modelling can assist the modelling process while giving learners greater responsibility for decisions in their learning. Not all errors inserted into the models were identified, but most users noticed at least one inserted error, and most errors detected were edited appropriately; with fewer new errors introduced. There was no clear link between some of the features investigated and the accuracy of model editing (provision of evidence, self-assessment skills). But: weaker learners tended to have more difficulty detecting errors and editing inserted known concepts (but not misconceptions); and editing was more successful when the model showed belief statements rather than knowledge levels. We hypothesise also that the nature of the domain may influence model editing, as there were differences between editing concepts and misconceptions in DataEvidence and BusinessAssess. Given that some of the inserted errors were detected and correctly edited, we recommend further research into the potential for editable learner models to increase model accuracy and give learners more responsibility for their learning.

References

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