Developing a Scale for Assessing Instructor Attitudes Towards Open Learner Models

Carrie Demmans Epp

TAGlab, Dept. of Computer Science, University of Toronto, Toronto, Canada
`carrie@taglab.ca`

Abstract. The attitudes of students with respect to open learner models have been extensively explored, whereas the attitudes of instructors have not been fully explored. I have, therefore, begun the development of a scale to assess this. I describe the initial item development and revision which was based on cognitive interviews. I then describe a pilot study that was performed to further refine the scale before attempting to validate it. Once the scale has been validated, it could be used to assess individual instructors' views towards specific open learner models or open learner model use within specified contexts.

Keywords: Open Learner Models, Instructor Attitudes, Scale Development

1 Introduction

Considerable effort has been invested in assessing the use of open learner models (OLM) from the learner's perspective. While some researchers have considered the instructor's perspective, few have thoroughly evaluated instructor attitudes towards student use of OLM. This work takes additional steps towards this goal: it starts the development of a scale that can be applied to assess instructor attitudes towards the use of OLM in tutoring systems that augment instruction. A set of scale items was developed, evaluated, and refined using cognitive interviews and a pilot study. This scale is now ready to be validated. Following this, the scale could be used to assess instructors' openness towards the use of OLM or their opinions of specific OLM.

2 Related Literature

There has been little work that directly considers the instructor's perspective of OLM; most work has focused on the learner's perspective [1–4]. Much of the work that has discussed the instructor's role within open learner modeling has assumed that instructors want them. This assumption has been made both implicitly and explicitly.

When the assumption that instructors desire systems with OLM is implicit, the researchers discuss their needs without reporting on consultations with instructors, as is the case in Bull and Kay's work where they described how a teacher could use the OLM to adapt their teaching [5]. Additionally, researchers design OLM representations to be used by instructors and while instructors are sometimes involved in the development process [6] their attitudes towards OLM are rarely assessed. When the

desirability of OLM by instructors is assumed explicitly, researchers have used government policy to defend this assumption [7].

The work that has explored instructor perceptions of OLM [1, 8, 9] has gathered the opinions of small groups that were not necessarily representative of the population. Bull and McKay designed an OLM for use by teachers [8]. This was followed by a small survey of 15 teachers that asked how they felt about students using OLM [9]. While this work provides a glimpse into the attitudes that instructors have towards OLM, a more thorough treatment of the subject is due.

3 Scale Item Design

Scale items were designed by consulting the SMILI☺ [5] framework and reviewed to ensure item clarity and consistency. The different elements described in SMILI☺ were divided into four sub-scales (Adaptation & Personalization, Learner Access to Evaluation Metrics, Feedback Presentation, and Learner Control). Combined, these subscales form the OLM Attitudes scale.

A silent brainstorming session was conducted, with 20 researchers who received an introduction to OLM. A stimulus statement was presented (e.g., what do instructors think about the timeliness of feedback) and participants wrote a related word or phrase on a sticky note. Participants grouped their sticky notes (ideas) according to the subscales and voted to rank the themes (grouped sticky notes) by importance.

The identified themes were reviewed by one person and 54 scale items were created using positively (e.g., Learners should be able to see their feedback.) and negatively worded statements (e.g., Changes in a learner's abilities should be hidden from him/her). Some statements were also included to check for response consistency [10].

The initial scale items were reviewed by 3 people. This resulted in the rewording of 21 items and the removal of 1 item. Cognitive interviews were then performed to ensure that the scale items were being interpreted as intended [11]: a convenience sample of people with teaching experience was used. These interviews resulted in the rewording of 6 items and a major reorganization of the remaining scale items.

4 Pilot Test

A convenience sample of 12 instructors was used. This sample was biased towards special education (16.7%) and university level instructors (50%) when compared to the Canadian instructor population (3% special education, 9% university) [12]. Computer science instructors were also overrepresented (50%).

The questionnaire was administered through the Internet and included the 53 scale items; they were rated using a 5-point Likert scale. This resulted in a Cronbach's alpha of 0.81for the scale as a whole. However, each of the sub-scales did not demonstrate this level of reliability. Items were removed to decrease the size of the scale and increase each subscale's reliability to a sufficient level ($\alpha \geq 0.70$ [10]). Cronbach's alpha, for the scale as a whole, increased to 0.82 after reducing the scale to a size of 34, and all subscale alphas increased to acceptable levels.

5   Conclusions and Future Work

Now that this scale has been piloted, it can undergo field testing where it can be validated using a representative group of participants.

Following validation, the scale can be used to assess instructor attitudes towards learner use of open learner models. This will allow designers to make informed decisions about which components of the learner model should be opened up to instructors and learners for a target domain and population. It will allow researchers and practitioners to customize their systems in a way that will be appreciated by users, and it will allow them to effectively evaluate changes to the OLM that their systems use.

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TAGlab, Dept. of Computer Science, University of Toronto
http://taglab.utoronto.ca/
cdemmans@cs.toronto.edu

Why Develop a Scale?

- Instructor desire for open learner model (OLM) assumed
- Instructor opinions affect OLM adoption
- Opinions may change following the use of a specific OLM

Scale Development & Refinement

Variables Affecting Instructor Attitudes

Brainstorming Session
- 20 people
- 4 themes

What do instructors think about
How much learners can see regarding
model uncertainty

Item Review
- 3 people
  - 1 lay person
  - 2 researchers

3 Cognitive Interviews
- 1 think aloud
- 2 prompt-based

Prompts:
How confident are you of your answer? Why?
Why did you select that as your answer?
Would you paraphrase the question for me?
What do you think this question is trying to answer?
What does X mean to you?

Pilot Testing: Convenience sample of 12 instructors

Evaluation

Learner Access to Evaluation Metrics (α=0.76)

No.	Item-Remainder Coefficient	Alpha if Item Removed
1	0.38	0.76
2[D]	0.48	0.74
3[D]	0.62	0.73
4[D]	0.65	0.71
5	0.15	0.76
6	0.66	0.71
7	0.45	0.74
8	0.24	0.76
9	0.40	0.75
10[E]	0.54	0.73
11[D]	-0.44	0.80
12	0.07	0.79
13	0.77	0.72
14	0.78	0.71

Feedback Presentation (α=0.64)

No.	Item-Remainder Coefficient	Alpha if Item Removed
1[F]	0.63	0.56
2[F]	0.59	0.57
3[E]	0.26	0.63
4	-0.29	0.68
5	0.30	0.62
6	0.06	0.65
7	0.01	0.69
8	0.68	0.56
9	0.73	0.59
10[G]	0.70	0.55
11[G]	0.35	0.62
12	0.02	0.72
13[H]	0.19	0.64
14[H]	0.11	0.65

Adaptation & Personalization (α=0.39)

No.	Item-Remainder Coefficient	Alpha if Item Removed
1[A]	0.07	0.43
2[A]	0.49	0.19
3[B]	-0.50	0.50
4[B]	0.06	.40
5	0.46	0.24
6[C]	0.25	0.32
7[C]	0.40	0.24
8	0.14	0.37
9	-0.10	0.46

Letters indicate which items can be used to check for response consistency

e.g., For the Adaptation & Personalization sub-scale, No. 1 and 2 are asking the same question in different ways.

Learner Control (α=0.68)

No.	Item-Remainder Coefficient	Alpha if Item Removed
1[I]	0.31	0.66
2[J]	0.39	0.66
3[I]	0.31	0.66
4	0.17	0.68
5	0.17	0.68
6[K]	0.73	0.64
7[J]	0.79	0.58
8[J]	0.29	0.66
9[I]	0.43	0.64
10[K]	0.69	0.60
11[K]	0.25	0.67
12[L]	0.58	0.62
13[L]	-0.19	0.74
14[L]	-0.48	0.77
15[L]	0.37	0.66
16	0.61	0.63

Resulting Scale

Adaptation & Personalization Attitudes (α = 0.73)

No.	Item Text
2	Learners should be ignorant of changes that the system makes in order to enable their learning.
5	Learners should know that a system changes things to meet their personal needs.
6	Learners should be blind to how the system changes their learning materials in order to meet their personal learning needs.
7	It harms the learner's ability to acquire information when the materials are adjusted to his/her abilities.
8	Learners should be able to tell the system what they like or dislike.

Learner Control Attitudes (α = 0.70)

No.	Item Text
2	An expert (e.g., a teacher, the e-learning system) should determine what the learner is taught.
3	A learner's classmates should be allowed to see how she/he is performing.
6	Learners should be allowed to request feedback about their performance when they want it.
7	You should only be allowed to see how a learner is performing in an e-learning system if the learner gives you permission to do so.
8	Learners should be allowed to perform additional tasks if they disagree with the results of their formal assessment.
9	Learners should be allowed to determine if others (anyone else) can see how they are performing.
10	Learners should be allowed to set their own learning objectives.
11	Learners should be allowed to choose how they learn the material.
12	Learners should be allowed to decide who (specific people) has access to information about their academic performance.
14	Learners should be allowed to provide a self-assessment that is partly incorporated into their formal assessment.
16	Learners should be allowed to request more detailed feedback.

Feedback Presentation Attitudes (α = 0.79)

No.	Item Text
1	Learners should only be allowed to see a subset of the performance information that the system has about them.
2	Learners should be allowed to see how much they knew 1 month ago.
8	Feedback should be provided to learners using different formats (e.g., comments, grades, stickers).
9	Learners should be given an overview of their knowledge and abilities.
10	Learners should be given feedback in many forms (e.g., visual and auditory).
11	Learners should be given help with interpreting their feedback.
13	Learners should be able to compare how they did before to how they are doing now.
14	Learners should be shown a projection of what they will learn.

Learner Access to Evaluation Metrics Attitudes (α = 0.84)

No.	Item Text
3	Learners should be given specific feedback about their performance (i.e., key errors should be highlighted).
4	Every aspect of an assessment should be explained for learners.
5	Learners should be told when there is uncertainty in the results of an assessment of their work.
6	Learners should be given detailed feedback about their performance (i.e., every single error should be pointed out).
7	Learners should be ignorant as to how assessments of their knowledge are performed.
8	Learners benefit more when they are shown evidence that supports the results of an assessment.
9	A learner's weaknesses should be hidden from him/her.
10	Learners should be able to see the results of every assessment performed on their work (e.g., grades, instructor comments).
13	Learners should be shown the assessment process alongside the results of their assessment
14	Learners should be able to see all of the information about their performance.

Potential Uses: Monitoring attitude changes, assessing how attitudes differ across domains and populations

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