

TOWARDS A TRUST MODEL IN E-LEARNING: ANTECEDENTS OF A STUDENT'S TRUST

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ABSTRACT

When a student is faced with uncertainty in the trustworthiness of a learning activity to meet their intended learning goals, it may cause a student to have a state of anxiety and a lack of confidence in the teaching activity. A student's trust in the teaching agents' ability to provide an appropriate teaching activity is needed to reduce the student's uncertainty. In this paper, we present a conceptual trust model for an e-learning transaction. The trust model quantifies how much of the student's trust should be given to a teaching activity by using a learning outcome-based trust and a reputation-based trust technique. A possible utility of a teaching activity is estimated in order to calculate the degree of a student's trust in an outcome-based trust technique. It is hoped that the trust model presented in this paper could help a student choose the trustworthy material without any recommendation from an expert.

KEYWORDS

E-learning, trust, trust in e-learning

1. INTRODUCTION

Uncertainty presents a difficulty for students when choosing appropriate teaching activities and materials, especially for their self-study. A student's uncertainty can be resolved by building their trust in the teaching activities and materials in e-learning. For example, trust can be determined to choose appropriate learning resources from different providers in recommender systems, or used to explore people's experience to find out suitable groups of collaborative learning. However, the research of trust in e-learning is still lacking in terms of the evaluation method of trust in e-learning/teaching activities (Yingchun; Youli 2010). This paper is aimed at proposing a new conceptual trust model that can be used to calculate the student's trust, which is the degree of trust in a teaching activity within an e-learning transaction, from the perspective of the student. The model aims to support a student's decision-making when considering trust in teaching activities and materials. The paper is organised as follows. The related work for our trust model is given in Section 2, followed in Section 3 by the proposal of a conceptual student's trust model. Finally, conclusions are drawn in Section 4.

2. RELATED WORK

An e-learning transaction is defined as the consideration of a situation in which a teacher and a student are attempting to achieve the same outcome in a specific context (Gilbert & Gale, 2008). An e-learning transaction model is composed of three units: an intended learning outcome (ILO), a teaching activity and a learning activity. First, an ILO is a statement of what the student is expected to know and will be able to do at the end of an applied learning process. An ILO must be clear in order to support the delivery and assessment planning, such that students can recognise what is happening and understand how to cope with their learning and assessment (Macdonald, 1999). The general statement of an ILO is presented as, "By the end of the course, the student will be able to X, where X is a performance" (Gilbert and Gale, 2008). For example, in an e-learning lesson, an ILO is defined as "the student will be able to analyse target audience characteristics by

listing those characteristics pertinent to the e-learning under consideration". The performance is defined as "...to analyse target audience characteristics by listing ...". The intended learning outcome consists of two primary elements: subject matter and capability. Second, a teaching activity is defined as an intentional activity of a teacher whose aim is to bring a learning activity (Hirst, 1971). The design of a teaching activity is considered in two parts: pedagogical content knowledge and types of teaching activity. The pedagogical content knowledge in teaching is sourced from teachers' own subject-matter knowledge of taught materials (Even & Tirosh, 1995). Several kinds of teaching material are used to represent the pedagogical content knowledge or the subject matter, such as an assignment in a book, an example in a video or a definition on a website. There are four types of teaching activity: "showing", "telling", "asking" and "feeding back". The teacher needs to decide which teaching activity is appropriate for the student based on the student's prior competence and the ILO. Third, a learning activity is an activity performed by the student that aims to bring about the achievement of a new competence by using an existing one (Hirst, 1971). In other words, every student learns in a unique manner and the new competence is acquired from a prior competence, such as a cognitive ability.

3. TRUST BASED ON LEARNING OUTCOME AND REPUTATION (TOR)

In a learning outcome-based trust technique, the antecedents of trust are derived based on the schema of intended learning outcome (sILO). In details, the sILO is a direct acyclic graph of ILOs (Tangworakitthaworn et al., 2013). The sILO is given by an expert to connect tasks between the teaching and learning activity. If we know exactly how an expert achieves ILO by their own knowledge, it is then possible to estimate any teaching activity's trustworthiness based on the expert's knowledge. When the schema of intended learning outcomes represents the expert's knowledge, the trustworthy teaching activity will be determined from the sILO. It is possible for students to estimate a degree of trust using their own assumption and trustworthiness information. The proposed conceptual student's trust model is aimed at helping a teaching agent provide the evidence of trustworthiness in teaching activities and materials for students. The construction of a student's conceptual trust model using a learning outcome-based trust and reputation-based trust technique (TOR) is shown in Figure 1. The antecedents of the student's trust model are grouped into three categories: a student's assumption to trust, a student's trust perception of a teaching activity, and a pedagogy context depending on the student's expectation of ILO (eILO). The details of each antecedent of a student's trust are described below.

3.1 Student's Assumption to Trust

In this work, '*student's assumptions to trust*' is defined as a notion of trust that a student considers to be true by themselves. Students have to choose an appropriate teaching activity in order to acquire or improve their technical skills or new subject knowledge. They need to develop their own opinions and make a decision to trust any new information themselves. Therefore, students need some notion of trust, so that they can estimate the trustworthiness of a teaching activity. The good assumption of trust arises from the good trust propensity and their prior competences (Bigley & Pearce; 1998 Mayer et al., 1995; Rotter, 1980).

Mooradian et al. (2006) reported that individuals with a low trust propensity perceive others as self-centred, conniving and potentially dangerous. People who have a high trust propensity believe that most people are sincere, fair and have good intentions. Trust propensity is an important factor that influences a trust antecedent in new, unusual, uncertain or unstructured situations and it is a measure of how willing an individual will be to trust someone before they have any information about that person. On the other hand, most of the time, the prior competences of a student are not enough to engage the new learning purpose or to use it to bridge new learning. Students may face difficulty in decision-making to trust in a teaching activity that will hopefully engage new knowledge. More potential of a student's related prior competences (pILO) to the teaching activity means an increase in student's trust in the teaching activity. Therefore, an analysis is needed of how many of a student's prior competences are potentially relevant for acquiring new knowledge. The teaching agent in e-learning should recognise the knowledge schema to understand students' background knowledge, and use the knowledge schema to bridge between student's prior competence and new learning. Therefore, the student's trust propensity and the student's prior competence are needed, especially when the trust prediction has little or no information about a teaching activity.

3.2 Trustworthiness of Teaching Activity

Past research has suggested that trust from a student’s perspective is their willingness to believe and have confidence in a teaching agent, such that it will take appropriate steps to help them achieve their learning purpose or the intended learning outcome (Corrigan and Chapman, 2008). The teaching activity must have the following characteristics in order to give evidence about the value of the learning experience:

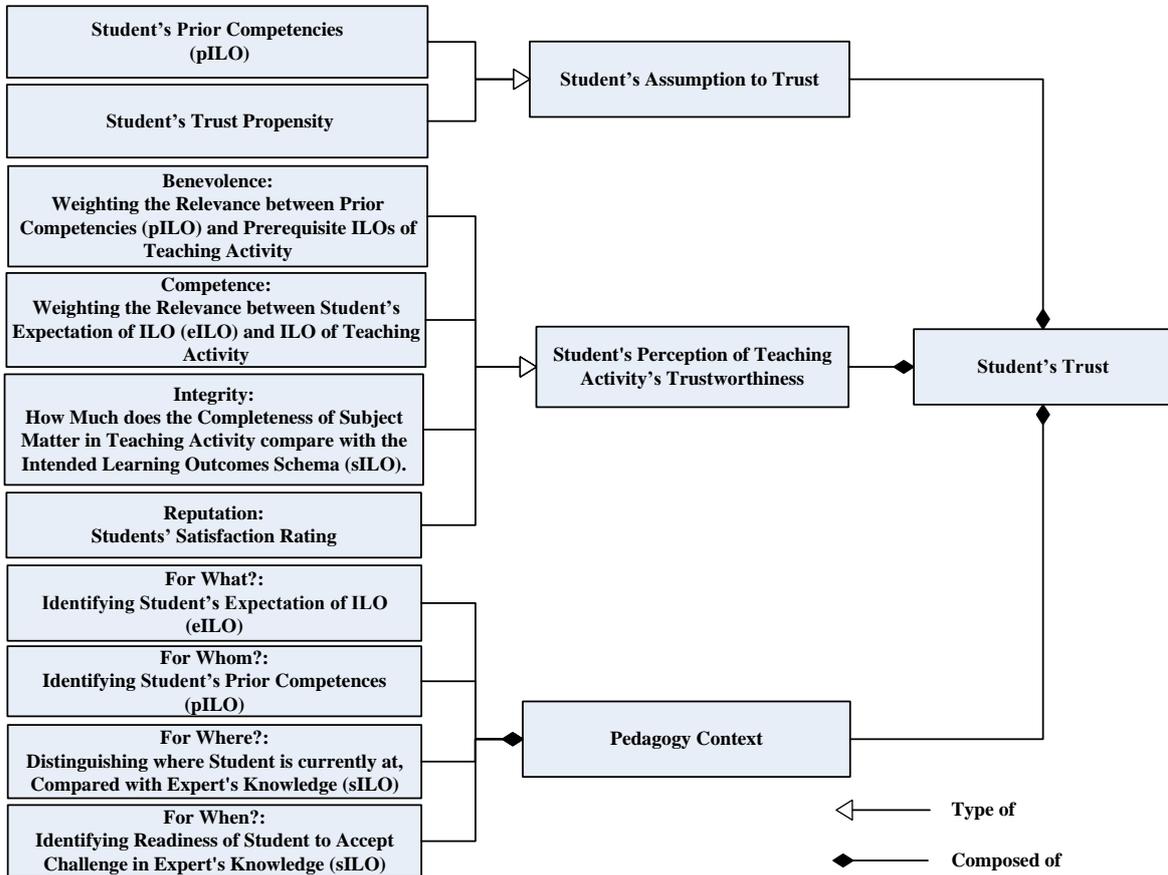


Figure 1. Conceptual model of a student’s trust based on learning outcome and reputation (TOR model)

- Benevolence is the belief that the teaching agent cares about the well-being of the student. A teaching activity is benevolent if it is provided based on the student’s expectations and prior competence. The benevolent characteristic of a teaching activity is measured by weighing the relevance between the student’s prior competences (pILO) and the set of prerequisite ILOs of each teaching activity within the schema of intended learning outcomes (sILO).
- Competence is a student’s perception that the teaching agent has the professional knowledge and abilities to fulfil its required tasks. Being competent could be measured by weighing the relevance between the student’s expectation of ILO (eILO), and the ILO of each teaching activity within the schema of intended learning outcomes (sILO).
- Integrity is a student’s perception that the teaching agent shows honesty with its sources of material and is honest to the student. The integrity could be measured as the completeness of subject matter content in a teaching activity compared with the schema of intended learning outcomes (sILO) and also detail of the source material used in the teaching activity, for example author details and material type, location, and modification date.
- Reputation is how much respect or admiration a teaching agent receives for giving the teaching activities, based on past transactions and interaction. Being reputable could be measured by student satisfaction ratings that focus on the importance of the teaching agent fulfilling its students’ expectations.

3.3 Structure of Pedagogy Context

Literature has shown that trust formation can be improved by using context data (Jøsang 2005, Trbovich & Patrick 2004). We enhance the student's trust model by considering the pedagogy context to enrich trust estimation functions with the possibility of analysing contextual information. This research defines the pedagogy context as information that can be used to characterise the situation of a person or an object in a pedagogical environment. The pedagogy context is constructed by the teaching agent based on the student's expectation of ILO (eILO) and the expert's knowledge represented by the schema of intended learning outcomes (sILO). The pedagogy context is categorised into four parts:

- What? – What a student expects or wants to achieve. This is represented by the student's expectation of ILO (eILO) including the surrounding information and their condition.
- Whom? – Distinguishing the characteristics of a student by knowing how much knowledge a student already has (pILO) and how much knowledge a student needs in order to capture the necessary ILO in the schema of intended learning outcomes (sILO). Recognising what the trustworthy teaching activity is relevant to the student's expectation.
- Where? – Distinguishing where a student is currently at in the schema of intended learning outcomes (sILO) during the learning processes. Recognising what the trustworthy teaching activity is relevant to the potential of where that student could be.
- When? – Identify when a student is ready to learn each teaching activity. Identifying the readiness of a student to accept the challenge of the teaching activities. Recognising when the teaching activity could be delivered to the student based on the student's expectation of ILO (eILO), the student's prior competences (pILO) and the prerequisite ILO of teaching material.

4. CONCLUSION

In this paper, we present a conceptual student's trust model that shows the antecedents of a student's trust using learning outcome-based trust and a reputation-based trust technique. A student's trust is defined as the degree of trust from the student's perspective, and it shows the student's willingness to believe and have confidence in the teaching agent, such that the student will take appropriate steps to help them achieve their intended learning outcome (ILO). In more detail, the stating of learning purpose, the perception of evidence of trustworthiness and the student's own assumptions are introduced as antecedents to assign a student's trust degree in a teaching activity. The proposed trust model is aimed at estimating the student's trust degree in teaching activity even if the student has no opinion and without any recommendation from an expert. In future work, the TOR model will employ the fuzzy logic to calculate the degree of the student's trust, and be validated via a user evaluation. The accuracy and precision of the TOR model will also be quantified.

REFERENCES

- Bigley, G. A. & Pearce, J. L., 1998. Straining for shared meaning in organization science: Problems of trust and distrust. *The Academy of Management Review*, vol. 23, no. 3, pp. 405–421.
- Corrigan, M. W., & Chapman, P. E., 2008. Trust in teachers: A motivating element to learning. *Radical Pedagogy*, vol. 9, no. 2, pp. 3.
- Even, R., & Tirosh, D., 1995. Subject-matter knowledge and knowledge about students as sources of teacher presentations of the subject-matter. *Educational studies in mathematics*, vol. 29, no. 1, pp. 1-20.
- Gilbert, L. & Gale, V., 2008. *Principles of E-learning Systems Engineering*. Chandos Publishing (Oxford).
- Hirst, P. H., 1971. What is teaching?. *Journal of Curriculum Studies*, vol. 3, no. 1, pp.5-18.
- Jøsang, A., Keser, C., & Dimitrakos, T., 2005. Can we manage trust?. In *Trust management*, pp. 93-107. Springer Berlin Heidelberg.
- Macdonald, R., 1999. *Specifying aims and learning outcomes*. In G. Gibbs, editor, *Teaching in Higher Education: Theory and Evidence*, chapter 2. Milton Keynes:Open University.

- Mayer, R. C., Davis, J. H., & Schoorman, F. D., 1995. An integrative model of organizational trust. *The Academy of Management Review*, vol. 20, no.3 , pp. 709–734.
- Mooradian, T., Renzl, B., & Matzler, K., 2006. Who trusts? Personality, trust and knowledge sharing. *Management Learning*, vol. 37, no. 4, pp. 523–540
- Rotter, J. B., 1980. Interpersonal Trust, Trustworthiness, and Gullibility. *American Psychologist*, vol. 35, no.1.
- Tangworakitthaworn, P., Gilbert, L. & Wills, G. B., 2013. Designing and Diagraming an Intended Learning Outcome Structure: A Case Study from the Instructors' Perspective. *The 13th IEEE International Conference on Advanced Learning Technologies (ICALT2013)*, July 15-18, 2013, Beijing, China [in press].