

# Negotiation Driven Learning: A New Perspective of Learning Using Negotiation

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**Abstract.** Negotiation mechanism used in the current implementations of Open Learner Models is mostly positional based and provides minimal support for learners to understand why their beliefs contradict with that of the system. This study aims at proposing a new paradigm of learning that uses negotiation coupled with targeted responses to motivate a learner and enhance their metacognitive skills along with their cognitive skills.

**Keywords:** Negotiation, Metacognition, negotiation-driven learning, inter-est-based negotiation, learner motivation.

## 1 Introduction

In recent years much research has been done in the field of Intelligent Tutoring Systems (ITS) to support and promote independent, self-regulated learning. Much of this research has primarily focused on generation and visualization of Learner Models (LM). Open Learner Models (OLM) aim at enhancing both cognitive and metacognitive skills of a learner through guided content, externalization, scaffolding and negotiation. However, negotiation has been underutilized in the current OLMs. Negotiating or debating with others allows us to identify alternative perspectives [1][2]. According to the Constructivist Learning Theory “learning is a process of construction of knowledge through dialogues” [1]. Therefore in this study we will focus on “fully-negotiated” LMs [3] and propose the paradigm of Negotiation-Driven Learning (NDL) with the aspiration to enhance the role of negotiation as a problem-understanding technique and use it to promote metacognitive activity and enhance learning.

## 2 Problem Description

The negotiation aspect of the current implementations of OLMs is aimed at solving the problem of the conflict between the learner’s beliefs and that of the system [4]. OLM relies upon the externalization of a learner’s knowledge to promote metacognitive skills. Negotiation is generally related with the occurrence

and resolution of conflict. Position-Based Negotiation (PBN) is employed which considers both the learner and the system to firmly commit to their positions. Only one party finally reaches their position or a compromised position is accepted by both parties [5].

A negotiation session is initiated by the system when there is a conflict between the learner's and system's sets of beliefs. A learner is also allowed to start a negotiation session when they do not agree with their LM. The learner is allowed to defend and retain their beliefs if they can justify them [3]. In order to justify themselves, the learner has to provide evidence or justification. The system asks the learner a set of questions to prove the validity of their claim. These are closed-ended, directed questions that evaluate the knowledge of the learner about a certain topic. What is "tested" is not the "motivation" behind their claim but the learner's knowledge. This confines the scope of negotiation as more of a "problem solving" technique rather than a "problem understanding" technique.

### 3 Proposed Solution: Negotiation Driven Learning

Almost all implementations of fully negotiated LMs follow an ideology which constrains negotiation to just "negotiating to solve problems/conflict". In this context, negotiation is used as a supplement for "teaching" whereas in our point of view negotiation provides an excellent opportunity for "learning".

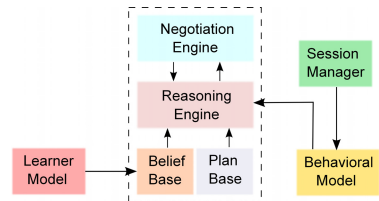
When a learner negotiates their LM with the system, they are actively involved in a dialog, intrinsically motivated to justify their claim, hence more likely to conceive new knowledge. This provides an excellent opportunity to indulge the learner in metacognitive-guided learning, where they build knowledge by actively using and enhancing their cognitive and metacognitive skills. NDL aims to take advantage of this precise opportunity by understanding and challenging the motivational state of the learner, indulging the learner in an active dialog which promotes self-regulated learning, and provides a chance to the learner to understand "what and how" they learn. Contrary to the concept of PBN, Interest-Based Negotiation (IBN) [1] is a process that aims at exploring underlying interests of the parties rather than their negotiating positions. Therefore the concept of IBN seems much more appropriate to be incorporated in NDL. The concept of IBN can allow us to use negotiation as means to understand the reasons behind the beliefs of a learner. IBN can play a vital role in NDL, since in NDL we are concerned with motivating the learner by trying to understand their reason for holding a particular belief which in turn can help identify why such beliefs are held and how can a learner be persuaded to change them.

#### 3.1 Proposed System

The proposed system would generate a Behavioral Model (BM) of the learner as they interact with the system. The BM will include information about the interactions of the learner with the system; their interest in their respective LM,

their enthusiasm in discussing their LM, their help-seeking pattern and their confidence in their abilities. The behavioral model will be continuously updated through the Session Manager (SM) which would record interactions of the learner with the system in real-time.

Once the baseline BM of the learner is generated it will be used by the Automated Negotiation Agent (ANA) to understand the motivational state the learner is in and use this information to select the best suited negotiation strategy from the Plan Base (PB) to maximize learning. For example; if the BM of the learner shows that they are confident in their abilities but avoid discussing their LM with the system, the ANA will try to prompt the learner's attention towards their LM. Using "challenge" as a motivational trigger, the system will try to entice the learner into discussing why their beliefs differ from that of the system in an open-ended discussion. The goal would be to intrigue the learner into discussing their LM such that both the system and the learner understand why they hold certain beliefs and how they can overcome these differences.



**Fig. 1.** Proposed Interest-Based Automated Negotiation Agent

## 4 Concluding Remarks

NDL follows the notion that learning is maximized by participation in the learning process and negotiation provides an excellent opportunity to challenge the learners which promotes metacognitive skills by motivating them to think more objectively about their learning. Although the research on NDL is in its early stages, we believe that the paradigm of NDL holds great potential as it opens up new perspectives of learning by using automated IBN to challenge and intrinsically motivate learners through discussions.

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