

# The Role of a Help Requester in Collaborative Learning

David Nadler Prata

**Abstract**—Computer Supported Collaborative Learning (CSCL) systems can offer the automation of many teaching resources and activities by the encouragement of the interaction among students as a means of implementing constructivist and sociocultural educational theories. This study is grounded on Piagetian Theories to investigate the use of cognitive knowledge misconceptions (lacking and misunderstanding) in a dialogue protocol, and to evaluate how social behavior can influence student's learning. Results show the role of help requesters in CSCL by the assessment of four dialogue dimensions.

**Index Terms**—CSCL, social behaviour, learning gain, education technology.

## I. INTRODUCTION

In CSCL tasks, student's interaction can generate large amount of data to be time consuming analyzed. Hence, automation procedures for coding these dialogues have to be on demand. In collaborative learning, students encourage each other to ask questions, elucidate beliefs, justify their opinions, argument their reasoning, and negotiate their meaning, in a wide variety of collaborative and learning behaviors, which impact each students' learning in a multifariousness of possibilities [1]–[3].

Besides, some authors claim that it is inconceivable to dissociate cognitive tasks from social tasks, because all cognitive tasks have a social factor [4].

This study is grounded on Piagetian Theories. Piaget claimed that one source of progress in the development of knowledge is found in the imbalance that forces a subject to seek new equilibriums through assimilation and accommodation. The code scheme focus on searches for individual's knowledge gains on the basis of the students' collaborative behavior through their beliefs' negotiation of their meaning [5]. It allows the investigation for the use of cognitive knowledge misconceptions (lacking and misunderstanding) in a dialogue protocol, and the student's roles of cooperation and competition.

This work aimed to evaluate how social behavior can influence student's learning. The collaborative learning can be seen as a social game where agents (players) are able to cooperate or compete in order to solve a problem. Ref. [5], [6] found results indicating that student's competing behavior as speaker's speech act (sender) are associated with effective positive learning. In this paper, we describe complimentary findings for the hearer (receiver) playing the role of cooperation. The purpose is to provide agents with cues of

what, when and how to intervene in the collaborative learning dialogues. For example, the task of a group-learning facilitator is to monitor a large number of on-going collaborative learning discussions and to mediate when necessary to keep the conversation moving in a productive direction.

This study builds on exploratory research. So far, Piagetian theory claims that the cognitive conflict of ideas between students is seen as beneficial for learning. Whereas, [7], [8] provide evidence that the conflict of ideas often leads to interpersonal conflict. Therefore, the authors question which sorts of interpersonal behaviors are positively or negatively related to effective learning?

## II. BACKGROUND

### A. Learning Game

Collaborative learning can be seen as a social game where agents (players) are able to cooperate or compete in order to solve a problem. For Game Theory, the classic prisoner dilemma, the goal is to win goodness; competition means win-lose, cooperation means win-win, and there is also the awkward situation of lose-lose. The medium could be communication, negotiation and/or mediation. We want to examine which types of behaviors are associated with victory or defeat in CSCL games by examining both the roles of the person who cooperates or who competes and the person who sends information or receives it, and the effects of communication, negotiation and mediation.

Based on the results of [5], [6], Fig. 1 is a three dimension graph depicting speech acts by player roles, the cognitive and social learning activities, and the speech actors of speaker and hearer.

The analysis of a set of chat protocols using a coding scheme allowed identifying speech acts [9] correlated with learning gains for the student's player roles of cooperation and competition. These categories were qualified in cognitive and social behavior activities in accordance with the coding scheme: divergent reasoning, contradiction and insults. The study was conducted using a fine-grained extension to the discourse analysis, making a distinction between the sender of the speech act (speaker) and the receiver of the speech act (hearer).

These results addressed evidence that the cognitive process of cooperation is a learning benefit for the hearer because the work could not find speech acts with significantly correlated learning gains for the speaker. However, the cognitive process of competition should be equally beneficial to the speaker because the study could not find speech acts with significantly correlated leaning gains for the hearer.

The quadrant flaw (Fig. 1), identified by an interrogation

character, elicited speech acts able to fill in the gap among: social behaviour dimension, the role of cooperation dimension, and the hearer speech actor dimension.

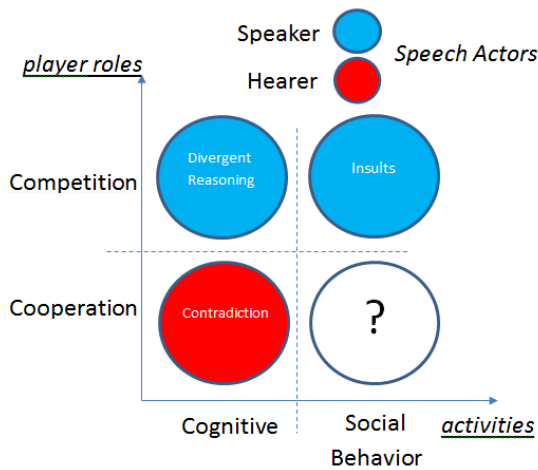


Fig. 1. A three dimension graph depicting learner's dialogue speech acts.

**B. Social Context for Learning**

Ref. [10] stated that the development of higher level thinking is rooted in social interactions. Ref. [11], [12] argue that social interaction is crucial to productive collaborative learning. Cognitive processes in collaboration, such as problem solving [13], are as important as social processes such as motivating environments with positive affective relationships [14], [15].

Likewise, others researchers argue that the social context in which cognitive activity takes place is an integral part of the holistic activity. In other words, only understanding the set of social circumstances of the situation a valid interpretation of the cognitive activity can be made, e.g., theorists of situated learning [16].

Many authors claim that the benefits of collaborative learning are only achieved by active teams, e.g., theorists of active learning [17]. Nevertheless, [1] stated that "One should not talk about the effects of collaborative learning in general, but more specifically about the effects of particular categories of interactions".

So far, many readings are particularly limited to focus on written recorded protocols of group interactions [18], [19]. Worthwhile, based only on statistical study of student's written contributions make difficult to evaluate the quality of the interaction. These approaches also lack the intentionality of the players [20]. In the other hand, [21] described the potential of the computer to mediate the process of learning in mathematics education field.

This works focuses on an exploratory research to qualitatively identify on-line peer-to-peer communication that contributes positively or negatively toward effective peer interaction in collaborative learning. The purpose is to provide agents with cues of what, when and how to intervene in the collaborative learning dialogues to keep the conversation moving in a fruitful course.

**III. INFRASTRUCTURE AND METHODOLOGY**

Thirty two grade students from a suburban elementary school participated in the study. The students were arranged by the experimenter into pairs with a mixture of mixed-ability and homogeneous ability pairs.

The materials for the experimental were the following: (a) a mathematics tutoring program covering problems on fraction addition, subtraction, multiplication, and division; and (b) two extensive isomorphic tests were designed for use as pre-test and post-test. The pre-test with forty nine questions and forty seven questions for the post-test.

TABLE I: SPEECH ACTS DESCRIPTIONS

Intention	Speech Act	Description	Sketch	Example
Provoke a cooperation action	Help Requester	The peer requests his/her partner to provide help about the problem solving. A Help Requester is the intention of a peer to provoke his conversation partner to perform the action of help him to solve the problem. This request do not identify any specific concept term about the problem. This expression is characterized by a requisition, and can be an interrogation or an affirmation.	"Help me"	"help me" Student 4a
			"Can you do this for me?"	"can u do that" Student 8a
	Belief Requester	The peer requests his/her partner to provide a belief about the problem solving. A Belief Requester is the intention of a peer to provoke his conversation partner to perform the action of answer or explain a belief about the problem solving. This request must identify, in an explicit manner, the specific concept term in question by expressing it in the sentence. This expression is an interrogation.	"What is the solution to solve this problem?"	"should it be 15" Student 3b

The experimental procedure extended for four school days. There was a first day of the experimental with a pre-test performed by each student alone. The pre-test lasted for about 30 minutes with the aim to assess how much the students knew about the subject matter. A short collaboration training manual was also provided with the intention to teach the students about good collaboration dialogue. In the second day, there was the first day lab when the students work together, and for the next day there was the second day lab. Each lab session lasted for forty five minutes. The fourth day of the experiment was the post-test that was separated by the third

day of the experiment by a weekend. These two days lag between the last lab day and the post-test day allowed a measure of retention. Each student performed the post-test alone. Teams remain the same all over the experiment.

The students were foster to work in cooperation by offering a small prize for the teams at the end of the study based on how much they learned the subject matter, and how much problems they solved correctly working together.

This experiment allowed to investigate the student's knowledge gains based on the pre- and post-tests and to analyze the chat and CTAT contributions based on students'

pairs and the students alone. There were a total of twenty four students analyzed that participated in all the investigation process, since the pre-tests, throughout the lab days until the end of the experiment with the post-tests. Because one of the students did not participate in the chat interface during the two lab days, we reduced the sampling into twenty three students.

IV. SPEECH ACTS

The categories of the coding scheme were an attempt to measure the knowledge achievements among pairs. The total coding scheme has 32 categories. For this work, we have selected two categories related to social behavior. These categories have the intention to exchange cooperation between participants about the problem solving.

In Table I, we categorize these two knowledge misconceptions. The encouragement to elaborate these categories emerges from the student’s interaction dialogues analysis, and the studies of [22]. Ref. [22] defines a social act as any intention which encompasses another self and may be affecting another’s emotions, intentions, or beliefs. Social interactions are the acts of people mutually oriented towards each other’s selves attempting to influence another’s subjective intentions. Hence, we can identify the help requester and the belief requester speech acts as social behaviours.

V. RESULTS

We analyzed the correlations between pre- and post-test learning gains and the frequency of each category of our coding scheme in each pair’s dialogue. The overall pattern of results is shown in Table II. As can be seen, the amount a student request help was associated with significantly correlated learning gains, respectively  $r=0,44$ ,  $t(22)=-2.24$ ,  $p=0.03$ . But not for their partner,  $r=0,21$ ,  $t(22)=-0.99$ ,  $p=0.32$ .

By contrast, request belief was associated with negative learning, and only for the partner. The amount a student receive belief requests was associated with statistically significantly lower learning gains for their partner,  $r=-0.41$ ,  $t(22)=2.10$ ,  $p=0.04$ . However, there is no statistically significantly for the belief requester,  $r=-0.18$ ,  $t(22)=-0.38$ ,  $p=0.70$ .

In Fig. 2, we can see the descending linear regression of the belief requester speech act for the hearer.

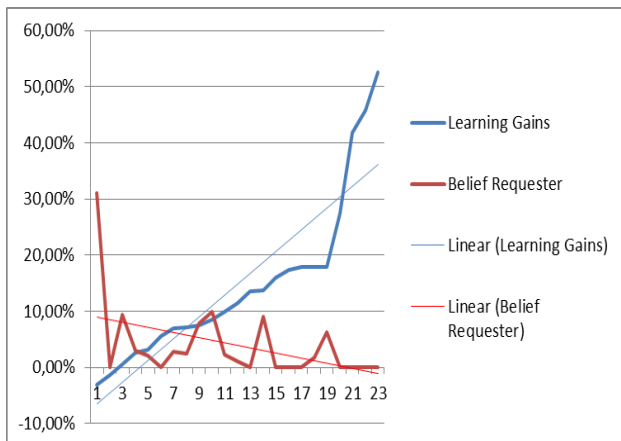


Fig. 2. Belief requester speech act versus learning gains.

TABLE II: SPEECH ACTS RESULTS

Context	Social Behavior		
	Sender	Hearer	Category
Cooperative	0,44	0,21	Help requester
	-0.18	-0,41	Belief requester

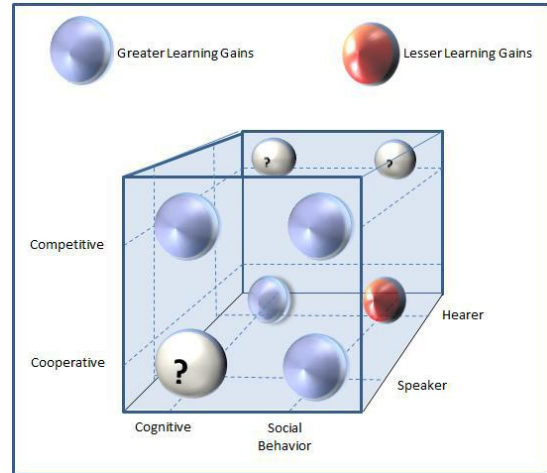


Fig. 3. Four dimensions to evaluate learner’s dialogues speech acts.

VI. CONCLUSIONS

Based on [5], [6] and from this work, we could design the research results for learning gains in four dimensions, Figure 3. Analyzing this graph, we can observe the absence of evidence for some convergent dimensions. This lack of evidence brings opportunities for new studies to elucidate the role of social behavior in regards to learning gains for collaborative learning.

This study also suggests for future researches to contemplate a new dimension for the study of learning gains in collaborative learning. We are talking about discerning between partners’ contributed activities and partners’ requested activities. These two kinds of speech acts, informing and requesting, can also determine the role of social behaviours for learning gains in collaborative learning.

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