Understanding collaboration in team design, task-oriented interactions

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Abstract. This paper presents a part of the methodology used in a broader study that aims to describe, analyze and evaluate the face-to-face interactions of teams that co-design online courses. Specifically, team design collaboration is viewed as a co-construction process, during which design content is contributed, co-elaborated, and offered for discussion by the participants. The proposed method has been applied to identify the most co-constructive episodes out of an extensive range of team meetings.

1 Introduction

Team design is both a complex cognitive activity (Visser, 2006) and a social construction process (Bucciarelli, 1998). Presently, many noticeable efforts to evaluate team design discourse have been reported, with (as in Darses, et al., 2001; Stempfle & Badke-Shaub, 2002; D'Astous, et al., 2004; Détienne, et al., 2005; Baker, et al., 2009) or without (as in Bucciarelli, 1998; Valkenburg & Dorst, 1998; Adams, et al., 2009) the further aim of evaluating the team design communication.

Collaboration regarding the inside-team communication processes is strongly context-related (Rigotti & Rocci, 2006) and, in the case of design, is design object-oriented. This thesis leads to two main assumptions: first, that not all communication emerging inside a work team is task-oriented, and, second, that not all task-oriented communication is also collaborative.

2 Research goals

The main goal of this research-in-progress is to understand how collaboration takes place among the members of a design team, with the aim to inform the team members of their own collaborative practices, and to make them reflect on their quality, in order to achieve better collaboration in future projects.

To do that, two main definitions had to take place beforehand: the design task-object, on which the specific team is working on, and the quality of collaboration, as part of this design process.

Regarding the first issue, the design task, three main dimensions have been identified, regarding the task of designing an online course: a) the *course elements,* such as the core-readings, the how-to-exercises, the tutor-marked assignments etc., b) the *elements' relations,* such as the relation between the elements inside a block of activities, the relation between media and instructional goals etc., and, c) the *third-party relations* – such as the interaction among learners, between learners and the course content, or between the designers and other agents.

As the quality of collaboration is concerned, a choice to view team design collaboration as an "expression" of team design communication has been made, according to the research goal mentioned above. Also, considering communication as a process of socio-cognitive construction (Trognon, 1999), collaboration can be seen as a co-construction process (Baker, 1995), when they both take place to a specific level-object (Baker, et al., 1999). Consequently, the quality of collaboration is (also) based on the quality of this co-construction.

Considering the open methodological issues on how to evaluate such co-construction, a second research goal has emerged: to propose a tool of analysis and evaluation of team design communication. This paper presents a part of the methodology applied for the analysis of synchronous communication among the members of a design team, working at an established Distance University, during an 18-month long design of a course.

3 Research questions

To achieve the goals just mentioned, the following questions are addressed:
- Which episodes of a specific team design interaction protocol are more co-constructive than others?
- To which other collaboration functions does this co-construction relate to?
- Which patterns of collaboration emerge as efficient, and thus, are recommended as reusable?

The present paper focuses on the first question, although taking into consideration the other two, mainly on what regards the methodological proposal. Maintaining the focus on the first question, the following sub-questions emerge:

(1) How is co-construction defined in team task-oriented interactions?
(2) How is this definition applied at the time of analyzing an extensive interaction protocol?
(3) How can co-construction be evaluated?

4 Definition of co-construction

In order to define "co-construction" in team, task-oriented interactions, three criteria are proposed: the explicitness of information, namely *informativity*; the elaboration of contributions at an inter-speaker level, namely *co-elaboration*; and the argumentative disposition of the participants, namely *argumentativeness*.

The criterion of *informativity* denotes the need of making explicit as much relevant information as possible, with the assumption that once made explicit, it can further be used for the production of design elements.

The criterion of *co-elaboration* describes the need of extending, clarifying, accepting, evaluating, and/or transforming the content of another speaker's contribution(s), either by adding information to it (adjunction relations), or by expressing a viewpoint on it (interjunction relations).

The criterion of *argumentativeness* describes the need to evaluate all statements made explicit, both by the others and by the statement "owner" him- or herself. In the analysis proposed, this need is satisfied by the existence of as much addresser-addressee relations as possible, meaning as such the relations of solution presentation, comment, explanation, reformulation, summarization, attribution, antithesis, justification, and (proposal of) action (adapted from Renkema, 2009).

A further step was to define the task and discourse components which could be used as "measures" of co-construction, in the specific context of team design. These components are defined as following:

• *Design-related contributions*. As already mentioned, not all design discourse is design object-oriented, and subsequently, not all speakers' sayings contribute to the design content. In order to decide which of the contributions are design-related, a design content analysis of the protocol has been first made and a number of design relations emerged, as shown in Table I. To consider a contribution as design-related, a specific relation among its referent(s) and the design object is necessary. Design-related contributions are related to the criterion of informativity.

• *Dialogue moves.* In order to understand the specific discursive function of each elementary discourse segment, and subsequently of the speakers' contributions, a categorisation of task-oriented dialogue moves (Carletta, et al., 1997) has been adapted to this research protocol. This categorisation supports the identification of main (or initiation) moves and their distinction from secondary (response and preparatory) moves. Statements, questions, and (if any) commands are considered to be the main moves, or those belonging to the presentation phase

in Clark's (1999) terms. The identification of dialogue moves allows the identification of inter-speaker relations, which are the basis of co-elaboration.

• *Discourse relations*. Moves are related to one another through discourse relations. Many classifications of discourse relations have been proposed until now, with the most known in the field of Rhetorical Structure Theory (Mann & Thompson, 1988). In this research, I adopt the Connectivity Model proposed by Renkema (2009), for three main reasons: a) it is based on the construction metaphor, making easier its extension to a co-construction context, b) the relations proposed are strongly related to the content of the discourse, especially the ones of the adjunction level, making tagging easier, and c) the notion of interjunction, as the highest level of discourse construction, has direct references to argumentation components, as the author himself argues (Renkema, 2009; pp. 123). Interjunction relations can be used as a basis for the identification of argumentative relations.

All these three components can be treated either quantitatively, as product, or qualitatively, as process. The method followed in this research considers both approaches, based on the following guideline: a quantitative "measurement" of co-construction can lead to a first filtering of the most salient episodes; afterwards, a more thorough qualitative analysis of those can –and should− follow. The present paper is focused on the former.

5 Coding scheme

The coding scheme constructed for the needs of this research is based on three dimensions: the agent, the task, and the discourse dimension[1].

Regarding the task and discourse dimensions, the main components previously described are coded with the categories appearing on Table I.

Coding Category	Sub-categories	Examples
Design **Relation** (DR)	**Past action** (pa)	*I couldn't download it*
	Action (a)	*We'll incorporate those bits*
	Function (fu)	*This exercise promotes reflection*
	Means (m)	*printing it out on PDF*
	Attribute (at)	*It's not too big*
	Reflective assumption (ra)	*in order to kind of reach that self-wise*
	Requirement (r)	*The tutors will need a kind of marking guidelines*
	Constraint (c)	*Consistently problems are coming up in the forum*
Cognitive	**Design problem** (p)	*If students can't use this tool*

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[1] I follow a who-what-how approach to define team design activity, as in Cole & Engeström (1991).

Focus (C)[1]	Design solution (s)	*What about having different voices?*
	Design goal (g)	*That will be a strength of the course*
	Domain rule (r)	*Students like talking about the assignment*
	Domain object (o)	*The language was quite nice and accessible*
	Task-Team (t)	*I'll work over it over the weekend*
Move (Mv)	Statement (S+ID)	*It can be on different levels*
	Question (Q+ID)	*What about the readings?*
	Command (C+ID)	*So don't send that out*
Relation type (Rt)	Conjunction (C)	*Yeah we should do that*
	Adjunction (A)	*Yeah, providing we cut and paste titles*
	Interjunction (I)	*Yeah, unless it's a very open end* [2]
ID number of related EDU (rID)	Statement (S+ID)	
	Question (Q+ID)	
	Command (C+ID)	

Table I. Coding categories relevant to co-construction.

According to the above categories, design-related contributions are all the moves made within a design cognitive focus, that have a direct (action, past action, function, means, attribute) or indirect (reflective assumption, requirement, constraint) content relation to the design object. Main moves are distinguished from secondary moves by the mere fact of non-marking the latter. Finally if a move is related to a previous move, this is marked with one of the three relation types: conjunction, when the relation is at a "form-to-form" level; adjunction, when it is at an "information-to-information" level; interjunction, when it is at an "addresser-addressee" level (Renkema, 2009).

As far as the agent dimension is concerned, three main components are taken into consideration: the speaker, the enunciator or "other voice" (to whom an action is attributed, e.g. by a reflective assumption), and the agent's epistemic role (also see Baker, et al., 2009). The latter is marked through shifts in domain language, initiated by a speaker alone or after invitation[3] (in this case he/she is considered the "expert" of that language). The sub-categories emerging for each one of the agent categories are based on the specific protocol under analysis, and are the ones appearing on Table II.

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[1] The sub-categories used to describe this category are adopted from Darses et al. (2001) and adapted to this protocol's needs.

[2] These three examples are all indicators of consensus expressed in a different type of discourse relation. These cases were selected as examples, because the answer format allows the identification of the relation without necessary referring to the previous moves.

[3] I owe this consideration to Janet McDonnell.

Category	Sub-categories
Speaker (Sp)[1]	Course leader (L), Course manager (M), Course Author 1 (A1), Course Author 2 (A2), Course Author 3 (A3), Collaborator 1 (C1), Collaborator 2 (C2), External 1(E1)…
Enunciator-other voice (E)	the above plus: Course team (CT), Other team (OT), Other person (OP), Students (stu), Tutors (tut)…
Epistemic shift (Es)	Technology (T), Pedagogy (P), Design (D), Management (M), plus an "i" in front when the shift is invited, asked for

Table II. Categories considering the "agent".

Finally, a consideration regarding the amount of new information carried through each contribution is made. This new information is named after as *design referent*; it forms part of the task dimension and it refers to those elements of the contributions through which the design relation is implied. In most cases, this is made explicit through specific words, which are then marked in bold in the protocol. An effort to decide the informative strength of all contributions is currently being carried, with the further aim to indicate by a number how elaborated a contribution is in terms of quantity of new information supplied, always in relation to the rest of contributions. A short excerpt of the coding protocol is shown in Table III.

Speech		Agent			Task			Discourse		
ID	**Transcription**	**Sp**	**E**	**Es**	**Dr**	**DR**	**C**	**Mv**	**Rt**	**rID**
38	So **that**'s a bit like what I've set up	E1			1	at	o	S38		
39	Yeah () would you prefer it if we were **writing** into this?	M		iT	1	a	o	Q39	I	**S38**
40	Ideally but you're **Mac based** and stuff like that	E1			1	c	p	S40	I	**Q39**
41	Yeah that's the thing with **structured content**, it's more **fiddly**	L			2	c	p	S41	I	**S40**
42	it's a bit more like kind of **laying out a webpage** with **code**				2	m	p	S42	A	S41
43	So this is not **Mac friendly**?	M			1	at	o	Q43	A	**S42**
44	No	L, E1					o		C	**Q43**

Table III. An excerpt of the coding protocol. In bold the design referent keywords and the inter-speaker relations.

6 Discussion

In this paper, an effort to define co-construction in the specific context of the team design of eLearning material has been presented. The components of co-construction discussed, namely *informativity, co-elaboration,* and *argumentativeness,* have been hitherto treated as quantitative measures based on task and discourse components. This need was due to the fact of treating a quite extended protocol, thus qualitative processes of common-grounding, goal sharing, and weighing of arguments could not form objects of analysis for the whole protocol.

As far as the identification of the most co-constructive episodes is concerned, a "filtering" process based on the proportional number of design-related contributions, dialogue moves, and interjunction relations is currently being followed[1]. The next step consists in thoroughly treating the episodes emerging as "most" co-constructive. This can be done through relating the components of co-construction proposed with other functions of team collaboration, such as the roles of the participants at a communication and epistemic level, the inclusion of "other voices" in discourse, and the quality of argumentation expressed at both an individual and a team (inter-speaker) level.

After that, the third research question regarding the identification of patterns of collaboration can be addressed.

7 Acknowledgements

8 References

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[1] No results can be reported yet due to reliability and statistical controls still under process.

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