



## Processes of Knowledge Appropriation in an Online Collaboration Device

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### ABSTRACT

The purpose of this research is to identify variables that may have an impact on learners' knowledge appropriation in a context of academic training based on online collaborative learning according to determinants of appropriation ( appropriation of the task and appropriation of the group) and indicators of appropriation (appropriation performance, appropriation process and appropriation perception). We will focus here on analyzing the variable that concerns the process of appropriation. This one is measured through the contribution of the learners to the forum during collaborative activities. We analyzed content from messages by processing two types of data:

- lexical units which make it possible to specify the topics of the messages delivered by the learners;
- The meaning units that allow analyzing the nature of activity of the learners in the team forum.

**KEYWORDS:** appropriation, task, collaborative activity, lexical units, meaning units.

### INTRODUCTION

When we aim to give coherence to a learning situation by interacting with different objects and actors (learner, teacher, resource, activities, instruments, tools), we are in the educational scenario. Pedagogical scripting is therefore the process of developing an educational scenario that can be used in a learning context.

In this sense, any didactic device lends itself perfectly to a representation by a technical device, but the educational device is always to invent and reinvent. This is where the whole value of an innovation lies, and it is against that value that the process of appropriation is measured.

The appropriation of a technopedagogical device necessarily involves the design of a pedagogical scenario. The scripting process and the decisions it involves necessarily influence the process of appropriation by the learner. The more precise the scripting will be, the better the supervision will be done in a coherent way and the better will be the appropriation. The technical device remains important, but the pedagogical system ensures coherence by dealing with the methods of intervention of each of the actors of the training. Giardina&Oubenaïssa (2003), following Paquette, Crevier&Aubin (1997), define the pedagogical scenario as the coherent structuring of two entities they call "learning scenario" and "framework scenario". We adopt this definition in the implementation of our experience. It allows, as part of a distance-learning device, to align the technical, didactic and pedagogical devices.

In this work, the scripting process is based on the concept of alignment that we take from J. Biggs (1999), which we developed and experimented with in another research (Ibrahimi& al. 2014) in which we propose two kinds of alignment, modeled as follows:

**Figure 1:** Modeling educational alignment

Alignment	Disciplinary knowledge	Learner // Teacher	Tools
Didactics	Didactic device		Device Techni
Pedagogic	Didactic device	Educational device	Technical device

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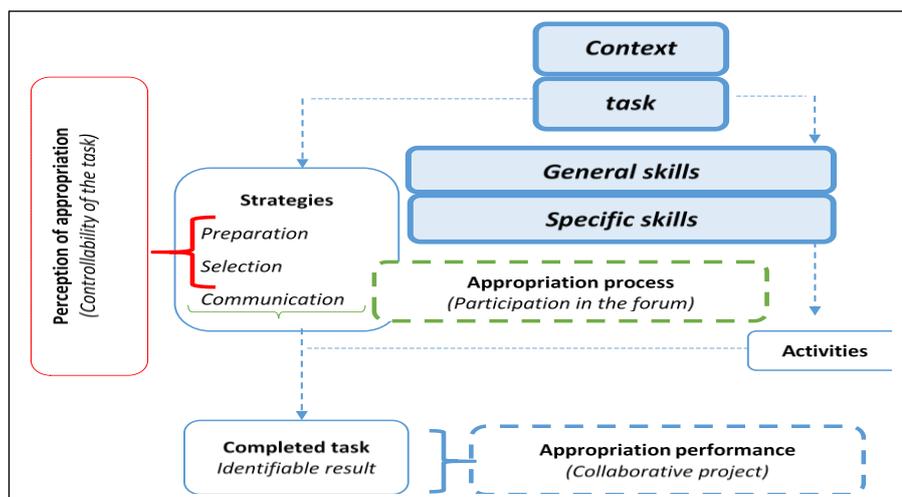
The didactic alignment consists in putting coherence between the disciplinary knowledge and the learner on the one hand (here it is the principle of didactic transposition that is implemented) and between this didactic transposition and the technical tools of other share. However, in this kind of alignment, we only reproduce a classic situation. We do the same thing differently. Classical situations are reproduced with electronic means.

The pedagogical alignment of artifacts can only be achieved through in-depth reflection. This reflection is none other than the educational scenario. This one traces beforehand the actions of each actor (tutor, teacher, learner) with respect to the different devices (technical, didactic and pedagogical). The result of this process is the pedagogical scenario that can be broken down into several components: the learning scenario, the coaching scenario, and the media scenario (Depover& al., 2003).

The pedagogical alignment results here from the choice of a disciplinary content which accommodates with a pedagogical scenario in adequacy with the functionalities of a digital environment of remote work.

The scripting and modeling processes also rely on Computer-Supported Collaborative Learning (CSCL) theories that state that a well-structured task better supports the cognitive process in the learner. These theories will support the hypotheses and research questions proposed as part of this work that we are modeling as well.

**Figure 2:** Modeling educational scenario based on the concept of alignment



According to Dillenbourg (2002), interactions between learners, when structured through preconceived scripts, better support collaborative learning. The notion of script then takes on its full value. It corresponds to instructions for students to guide them in how to interact and collaborate to perform work tasks. Fischer & al. (2013), distinctly define the internal collaboration script and the external collaboration script<sup>1</sup>.

This work seeks to identify the variables likely to have an impact on the appropriation of knowledge among learners while aiming to show that the processes of scripting and alignment of training devices remain likely to better insert e-learning in the Moroccan university context.

## I. DESCRIPTION OF THE RESEARCH

### A. Context of research

The context of the research is that of face-to-face real-life training, to which we have inserted a distance learning part from the Caroline Connect platform.

This training is spread over a semester during which learners are led to appropriate the theoretical framework that corresponds to a methodology between five phases and then use it in a collaborative project. The data to be analyzed as part of this research come from the three phases of project development: phase I, phase III and phase IV. The first phase consists in producing a specification in two moments. The third phase of the project is to produce a paper model of learning situations in two moments as well. We also take into consideration the finalization or not of the product that corresponds to phase IV. These different phases correspond to the most intense moments of the project, because they call for important decisions regarding the general conception of the work and thus call for a more intense collaboration.

Collaborative activities, corresponding to the various phases of the final project, are carried out by 12 teams of 4 learners, each of whom has a specific role. To better lead the experiment, we set up a crossed experimental plan: the discussion forum

<sup>1</sup> « An internal collaboration script is a configuration of knowledge components about a collaborative practice and its parts at different levels of complexity (the so-called internal collaboration script components) that guide the person's understanding of and actions in the collaboration. It is assumed that this configuration is built up dynamically from its constituents during a particular instance of collaboration [...] An external collaboration script is a configuration of representations (e. g. textual or graphical) of a collaborative practice and its parts at (potentially) different levels of complexity (the so-called external collaboration script components). » (Fischer & al., 2013, p. 4)

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(structured vs. unstructured) being associated with one of the two working modalities of the teams (modality 1: team "structured by the roles "Modality 2:" unstructured team ".)

### B. Sample

The subjects that make up our sample are university students in initial training at the ENS de Tetouan. Enrolled in the 1st year of the specialized master's degree (Multimedia Pedagogical Engineering), they attend face-to-face activities of appropriation of a methodology of multimedia pedagogical scripting and the application of this methodology as part of a design of a multimedia educational project.

The experiment is carried out with 48 learners spread over two academic years: promotion (2016-2017) and promotion (2017-2018).

The average age of the sample is between 20 and 24 years of which 74% is composed of girls. The characteristics of the learners from the various promotions are relatively similar if one considers the criteria of the pre-selection and the job interview that were applied to them for the recruitment to the training. We can therefore consider that, from the point of view of these criteria, the two promotions are not different and can constitute one and the same sample.

### C. Research questions

We define our research question around two main axes. The first concerns the distance training system as a whole, which we formulate as follows:

**Q.1** : To what extent does the technopedagogical device for online collaboration have an impact on learners' performance?

The second concerns the effect of educational scripting on the appropriation process that we formulate here as follows:

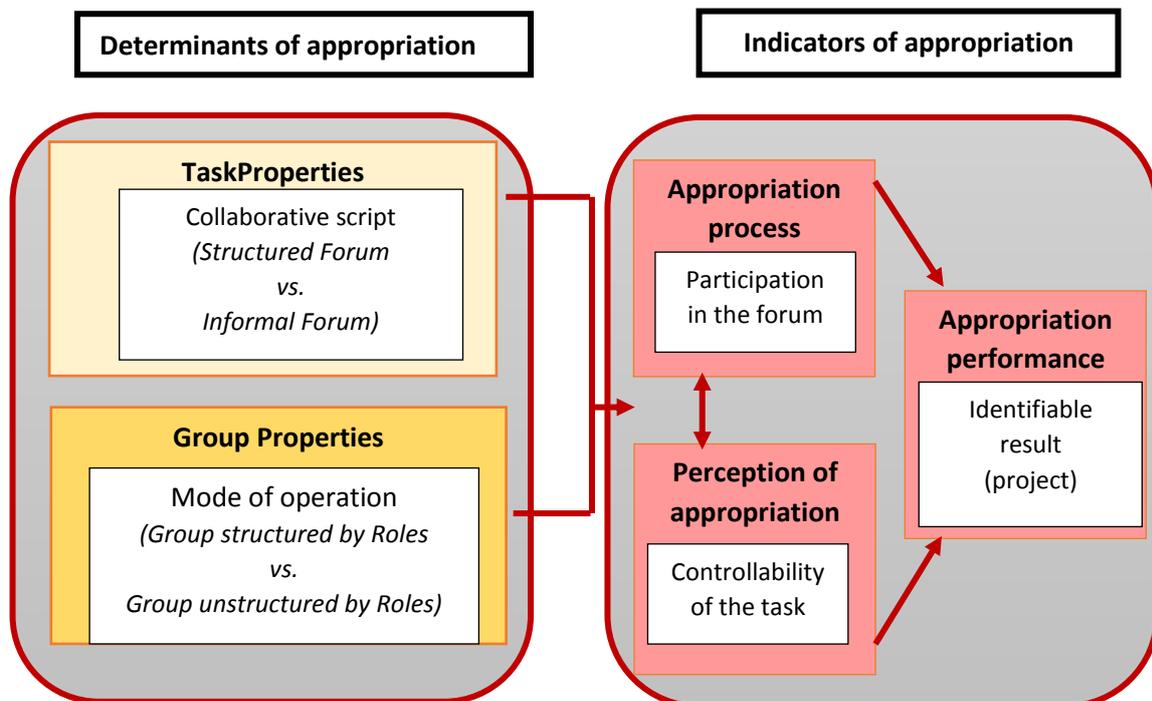
**Q.2** : to what extent does the principle of pedagogical alignment have an effect on the appropriation of a distance learning device?

### D. For a modeling of the research device

In this work, we have jointly implemented two external collaboration scripts. The first is to structure the forum in stages to foster collaborative knowledge acquisition (Gunawardena et al., 1997). The second is to structure the teams to form contrasting teams according to whether the roles are assigned or not. (Strijbos& De laat, 2010)

For the internal collaboration script, it is taken into account by observing the controllability system of the task (Viau, 1994) developed within the teams of learners.

Figure 3: Modeling of the research device



The model of the research device (Figure 3) that we put in place to verify our hypotheses is based on the one that

Decamps (2014), following Schellens, Van Keer, Valcke& De Wever (2007), proposed. It takes into consideration two aspects that become, as part of our experimental design, independent variables (left-hand side of Figure 1), namely the properties

of the group according to its mode of operation (group structured by the roles or unstructured by roles) and the properties of the task following the collaborative script. Let us take a closer look at these components.

The first component of this model deals with group properties. It is characterized by a dynamic of its own. This dynamic plays a decisive role in a technopedagogical device for online collaboration. The assignment of roles can give a great deal of autonomy to the members of the group by allowing a more balanced participation. This creates a positive interdependence of the group and a shared responsibility for the goal to be achieved by the group (Strijbos 2004). Roles help group members tackle the task from different perspectives. Kollar, Fischer & Hesse (2006) see this as an opportunity where each partner helps to make the group work well. The assignment of roles directly influences the collaborative process that influences the appropriation process. In this perspective, we plan to test team configurations by comparing teams where roles are assigned to teams where roles are not assigned.

The second component of the model touches the properties of the task. All research conducted in group dynamics agrees on the same fact: the effects observed depend largely on the characteristics of the task (Shaw, 1981, Pavitt, 1998). In this research we consider that the task corresponds in a mental operation to an object that generates a product (Dillenbourg 2002). Knowledge becomes, in this perspective, subordinated to a development of a new product.

The two components of our model are the determinants of the appropriation process. To analyze the effects attributable to these determinants, we proceed to a triangulation of three indicators that are the process of appropriation (measured through the learners' interactions in the discussion forum), the perception of appropriation (measured through the concept controllability of the task) and the appropriation performance (measured through the development of a collaborative project). These indicators (right part of Figure 1) are the dependent variables of our experimental plan.

### E. Experimental plan

The structuring by the roles and the structuring of the forum constitute the two facets of an analysis carried by a factorial experimental design (with two factors) which draws its justification in the fact that it makes it possible to treat two types of effects:

- The main effects of the structuring by the roles and the structuring of the forum
- The interaction between these main effects.

We use the notation of Rouanet&Lépine, quoted by Decamps, (2014) following Linder (2005) to symbolize this type of plan:

$$S_{16} < M_3 * F_2 >$$

<...> means "Nested", that is, there is one group per modality;

\* means "crossed", ie there is only one group for all modalities;

S means "subject", and 16 in index indicates the number of subjects per modality;

**M3** = M is the symbol of the independent variable n° 1 (Structuring by the roles), and 3 in index, indicates the number of modalities.

**F2** = F is the symbol of VI n° 2 (Structuring the forum), and 2 in index, indicates the number of modalities.

The crossing of the two dimensions M3 and F2 gives rise to six experimental groups consisting each of two teams of four learners. In total, 12 teams and 48 subjects.

### F. Independent variables

The experimental design allows us to structure the analysis around the effects attached to the following independent variables:

- • *The effect of structuring teams by roles (Axis 1)*
- • *The effect of structuring the forum by the collaborative script (Axis 2)*
- • *The interaction effect between the structuring modality of the teams and the structuring of the forum (Axis 3)*

The analysis of these effects will make it possible to show the process of appropriation of the e-learning device likely to answer our previously asked research questions.

The experimental design, adopted in this research, and the main effects related to independent variables (see above) guide the choice of research hypotheses. Dependent variables are the objects of these hypotheses: the appropriation process, the perception of appropriation and the appropriation performance.

### G. Dependent variables

We study in this research the main effects of two independent variables (the structuring of teams by roles and the structuring of the forum by the collaborative script) and the interaction effects of these on three dependent variables: the appropriation performance, the process of appropriation and the perception of appropriation.

Our research focuses on the phenomenon of appropriation invested in online collaborative activities. The analysis and interpretation of the resulting data is at a group level (Hoyle, Georgesen & Webster, 2001). Table I provides a synthetic view of the dependent variables and their analysis.

**Tableau I:** Summary view of the dependent variables and the modality of their analysis

Dependent variable	Type of measurement	Moment of measurement	Nature of measurement	Observation modality
Appropriation performance	Score	Phase I, III et IV	Team	Evaluation grid
Appropriation process	Units of meaning	Phase I	individual	Categorical analysis
	Lexical units	Phase I	individual	Lexical-metric analysis
Perception of appropriation	Feeling of the controllability of the task	At the end of phase II	individual	Questionnaire

We will focus here on analyzing the variable that concerns the process of appropriation.

## II. METHOD OF ANALYSIS

The appropriation process, which indicates how to appropriate the knowledge, is measured through the contribution of the learners to the forum during activity 1 (Elaboration of the specifications). The analysis covers 48 students with 1176 messages, which represents an average of 24,5 messages per learner.

We analyzed content from messages by processing two types of data:

- lexical units which make it possible to specify the topics of the messages delivered by the learners;
- The meaning units that allow analyzing the nature of activity of the learners in the team forum. Categorical analysis allows us to develop a profile of learner participation.

### A. Lexical units

The Tropes software (V8.4)<sup>2</sup> allowed us to automate lexical analysis and automatically draw the semantic contours of the analyzed content. This approach has allowed us to build a lexical basis. On this basis, the software allowed us to draw up a "semantic scenario". "Scenarios are designed to enrich and filter equivalence classes based on an analysis strategy. These are specific ontologies, which allow to:

- define your own classifications;
- modify or restructure the dictionaries of the software;
- replace a thesaurus and customize your information search functions;
- define an analysis grid to automatically generate a report»<sup>3</sup>.

The lexical base includes 115 units that we distributed over four semantic categories. These constitute the semantic scenario, which is formed of groups containing semantic classifications. The Tropes software allows taking a lexical unit (word, reference, verb or adjective) to create a group. The development of the semantic scenario allowed us to apply it to the content of the team forums, with the objective of raising the frequencies of occurrences of the different semantic categories for each member of the team.

**Tableau II:** Semantic scenario

Semantic category	Description	Lexical unit	Example
Cognitive	This category touches on the concepts and concepts seen in the course.	64 units	In French <sup>4</sup> : Etude préalable, analyse et structuration du contenu, élaboration des situations d'apprentissage, Cahier des charges, idée mobilisatrice, modularisation du contenu, Module, système d'entrée, système d'apprentissage, système de sortie, objectifs, prétest, posttest, test d'entrée, orientation, remédiation, prérequis, structuration, aides, Scénario.
Managerial	This category deals with the management of collaborative work (action, time or place)	24 units	In French <sup>5</sup> : rdv, réuni*, organis*, commenc*, fini*, termin*, avance*, forum, plateforme, chat, facebook, temps ( après-midi, aujourd'hui, date, h, heure, jour, semaine, soir, lundi, jeudi, samedi, dimanche...)

<sup>2</sup> [www.tropes.fr](http://www.tropes.fr) is a software available on the website and developed by Pierre Molette & Agnès Landré, based on the work of Ghiglione, Landré, Bromberg & Molette (1998).

<sup>3</sup> User manual for Tropes V8.4, p.34, <http://www.tropes.fr>.

<sup>4</sup> In English : Prior study, analysis and structuring of content, development of learning situations, specifications, mobilizing idea, modularization of content, module, entry system, learning system, exit system, educational objectives, pretest, posttest, entrance test, orientation, remediation, prerequisites, structuring, aids, Scenario.

<sup>5</sup> In English : appointment, meeting \*, organization \*, started \*, finished \*, ending \*, advance \*, forum, platform, chat, facebook, time (afternoon, today, date, h, hour, day, week, evening, monday, thursday, saturday, sunday ...)

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Social	It touches the social and emotional side between learners.	18 units	In Arabic: Salam, inchallah, zin, In French <sup>6</sup> : ok, bravo, courage, merci, super, difficile With et les emoticons (...).
Instrumental 1	It refers to the technical instruments that support the activity.	09 units	In French <sup>7</sup> : Forum, chat, platform, internet, word, fichier, logiciel

### B. The units of meaning

If the message was considered to be a set of lexical units, here it is taken as a unit of meaning. The categorical analysis allowed us to analyze the messages posted in the team forum according to two categories that affect the act of language conveyed by each message: the **actantial nature** of the message and the **actantial role** of the message

The actantial nature of the message is observed in three dimensions: (initiative, reactive and appreciative), whereas the actantial role of the message is observed according to four dimensions (cognitive, managerial, social and instrumental). Each message, as a unit of meaning, therefore as an act of language, has an actantial nature and an actantial role, which gives rise to multiple combinations. The table below presents these different combinations according to a specific symbolic system.

**Tableau III:** System of Categorical Analysis of the Unity of Meaning (Message)

UNITY OF MEANING (message)		ACTANTIAL NATURE		
		Initiative	Reactive	Appreciative
ACTANTIAL ROLE	Cognitive	In_C	Re_C	Ap_C
	Managerial	In_M	Re_M	
	Social	In_S	Re_S	
	Instrumental	In_I	Re_I	
<b>Actantial verb</b>		<i>Proposer (To propose)</i> <i>Demander (request)</i> <i>Affirmer (to affirm)</i>	<i>Répondre(Reply)</i> <i>Questionner (to question)</i>	<i>Accepter (accept)</i> <i>Refuser (refuse)</i>

### III. ANALYSIS AND DISCUSSION OF RESULTS

In this part of the research, we answer the hypotheses relating to the effects of structuring teams by roles and the structuring of the forum by collaborative scripts, on the appropriation process analyzed through the participation of students in the team forum.

The general hypothesis is formulated as follows:

**H 3-** *The pedagogical alignment that is based on the scripting of collaborative work within groups of learners structured by roles and through a structured forum positively influences the level of learners' involvement in the process of knowledge appropriation.*

This hypothesis (H3) is put to the test from the team forum. Indeed, the appropriation process, which indicates how knowledge is appropriate, is measured through the contribution of learners to the forum during the -I- phase of the collaborative project (elaboration of the specifications). The analysis covers 48 students with a total of 1176 messages, which represents an average of 24.5 messages per learner.

We analyzed content from messages by processing two types of data:

- Sense units that allow analyzing the nature of activity of learners in the team forum. The categorical analysis allows us to draw up a profile of learners' participation, according to the actantial nature of the message (initiative, reactive, appreciative) and the actantial role of the message (managerial, cognitive, social, instrumental).
- The lexical units, treated through a lexicometric analysis, which makes it possible to specify the topics of the messages delivered by the learners.

<sup>6</sup> In English : ok, bravo, courage, thankyou, super, difficult

<sup>7</sup> In English : Forum, chat, platform, internet, word, file, software

**Tableau IV:** The actantial nature of the message and the actantial role of the message in relation to the structuring modality of the teams and the structuring modality of the team forum

Groups	N°	Type of forum	Teams	Actantial nature of the message			Actantial role of the message			
				%	%	%	%	%	%	%
G1 "unstructured by roles"		Structured	team.1	36,62	37,55	25,83	24,18	63,13	8,40	4,29
			team.2	37,52	38,45	24,03	23,78	62,15	9,00	5,07
	02	Total teams.1, 2		37,07	38,00	24,93	23,98	62,64	8,70	4,68
		unstructured	team.3	53,22	35,12	11,66	32,13	57,13	5,00	5,74
			team.4	54,32	34,11	11,57	30,34	55,19	7,20	7,27
	02	Total teams.3, 4		53,77	34,61	11,61	31,23	56,16	6,10	6,50
04	Total G1		45,42	36,30	18,27	27,60	59,40	7,40	5,59	
G2 "unstructured by roles"		Structured	team.5	41,24	29,67	29,09	26,07	61,02	7,10	5,81
			team.6	43,44	27,87	28,69	24,67	60,67	7,40	7,26
	02	Total teams.5, 6		42,34	28,77	28,89	25,37	60,84	7,25	6,53
		unstructured	team.7	45,25	32,36	22,39	34,14	57,34	5,42	3,10
			team.8	47,05	31,25	21,70	35,18	56,23	5,39	3,20
	02	Total teams.7, 8		46,15	31,80	22,04	34,66	56,78	5,40	3,15
04	Total G2		44,24	30,28	25,46	30,01	58,81	6,32	4,84	
G3 "structured by roles"		Structured	team.9	41,73	30,70	27,57	15,28	70,95	10,00	3,77
			team.10	40,82	31,62	27,56	17,00	69,76	9,10	4,14
	02	Total teams.9, 10		41,27	31,16	27,56	16,14	70,35	9,55	3,95
		unstructured	team.11	47,62	32,50	19,88	19,22	61,28	12,15	7,35
			team.12	48,45	33,25	18,30	18,87	62,12	11,50	7,51
	02	Total teams.11,12		48,03	32,87	19,09	19,04	61,70	11,82	7,43
04	Total G3		44,65	32,01	23,32	17,59	66,02	10,68	5,69	
G1,2,3	12	Total G1,2,3		44,77	32,86	22,35	25,06	61,41	8,13	5,37

The table above provides an overview of the categorical analysis carried out, according to the categories (initiative, reactive and appreciative) which are part of the actantial nature of the message and according to the categories (managerial, cognitive, social and instrumental). ) that are part of the actantial role of the message. The data provides a clear picture of the ownership process, given the percentage of messages for each category. This percentage depends on two structuring modalities of the forum (structured vs. unstructured) and two modalities for structuring teams (unstructured teams by G1 / G2 roles vs teams structured by G3 roles).

Overall, the descriptive data shows a tendency towards messages whose actantial nature belongs to the initiative category and whose actantial role belongs to the cognitive category. Does this trend differ according to the structuring modality of the teams and or the type of forum?

**A. The effect of structuring teams by roles**

The hypothesis that we pose here, tries to verify if the structuring of the teams by the roles exerts an effect on the process of appropriation. She puts it this way:

**H3.1** - "Role-structured" (G3) teams are more involved in the knowledge appropriation process than "unstructured" teams (G1 and G2).

To test this hypothesis (**H3.1**), we compare the process of knowledge appropriation to phase (**I**) of the collaborative project (elaboration of specifications), with an estimate of the actantial nature of the message and its actantial role, to check if the groups are differentiated according to the mode of structuring of the teams. The comparison is based on the percentage obtained in relation to predefined categories and in relation to the lexical units found in the cognitive category of messages posted in the team forum.

**1. The units of meaning**

**Tableau V:** Comparison of units of meaning for all groups.

	Unity of meaning	Actantial nature of the message			Actantial role of the message			
		<i>initiative</i>	<i>reactive</i>	<i>appreciative</i>	<i>managerial</i>	<i>Ognitive</i>	<i>social</i>	<i>instrumental</i>
<b>Groups 1,2,3</b>		%	%	%	%	%		%
<b>Total</b>		44,77	32,86	22,35	25,06	61,41	8,13	5,37

The table shows that the actantial nature of the message tends to groups towards a high percentage of the initiative category (41.87%), whereas the actantial role of the message tends to favor the cognitive category (61,41). This suggests that, in a global sense, groups are actively engaged in the process of knowledge appropriation. Indeed, taking the initiative is a fairly clear mark of commitment and motivation. Moreover, the concentration of messages on the cognitive component attests to a high sense of regulation linked to a goal of appropriation of knowledge.

The comparative analysis of the different groups, makes it possible to establish if the structuring of the groups by the roles influences or not the percentage and the distribution of the messages within each of the actantial categories of the messages.

**a. The actantial nature of the message**

**Tableau VI:** Distribution of semantic categories specific to the actantial nature of the message according to the structuring modality of the groups.

Groups	Unity of meaning	Actantial nature of the message						Total number of messages
		<i>initiative</i>		<i>reactive</i>		<i>Appreciative</i>		
		n	%	n	%	n	%	
<b>G1 "unstructured by roles"</b>		164	45,42	131	36,30	67	18,27	362
<b>G2 "unstructured by roles"</b>		130	44,24	89	30,28	75	25,46	294
<b>G3 "structured by roles"</b>		232	44,65	166	32,01	122	23,32	520

In terms of the overall number of messages, the group (G3) outweighs the other groups with 520 messages posted on the forum.

The message as an act of language has an actantial nature. Three categories are observed in this table (initiative, reactive and appreciative). The structuring of groups by roles influences the ownership process significantly. While the category (initiative) remains a mark of commitment for all groups, marking a high percentage compared to the other categories (reactive and appreciative), it also draws a difference between the groups. Indeed, the type of messages seem to be higher in the G3 group (structured by roles), given the overall number of messages posted on the forum. Initiative type messages, is an indication of a strong motivation for the appropriation of knowledge. The person who is able to take the initiative, shows a high degree of motivation to start an activity and thus to better appropriate the knowledge. This observation should be compared with the table below, corresponding to the actantial role of the message

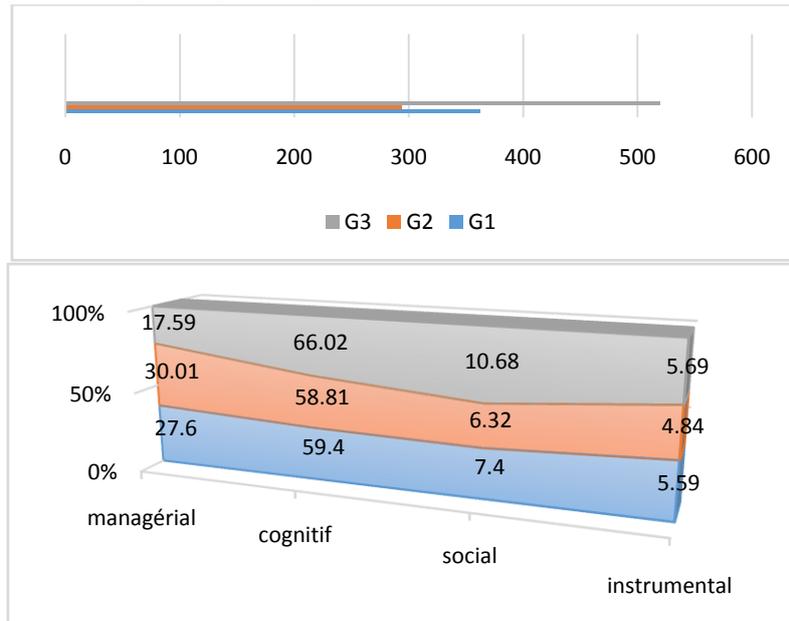
**b. The actantial role of the message**

**Tableau VII:** Distribution of semantic categories specific to the actantial role of the message according to the structuring modality of the groups

Groups	Unity of meaning	Actantial role of the message								Total number of messages
		<i>managerial</i>		<i>Cognitive</i>		<i>Social</i>		<i>Instrumental</i>		
		n	%	n	%	n	%	n	%	
<b>G1 "unstructured by roles"</b>		100	27,60	215	59,40	27	7,40	20	5,59	362
<b>G2 "unstructured by roles"</b>		88	30,01	173	58,81	19	6,32	14	4,84	294
<b>G3 "structured by roles"</b>		91	17,59	343	66,02	56	10,68	30	5,69	520

The table VII shows a cognitive engagement of all groups. In fact, the cognitive category has a high percentage compared to the other categories, especially for the group (G3) structured by the roles. This attests to a degree of mental effort that the group deploys when carrying out the activity. This effort is evident in the participation of students in the team forum. The participation rate remains clearly in favor of the group structured by the roles.

Figure 4: Number of messages and categorical percentage



This explains why because of the cognitive effort deployed by the group (G3) (66.02% of the messages are centered on the cognitive category), the degree of appropriation performance is higher within this group. Group structuring by role also allows group members to not focus much on other categories. The managerial category, which affects the organizational aspect of the group, for example, reveals a very low percentage compared to those marked by the other groups. 17.59% of the messages submitted by the group (G3), affect the managerial category. The group (G3) also seems better able to think about the instruments to be used and more inclined to maintain the social bond. These aspects have allowed the group to fit into a more coherent and therefore more effective knowledge-sharing process.

In order to draw a clearer picture of the process of knowledge appropriation, we proceed to the analysis of the messages posted in the team forum following a lexicometric approach, centered on the cognitive category.

**2. Lexical units**

Here we consider the "cognitive" category independently of the other categories listed in the lexicometric analysis, since it allows a better appreciation of the process of knowledge appropriation. We have divided this category into two sub-categories. The first touches the elements of the course that we call here "course". The second touches on the specific aspects of the co-appropriation of knowledge that we here call "co-appropriation". The latter concerns all the aspects specific to semantic transactions (negotiation of meaning, co-construction of meaning, appreciations ...).

The following table provides an overview of the lexical units "Courses" and "Co-appropriation", through the average of the occurrences per learner according to the structuring or not of the group.

Tableau VIII: Average occurrences per learner according to membership in the structured or unstructured group.

Lexical units		Category "Cognitive"	
		Course	Co-appropriation
G1 "unstructured by roles"	$\mu$	13,67	26,34
G2 "unstructured by roles"	$\mu$	12,54	25,08
G3 "structured by roles"	$\mu$	18,12	32,24

The reference average to the "course" per learner differs considerably according to the structuring mode of the group. The learners from the group (G3) structured by the roles significantly exceed the other two groups (G1) and (G2) unstructured by the roles, with 18,12 references to the course and 32,24 references to co-appropriation. This can be attributed to the structuring mode of the group (structured by roles vs unstructured by roles). In the next section, we consider whether structuring the forum also favors the process appropriation.

**B. The effect of structuring the forum**

The hypothesis relating to the effect of the structuring of the team forum on the appropriation processes is expressed as follows:

*H3.2 - Teams that interact in a structured forum are more involved in the process of appropriation of knowledge than teams interacting in an "unstructured" forum.*

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The hypothesis (H3.2) is examined through the comparison of the process of knowledge appropriation in phase (I) of the collaborative project (elaboration of specifications), with an estimation of the actantial nature of the message and its actantial role, to check if the teams differ in the modality of structuring their team forum. The comparison is based on the percentage obtained with respect to the units of meaning and the lexical units.

### 1. The units of meaning

#### a. The actantial nature of the message

The table below presents the results of the analysis carried out on the categories inherent in the actantial nature of the message (initiative, reactive and appreciative). The comparison criteria are based on the number of messages posted in the team forum and on the percentage reserved for each semantic category, depending on whether or not the team forum is structured.

**Tableau IX :** Actantial nature of the message and structuring of the forum

Experimental groups	Actantial nature of the message						Total number of messages
	<i>initiative</i>		<i>reactive</i>		<i>appreciative</i>		
	n	%	n	%	n	%	
<b>structured forum</b>	<b>315</b>	<b>40,22</b>	<b>256</b>	<b>32,64</b>	<b>212</b>	<b>27,12</b>	<b>783</b>
<b>unstructured forum</b>	<b>194</b>	<b>49,31</b>	<b>130</b>	<b>33,09</b>	<b>69</b>	<b>17,58</b>	<b>393</b>

The analysis of the table above shows an effect related to the structuring of the team forum on the process of appropriation to the different semantic categories specific to the actantial nature of the message. This effect is also apparent in relation to the higher number of messages posted in the structured forum (744 messages), distributed in percentages quite close to those marked by the teams that interact in an unstructured forum, even if the number of messages is less important (432), or 312 fewer messages.

#### b. The actantial role of the message

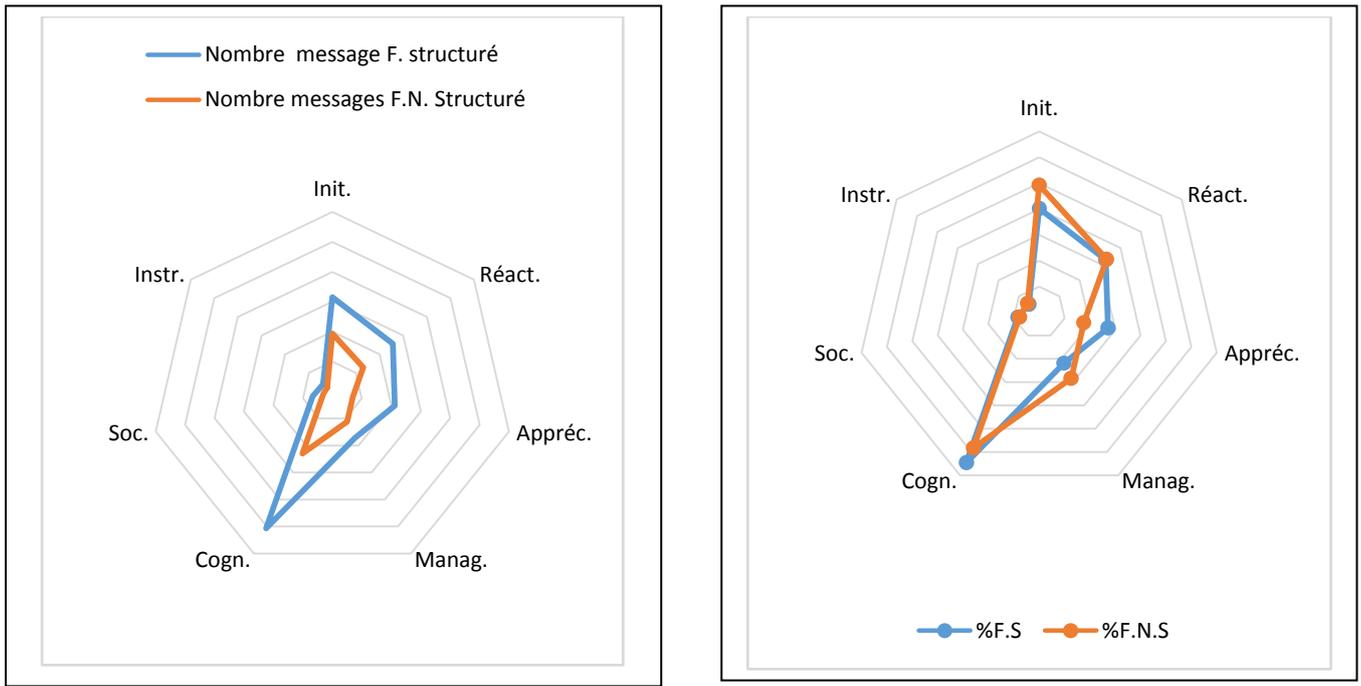
**Tableau X:** Actantial role of the message and structuring of the forum

Type of forum	Actantial role of the message								Total number of messages
	<i>managerial</i>		<i>cognitive</i>		<i>social</i>		<i>instrumental</i>		
	n	%	n	%	n	%	n	%	
<b>structured</b>	<b>171</b>	<b>21,83</b>	<b>506</b>	<b>64,61</b>	<b>67</b>	<b>8,50</b>	<b>39</b>	<b>5,05</b>	<b>783</b>
<b>unstructured</b>	<b>111</b>	<b>28,31</b>	<b>229</b>	<b>58,21</b>	<b>31</b>	<b>7,77</b>	<b>22</b>	<b>5,69</b>	<b>393</b>

The table X, above, presents the results of the analysis carried out on the categories inherent to the actantial role of the message (managerial, cognitive, social and instrumental). The comparison criteria are based on the number of messages posted in the team forum and on the percentage reserved for each semantic category, depending on whether or not the team forum is structured. The effect of structuring the forum is evident in the cognitive category. The number of messages (506 vs 229) and the percentage reserved for this category (64,61 vs 58,21) allows to appreciate a concentration on the cognitive category on the part of the teams having benefited from a structured forum. The appropriation process that can not do without the cognitive category thus seems to be better supported.

The following figure clearly shows how the structured forum influences the trajectory of the process of appropriation in experimental groups in relation to the semantic categories of type (initiative, reactive, appreciative, managerial, cognitive, social and instrumental).

Figure 5: Trajectory of the appropriation process based on the number and percentage of messages related to semantic categories.



The absence of a pre-established structure of the forum seems to require the teams to take a greater initiative in the management of teamwork. This has an immediate effect on the cognitive category. In fact, learners focus more on the cognitive category of the discussion when their forum has a pre-established structure. For this reason, we deal in the following point; lexical units related to the category "cognitive" that would allow us to better outline the process of appropriation for each experimental group.

2. Lexical units

It is important to remember here that we consider the "cognitive" category independently of the other categories listed in the lexicometric analysis. This category consists of two elements. The first is the set of lexical units that refer to the "course". The second is the set of lexical units that refer to "co-appropriation" (negotiation of meaning, co-construction of meaning, appreciations ...).

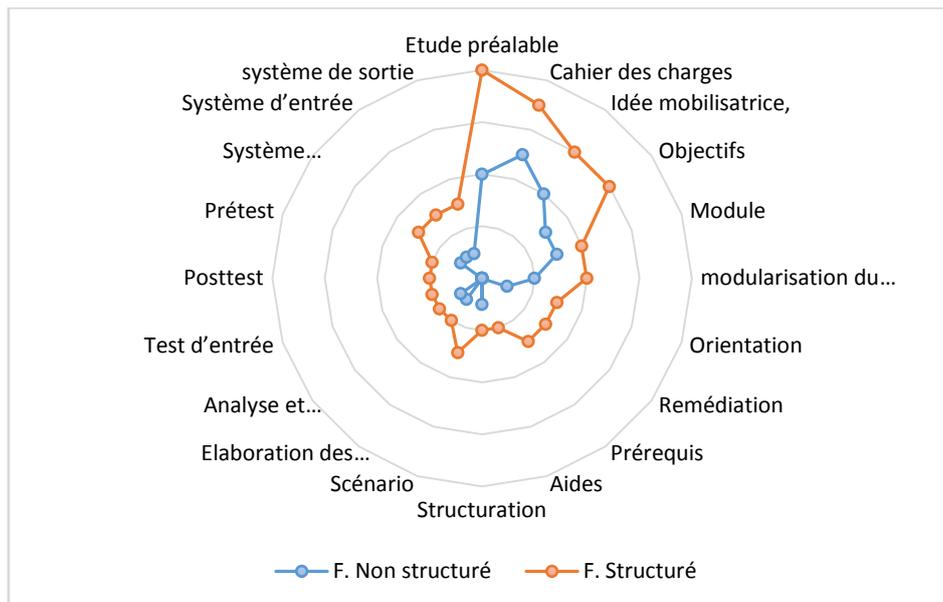
The following table provides an overview of the lexical units "Course" and "Co-appropriation", through the average of occurrences per learner according to the structuring or not of the team forum.

Tableau XI: Average occurrences per learner by type of forum (Structured vs. Unstructured)

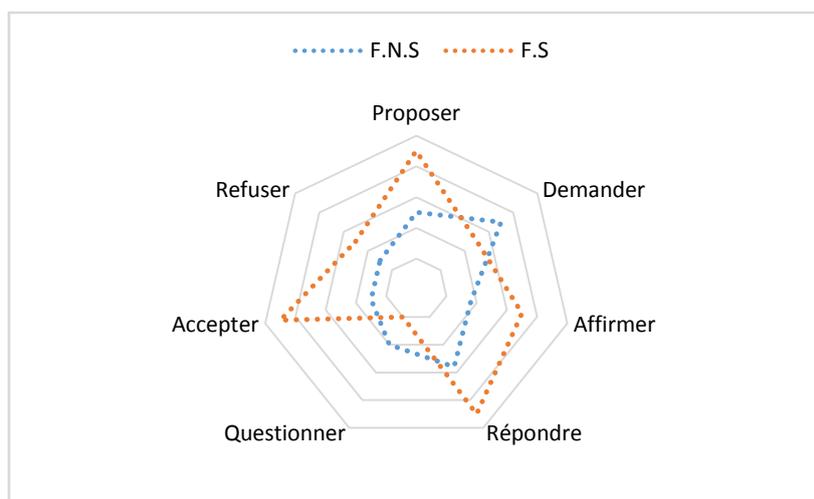
Category "Cognitive"	Lexical units			
	course		Co-appropriation	
	structured forum	unstructured forum	structured forum	unstructured forum
$\mu$	8,46	6,31	16,32	11,56

The average reference to the "course" per learner differs considerably according to the way in which the forum is structured. Learners who interact in a structured forum mark a higher average course and co-appropriation average than those who interact in an unstructured forum. Les figures suivantes dessinent clairement cet état par rapport au « Cours » et par rapport à la « Co-appropriation ».

**Figure 6:** Appropriation process measured through the reference to the "Course8" according to the type of forum (structured vs. unstructured)



**Figure 7:** Co-appropriation process measured through actantial verbs<sup>9</sup> according to the type of forum (Structured vs. Unstructured)



The first figure above (figure 6), allows a comparison on two levels. The first point out that the reference to the course is doubly more important for learners who interact in a structured forum. The second point attests that learners who interact in an unstructured forum do not make any reference in their forum to several concepts from the course (remediation, prerequisites, help, scenario ...).The second figure (figure 7), for its part, clearly shows that the process of co-appropriation (negotiation of meaning, co-construction of meaning, appreciations ...) measured through actantial verbs retained in the semantic scenario is more important for teams who interact in a structured forum.

**C. Effect of interaction between the structuring of the teams by the roles and the structuring of the forum by the collaborative script**

To date, we have independently examined the effect of team structuring through roles and the structuring of the forum on the knowledge appropriation process. Here we examine the interaction effect of these two factors.

The hypothesis relating to the effect of interaction between the structuring of the teams by the roles and the structuring of the team forum on the appropriation processes is expressed as follows:

**H3.3** - Roles-structured teams interacting in a structured forum (G3) are more involved in the appropriation process of knowledge than "unstructured" teams (G1 and G2) interacting in a "non-structured" forum. structured".

<sup>8</sup> (Preliminary study ; Specifications ; Mobilizing idea ; educational goals ; Module ; Modularization of the content ; Orientation ; Remediation ; Prerequisites ; Aids ; Structuring ; Scenario ; Elaboration of learning situations ; Content analysis and structuring ; Entrance test ; Posttest ; Pretest ; Learning system ; Entry system ; Output system)

<sup>9</sup> (To propose ; Request ; To affirm ; Reply ; To question ; Accept ; Refuse)

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To test this hypothesis (H3.3), we proceed to an analysis of the content of the forums according to the units of meaning (actantial nature of the message and actantial role of the message) and according to the lexical units (Course and Co-appropriation).

### 1. The units of meaning

#### a. The actantial nature of the message

To verify this hypothesis, we take into account the three experimental groups according to a comparison of the number of messages deposited in the team forum and the percentages relating to the semantic categories, according to the two structuring modalities of the forum and for each experimental group (G1 , G2, G3). The table below shows the results of this step:

**Tableau XII:** Actantial nature of the message (number and proportion) and interaction of the effects of the structuring of the teams and the structuring of the forum.

Actantial nature of the message	G1 "unstructured by roles"						G2 "unstructured by roles"						G3 "structured by roles"					
	<i>Initiative.</i>		<i>Reactive</i>		<i>Appreciative</i>		<i>Initiative.</i>		<i>Reactive.</i>		<i>Appreciative.</i>		<i>Initiative.</i>		<i>Reactive.</i>		<i>Appreciative.</i>	
Number and proportion	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%
Structured Forum	89	37,07	91	38,00	60	24,93	80	42,34	55	28,77	55	28,89	14	41,27	110	31,16	97	27,56
Unstructured Forum	66	53,77	42	34,61	14	11,61	48	46,15	33	31,80	23	22,04	80	48,03	55	32,87	32	19,09

Learners from the "role-structured" G3 group who benefit from a pre-structured forum post a larger number of messages whose actantial nature touches the types of "Initiative" "reactive" and "appreciative". These learners are thus much more involved in the ownership process through more active participation in the team forum, which results in a higher number of messages with a balanced proportion between the semantic categories that make up the actantial nature of the messages.

#### b. The actantial role of the message

**Tableau XIII:** Actantial role of the message (number and proportion) and interaction of the effects of the structuring of the teams and the structuring of the forum

Actantial role of the message	Structured Forum								Unstructured Forum							
	<i>Managerial.</i>		<i>Cognitive</i>		<i>Social</i>		<i>Instrumental</i>		<i>Managerial.</i>		<i>Cognitive</i>		<i>Social</i>		<i>Instrumental</i>	
Number and proportion	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%
G1 "unstructured by roles"	58	23,98	150	62,64	21	8,70	11	4,68	38	31,23	69	56,16	7	6,10	8	6,50
G2 "unstructured by roles"	48	25,37	116	60,84	14	7,25	12	6,53	36	34,66	59	56,78	6	5,40	3	3,15
G3 "structured by roles"	57	16,14	248	70,35	34	9,55	14	3,95	32	19,04	103	61,70	20	11,82	12	7,43

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Learners from the "role-structured" G3 group who benefit from a pre-structured forum deposit a larger number of messages whose actantial role touches the "managerial", "cognitive", "social" and "instrumental" types. These learners are thus much more involved in the ownership process through more active participation in the team forum, resulting in a higher number of messages (248 messages) and a very high proportion for the cognitive category (70.35%).

### 2. Lexical units

The table below gives an overview of the lexical units "Courses" and "Co-appropriation", through the average of the occurrences per learner according to the effect of the structuring of the teams by the roles and that of the structuring of the forum by the collaborative script.

**Tableau XIV:** Lexical units ("course" and "Co-appropriation"): Average occurrences per learner according to the type of group (structured by the roles vs unstructured by the roles) and according to the type of forum (structured vs unstructured).

Lexical units		Cognitive Category			
		course		Co-appropriation	
		Structured Forum	Unstructured Forum	Structured Forum	Unstructured Forum
G1 "unstructured by roles"	$\mu$	10,96	9,99	21,33	18,95
G2 "unstructured by roles"	$\mu$	10,50	9,42	20,70	18,32
G3 "structured by roles"	$\mu$	<u>13,29</u>	12,21	<u>24,28</u>	21,90

The "Course" data (left side of the Table XIV) shows that it is the learners in the "role-structured" G3 group that evokes more references to the course when their forum is structured. These learners make, on average, 13.29 references to the "Course" in a structured forum. On the other hand, it is the learners, who do not benefit from the structuring of the group by the roles, nor from the structuring of the team forum by the collaborative script, which evoke the least reference to the "Course" (9, 42 for G2 and 9,99 for G1).

The same observations can be evoked for "Co-appropriation" (negotiation of meaning, co-construction of meaning, appreciations ...). The "Co-appropriation" data (right-hand side of the table) displays an average of 24.28 references in favor of learners who benefit from the structuring of their team by the roles and their forum by the collaboration script.

### CONCLUSION

The analysis of the appropriation process based on the learners' interactions within their team forum, allowed us to show that:

- The comparative analysis of the different groups makes it possible to establish that the structuring of the groups by the roles positively influences the number and the proportion of the messages with respect to each semantic category (actantial nature of the message and actantial role of the message). Actantial categories (initiative, reactive, appreciative, managerial, cognitive, social and instrumental) served as a guide for the analysis of the units of meaning. Similarly, the analysis of the lexical units "Course" and "Co-appropriation" displays a reference average per learner, which differs considerably according to the structuring mode of the group and in favor of the group structured by the roles.
- Analysis also reveals an effect related to the structuring of the team forum on the process of appropriation to different semantic categories (actantial nature of the message and actantial role of the message). This effect is also evident in relation to the higher number of messages posted in the structured forum.

Learners from the "role-structured" group who benefit from a pre-structured forum are much more involved in the ownership process through more active participation in the team forum, which results in more high of messages with a relative balanced proportion between semantic categories. The lexical analysis also shows that it is the learners of the group "structured by the roles" who evoke a greater number of references to the concepts derived from the course and to "Co-appropriation" (negotiation of meaning, co-construction of meaning, appreciations ...), when their forum is structured. Therefore, the interaction of these two factors (structuring of the forum and structuring of the teams by the roles) presents the most favorable conditions for the appropriation process.

However, the results obtained and analyzed in this part of the research remain incomplete since they would have to be compared to the other results realizing the other variables constituting our general experimental plan.

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