

# YOUFLOW MICROBLOG: ENCOURAGING DISCUSSIONS FOR LEARNING

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## ABSTRACT

Microblogs have been used in the educational context. However, differently from following friends' status messages, in the educational scenario it is important to follow the discussions, to understand the flow of messages. YouFlow microblog was developed for that purpose. It is a microblog that provides the main structures of discourse that are available on communication systems as well as messages' categorization according to a lesson plan. An exploratory case study allowed analyzing the use of the structures of discourse on the microblog in an educational context. Then, an explanatory case study showed an increase in the participation on discussions of topics according to a lesson plan.

## KEYWORDS

microblogs; discussions; collaborative learning; lesson plan; structure of discourse.

## 1. INTRODUCTION

As microblogs become more used, some differences are explored on specific domains, such as microblogs for a specific geographic area: i) Frazr (<http://www.frazr.com>), which is focused on European public that speaks German, Spanish or French, and ii) Sina (<http://www.sina.com.cn>), focused on the Chinese public; or a specific age group or sex (Sina - <http://www.sina.com.cn>), common objective, learning (Edmodo - <http://www.edmodo.com>, and Cirip - <http://www.cirip.ro>), collectivity and other characteristics.

Similarly, some online social network environments such as Facebook (<http://www.facebook.com>) and Myspace (<http://www.myspace.com>) provide microblog functionalities for the participants. An analysis of the 100 main learning systems in 2009 showed the importance of microblogs systems in the educational context as Twitter (<http://www.twitter.com>), Edmodo and Plurk (<http://www.plurk.com>) were listed (Holotescu and Grosseck, 2010). In 2011 (<http://c4lpt.co.uk/top-100-tools-for-learning-2011/>), Twitter is listed as the main system (among the top 100) to support learning.

Microblogs are systems with a high publishing frequency, which makes the conversation interesting for learning. Although they are considered asynchronous conversation tools, usually there is an expectation that the information is consumed in real time because there is a huge amount of users online.

However, this high amount of publications, in addition to the way the messages are organized, may lead to a misunderstanding of the discussion (Lim, 2008). It promotes a search for other microblogs that can organize the content better (Academic Aesthetic, 2008).

As in a microblog the publishing frequency is high (140 million of posts per day in Twitter - 2011 KISSmetrics - <http://blog.kissmetrics.com/twitter-statistics/>), it is necessary a filtering mechanism for the user to get the relevant content and follow the discussion. When applied to the educational context, the relationships among the messages (posts, comments, replies etc.) is really important because the user needs to understand not only the message content, but also its relationship with the other messages in order to follow the discussion and participate of the collaborative dynamics based on discussions on microblogs. In the future, this kind of dynamics could be supported by models such as those proposed by Atif (2012).

We explored the discourse's structures as well as the categorization of messages in microblogs for teaching and learning. Section 2 presents structures of discourse in microblogs according to the exploratory case study. Section 3 explores how categorization, filtering and search can be used in the educational context in microblogs. Section 4 presents the data analysis of our research according to the use of these functionalities on YouFlow during the second case study. Section 5 provides a deeper analysis on the participation of the students on the second case study. Finally, Section 6 presents some final remarks.

## 2. STRUCTURES OF DISCOURSE ON MICROBLOGS

We supposed the structure of discourse may influence on how the user can follow the messages in microblogs. Then, this section describes the structures of discourse that are available on collaborative (communication) systems. The structuring of discourse represents the relationship possibilities among the messages. Among the main structures are (Gerosa et al, 2005): list, tree and graph.

In the list structure (or linear) each message is chained sequentially. It may be ordered by the author's name, message's title or posting date. The visualization of the messages follows this order and therefore the possible relationships among the messages are not explicit (although they may happen, for instance a message may be an answer to another one).

In the tree structure (or hierarchical), each message (that comes after the first one) must be associated to another one that is called its parent. A parent message may be associated to more than one child. It allows a divergence on the communication.

In the graph structure (or network), a message may be associated to more than one message at the same time (independently of the hierarchical position). Therefore it is possible to notice when a conversation is getting a consensus. This approach is similar to the one presented at (Camusi and Giovannella, 2010).

The star-graph structure is a specific type of the tree structure where there is a central node (root), which is the parent of all the other messages. The root message is the one that starts the discussion. All the other messages are called leaves. This structure allows a focused discussion (on the starting message) and it is common on blogs (Marques et al, 2013).

YouFlow microblog was developed to support an analysis on the different structures of messages. Therefore one can choose the structure and use it accordingly. Table 1 compares YouFlow and other microblogs used in the educational context according the structuring of messages. Most of them are based on the linear and star-graph structures.

Table 1. Comparing the structuring of discourse on the main microblogs

<b>Microblog</b>	<b>List</b>	<b>Star-Graph</b>	<b>Tree</b>	<b>Graph</b>
Cirip	X			
Edmodo	X	X		
Twiducate	X			
Twitter	X	X		
Plurk	X	X		
Buzz	X	X		
YouFlow	X	X	X	X

Figure 1 shows the Tree structure in YouFlow, while Figure 2 show the Graph structure.

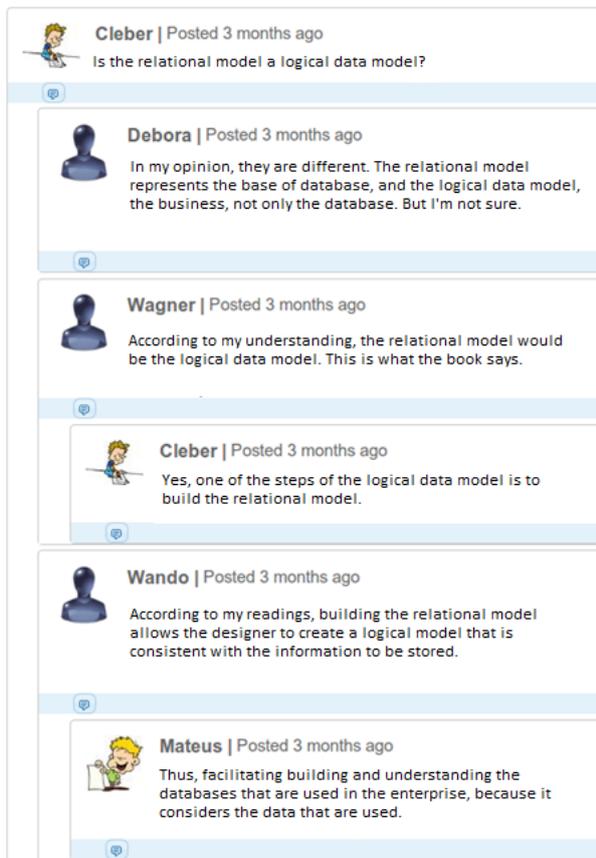


Figure 1. Tree structure in YouFlow.

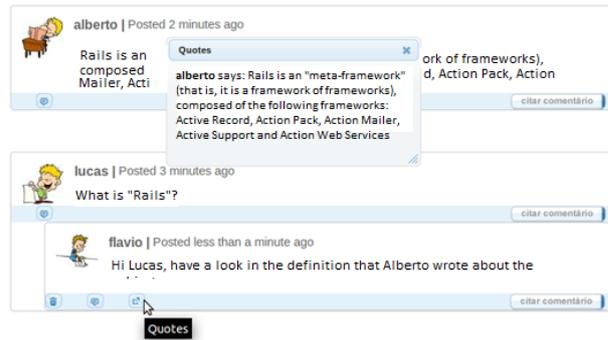


Figure 2. Graph structure in YouFlow.

A case study using YouFlow microblog in an educational context was performed during the first semester of 2011 in the course of Fundamentals of Information Systems. This course is part of the undergraduate curriculum of Information Systems of a university.

From the data analysis it was possible to notice the importance of using microblogs in the educational context. When inquired about the microblog influence in learning (closed question), 82% of the students answered it favors learning and 18% answered it does not influence. In the testimonies (open questions) it was also possible to notice the microblogs' influence on learning. Maria stated "the use of microblogs helps on improving the interaction among the students, directly contributing to increase everyone's participation. It makes the activity delightful.". Lucas said he "liked it because it promotes a good interaction and improves searching online content". John told he "thinks it is good for exchanging information about the course". Finally, Cleber stated "it is interesting because it makes the students leaves the inertia."

About the use of the microblog, the participants highlighted its simplicity, dynamics, practice and intuitive use as the characteristics they liked most. They answered the open questions with good observations. John: "YouFlow is quite similar to Twitter."; Lucia: "I liked most the messages about the subjects and the possibility of quoting comments of other friends."; Maria: "I liked the fact of everybody participating more since the interaction through the computer decreases the inhibition of the students."; and Cleber: "it is a different (interesting) way of studying."

Although the participants were used to the environment based on microblog, some had some difficulties. From the participants that answered the questionnaire, 18% of them thought it was very easy to use, 55% almost did not have difficulties and 27% had some difficulties. Through the log analysis it was possible to notice that the quote functionality, which was available in the structuring of discourse based on graph, was not used. John reported he "had some problems with the user interface that confused in some moments." Carla said she "had difficulty on using graph". The other approaches, linear and tree, were commonly used.

Although the graph structure provides more possibilities for relationships among the messages (quotes), it was considered a complex alternative. Perhaps it would be necessary to consider a previous training with the participants in order to have this functionality used.

The linear structuring of discourse promoted the communication through publishing content and definitions. However, when the focus is on discussions, the relationships among the messages are important. This was the case for one participant when making explicit the relationship through the use of "@" sign for answering a message from other participant (this is a really common feature on Twitter). The tree structure was the alternative that best adapted to the dynamics because it allowed the relationship among the messages and promoted the interaction among the participants.

### **3. CATEGORIZATION, FILTERING AND SEARCH IN MICROBLOGS IN THE EDUCATIONAL CONTEXT**

Collaboration requires communication, coordination and cooperation (Gerosa et al, 2005). Individuals must collaborate in order to work or learning in group. They must share ideas (communicate), work in harmony with other participants of the group (coordinate) and perform tasks well (cooperate) (Fuks and Assis, 2001).

Although the discussion of subjects is important to communication systems, when it is not correctly managed it may result on information overload. It can bring out the difficult of assimilating content.

In order to reduce the content provided to the user, predefined criteria can be used to categorize content. We chose the classification based on topics of a class plan (programmatic content) because the domain specialist (the teacher) defines the topics to be discussed. It promotes thinking on the students' messages and provides a classification that is better or equal to the free classification. The classification based on the topics of the programmatic content of a class plan also provides different mechanisms for retrieving information as well as it has a good potential to support teaching and learning.

The classification of the messages can support search and retrieving information through filters that helps understanding what is under discussion or through textual searches.

Therefore, the message categorization in the microblog YouFlow is based on the topics of a class plan. When registering a new topic, information about the topic (such as the description of the topic) can also be added. Then, textual searches can use these pieces of information to improve and expand their results.

For instance, a class plan could be organized in topics such as Technology-Enhanced Learning, Web-Based Education, and Microblogs for Learning. Then, these topics should be registered in YouFlow and when posting a message, the user could choose one of these topics to categorize its message. Therefore, it would be possible to filter the messages related to each specific topic.

The textual search is based on keywords, which allows retrieving the categories that has in their description the searched term. Then, users may have access to microblog messages that do not explicitly mention the searched term, but that were classified in a category that has this term in its description. The keyword search may be executed through a free textual search or through categories that were predefined according to the class plan.

The search by related messages is executed in three steps: i) retrieving information from tracks that have the searched term, ii) recognition of each node of the track that corresponds to the search, and iii) exhibition of the sub-track that is built from the previous step.

Therefore, YouFlow microblog has categorization, filtering and search.

### **4. SECOND CASE STUDY**

A second case study was performed aiming at analyzing if in a microblog with tree structuring of messages, in addition to the classification of its messages in topics of a class plan, would provide a better following of the discussion as well as better participation of the students.

The case study was performed in the second semester of 2011. It started in a classroom of Fundamentals of Information Systems, of the undergraduate program of Information Systems in a university. The characteristics of the students and the class are the same of the first case study. In this class, YouFlow microblog was introduced to the students as well as the instructions for the class activity.

It was possible to notice from the application log that the amount of messages by day was bigger when considering categorization of the messages than the approach with no categorization of messages. Fig. 3 shows the diagram of discussions per day and the amount of messages in each approach.

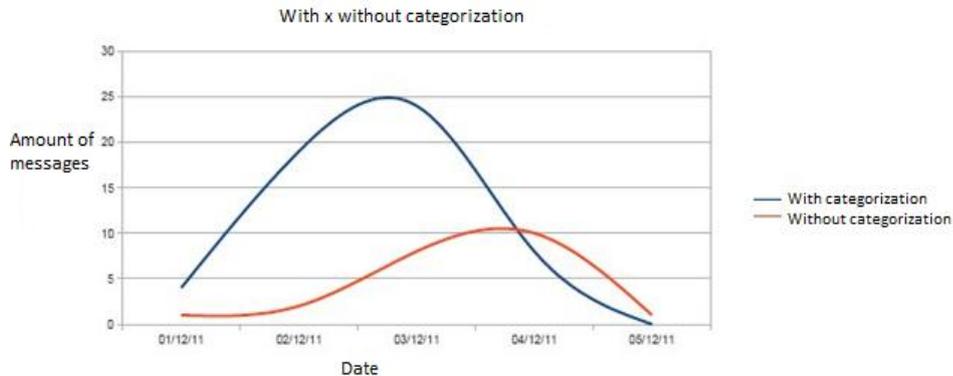


Figure 3. Messages per day.

In addition to the amount of messages with categorization being bigger than the amount without categorization of the messages, the students confirmed the preference to the categorization approach through the online questionnaire with open and closed questions. When inquired about the approach that benefits the education, 80% of the students selected the categorization while 20% chose the approach without categorization. When inquired about the approach that improves the discussion, the result was similar to the education question: 70% selected the categorization approach while 30% chose the approach with no categorization.

The categorization is available at two stages: i) publishing and ii) reading. When inquired about publishing messages, 30% of the users preferred to publish without classification while 70% preferred to publish the message classifying it. When inquired about reading, 90% of the users preferred to use the filter to understand the discussion, while 10% preferred not to use the filter and see everything. John argues about the importance of using the filter especially when reading: "It is easier than in other blogs. I always got lost on the blogs because we are in a discussion and someone sends a message that is not related to the discussion. Then, another person answers that and sometimes the previous subject gets lost. The filter organizes the messages and solves this problem."

The open questions of the questionnaire allowed collecting data about the educational dynamics. When inquired about the experience of using YouFlow microblog on the course, the results show the use of microblog improved learning. Some answers were: "It showed a usage that I hadn't thought about to discuss the subjects in a faster way.", "It was an interesting experience because I already use microblogs, but in a different goal from the activity in YouFlow.", "It was an excellent experience of sharing information and learning that should be used since the beginning of the courses because it really helps the students.", "It is interesting because the course has lots of subjects and plenty of content material. The subjects lead to discussions and the microblog helped the discussion outside the classroom, online."

The project of the case study consisted of using YouFlow in three stages: there were two different subjects (stages one and two) to be discussed and the third stage used a subject that encompassed the previous two. Therefore, in the third stage the students could use the search functionality available on the microblog to access the previous content. In the stage one, the groups of students were organized on those who would discuss the subject using the categorization of messages and those who would discuss the subject without categorizing the messages. Then, in the stage two, the group exchanged the approach (i.e., the one who used categorization of the messages in stage 1 could not categorize the messages in stage 2 and vice-versa).

The students were at the beginning of the course and therefore they were in at the same level. They were motivated to participate on the discussion of the group and the results presented at (Stepanyan et al, 2010) for student interaction at Twitter does not directly apply to this study.

Through the analysis of the application log, it was possible to notice that the search functionality was not used as much as expected. There were only a few searches. However, when inquired about the search results,

50% of the users preferred the categorization of the messages (topics), 50% preferred related messages and 0% preferred the loose messages when the focus was on the discussion. Considering the learning aspect, 80% of the users preferred the categorization (topics), 20% preferred the related messages and 0% preferred the loose messages. Although preliminaries, the search results show a possible evidence that the search results grouped by categories and related messages are more relevant (or better) to discussion and education purposes.

## 5. ANALYSIS ON THE IMPROVEMENT OF THE DISCUSSIONS

Be  $\beta = \{A, B, C, D, E, F\}$  the graph (tree) showed in Fig. 4. The tree's depth is the depth of the leaf of highest hierarchy, i.e., leaves E and F. For the tree  $\beta$ , the depth is equal to 2.

For the data triangulation, two groups were analyzed: with and without categorization. Considering the tree depth concept, the depth of a discussion with and without categorization was calculated through the sum of each tree of the forest, divided by the amount of trees. Fig. 5 shows the formula for calculating the average depth according to each approach (with and without categorization), where  $P_m$  is the average depth of each approach, and  $P_i$  is the depth of each discussion on each approach, varying from  $i=1$  to  $n$ , where  $n$  is the maximum amount of tracks of the approach.

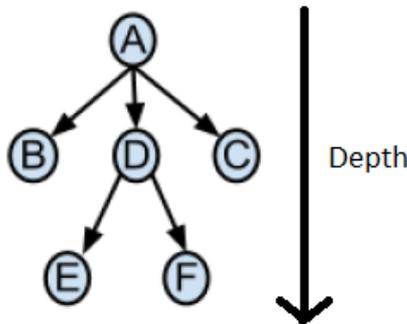


Figure 4. Depth of a tree.

$$P_m = \frac{\sum_{i=1}^n P_i}{n}$$

Figure 5. Formula for calculating the average depth.

We analyzed the data from the application log and applied the formula for calculating the average depth by approach. The discussions based on the tree structure with categorization of messages had a higher average depth than the one without categorization. Table 2 shows the results of average depth, where in the categorization we found 2,12 messages while without categorization we found 1,43 messages. The categorization approach had 53 messages in a forest of 17 trees. The approach without categorization had 17 messages in a forest of 7 trees.

Table 2. Average depth by approach

Approach	Average depth	Amount of messages	Amount of trees
With categorization	2,12	53	17
Without categorization	1,43	17	7

Analyzing the 17 discussions (trees) from the categorization approach, the maximum depth was 5 (first and fifth discussions), while the minimum depth was 0 (second discussion). The depth zero means a message was published, but had no answer.

Analyzing the 7 discussions (trees) from the approach without categorization, the maximum depth was 2 (third, fifth and seventh discussions) while the minimum was 1 (all the other discussions).

Fig. 6 and Fig. 7 show the probability by depth for each approach (respectively, with categorization and without categorization).

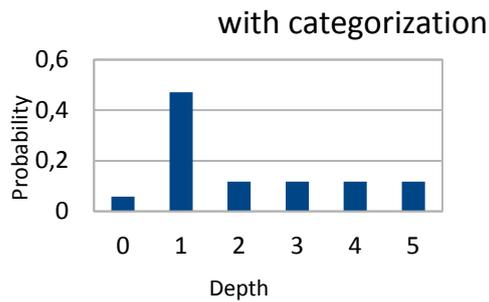


Figure 6. Probability of occurrences of discussions by depth (with categorization).

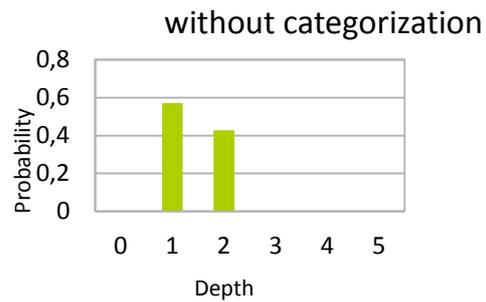


Figure 7. Probability of occurrences of discussions by depth (without categorization).

In this research we considered the messages that are related to the root node in each discussion. Therefore, the amount of messages for each track (or discussion) per approach (with categorization and without categorization) was calculated. Table 3 shows the average amount of messages per track. When the categorization of messages was available, the amount of messages was higher than when the discussions did not consider the categorization of messages.

Table 3. Average of messages by approach

Approach	Average of messages
With categorization	1,9
Without categorization	1,4

## 6. CONCLUSION

In this work we explored the use of different structures of discourse as well as the categorization of messages in microblogs when considering the educational context. Although other works discuss the influence of microblogs in the academic environment, e.g., (Ebner, 2013) and present the importance of discourse structuring in microblogs, e.g., (Mühlfordt and Wessner, 2005), we developed a microblog that allowed not only structuring the discourse according to different approaches, but also characterizing the discussions according to a lesson plan. The objective was to provide a better understanding of the discussions, allowing the participants to follow the messages and their relationships in collaborative dynamics based on discussions. The results were: i) the categorization of messages according to the class plan allowed deeper discussions; ii) the amount of messages and preference of the students for the categorization approach are directly related; iii) the filtering of messages (categorization on the reading time) was used as a facilitator of the discussion understanding; iv) the students prefer search results organized by the categories and related messages; and v) the students were able to follow the discussions supported by the tree structure of discourse, categorization of messages according to the class plan and searches or filtering of messages.

Some approaches for messages' visualization were considered in this work, such as discourse structuring (linear, tree, graph and star-graph), categorization of messages and search. However, other approaches could be explored, such as i) recommendation of messages in microblogs; and ii) groupings of messages according to date, priority and subject. These approaches are alternatives for reducing the amount of information to be explored and therefore they consist of possibilities for showing the messages that are more relevant to the user, which in an educational context can provide better understanding of the content and discussions.

Although the focus of our work is on helping the participants of the conversations to follow the discussions, we could also provide easier feedback to the teacher in an approach similar to the MIRA (Akbari et al, 2010), but based on message structuring and filtering.

The search presented by YouFlow has a good potential to be explored in microblogs used for learning, especially considering the results by topics of a class plan and related messages. If the domain semantics is also considered, then we believe that even better results could be provided. It would be possible to provide search results based on synonyms, meanings or related subjects or even other categorizations schemes (e.g., user-based categorization). In addition, automatic classification procedures such as an adaptation of the

approach used for classifying learning objects presented in (Mendoza and Becerra, 2010), (Lama et al, 2011) or (Lau and Lee, 2012) could be considered. We are also studying if YouFlow can be considered a new communication mechanism: the micro-forum.

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