

Cooperative scientific literature search and socialization through virtual teams

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1 Introduction

The scientific literature search is a key enabler for the research process. However, since it presents a lack of systematic procedure, is one of the most problematic and inefficient activities that researchers need to face during the development of their state of the arts. Moreover, most University students never experience scientific literature search, despite research is the main mission of the universities and one of the major activities of their professors as well as a primary parameter for their careers. Although significant work on systematic review has been carried out (e.g.; [1]), we believe that there is enough room for improvements. In view of the above, the aim of this paper is to i) present a new approach for scientific literature search based on virtual team collaboration ii) explore the team dynamics of the knowledge building process in a virtual environment and, iii) propose a blog tool for open knowledge sharing both for experienced researchers and beginning students.

An experiment on a collaborative scientific literature search on 5 self-controlled virtual teams for a total of 25 students has been developed. The collaboration result is a Google Sites embedding individual blogs where each virtual team can collaborate in building and sharing organized knowledge.

2 Background

As everybody knows, “queries” are the main pillar defining the performance of the search. The two recognized parameters that quantitatively assess this performance are precision (purity of retrieval) and recall (completeness of retrieval) [2]. Significant work has been carried out on query optimization, and collaborative querying has been identified as a practical solution in the sharing of experts’ knowledge that leads to faster information seeking [3].

The current COVID-19 pandemic has imposed and boosted virtualization in every context, even in a higher education environment [4]. Virtual teams have therefore been treated and re-discovered in the enhancement of social and professional skills through processes of sharing, exchange, and motivation [5, 6].

Tools like blogs, in addition to being open access and easy to use platforms, are therefore a valuable way to build an indexed knowledge storage system — e.g., hyper links — in educational settings, too [7]. Moreover, these tools provide a nourishing environment that encourages collaboration and an interchange of skills among students and other stakeholders by building a learning community based on shared knowledge [8].

3 Methodology

An experiment on a collaborative scientific literature search conducted by 5 self-controlled virtual teams for a total of 25 students has been developed. The collaboration result is a Google Sites embedding individual blog where each virtual team can collaborate in building and sharing organized knowledge.

The methodology for a collaborative scientific literature search based on virtual team cooperation as a way to improve the performance of the search is proposed. The main four phases of the case study presented here are shown in Fig.1 and summarized below.

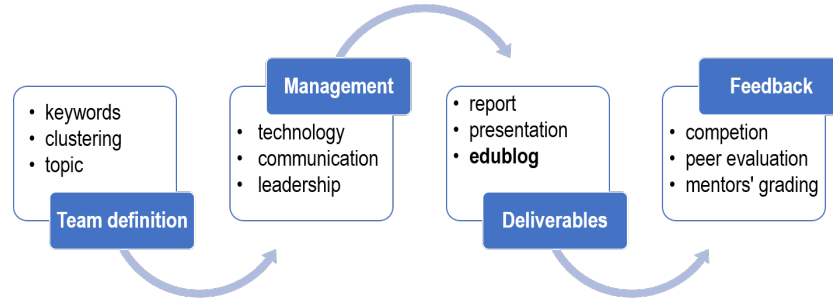


Fig. 1. The methodology of collaborative scientific literature search in virtual team environment.

Team definition: students define one or more interested keyword in a given set of topics and assign each one a degree of interest (e.g., I, II or III choice). Once all the students have given their keywords and corresponding degrees of interest, a semantic clusterization has been created. The output is a set of 5 teams having common interests in a specific macro-topic.

Management: all the self-defined teams determine the tasks as well as roles and responsibility in the project. Formal and informal leaders will emerge in the organization of the work, timeline, and selection of technological tools. Among

the tested *tools for collaboration* are Microsoft Teams channels (formal exchanges), Google Drive (paper collection and analyses), WhatsApp (discussions) and as for the *scientific databases*: Google Scholar, Eric, PubMed, ScienceDirect. Comments and observations are taken into consideration during iterative rounds of literature search. Each student contributes by bringing hard and soft skills to a contamination environment with a high level of interaction level. Deliverable:

Deliverable: each team develops reports in the classical scientific literature search style. The material is also reformatted for web communication (short text and hyperlinks) and exported to the educational blog (aka *edublog*). Cross comments coming from other teams by individual team members are possible.

Feedback: peer to peer feedback must be shared all along. Moreover, after the final presentation a formal vote is assigned, and mentors' tips are embedded to improve the final deliverable.

4 Results

A major deliverable of this work is the *edublog* developed as a platform for a collaborative scientific literature search and results presentation in Fig. 2, containing 50+ original articles, that received 2k visits.

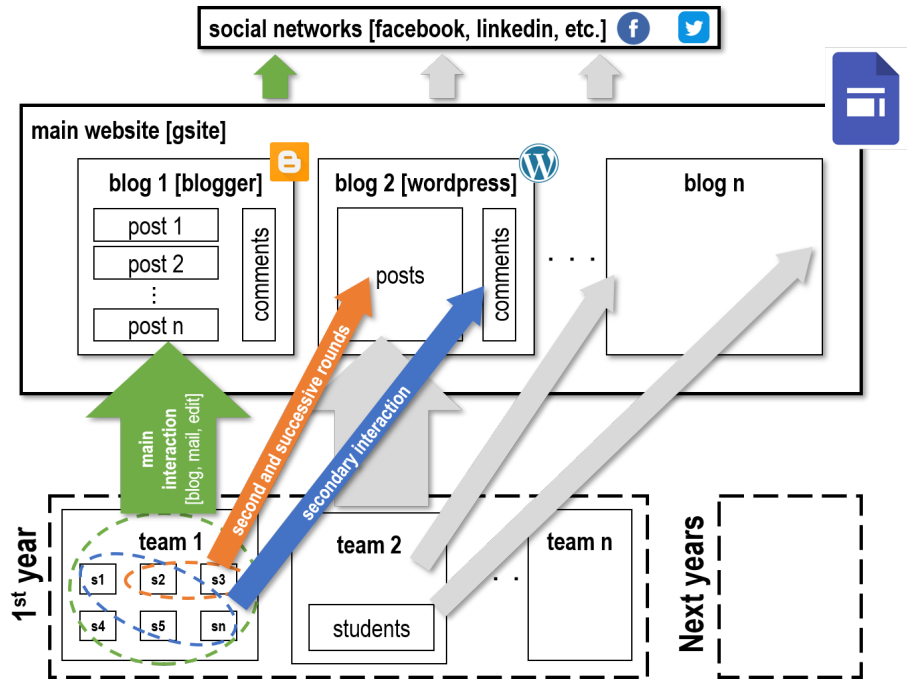


Fig. 2. The proposed *edublog* structure [<http://valorizzazione.cafre.unipi.it> (in Italian)] showing the intra- and inter-team cooperation.

5 Conclusion

The aim of this work was to analyze the scientific literature search from a team perspective in a virtual scenario. An actual experiment involving 5 teams was carried out, at the 2nd edition of the 2nd level Master in Valorization of different abilities and education research proposed by the CAFRE Interdepartmental Center for Lifelong Learning, Training and Education Research at Pisa University. A two month experiment took place in the middle of a pandemic, which necessitated virtual collaboration. The teams, made up of students with diverse cultural backgrounds and ages (25-70) have been clustered around contiguous topics. This experiment has shown how to improve the performance of an information retrieval process through the use of a collaborative approach. This sort of “multiple exploration” of the space of knowledge improves the likelihood of retrieving good information. This work has several merits, which can be individually explored further: the quality of the deliverable coming from a cooperative search; the virtual team dynamics generated in an educational environment by enabling the production of new knowledge and soft skills in an educating community; the infrastructure of the developed *edublog*. One sign of the effectiveness of the proposed method is the involvement of 5 (former) master’s students in this research paper experience. The next planned research paper is about the cooperation for the writing of this paper (matryoshka effect).

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