

## Improving Collaboration through Visibility of Students' Learning Products in a Digital Classroom Environment

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**Abstract:** This study addresses the possibility of increasing motivation and learning success in a classroom setting by means of making the intellectual production of students visible. For this purpose, a software program has been developed to support “classroom visibility management”. The approach has been tested with a sample of 80 ninth graders of a public school in Colombia. The collaborative work is analyzed in terms of the observable interactions among students and uses social network analysis as an analytic tool.

### Research Objective

Often students working on individual or small group assignments in a classroom environment produce interesting results that are not shared with the whole group. Also teacher feedback tends to be selective and does often ignore the best available student products in a classroom. We believe that the sharing of learning products with supervisors and peers should become a standard practice and attitude, which can be effectively supported by existing community tools. In our case, the Elgg social networking platform has been used to support the visibility and sharing of results in a classroom environment.

Our study is based on two hypotheses: First, the pedagogical management of visibility of the students' intellectual production favors their conceptual development, and second, the visibility of students' learning products in the class stimulates/improves collaborative work. We expect visibility to improve motivation through peer feedback and the building up of reputation or social prestige derived from the contributions (i.e. the learning products) as well from the communicative interactions based on the sharing of these products (cf. Stajkovic and Luthans, 2003). Our study aims at establishing the effect of the pedagogical use of visibility, both in collaborative work as well as in the conceptual development of a group of students. Our research examines the relationship between visibility (independent variable) and conceptual development and collaborative work in a learning scenario (dependent variables).

### Theoretical and Methodological Framework

Several authors have used of Social Network Analysis (SNA, see Wasserman & Faust, 1994) to analyze interaction structures and role dynamics among students in a classroom. In this orientation, Martinez et al. (2003) propose a mixed evaluation method that combines traditional sources of data with computer logs, and integrates quantitative statistics, qualitative data analysis and social network analysis in an overall interpretative approach. Similarly, Harrer et al. (2005), following the idea of triangulation, also used qualitative methods, statistical analysis and SNA to explore the patterns of communication for a mixed presence/web-based university course. The results show that while an isolated perspective does not suffice to explain the complex processes, taking more perspectives into account in an integrated way enables a better understanding of technology enabled communication and interaction.

Also based on SNA, Cocciolo et al. (2007) conducted an exploratory study that related communicative processes in a large digital repository with the emergence of an online community of practice. The analysis revealed that the online repository provided opportunities for novices to adopt the role of an expert knowledge facilitator. In terms of learning this study was inspired by the socio-cultural approach of Vygotsky (1978), in which social interaction mediated by language is seen as the main engine of intellectual development. Our hypothesis is that increasing the visibility of results will encourage collaborative knowledge building of students.

### Software Environment

Our software platform has been developed to allow students to expose their intellectual products to other learners and supervisors in the classroom and to allow for communication, especially commenting, around these products. The software is a tool for social interaction based on products and value judgments. We have used the Elgg social networking platform together with a MySQL database as a basis for our classroom environment. The design of the specific interface with menus and archive structures was based on a prior participatory paper-and-pencil study with students from the same educational environment. This paper prototype facilitated and pre-determined our design decisions on settings, location of elements, and configuration of new resources.

Once the platform was ready each member was registered with a role (teacher, student or administrator) and corresponding privileges. An initial training procedure was conducted with the researchers as well as with

teachers and students. Features enabled for all participants were: create thematic discussion groups, join existing groups. The groups gave access to discussion forums and blogs and allowed for creating public pages visible within the network.

## Sample and Data Collection

The sample consisted of two groups of 40 ninth graders each in a public school in Bogotá (Colombia). One group used the visibility tool and procedures, the other one followed the standard pedagogical practice in this school. The group size in the collected data, however, is usually lower due to frequent absence of a higher numbers of students. To collect data we used field notes, knowledge tests, and data of collaborative work available in the system. Knowledge tests used an open answer format, and a content analysis was conducted to find the concepts the student included. Information on collaborative work was based on answers to the question “with which partners did you work?”, for which the student selected the names from a list with all partner names.

## Results

Based on the available interaction data, the UCINET software was used to generate a graphical representation of the social network, i.e. a sociogram. A first visual comparison already identified clear differences in terms of number of relationships between students. The “visibility group” exhibited a higher density of relationships among participants as compared with the control group, for which there were more isolated nodes and less interactions (i.e. edges). Also, for each student we calculated basic structural graph measures such as centrality and degree.

To corroborate the hypothesis that with increasing visibility of the students’ learning products the frequency/intensity of collaborative groups would also increase, we conducted a correlation analysis between the times students spent publishing their results products and their corresponding degree in the sociogram. Results show a significant correlation of  $r=0.95$  ( $n=22$ ,  $p<0.05$ ). To prove the hypothesis that with increasing visibility the number of concepts included in knowledge sharing processes would also increase, we conducted a correlation analysis between the student degrees and the corresponding number of concepts assessed through the knowledge test. Results also show a significant relationship ( $r=0.85$ ,  $n=20$ ,  $p<0.05$ ). Finally, the number of concepts included by students from the two groups in the knowledge test was compared using the Student t-test. The difference between means (3.44 and 2.16, respectively) was highly significant ( $F = 1.41$ ,  $n=36$ ,  $p < 0.00063$ ).

## Conclusion

Based on our empirical findings, we can state that classroom visibility management stimulates cooperation as well as conceptual development, i.e., in summary, it supports joint knowledge construction processes. Available social networking platforms can be used to set up such environments supporting visibility management, and social network analysis has turned out to be an appropriate tool to visualize and analyze the resulting changes in classroom interactions.

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