

## Social Network Analysis as Method to Assess Collaboration

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In South African context, teachers are required since 2001 to establish professional learning communities. One of the expected outcomes of this collaborative model is improvement in the quality of teachers' work. Being part of a group does not automatically imply collaboration; therefore all groups of teachers cannot be defined as professional learning communities. In fact, the outcome of effective collaboration is the establishment of a professional learning community. Schools do create hierarchical structures, consisting of sets of formal relationships, to create an infrastructure for effective collaboration in the vertical dimension of a school. In such organizations, all teachers, except one, are subordinates (see Figure 1).

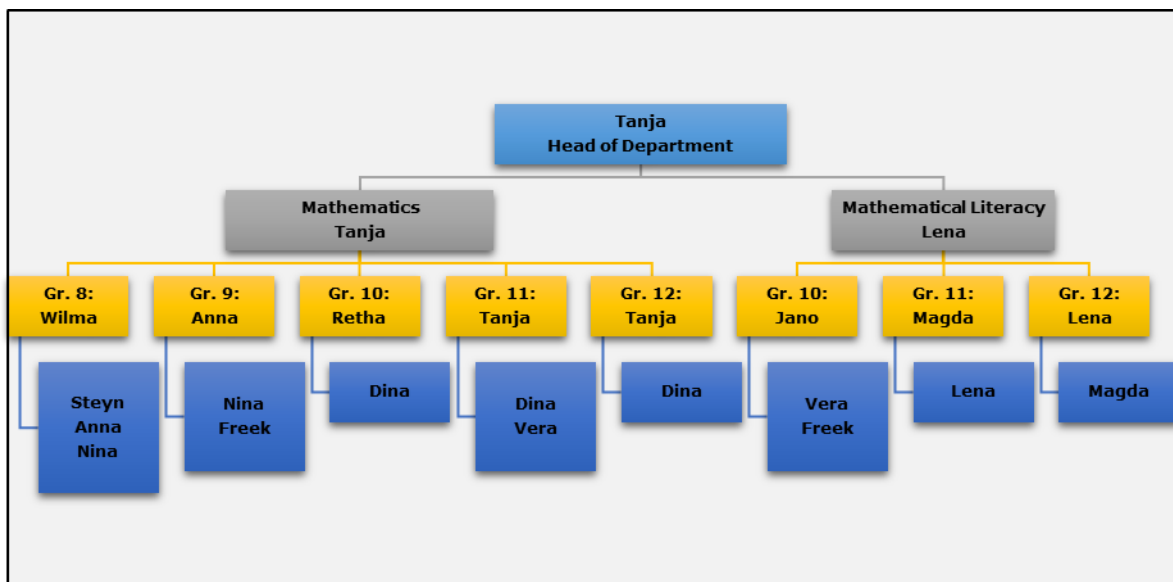


Figure 1 Hierarchical structure of the mathematics teachers of a school in Gauteng

However, when asked, line workers and executives alike will tell you that those boxes and lines (see Figure 1) do not really capture the way work is done in their organizations (Cross and Parker 2004:vii). The efficiency of work depends on the horizontal dimension, consisting of all formal and informal relations established to work effectively.

## Theoretical background

From a network perspective, teachers rely on their personal development networks consisting of the relationships they purposefully established to get access to information, knowledge, advice, support, guidance, expertise and concrete resources to perform their work (Van Staden 2012). These relationships are not built in isolation; therefore teachers embed themselves during collaborative activities into development networks, consisting of a group of teachers and the relationships between them. Such relationships are regarded as social capital (Wilson 1997). The idea that relationships are a form of capital implies that you can rely on them to do your work. It also implies that a lack of relationships will have a negative impact on the quality of your work. Therefore, development networks need to be assessed and evaluated to improve the quality of the social capital created in schools. Social Network Analysis provides an effective method to analyze development networks.

## Social Network Analysis

Jacob Moreno (1934) dotted the subjects of his research projects on a piece of paper, then linked pairs with a line to indicate the presence of the relationship he was interested in. He referred to these maps of relationships as sociograms. The sociograms in this discussion consist of nodes, or teachers and ties, or the seven relationships between the teachers. For the purpose of this discussion a tie between two teachers will indicate the presence of a relationship. These invisible social structures are not stable since relationships can be established and broken any time. But snapshots (sociograms) can be taken to understand and predict the impact of the relationships on the work of teachers at any given point in time.

Wide ranges of measures are available to assess development networks. For the purpose of this discussion a few measures are identified that are useful to assess development networks on three levels: individual, group and community levels. For the purpose of this discussion, the following measures were used to assess the efficiency of the teachers' work on individual, group and community levels (Figure 2).

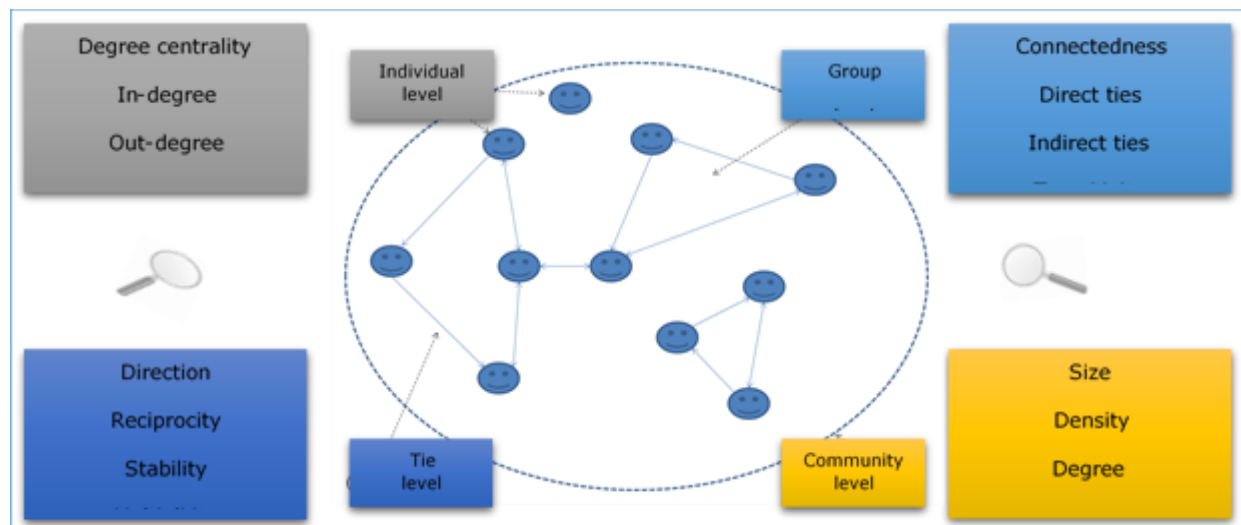


Figure 2 Measures to be used to assess development networks

## Assessment of a Real Life Development Network

It was assumed that a) reciprocal formal relationships (hierarchical structure) and b) reciprocal ties between the teachers who teach the same grade would support collaboration between the teachers of a mathematics department of a secondary school in Gauteng, South Africa. This assumption was developed into an 'essential development network' (see Figure 3).

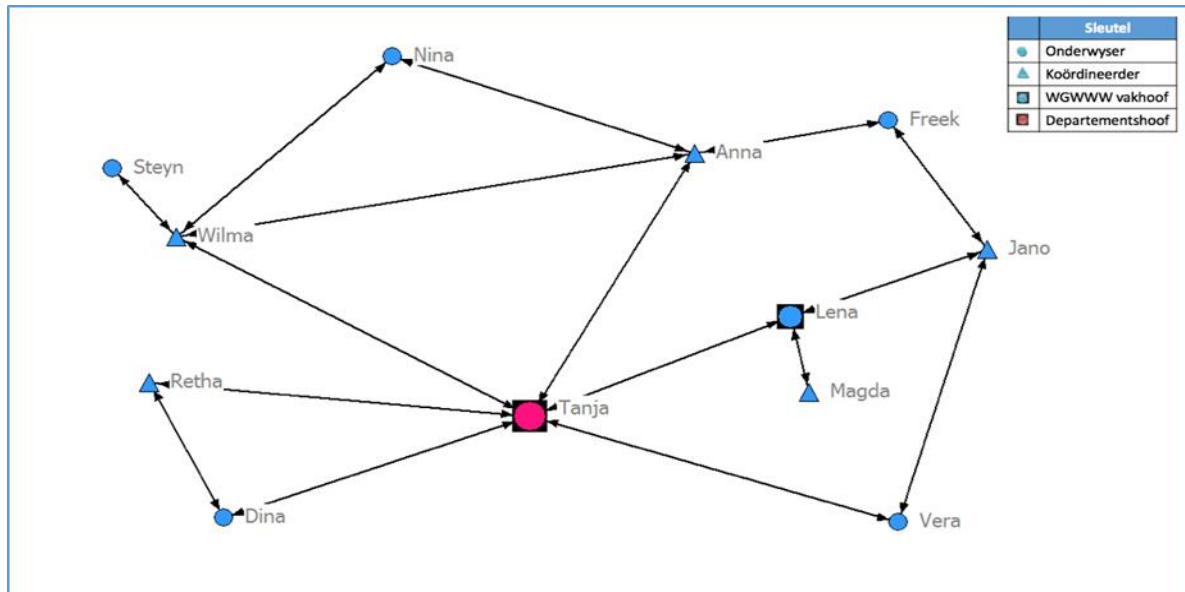


Figure 3 Essential development network for the mathematics teachers of a secondary school in Gauteng

This ideal development network provided a baseline for assessing the actual development of the teachers (see Figure 4).

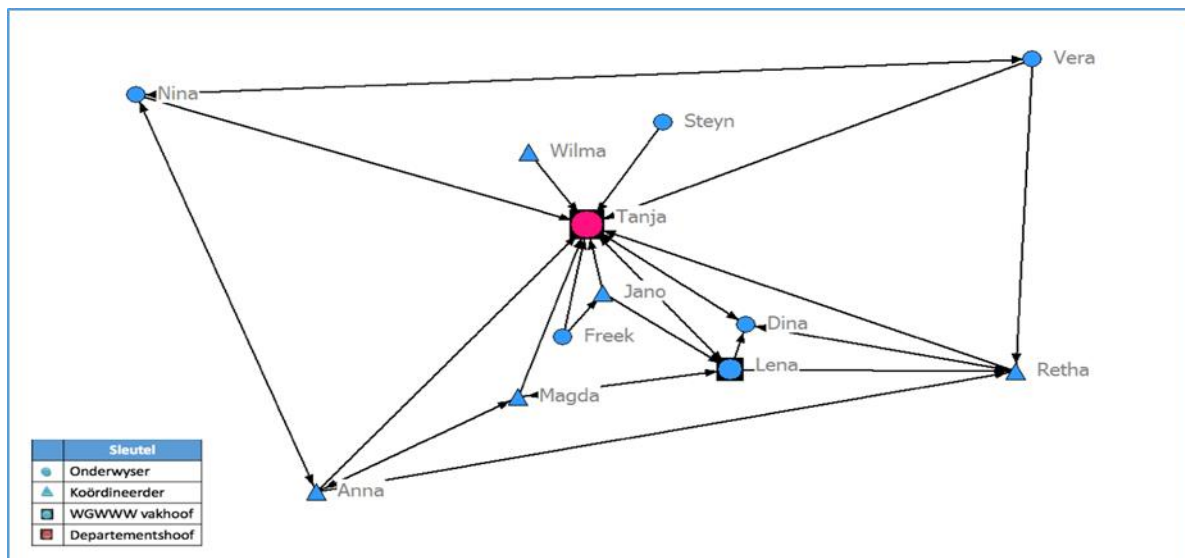


Figure 4 Actual development network of the mathematics teachers of a secondary school in GAuteng

The development consisted of 12 teachers and no one was isolated from the shared knowledge base. For the purposes of this discussion, I will highlight a few examples of the impact of this invisible social structure on the work of teachers.

### *Example: Star Structure*

The star structure, created by the 11 ties connected to Tanja, the Head of Department (see Figure 3), indicated a malfunctioning hierarchical structure since only six teachers needed to be directly linked to Tanja (see Figure 4). This structure could have been developed due to Tanja purposefully controlling the flow of information to secure her leadership position or due to ineffective collaboration between teachers. Several of the formal ties between coordinators and grade teachers are missing, namely between Wilma and the three grade 8 teachers, Anna and Jano (new comer), and Jano (new comer) and Vera (beginner teacher). These five teachers could have struggled to get access to information shared by Tanja, but they crossed the barrier by establishing direct ties with her. Tanja took over the role of the coordinators to improve the performance of her department, but overloaded herself in the process. It could lead either to information xxx or the burn out syndrome, therefore activities need to be created to improve collaboration between all vertical levels as well as between grade teachers.

The second example focuses on the 11 sub-groups. Nine of the groups were triads, consisting of three teachers (e.g Nina-Anna-Tanja) and two consisted of four teachers (e.g. Anna-Retha-Lena-Magda). Tanja was a member of nine of the groups, but she could get indirect access to the other two groups via Anna, Magda, Lena, Dina and Retha. The groups might indicate that the teachers were collaborating in small groups. Due to a lack of several reciprocal ties none of the groups are cooperative groups. Two groups need to be monitored since they might indicate a tendency to form cliques, namely Dina-Lena-Retha, consisting of experienced teachers and Anna-Magda-Lena-Retha, consisting of coordinators and the subject head.

Therefore, information could, if the direction allows it, flow between groups. Transitivity was possible between remote nodes where the direction of the direct and indirect ties allowed it. Due to the direction of the ties, information cannot flow in both directions. Please note that information flows in the opposite direction of the arrow since the arrow head indicates direction. The group consists of coordinators, therefore it might indicate Steyn and Wilma were not members of any groups and their one-directional ties with Tanja indicated that they did not share any sources, but got access to the network's shared resources via their ties with Tanja. The links between the teachers indicated that they rely on one another. Since the learners performed well, it might be possible to conclude they were embedded effectively in the development network. However, two problems were not solved. Why did all the teachers need direct ties with the HOD and why were Steyn and Wilma connected with only one tie to the development network? The problem could be better understood when the hierarchical structure (see Figure 1) was used to create a baseline for effective collaboration.

The conclusion could be made that Tanja did not build a star structure to take control of information in the Department. Instead, she was forced to take over the roles of the

coordinators due to the lack of interaction between the coordinators and their grade teachers. It also helped to explain why Tanja could not find time for her own work since she was overloaded by too many requests, which could have led to a bottle neck. She overcame that barrier by holding weekly meetings to disseminate information, but allowed the coordinators in the process to ride on her back. Therefore, this group of teachers can be described as a traditional work group and not a professional learning community

## **In Conclusion**

Malfunctioning hierarchical structures are often only identified when the quality of a teachers' work can be directly related to missing relationships between leaders and their subordinates. Social Network Analysis can be used to assess development networks in order to augment collaboration between school-based teachers. Sociograms provide an easy method to identify barriers and opportunities with regard to collaboration, to evaluate the efficiency of collaboration, to diagnose problems, and to predict the efficiency of development network networks.

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