

INVESTIGATING TEACHERS' INSTRUCTIONAL LEADERSHIP
IN THE SCHOOL BASED TEACHERS LEADERS PROGRAM

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Abstract

This study describes the use of social network analysis to evaluate the leadership configuration of mathematics teachers. The goal of this method is to use teacher collaboration data to map and explain the course of leadership and the adequate environment for a mathematics teacher to succeed as an instructional leader.

This shift in evaluation model modifies the traditional view from explanations of events based on individual teachers to a view where a more contextual and systemic understanding of events takes place. In this way, the use of social network analysis in evaluation changes the focus from characteristics of individuals to interrelationships of systems' individuals.

Network maps are a very informative tool that describes the organizational structure of the network. In this case, such maps were taken back to the key players in the school to see how they explain the resulting networks.

Social network analysis tends to focus too much in the relationships between interacting individuals. We opted for a combination of case study in conjunction with in depth interviews and social network analysis to understand better the leadership of SBTL mathematics teachers.

For the past four years the Delaware Education Research and Development Center (R&D Center) has assisted the Mathematics and Science Education Resource Center (MSERC) with the evaluation of the School Based Teachers Leaders (SBTL) program. SBTL seeks to solve the problem of providing effective instruction for students at-risk of failure in middle and high school mathematics; with the idea that mathematics teachers will become instructional leaders within their school. During these years, The R&D Center has consistently visited classrooms of teachers in the project. Twice a year, between 35 and 40 lessons have been observed. The information from these observations has informed MSERC how teachers perform in the classrooms after the program provides them with professional development. Observations have been based on at-risk behaviors such as avoidance behaviors, dependence upon excessive teacher scaffolding, and reluctance to produce detailed written work. The data gathered through observations provides a good picture of what happens in the classroom. However, little to no attention had been given to the role of a SBTL teacher as a leader in the school.

So the question emerged, how can a teacher become an instructional leader? To answer this question we decided to take a more holistic approach than before. In the past years we have been studying SBTL teachers as a unit within the four walls of their classrooms. However, to perform as a leader, a teacher needs to go beyond these walls and reach other teachers in the school. We decided to change the perspective. Instead of looking at teachers as the unit of study, we place the teachers in a system where they interact with other teachers in their department and with specialists, coordinators, and administrators. This is a shift in instructional leadership evaluation from a focus on the qualities of isolated individuals to a more contextual and systemic understanding of interrelationships and how people understand their environments.

The original question was refined and originated into two evaluation questions: (1) what instructional leadership roles do SBTL teachers play in their schools?; and (2) what aspects of the school organizational culture do teachers and administrators believe support the development and influence SBTL teachers as instructional leaders?

Social Network Analysis

Social network analysis (SNA) is the study of social relations among a set of actors. SNA views social relationships in terms of nodes and ties. Nodes are the individual actors within the networks (in this case, people involved in mathematics within a school), and ties are the relationships between the actors. SNA provides both a visual and a mathematical analysis of human relationships. The theoretical perspectives of SNA focus on relationships between actors rather than characteristics of actors.

Two common SNA applications are (1) supporting partnerships and alliances and (2) developing communities of practice (Cross & Parker, 2004). *Supporting partnerships and alliances* can be seen in an organization where initiatives of strategic partnerships are used to leverage the organization's unique capabilities. In the case of SBTL, it is vital to identify the influence teachers in the program have in their schools. Are they really acting as instructional leaders in their schools? SNA can help to unveil the effectiveness of these alliances among mathematics teachers in the school in terms of information flow, knowledge transfer, and decision-making. *Developing communities of practice* can also help to describe the organization's ability to leverage expertise distributed by virtue of physical location or organizational design. These two aspects are important when describing a system within a school. Does teacher location matter? Are teachers' relationships dictated by the school organizational design? SNA can be use to reveal key members of the community and to assess the overall health in terms of connectivity.

Methodology

The first step was the selection of the sites. People from MSERC decided on two schools, one middle school (School A) and one high school (School B). These schools were chosen as exemplary schools where a mathematics teacher acts as an instructional leader. The process to study the roles of SBTL teachers and the system of support in the school included several phases. First, we conducted a survey at each of the schools about communication, advice, and motivation regarding math instruction in the schools. Second,

we analyzed the survey data using social network analysis (SNA) to map out the relationships among teachers and support staff in the schools. Third, we went back to schools and interviewed selected teachers and administrators about leadership roles in Math Partnership. We also asked respondents to explain the patterns and relationships they saw in the SNA diagrams.

Survey

We compiled a comprehensive list of relevant mathematics instructors, aides, and administrators at each school. The survey consisted of 11 questions. Each of the 11 questions asked to select up to three people in different situations. SNA survey respondents selected names from this list. The survey questions were as follows:

Section A: Communication/Information flow

1. Select up to three people from whom you most often receive information about your school's mathematics curriculum.
2. Select up to three people to whom you most often give information about your school's mathematics curriculum.
3. Select up to three people you turn to most often when you want to discuss an issue about your school's mathematics curriculum.
4. Select up to three people with whom improved communication would enhance your math teaching.

Section B: Advice/support

5. Select up to three people you turn to most often for advice about your teaching math.
6. Select up to three people whose perspectives about mathematics education you highly value.
7. Select up to three people you turn to most often when you want to discuss an issue related to your mathematics teaching.
8. Select up to three people to whom you most often offer advice about mathematics teaching.
9. Select up to three people who have contributed most to your professional development as a mathematics teacher.

Section C: Motivation/Energy

10. Select up to three people who do the most to energize your mathematics teaching.
11. Select up to three people who most often inspire you to try something new in your mathematics teaching.

Sample for the survey

In School A, 20 people were identified as being involved with mathematics. Sixteen people were teachers and four people were administrators or department support staff. Out of the 20 people, only 16 responded to the survey. The four people who did not respond to the survey had different reasons: one did not want to rate their peers, two were not working at the school at the time of the survey, and one did not give any reasons.

In School B, 21 people were identified as being involved with mathematics. Sixteen people were teachers and five people were administrators or department support staff. Twenty out of the 21 people involved with mathematics responded the survey. The only person who did not respond was not working at the school anymore at the time of the survey.

Interviews

After analyzing the data from the SNA survey, we went back to the schools to interview key players in the system. We studied participants' interpretations of the social network diagrams. Our interest was centered on having these players describe what patterns they saw as especially telling; and what aspects of social dynamics they suggest are revealed or hidden in the social network diagrams. The interview topics focused on:

1. Interpreting the results of the social network analysis. By bringing diagrams to the interviews and asking respondents to reflect on the significance of patterns they see.
2. What roles do Math Partnership teachers play in instructional leadership in your school?
3. What aspects of the school organizational culture support the development and influence of Math Partnership teachers as instructional leaders?

Sample for the interviews

In each school we interviewed four people. Once again, people from MSERC helped us in the selection of participants for the interviews. We conducted individual interviews in each school with representatives from three groups: 1) administrators (e.g., principal, curriculum specialist), 2) Math Partnership teacher participants, and 3) other mathematics teachers.

Analysis

The analysis of this study was divided in two steps. The first step was the Social Network Analysis. In this step, we identified the individuals who were most often named in the networks of communication, advice, and motivation. The second step was the analysis of the interviews. Qualitative analyses helped us identify, compare, and/or contrast themes across the three groups of respondents and across the two study sites. Identify the organizational characteristics and relationships the respondents believe are especially important in the development and influence of Math Partnership teacher as instructional leaders.

Results

Social Network Analysis Results

The SNA survey included 11 questions about communication flow, support and motivation within the school. Each of these questions generated a diagram and a set of measures. The diagrams and measures for each school are included in Appendix A and B, respectively. A summary of the three main sections of the SNA survey: communication flow, support, and motivation for each school is described below.

Communication/Information flow for School A

For this section, the first three questions of the survey were considered. The fourth question (*Select up to three people with whom improved communication would enhance your*

math teaching) proved to be confusing and was not included. For the other three questions, we observed a similar pattern. The information seemed to flow very well among grade levels. The people from whom teachers received information about curriculum (Question 1) are clearly teachers who teach the same grade level as well as support staff (this category includes administrators and supervisor). When asked to whom they often give information about the curriculum (Question 2), teachers were again grouped by grade level. But this time, each grade level communicated better with different people. Two sixth grade teachers gave information to the three people considered as support staff. Only one seventh grade teacher gave information about the curriculum to a support staff member (administrator). In eighth grade, three out of five teachers gave information to one support staff member (mathematics coordinator). Finally, the people teachers turn to most to discuss an issue about the curriculum (Question 3), are teachers in the same grade level and two of the three support staff. From the three diagrams, it appeared that the communication flow in the school happened at grade level and at almost the same rate with support staff. Since we ask teachers to select “up to three” people in each category it is not possible to know at what level teachers communicated with teachers out of their grade level.

Advice/Support for School A

For this section, questions 5 to 9 of the survey were considered. When asked to select people whose perspectives about mathematics education they highly value (Question 6), we saw more interaction among grade levels and also an admiration for the support staff’s perspectives about education as well as for two particular teachers, one of them a SBTL teacher. Teachers demonstrated grouping again by grade levels when asked to whom they turn to most often when they want to discuss an issue related to their mathematics teaching (Question 7). However the same people highly respected in Question 6 were also selected here. For the other three questions, we observed a similar pattern. But then again, when asked to choose people they turn to most often for advice about their teaching (Question 5), we observed grouping by grade and many teachers seeking advice from the support staff. It is important to notice a disconnection between teachers in seventh grade in some of these questions. A similar pattern was observed when we asked about people to

whom they most often offer advice about mathematics teaching (Question 8). Finally, when asked about people who have contributed most to their professional development as mathematics teachers (Question 9), the support staff personnel were central to the network. From the diagrams, it seemed that the advice and support in the school came from the support staff and a few teachers whose perspectives in education are highly valued.

Motivation/Energy for School A

For this section, the last two questions of the survey were considered. It was interesting to see that the network diagrams for these two questions were less dense than the others. In these cases, people selected one or two people as energetic and inspiring. When asked who do the most to energize their mathematics teaching (Question 10), only eighth grade teachers remained cohesively as a group. Seventh grade teachers were again separated into two groups and there were very few relations displayed for seventh grade teachers. Still, two support staff members and two teachers were recognized as the more energetic. In the case of selecting people who inspire teachers to try something new in their mathematics teaching (Question 11), the support staff was central to the diagram. From the diagrams, it looked like the motivation and energy in the school came from many people, but mainly from the support staff.

Communication/Information flow for School B

As in School A, for this section in School B, only the first three questions of the survey were considered. The fourth question was not included. For the first three questions, we observed a similar pattern where support staff and one teacher (a SBTL teacher) were at the center of the network diagrams. The information seemed to flow well among teachers, but some teachers selected less than 3 people. The people from whom teachers received information about curriculum (Question 1) are clearly support staff (this category includes administrators and supervisor) and the SBTL teacher. The pattern observed is star-shaped with support staff and the SBTL teacher at the center of the information flow. When asked to whom they often give information about the curriculum (Question 2), most teachers again selected support staff and few other teacher. Finally, the

people teachers turn to most to discuss issues about the curriculum (Question 3), are support staff and the SBTL teacher. This was the network diagram with fewer relationships. From the three diagrams, it seemed that the teachers communicated very well with support staff. Since we ask teachers to select “up to three” people in each category it is not possible to know at what level teachers communicated with other teachers. Sometimes the three selected people were support staff.

Advice/Support for School B

For this section, questions 5 to 9 of the survey were considered. When asked to select people whose perspectives about mathematics education they highly value (Question 6), we observed an admiration for the support staff’s perspectives about education as well as for two particular teachers, one of them a SBTL teacher. Teachers demonstrated a similar pattern when asked to whom they turn to most often when they want to discuss an issue related to their mathematics teaching (Question 7). The same three support staff people and the SBTL teacher took center stage in the network diagram. For two other questions we observed a similar pattern. When asked to choose people they turn to most often for advice about teaching mathematics (Question 5), and when asked about people who have contributed most to their professional development as mathematics teachers (Question 9), the support staff personnel and the SBTL teacher were central to the network. Finally, when we asked about people to whom they most often offer advice about mathematics teaching (Question 8) we came up with a very scattered diagram with four teachers receiving the most advice from others. From the diagrams, it seemed that the advice and support in the school came from the support staff and the SBTL teacher whose perspectives in education are highly valued.

Motivation/Energy for School B

For this section, the last two questions of the survey were considered. For these two questions the same general pattern was observed. Teachers selected support staff members and a couple of teachers in most cases. Few interactions from teacher to teacher were observed. When asked who do the most to energize their mathematics teaching (Question 10), two support staff members and the SBTL teacher were recognized as the

more energetic. In the case of selecting people who inspire teachers to try something new in their mathematics teaching (Question 11), the support staff the SBTL teacher and another teacher were recognized as the most inspiring. From the three diagrams, it looked like the motivation and energy in the school came mainly from the support staff and two teachers.

Interviews Results

After having the results from the SNA survey, we went back to the schools and talked to administrators, SBTL teachers, and regular teachers. We interviewed four people in each school and showed them some of the network diagrams. We then analyzed the interview data. These were the main themes we found.

Conversation about Math

There are two types of conversation about mathematics going on in these particular schools. The first type of conversation is the one occurring in department meeting which occur monthly. Teachers and support staff recognized that conversation about math takes place in these meetings. Administrators use these meetings as a chance for updating teachers skills and knowledge about curriculum and teaching strategies. One administrator described what happens in a monthly meeting as planned and structured:

“...We use our department meetings which are monthly that usually last about an hour but we try to make all those department meetings mini-professional development opportunities for our staff. So, we’ll have different topics and we have an agenda each year that we are going to discuss whether it’s data analysis or differentiated instruction...”

Teachers agreed on the value of these monthly meetings, but for them most of the conversation occurs constantly. After asked where and when the conversation occurred, a teacher said: *“All the time!”* She continued to tell us how besides the monthly meetings, she meets with same grade colleagues every Wednesday; in addition they have weekly meetings with teachers from honors class; she explained how she talks to other teachers in

the hallways before and after school; and she added that she has lunch with another math teacher every day and they always discuss math.

Conversation occurring in the hallways is the second type of conversation. Support staff described this type of conversation as informal, but to teachers it is where most of the conversation occurs. It is a more personal two-way conversation. A teacher expressed that “Sometimes during the meetings there are suggestions but not direct advice.” On the other hand, mathematics conversation is happening “every single day.” Instead of informal, this type of conversation is unplanned and unstructured but regular and rich. One teacher described what happens in one of these dialogs before classes start. She said, “I would see [other teacher] across the hall and say, *Come on in*. We talk about what the day looks like.” Other teacher described these encounters as “If it is a hallway conversation it will probably be in the morning. I’d say: *What are you doing today?*, or *Have you covered this?*, or *Have you done this yet?*, *Did you do this problem?*, *I tried this and I got this solution*, *Did your kids do anything differently?*”. This type of conversation seemed richer and very useful for teachers.

Another way of conversation described by teachers and support staff was communication by email. Teachers said they are part of “mini communities.” Teachers teaching the same grade level or course form these groups. They had found posting questions and materials via e-mail as an effective and quick way of communication.

Time and Location

A frequent theme was time constraints. Teachers expressed that one of the challenging aspects of teaching was finding enough time to fit in activities such as meetings, planning, and professional development. They usually talked to other teachers before or after school because it is difficult to find a time to talk to other teachers at any other time. However, teachers said they find it easier to talk to teachers whose classrooms are nearby. Location seemed to play a very important role in teachers’ interactions. One of the schools is so big that a teacher said it is very difficult to see teachers from the other side of the building. They just see each other at department meetings. A way to alleviate the place and time constraints is a supportive math supervisor. For example in one of the schools, a SBT

teacher is very enthusiastic and likes to model lessons for other teachers. In order to do so, the mathematics supervisor works with the teacher and teach that day's lesson in the SBTL teacher's classroom. The mathematics supervisor works so closely with this teacher, that once she has observed the teacher often enough she can model the new technique or strategy for other teachers too.

Teachers, supervisors, and administrators recognized that implementing new teaching strategies, let alone new curriculum, takes a long time. It takes time before teachers feel confident using the new method or curriculum. This is why it is important for administrators and supervisors to have teachers sharing their experience and knowledge with other teachers.

It's all about sharing

Sharing materials, strategies, and thoughts were frequently mentioned in the interviews. As a teacher put it: "If you have five or six people, all teaching the same thing it is just easier to get together and share the work and share ideas instead of trying to come up with everything on your own." Although this could be seen as pure communication, we found another important aspect about sharing in both schools. Certainly teachers appreciated the communication flow they have in their schools, but teachers talked fondly about how they communicate. Apparently there is a great feeling of respect for each other's ideas. Teachers said they do not feel threatened or intimidated in any way when they want to express an idea. One teacher said, "A very good thing about the school is that no one is competitive. We work all together. We work together on warm ups, homework, etc. No one is trying to outdo another. This gives us results... That's an awesome feeling." Other teacher said they could talk to supervisors and administrators "as equals".

It is in this non-threatening environment that administrators have SBTL teachers sharing their experiences with other teachers.

Sharing SBTL Experiences

Administrators and supervisors in both schools were involved or very well informed about SBTL. They had SBTL teachers presenting strategies and experiences to other teachers in the school. In one case the presentation was not only for mathematics teachers, but also for all teachers in the school. This speaks volumes about the confidence administrators and mathematics support staff had in the program in these schools. They saw value in various aspects of the program, such as reflecting on their own practice by watching the videotapes. However in the eyes of teachers not involved with the program the message was not so strong. One teacher said that SBTL teachers always report what they do in the program, she sees the “leadership power” from teacher to teacher but she emphasized: “It is not SBTL it is the school.” Another teacher had a similar feeling about it. He said: “In our department meeting there is a quick overview of SBTL but it is not a major part of the meeting. If they find some technique they will share it the same way anybody else would share.”

Conclusion and Discussion

Let us return to the two applications of SNA described in the introduction of this paper. First, we said that identifying the influence SBTL teachers have in their schools was very important. From the diagrams one can see that teachers in the program are seen as leaders. But, are they really acting as instructional leaders in their schools? Well it depends on the definition of instructional leader. In terms of information flow, SBTL teachers communicated well with other teachers (see diagrams 1 and 2 in Appendixes A and B). In terms of knowledge transfer, sometimes these teachers were sought for advice and they offer advice to others (see diagram 5 in Appendixes A and B).

What roles as instructional leaders do teachers in the SBTL program play in their schools?

SBTL teachers were seen as enthusiastic (see diagrams 10 and 11 in Appendixes A and B), other teachers valued their opinion, and they communicated well with others. However, it was not clear if SBTL teachers became stronger teachers and better leaders because of the program or if they were strong to begin with and that is why they took the

role of SBTL teachers. It was interesting to find that through the eyes of the support staff (administrators, supervisors, specialists) the program made the teachers stronger. But through the eyes of teachers who were not part of SBTL, SBTL teachers were leaders before they were part of the program.

Second, we stated that physical location or organizational design could also help to describe the organization's ability to leverage expertise. As we noted, teacher location and organizational design matter. Teachers interact more with teachers whose classrooms are closer together and with teachers in their same grade level or teaching the same course. SNA survey results revealed key members of the community. We saw that in general support staff and a few teachers are central to the network. (see diagrams 1, 2, 3, 6, and 11 in Appendixes A and B). This observation has twofold implications. On the one hand, a school administration would like teachers to rely on support staff for curriculum and teacher information. On the other hand, this could make the network instable. What would happen if these key players were no longer part of the network? Sometimes, having less central players is better. In other words, it could be desirable to have teachers rely more on other teachers than almost solely on support staff. However, as noted before, this result could be due to the design of the survey (more on this in the next section).

What aspects of the school organizational culture do teachers and administrators believe support the development of teachers as instructional leaders?

As one teacher put it, "probably the biggest thing is we all try to work as a team." The administration in both schools made sure teachers were involved at the ground level when implementing new ideas and asked for their continuous feedback. The environment where they can share information without feeling intimidated made teachers feel there is nothing to fear. Mainly, being supportive of each other and knowing that the school administration will support teachers by providing them with opportunities to participate in in-servicing, are seen as the best assets of the system of support.

There are a few matters to consider about this study. First, the selection of the sites and interview participants was purposeful. The schools were chosen as exemplary sites where SBTL teachers functioned as instructional leaders. The results obtained from the

SNA survey and the interviews would have been completely different if other t schools had been chosen. The same would have happened if other people had been chosen for the interviews. However the sites and interviewees were carefully chosen based on what the SBTL director wanted to know about the study.

Second, two concepts key to the study were somewhat confusing for the interviewees. The notion of *instructional leader* caused confusion, sometimes it was understood as the department chair job and we had to explain further. We did not have a concise definition of it. The same happened with the concept of *school organizational culture support*. I believe that presenting concise definitions of these two concepts would have cleared misunderstandings during the interview process.

Finally, we selected few items from the SNA survey to take back to the schools to discuss with the interview participants. However, other network diagrams could have been shared with them. The items were chosen based on what we believed to be the most relevant items to inform the purpose of the study.

References

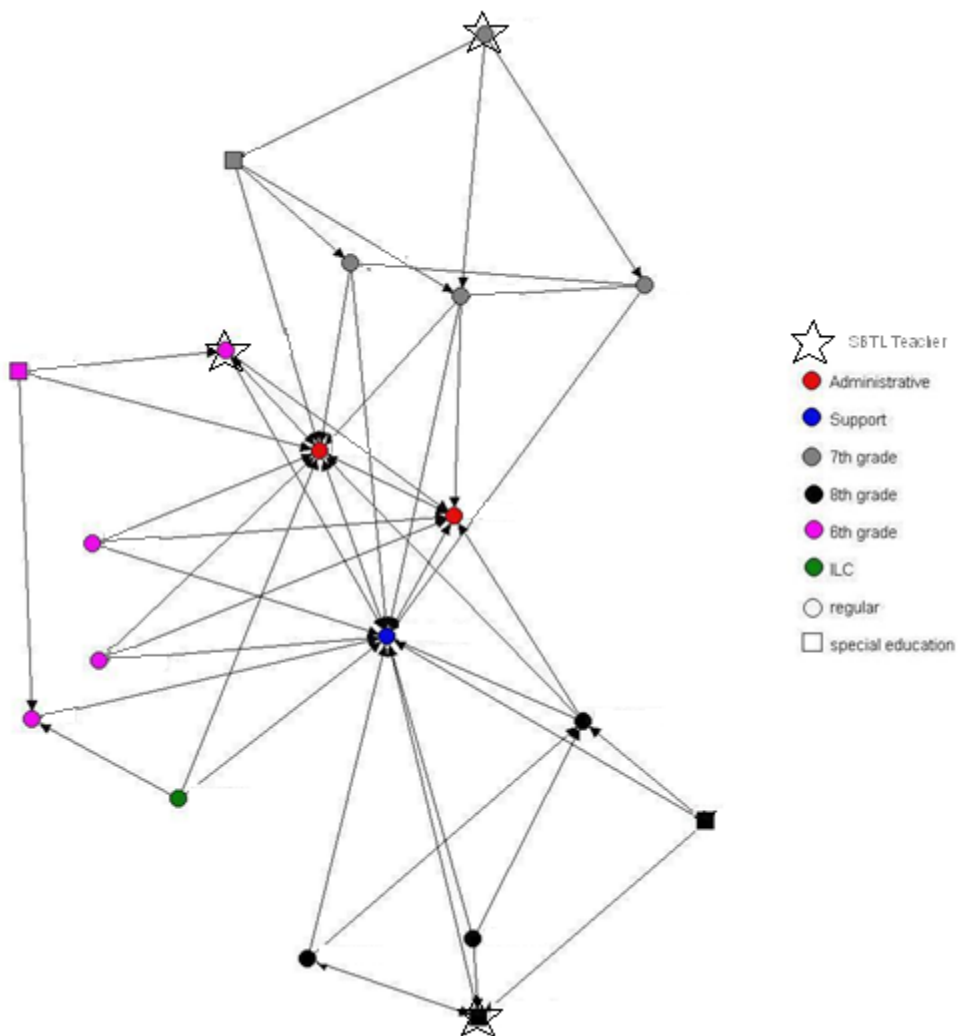
Cross, R., & Parker, A. (2004). The hidden power of social networks: Understanding how work really gets done in organizations. Boston: Harvard Business School Press.

Appendix A

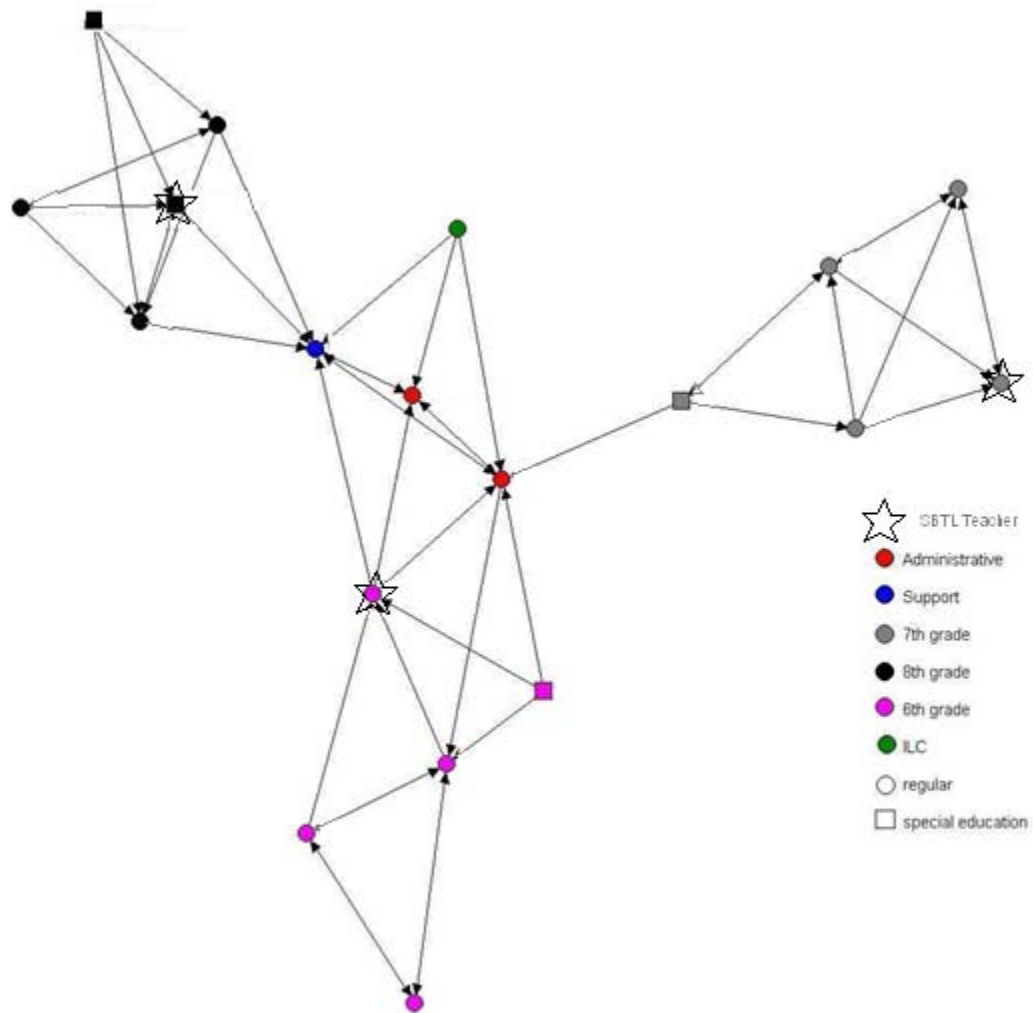
Social Network Analysis for School A

Communication/information flow

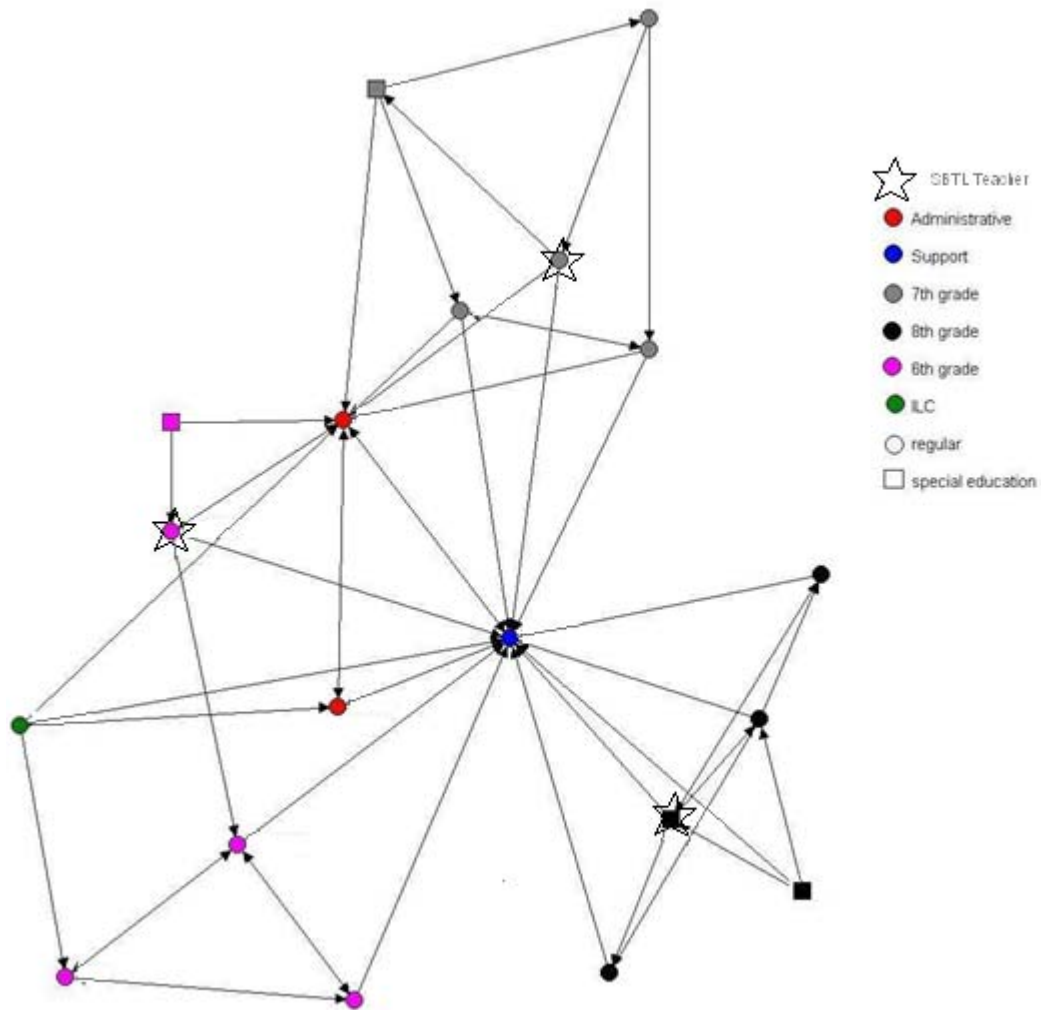
1. Select up to three people from whom you most often receive information about your school's mathematics curriculum.



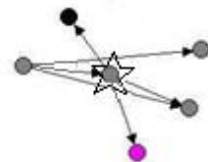
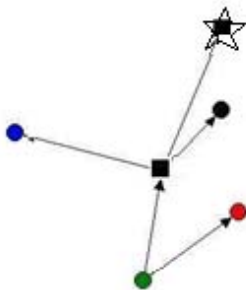
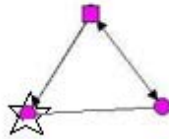
2. Select up to three people to whom you most often give information about your school's mathematics curriculum.



3. Select up to three people you turn to most often when you want to discuss an issue about your school's mathematics curriculum.

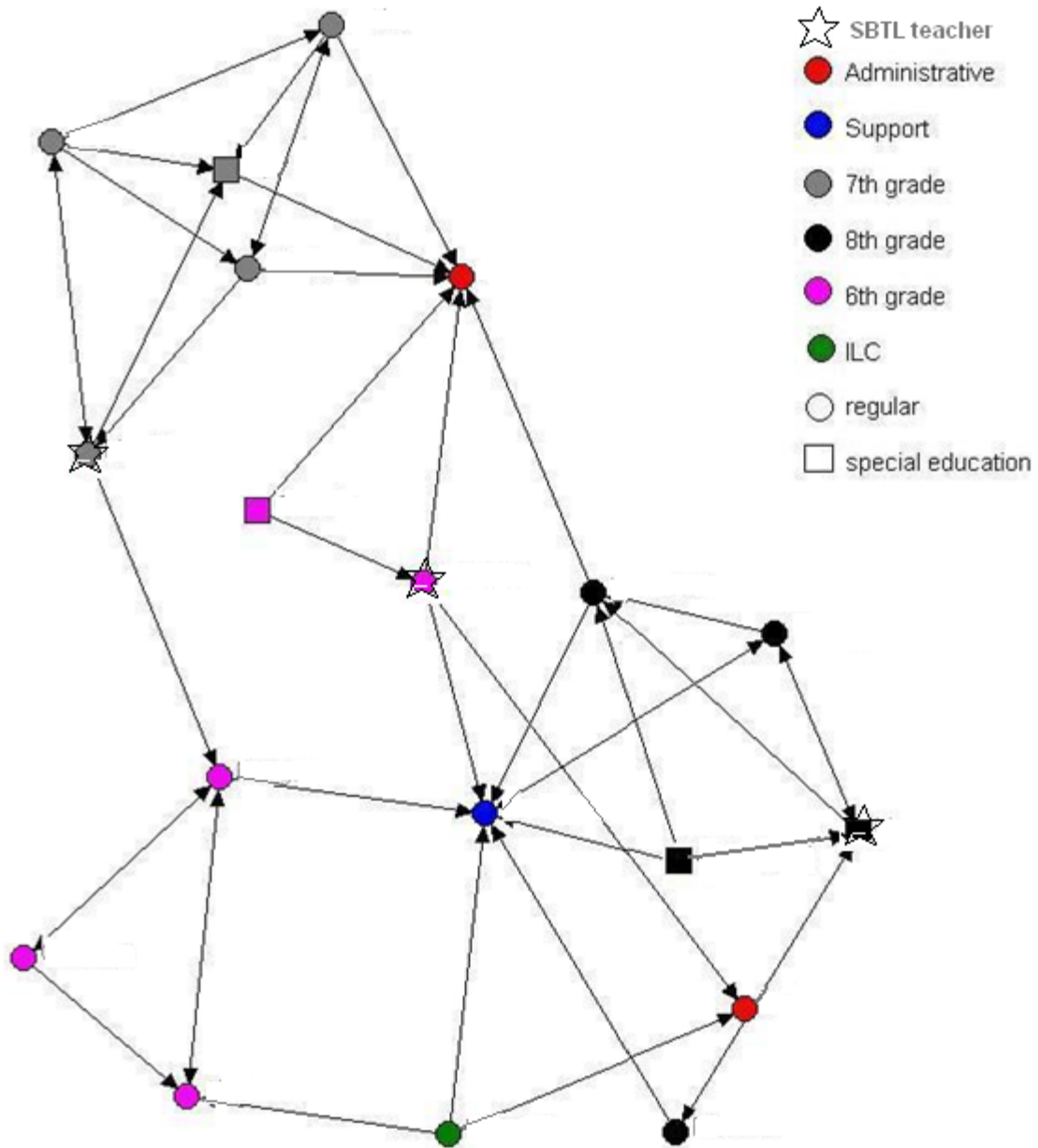


4. Select up to three people with whom improved communication would enhance your math teaching.

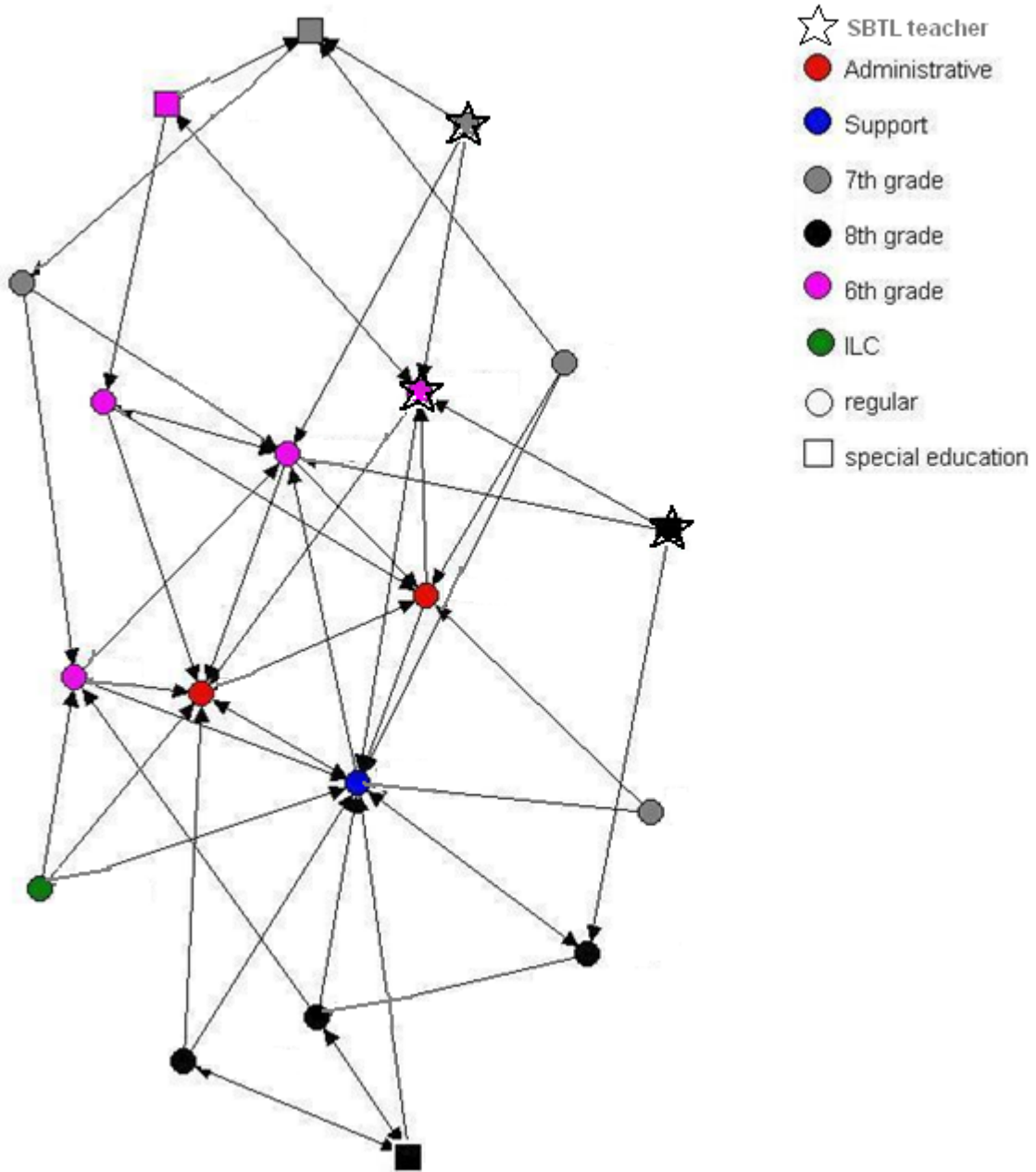


Advice/support

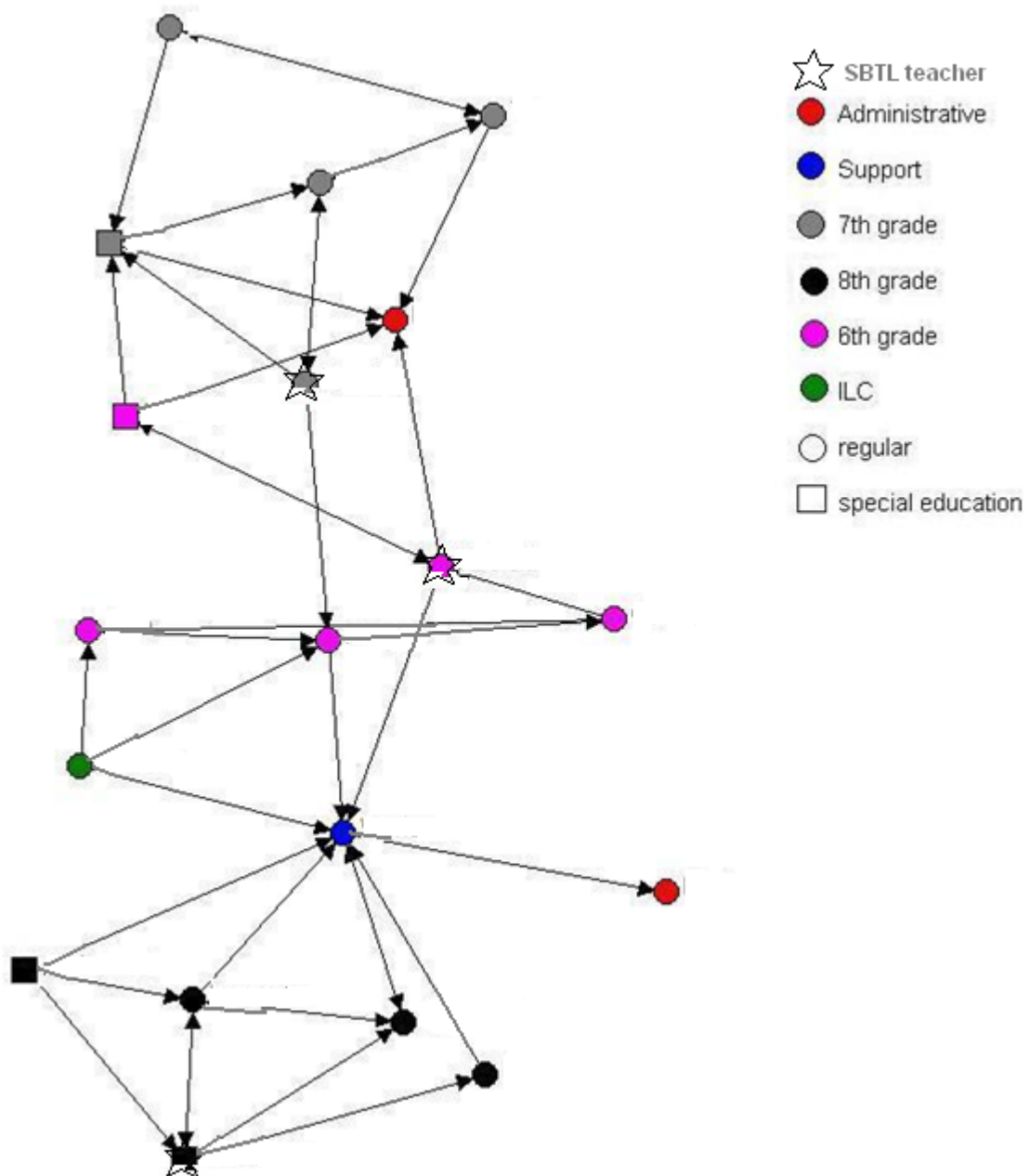
5. Select up to three people you turn to most often for advice about your teaching math.



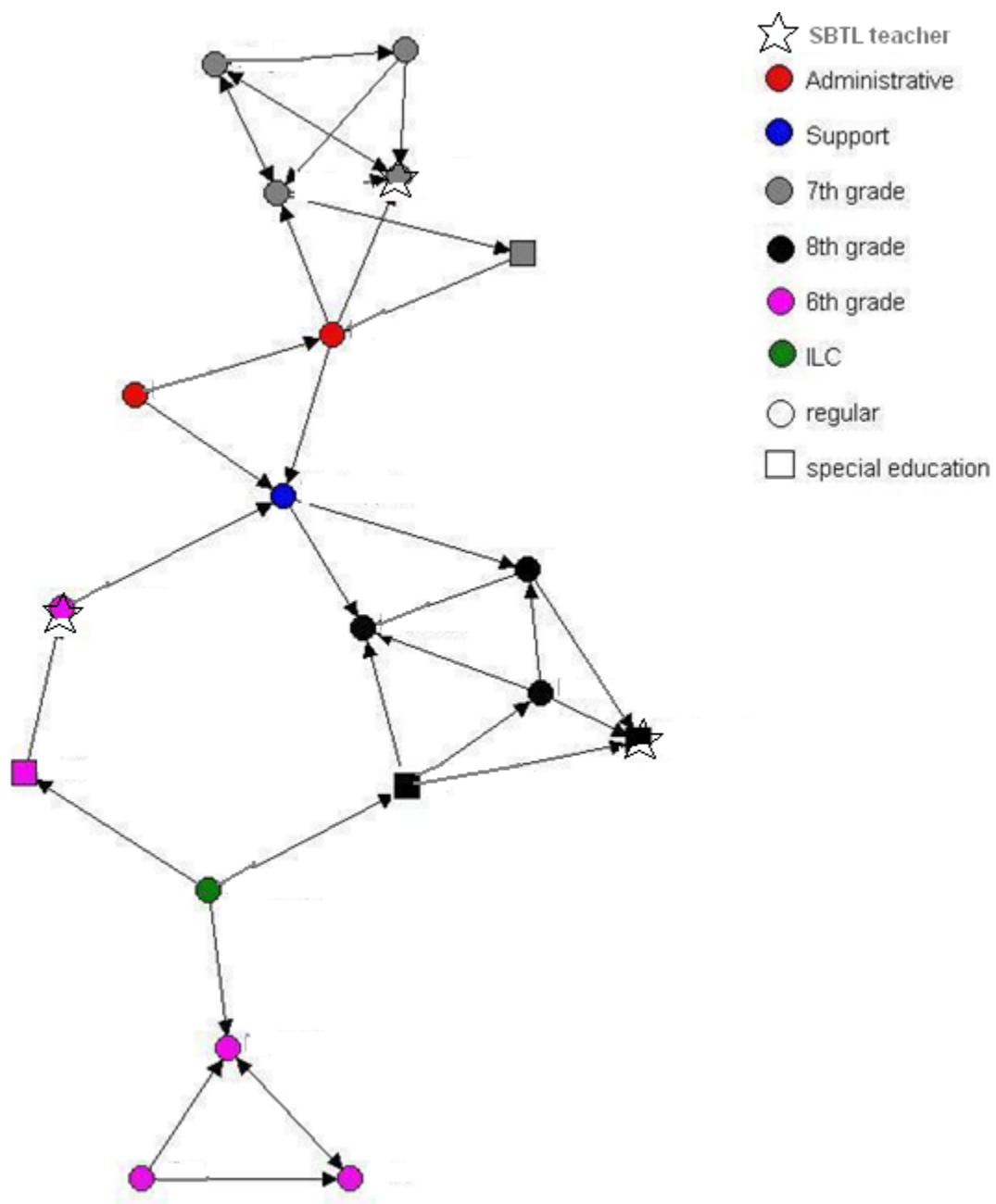
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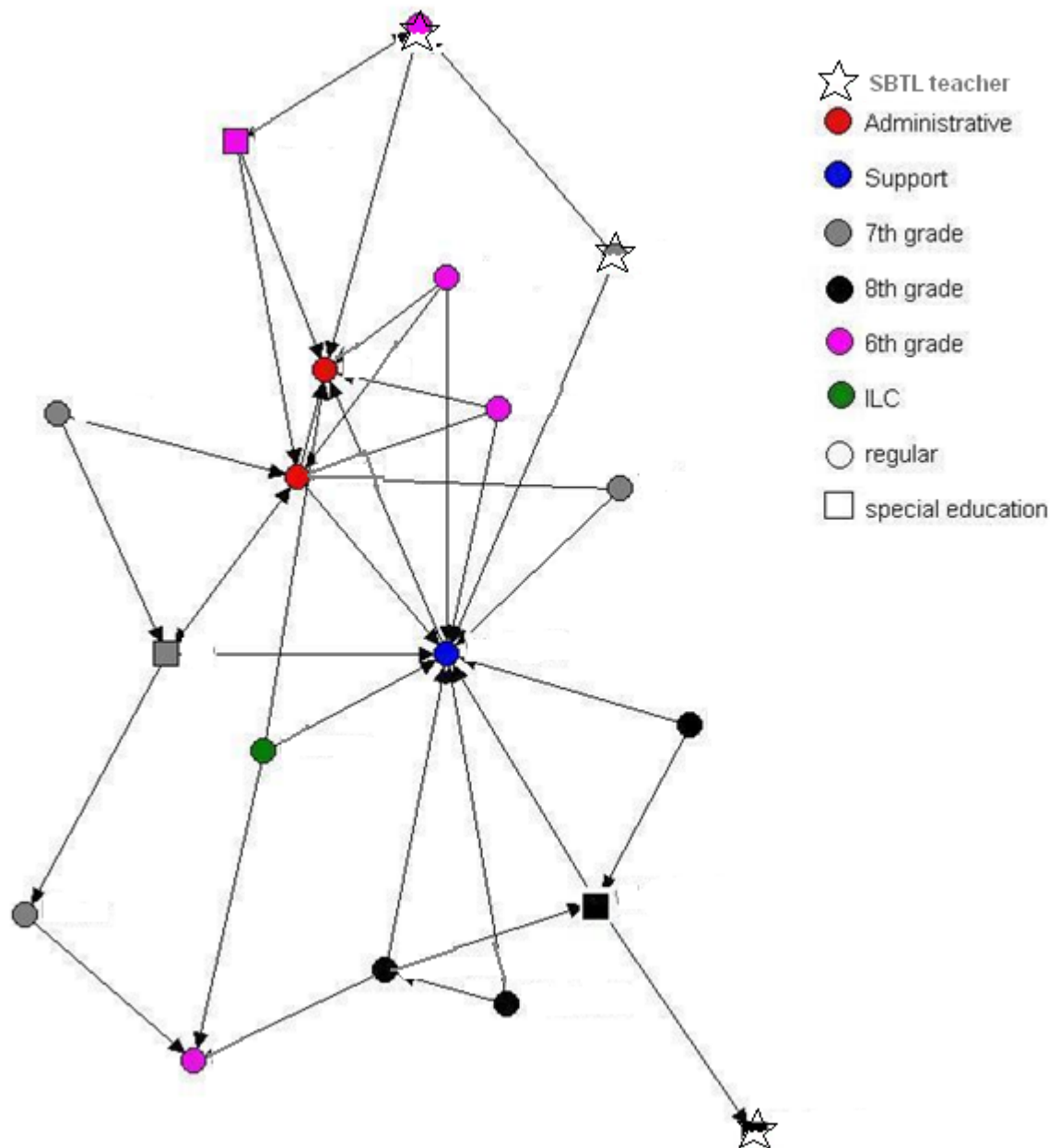
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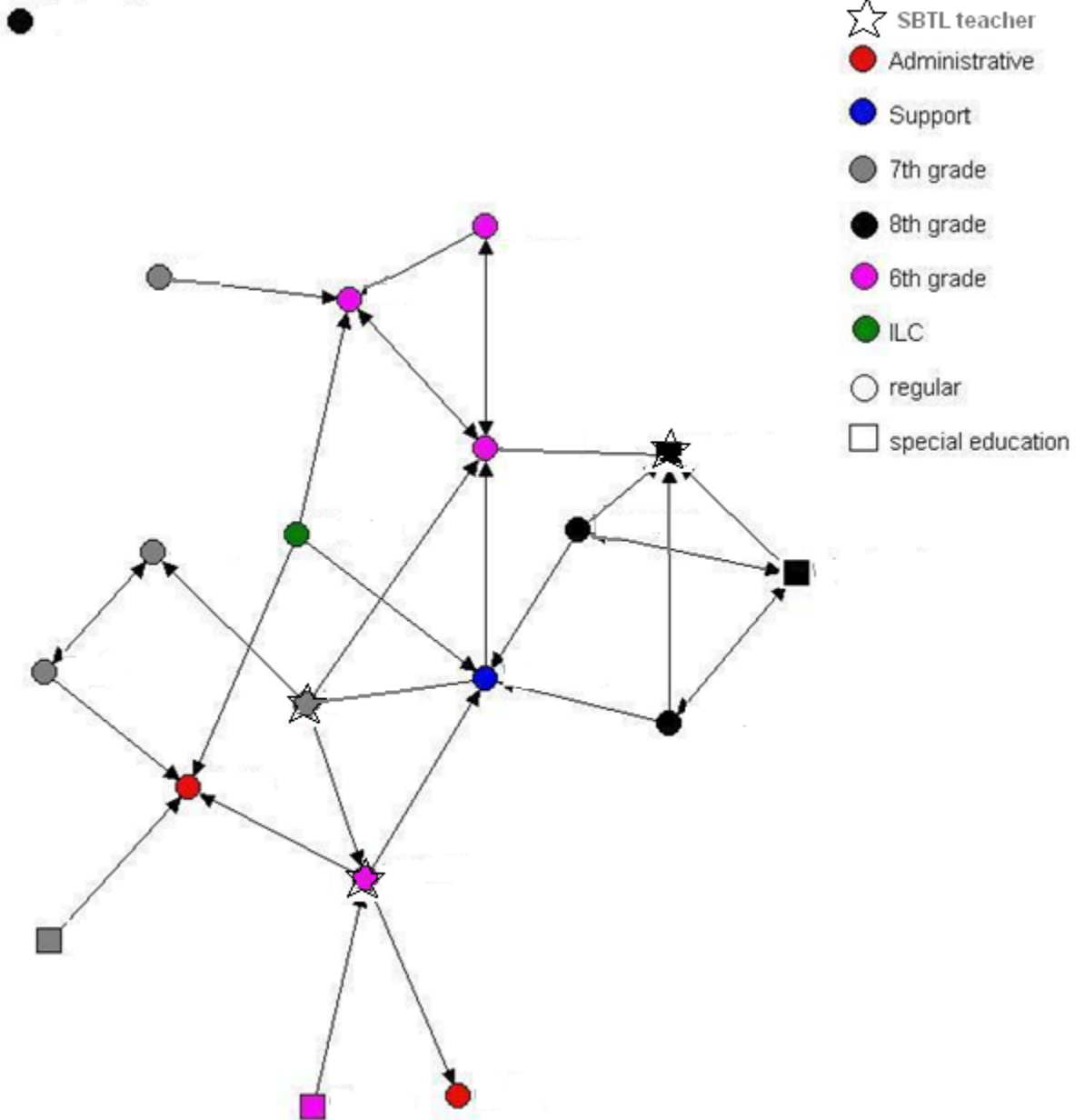


9. Select up to three people who have contributed most to your professional development as a mathematics teacher.

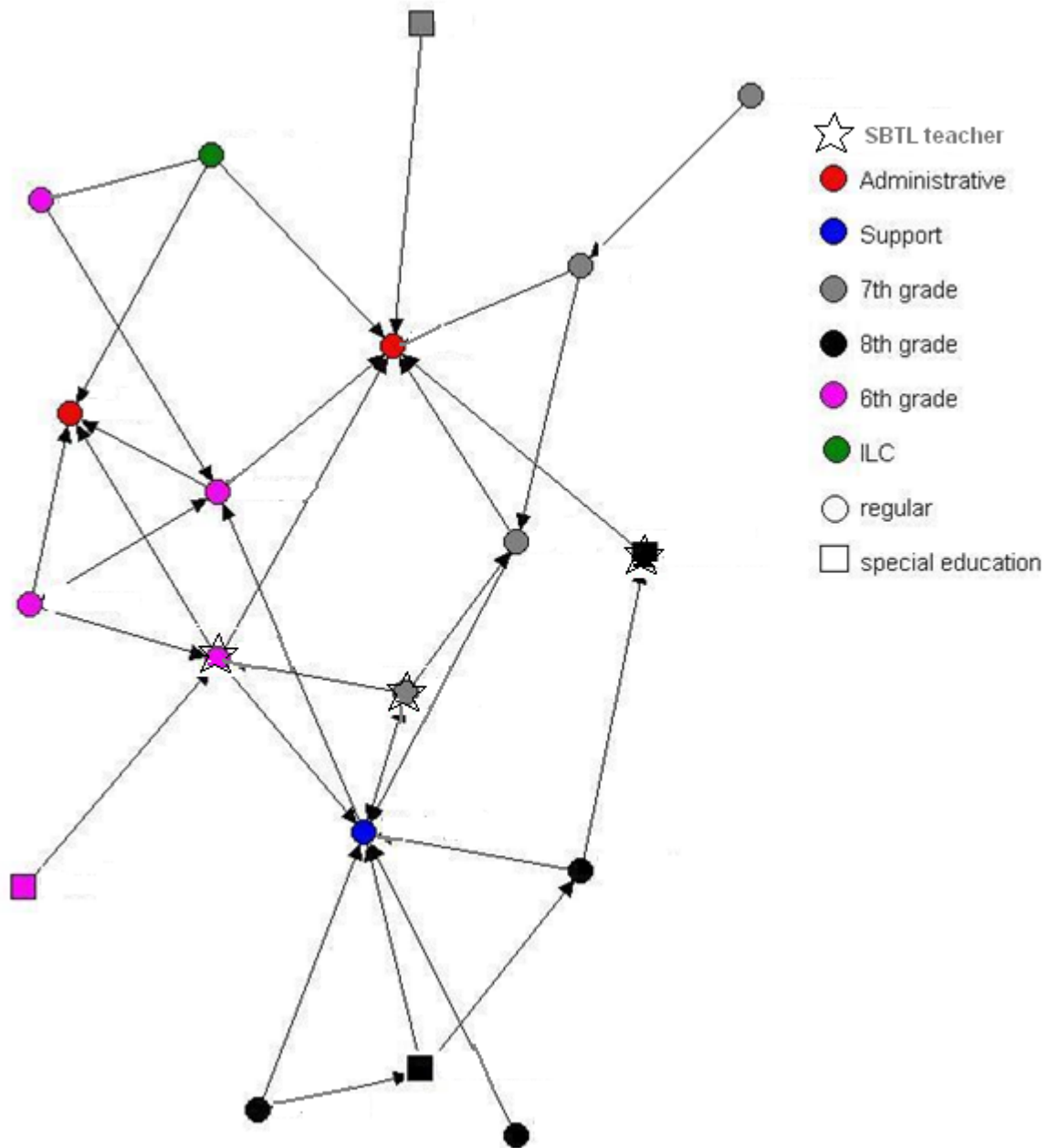


Motivation/energy

10. Select up to three people who do the most to energize your mathematics teaching.



11. Select up to three people who most often inspire you to try something new in your mathematics teaching.

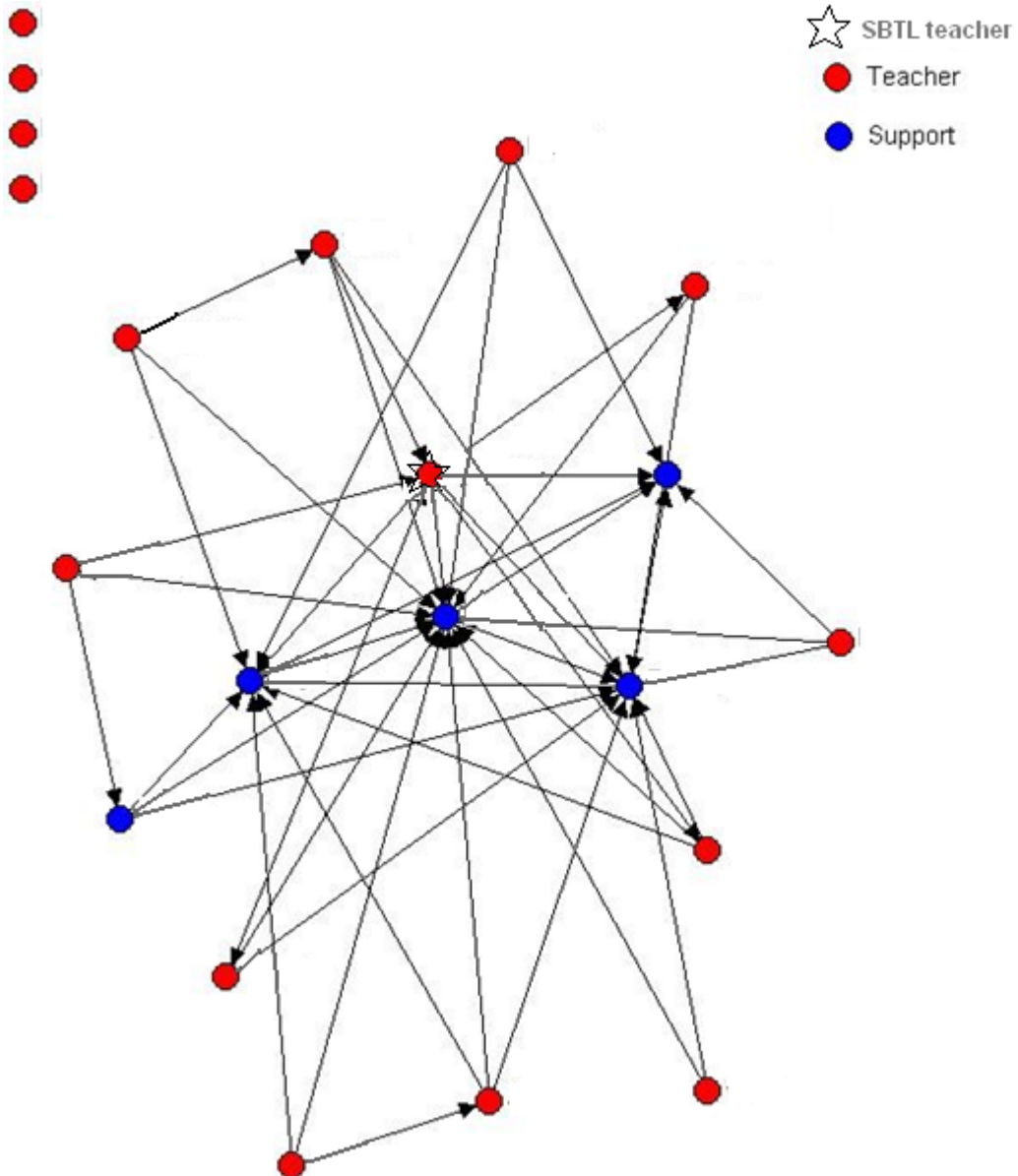


Appendix B

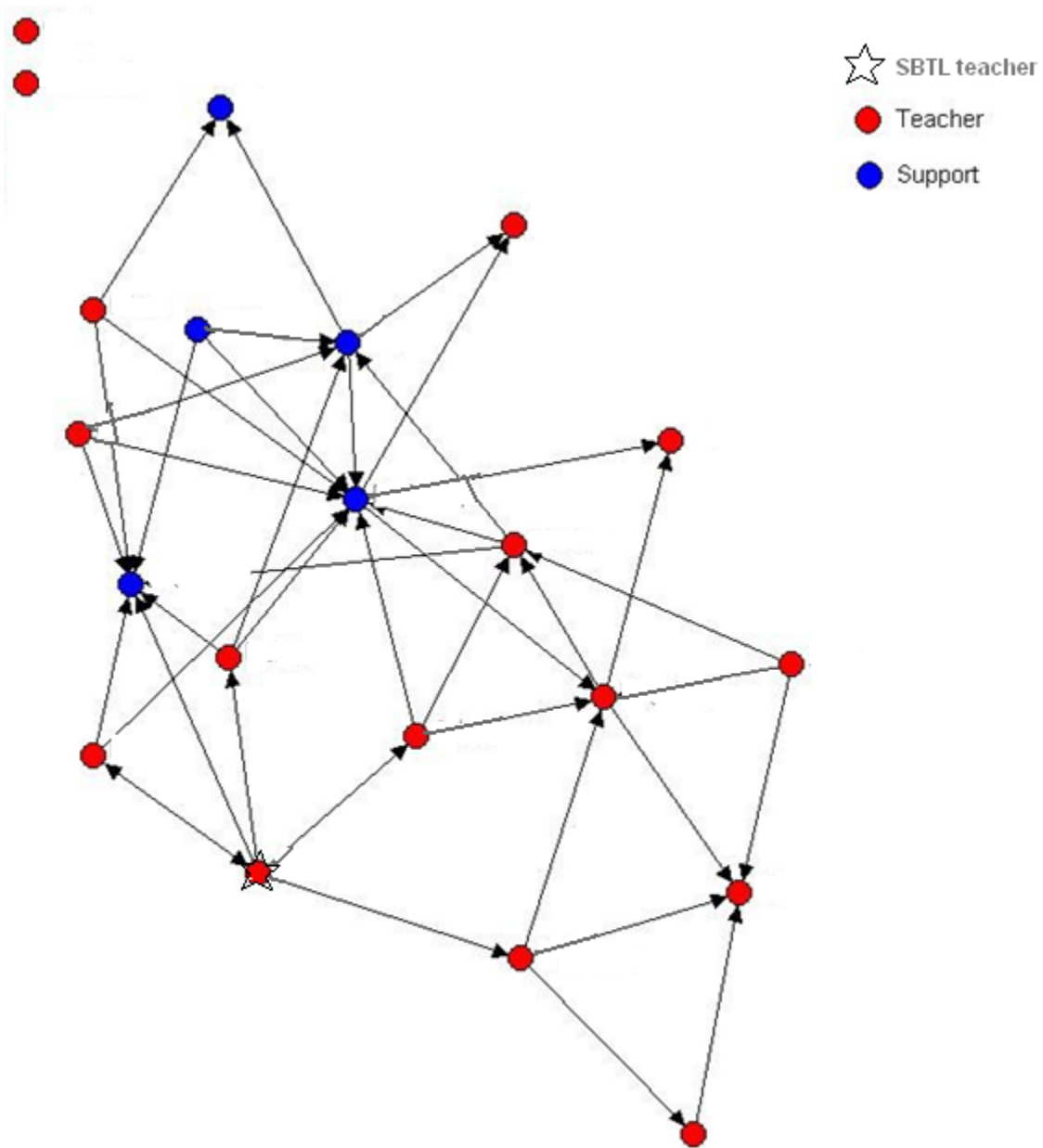
Social Network Analysis for School B

Communication/information flow

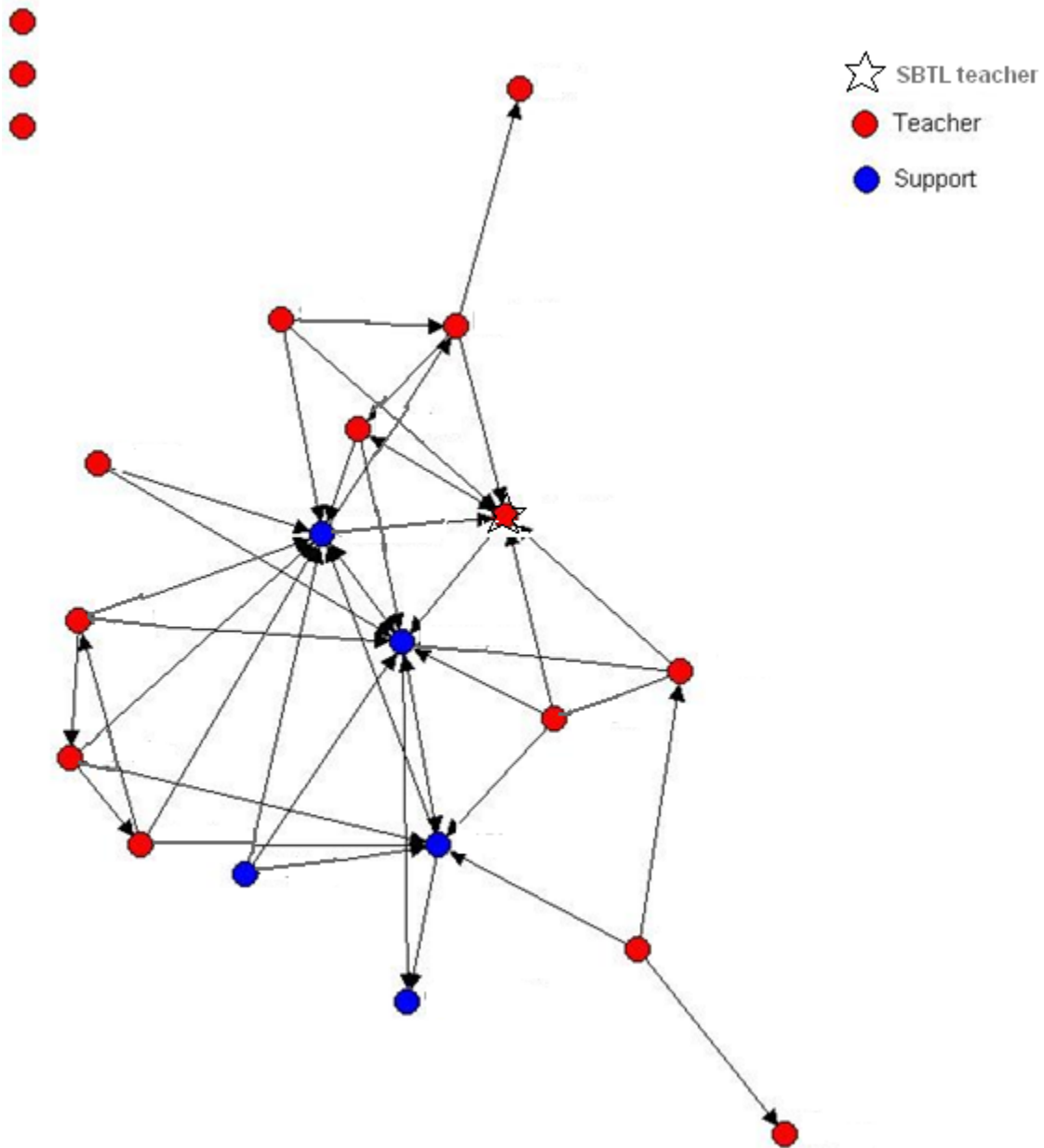
1. Select up to three people from whom you most often receive information about your school's mathematics curriculum.



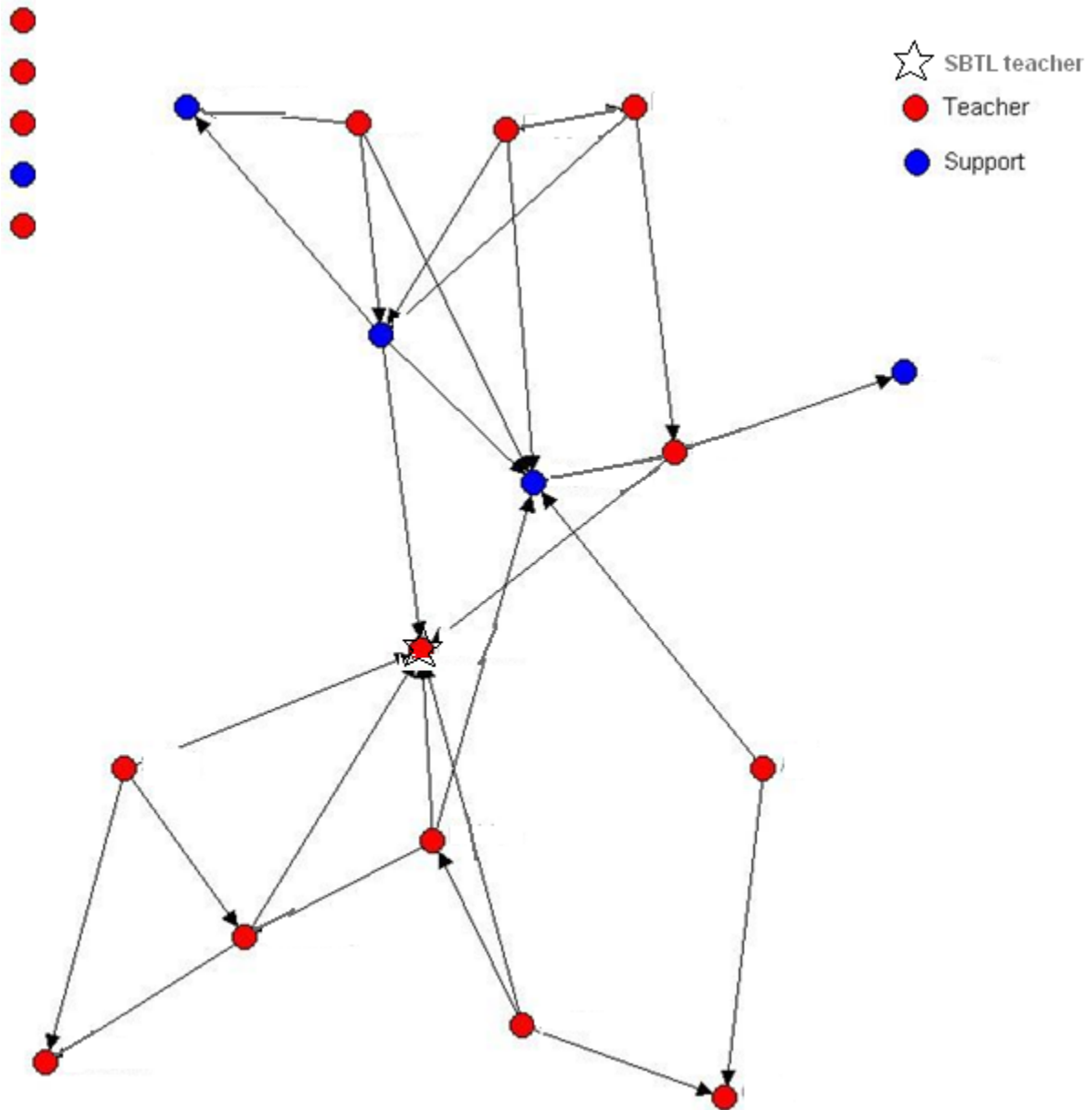
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3. Select up to three people you turn to most often when you want to discuss an issue about your school's mathematics curriculum.

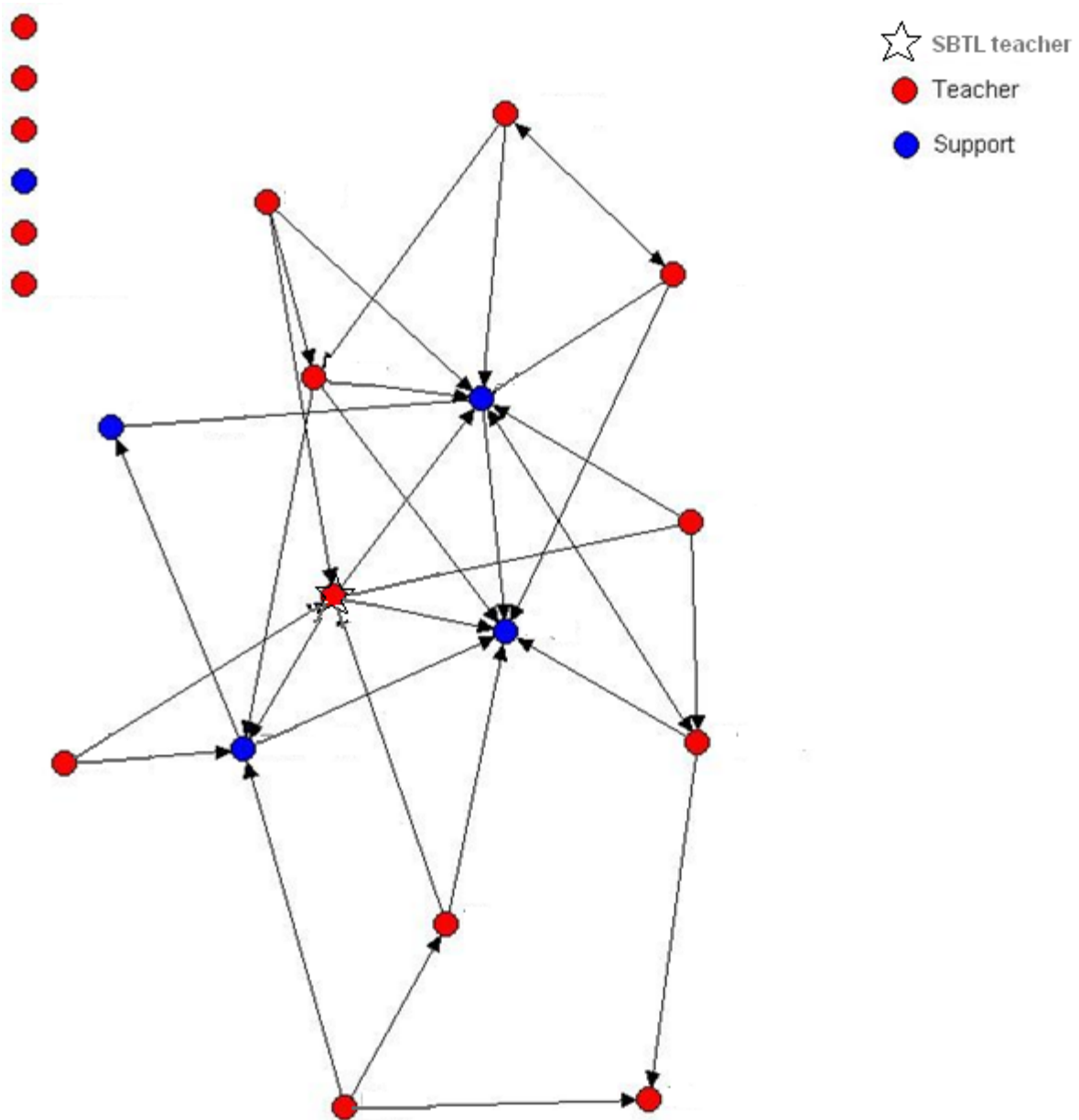


4. Select up to three people with whom improved communication would enhance your math teaching.

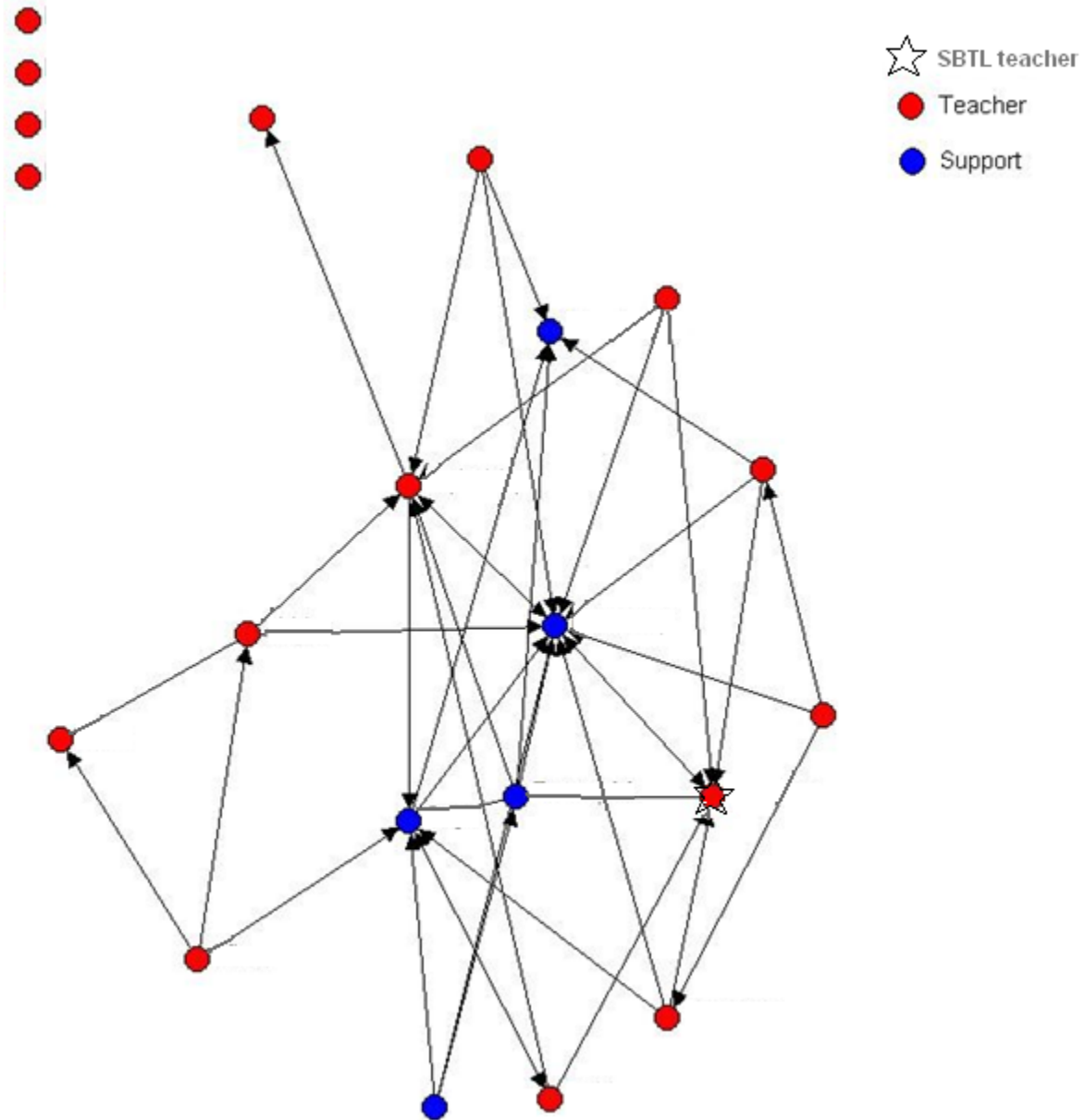


Advice/support

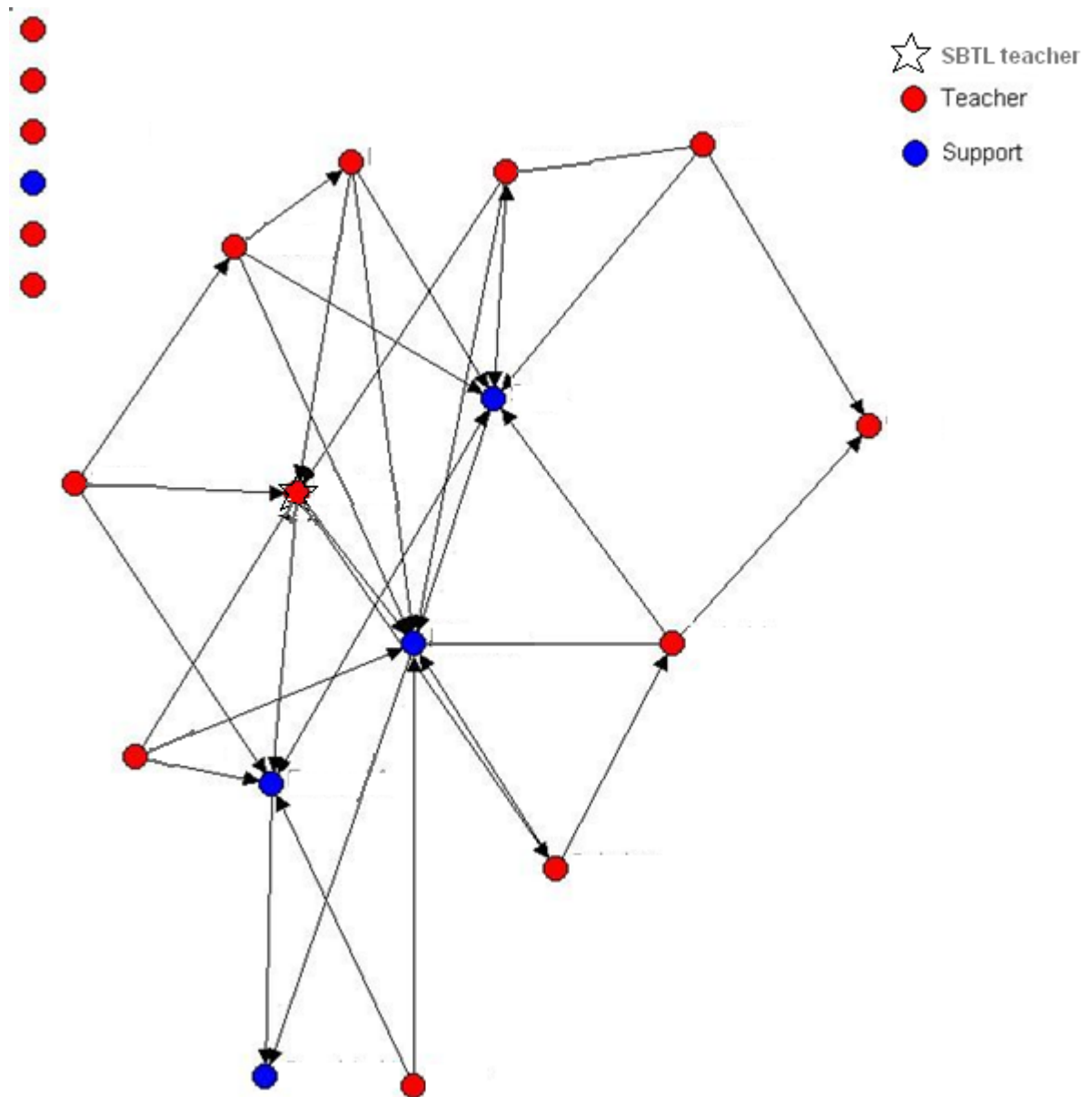
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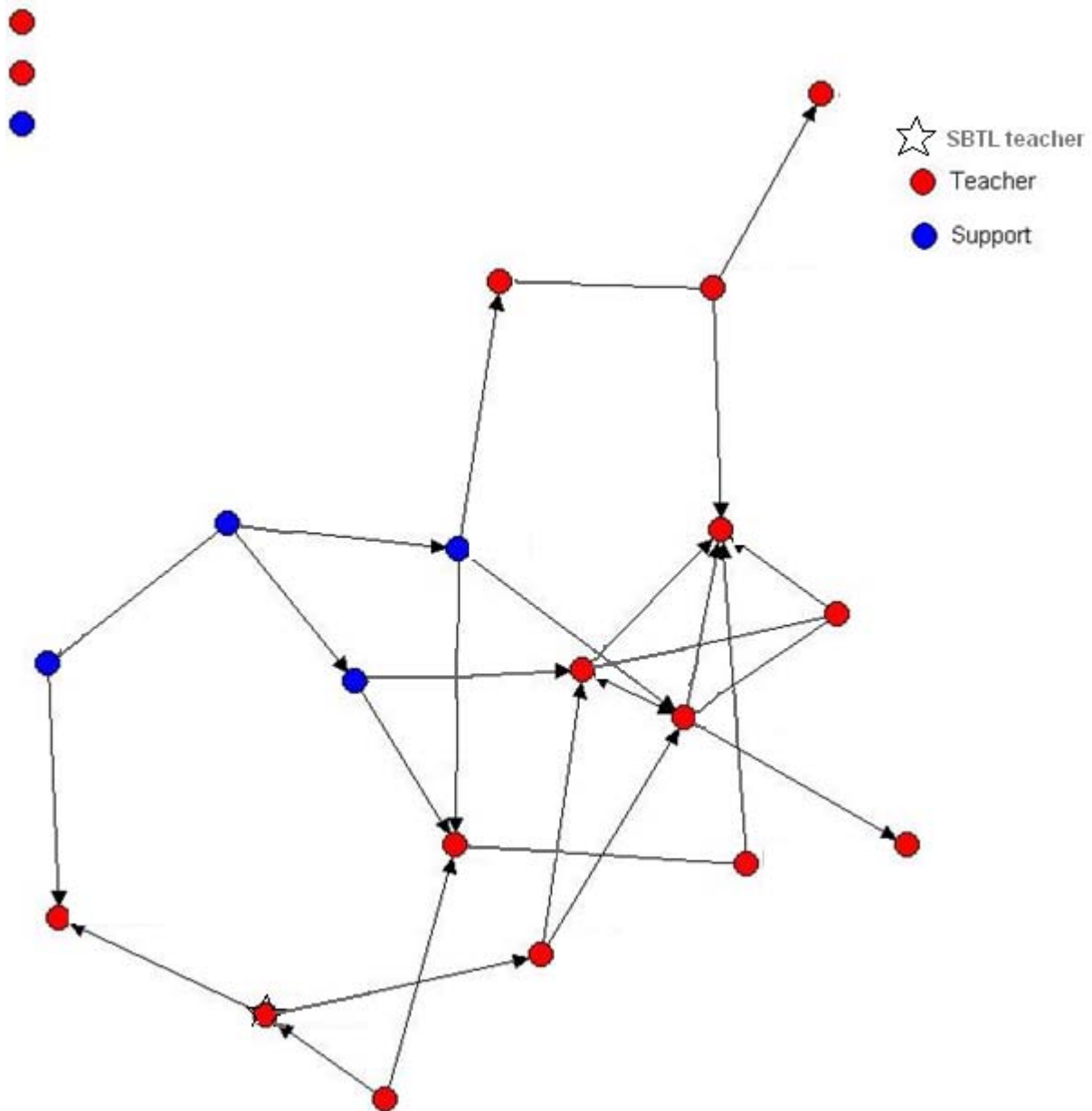
6. Select up to three people whose perspectives about mathematics education you highly value.



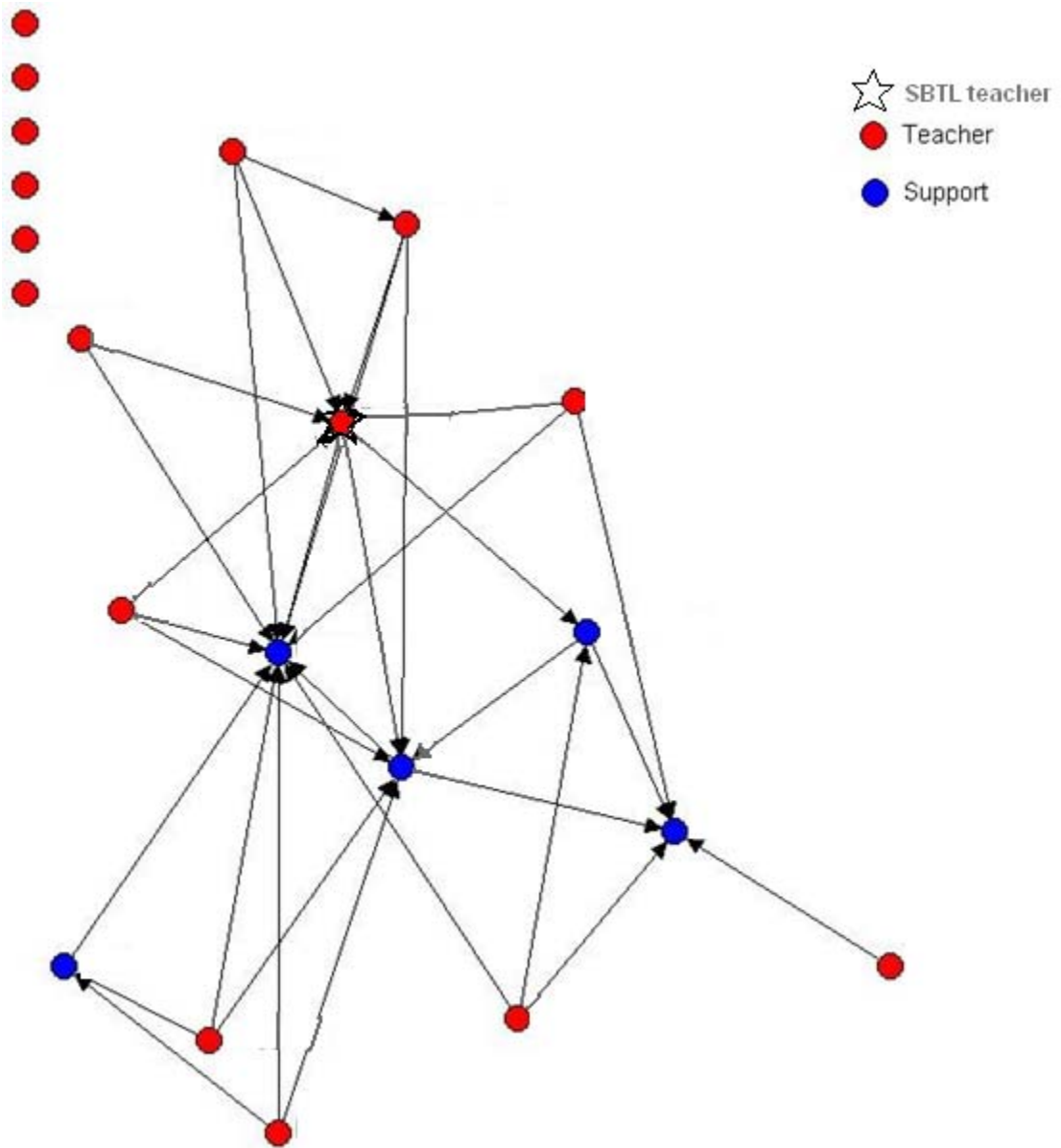
7. Select up to three people you turn to most often when you want to discuss an issue related to your mathematics teaching.



8. Select up to three people to whom you most often offer advice about mathematics teaching.

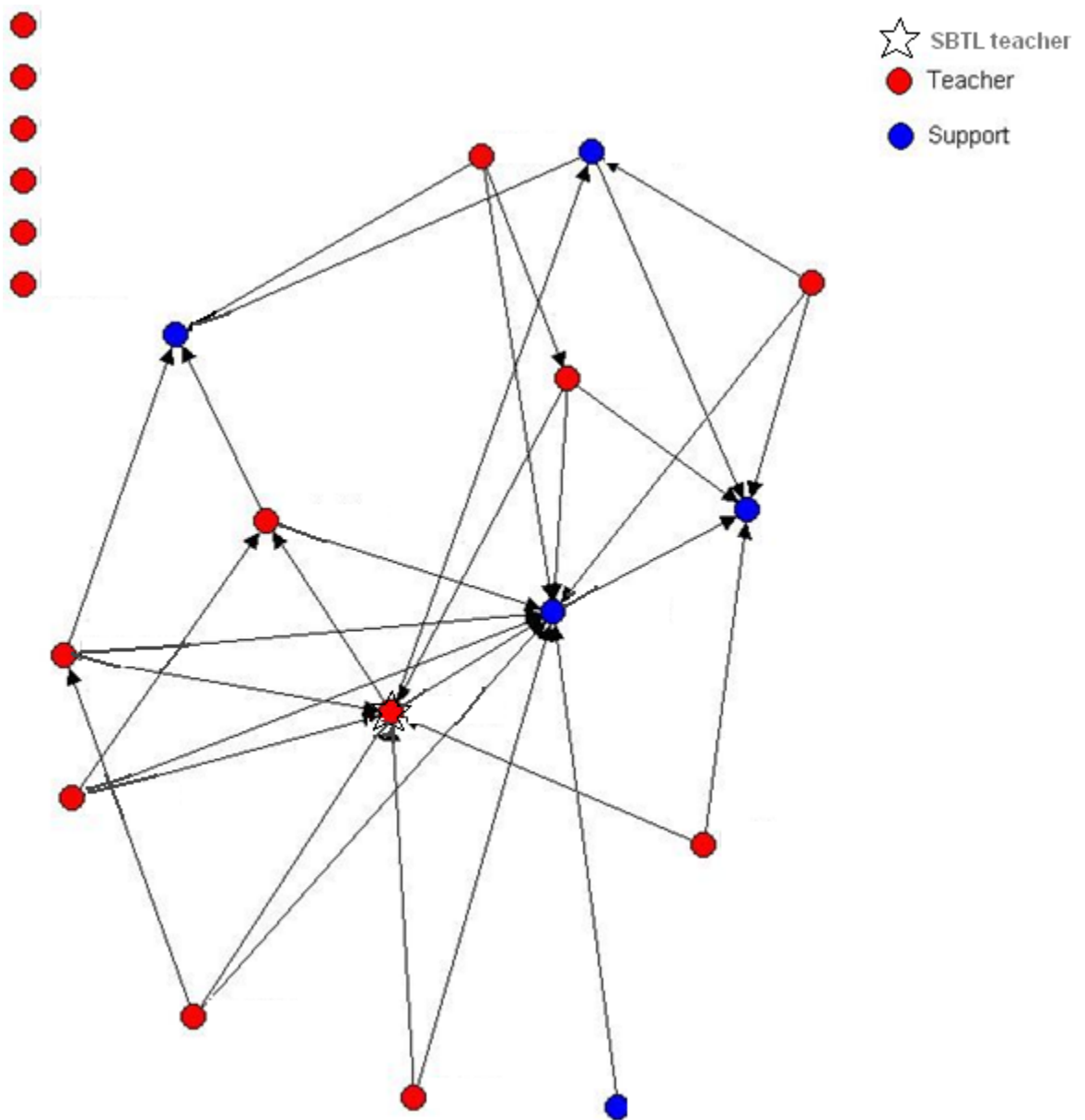


9. Select up to three people who have contributed most to your professional development as a mathematics teacher.



Motivation/energy

10. Select up to three people who do the most to energize your mathematics teaching.



11. Select up to three people who most often inspire you to try something new in your mathematics teaching.

