

Concept Maps As Network Data

Applying Social Network Analysis to a Network of Ideas

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Thursday, October 25, 2012
Session 346
Room 205A
2:40 PM to 4:10 PM



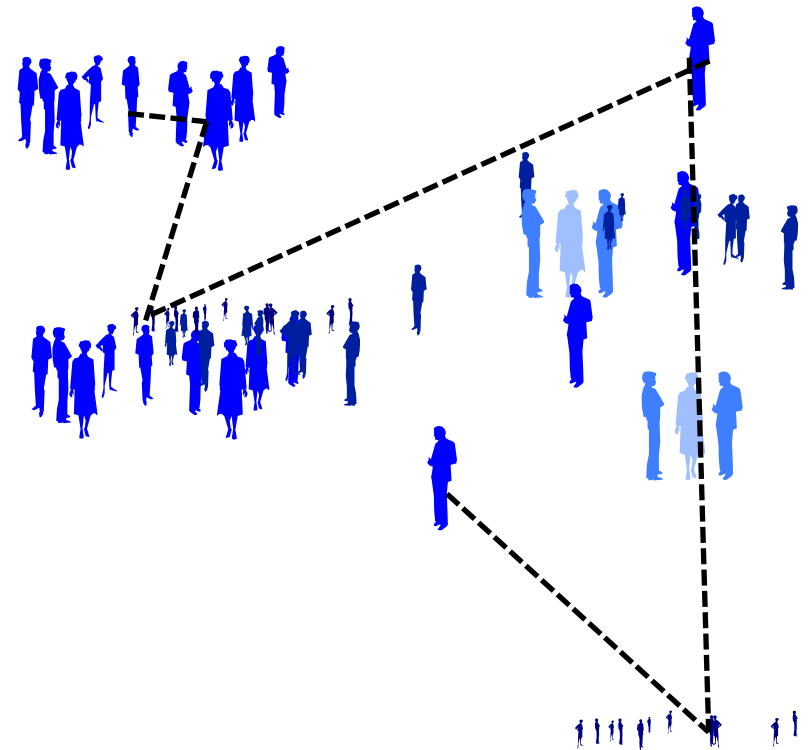
Concept mapping

What does a group of people think about an issue, a problem, an opportunity?



Social Network Analysis

How does a thought (or other things) travel among a group of people?



Data elements

Matrix of sorting data

	1	2	3	4	5	6	7	8	9	10	
1		10	2	3	6	0	2	1	0	10	0
2	2		10	2	1	0	10	2	8	2	2
3	3	2		10	3	2	2	2	2	1	2
4	6	1	3		10	0	1	0	2	4	0
5	0	0	2	0		10	0	0	0	0	9
6	2	10	2	1	0		10	3	3	2	1
7	1	2	2	0	0	3		10	2	0	2
8	0	8	2	2	0	3	2		10	0	1
9	10	2	1	4	0	2	0	0		10	0
10	0	2	2	2	0	9	1	2	1		10

Item x,y coordinates

	DIM1	DIM2
1	0.542326033115387	0.385941505432129
2	0.225024715065956	-0.703442990779877
3	0.662457406520844	0.316630721092224
4	0.221995964646339	0.211212575435638
5	-0.374371707439423	-0.454587280750275
6	-0.020222516730427	-0.645235419273376
7	-0.754471182823181	-0.269502848386765
8	0.126232028007507	-0.583325505256653
9	-0.263070911169052	0.632656157016754
10	-0.400508970022202	-0.605298221111298

Item cluster membership

	CLU5
1	1
2	2
3	1
4	3
5	4
6	2
7	4
8	2
9	5
10	4

Concept Mapping *

WHY

- Complex issue
- Multiple perspectives
- Need for shared understanding
- Leads to diverse thinking and open innovation

PROCESS

- Focus
- Participants
- Ideas
- Unstructured sorting
- Multivariate Analysis
- Interpretation

* Concept mapping

Kane, M. & Trochim, W.M.K. (2007). *Concept mapping for planning and analysis*. Thousand Oaks, CA. Sage Publications.

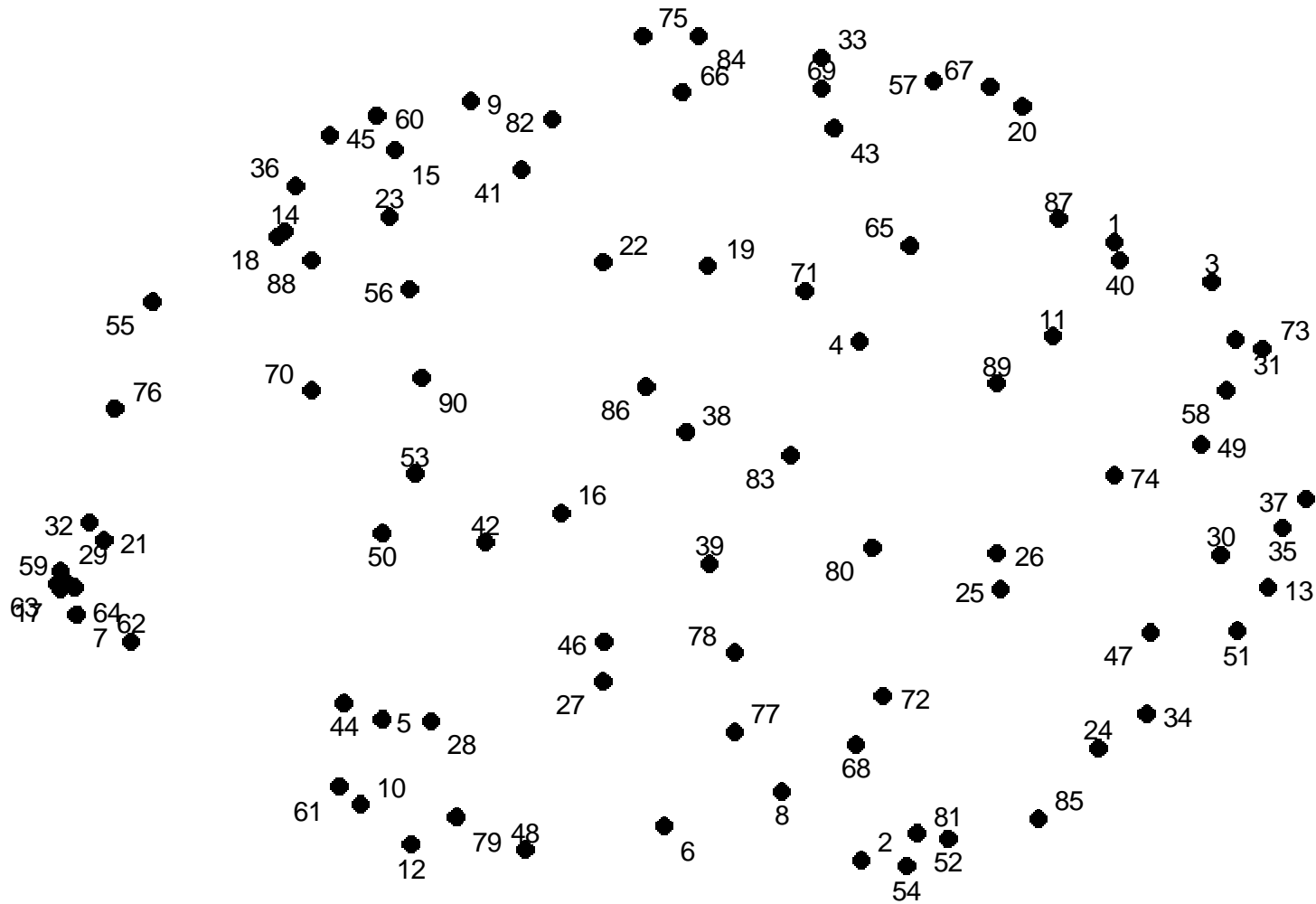
Trochim, W. M. K. (1989). An introduction to concept mapping for planning and evaluation. *Evaluation and Program Planning*, 12, 1–16.

Trochim, W. M. K. (1989). Concept Mapping: Soft science or hard art . *Evaluation and Program Planning*, 12, 87-110.

The Project

- Focus
 - *To reflect our role as the leader in child health and a global education destination Pediatric Grand Rounds must...*
- Idea Generation
 - Participants
 - CME committee
 - Physician Leaders
 - Residents
 - Fellows
 - Community Physicians
 - PGR attendees – Live event and online
 - PGR non-attendees
 - Results
 - Generated 187 expectations
 - Design team reviewed to eliminate redundancies, edited for consistency and create a representative sample of 90 ideas
- Sorting - Twenty two participants organized the 90 ideas into themes.
- Analysis - Multivariate statistical analysis to map the ideas and identify the themes
- **Network Analysis**

Multidimensional Scaling* to map the ideas

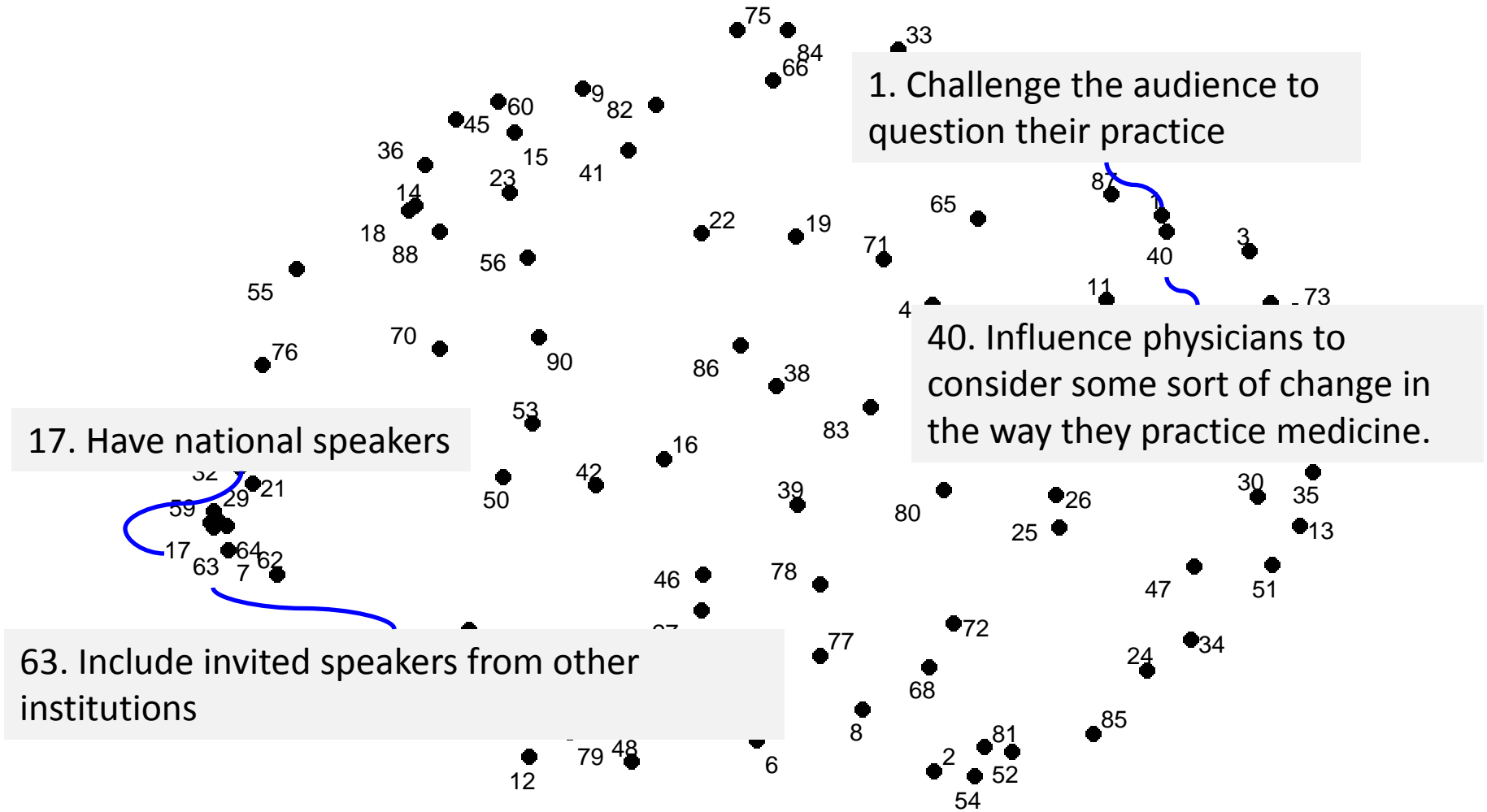


* [SMACOF procedure for MDS using R](#)

de Leeuw, J., & Mair, P. (2009). Multidimensional scaling using majorization: The R package smacof. *Journal of Statistical Software*, 31(3), 1-30.

R Foundation for Statistical Computing. (2011). *R: A language and environment for statistical computing*, version 2.13.

Similar ideas are close together and ...



... different ideas are far apart.

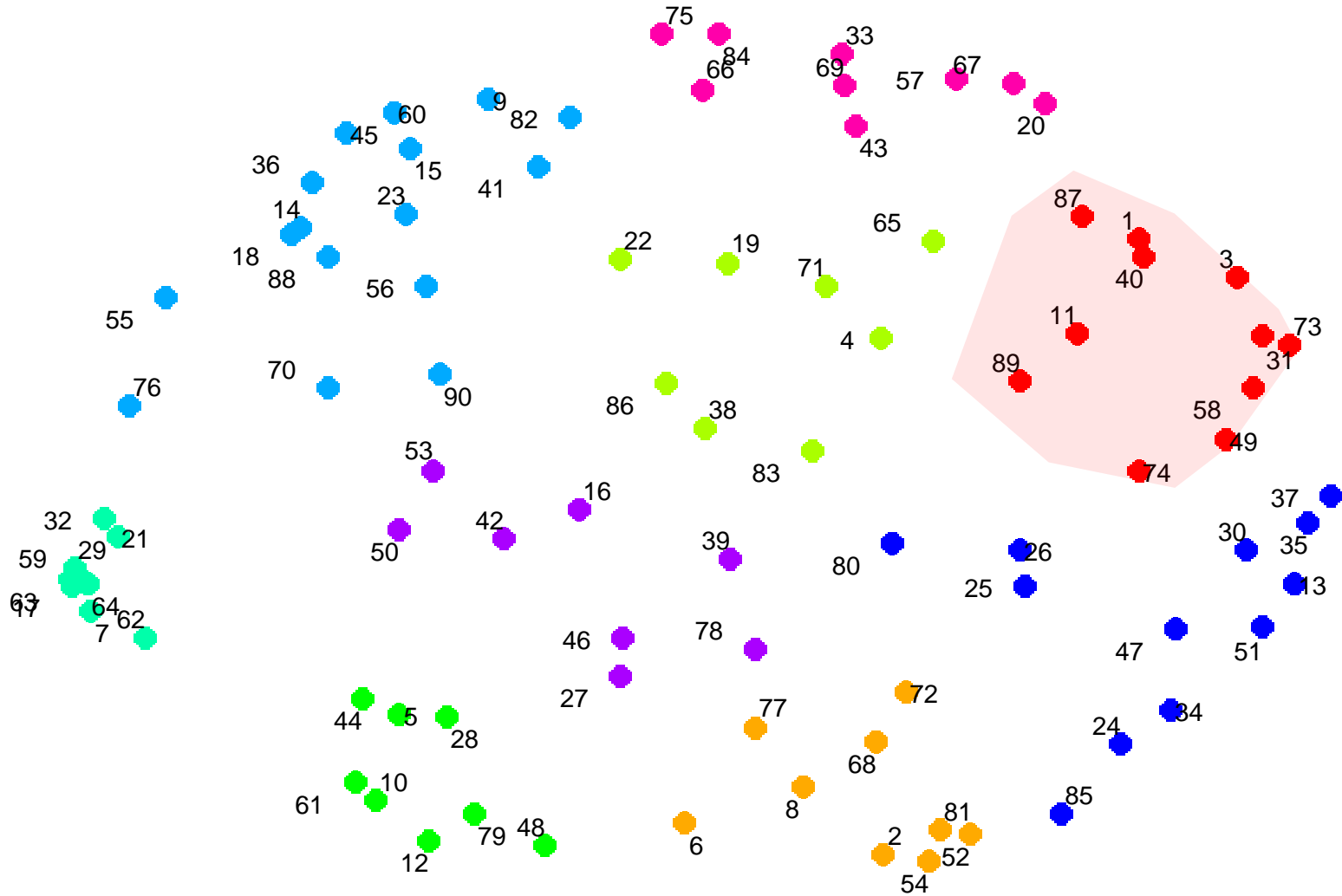
9. Generate more probing discussions during the question and answer sessions.

1. Challenge the audience to question their practice

63. Include invited speakers from other institutions

34. Provide current, state-of-the-art knowledge about key pediatric disorders and practice.

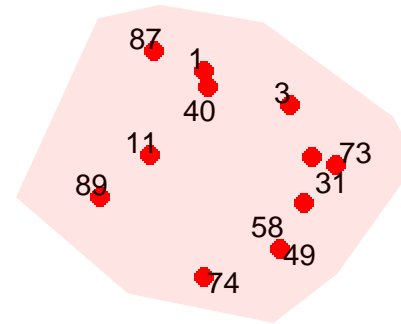
Similar ideas coalesce into themes*



* Cluster Analysis partitions the space based on x,y coordinates

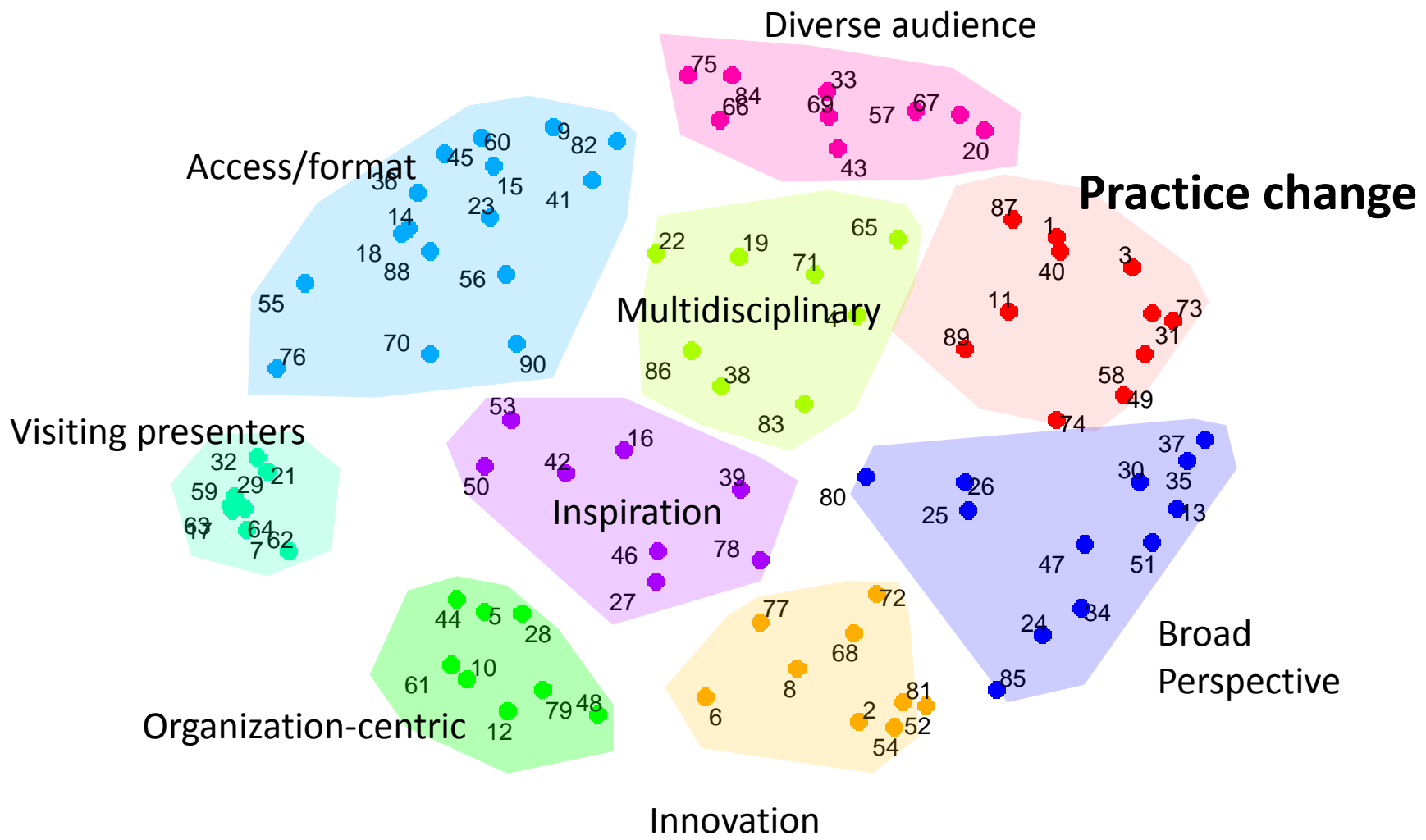
Each cluster is composed of multiple related ideas

1. Challenge the audience to question their practice
3. Provide a forum for topics of child health and education that are relevant to organization and to the community at large.
11. Provide an alternative format that includes dissemination of information of interest to the general pediatrician such as the infectious agents are currently being detected which could then be followed by a brief presentation.
31. Maintain contact with the pediatric community that supports the hospital by presenting topics important to that group
40. Influence physicians to consider some sort of change in the way they practice medicine.
49. Cover comprehensive reviews of pediatric topics with high impact
58. Provide the primary care physician in the trenches with information that is useful "in the trenches", for example, we don't necessarily need to know how surgeries are done, but when to refer to the specialist for a specific condition.
73. Cover a wide range of topics that are pertinent to the practicing general pediatrician.
74. Present topics that enable the pediatricians to survive in a changing healthcare landscape.
87. Stimulate the audience to make changes in their practice, for instance a recent grand rounds on autism helped me to see that my usual cheery entrance into an exam room may threaten a sensitive child
89. Cover topics that call for community and multidisciplinary involvement

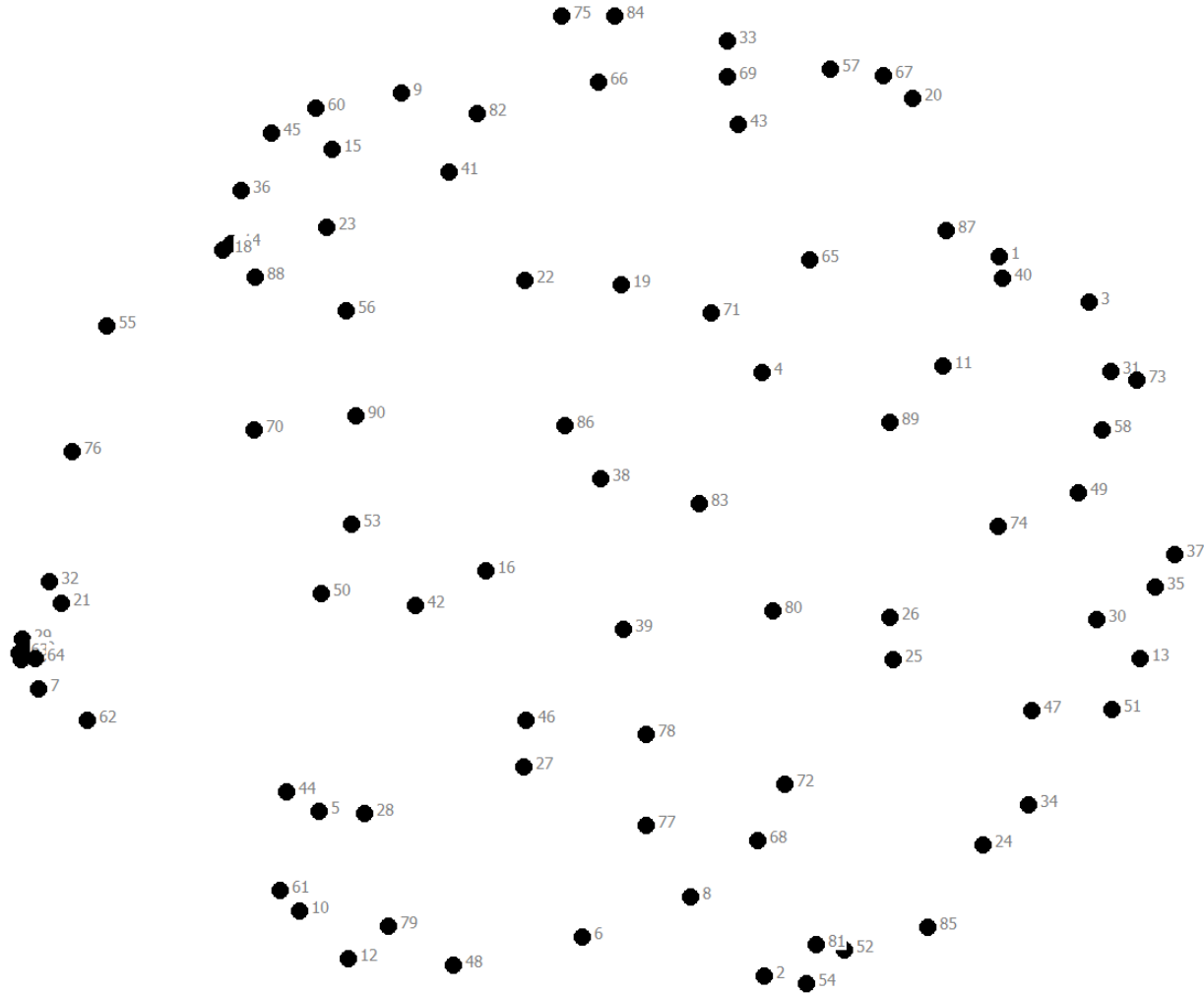


- Change in Practice
- Importance to the Primary Care Physician
- Impact on Primary Care

Naming the cluster creates a shared mental model through a common language



Apply network analysis to a network of ideas *

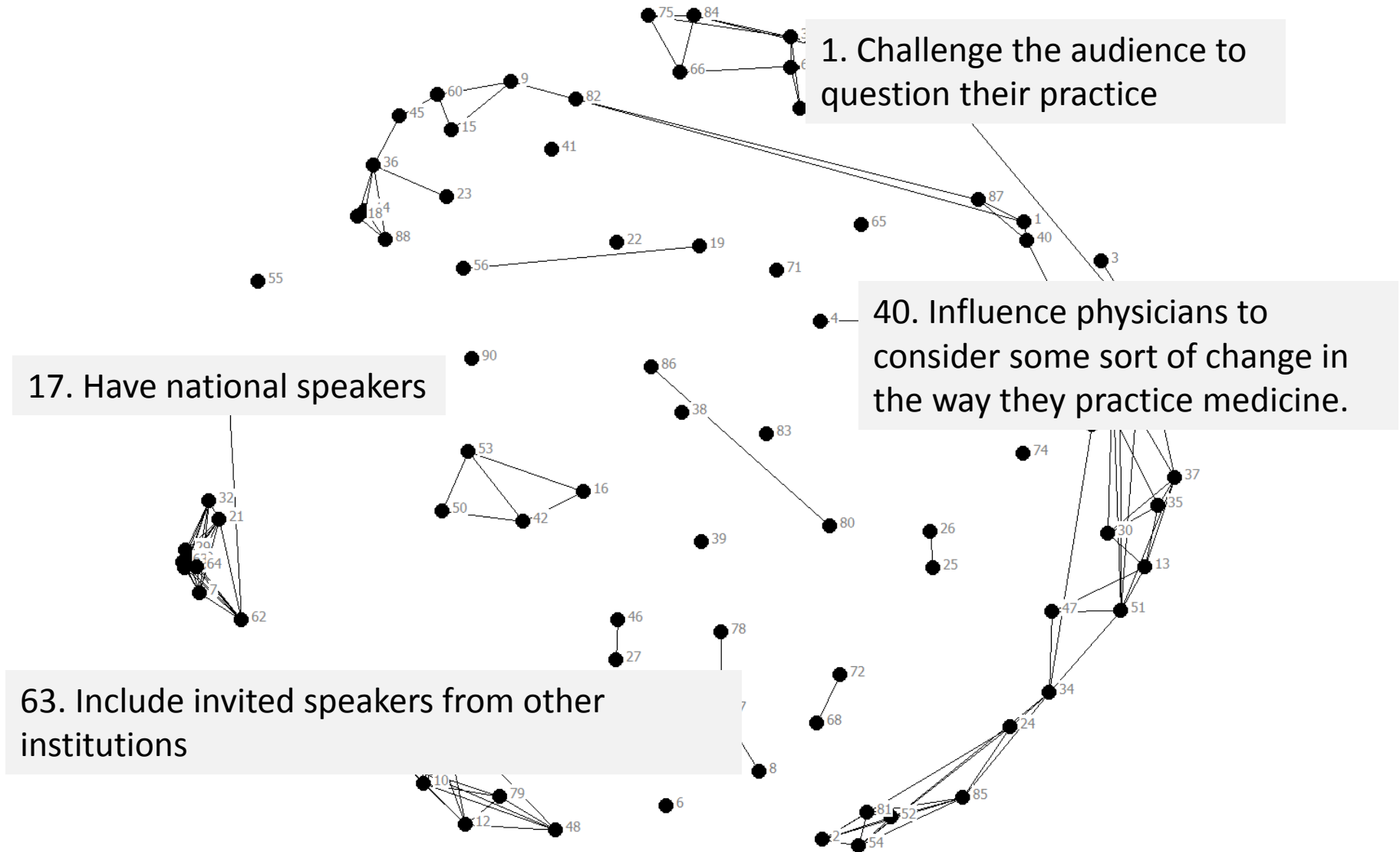


* Software

Borgatti, S.P.; Everett, M.G. & Freeman, L.C. (2002). Ucinet 6 for windows: Software for Social Network Analysis. Harvard: Analytic Technologies.

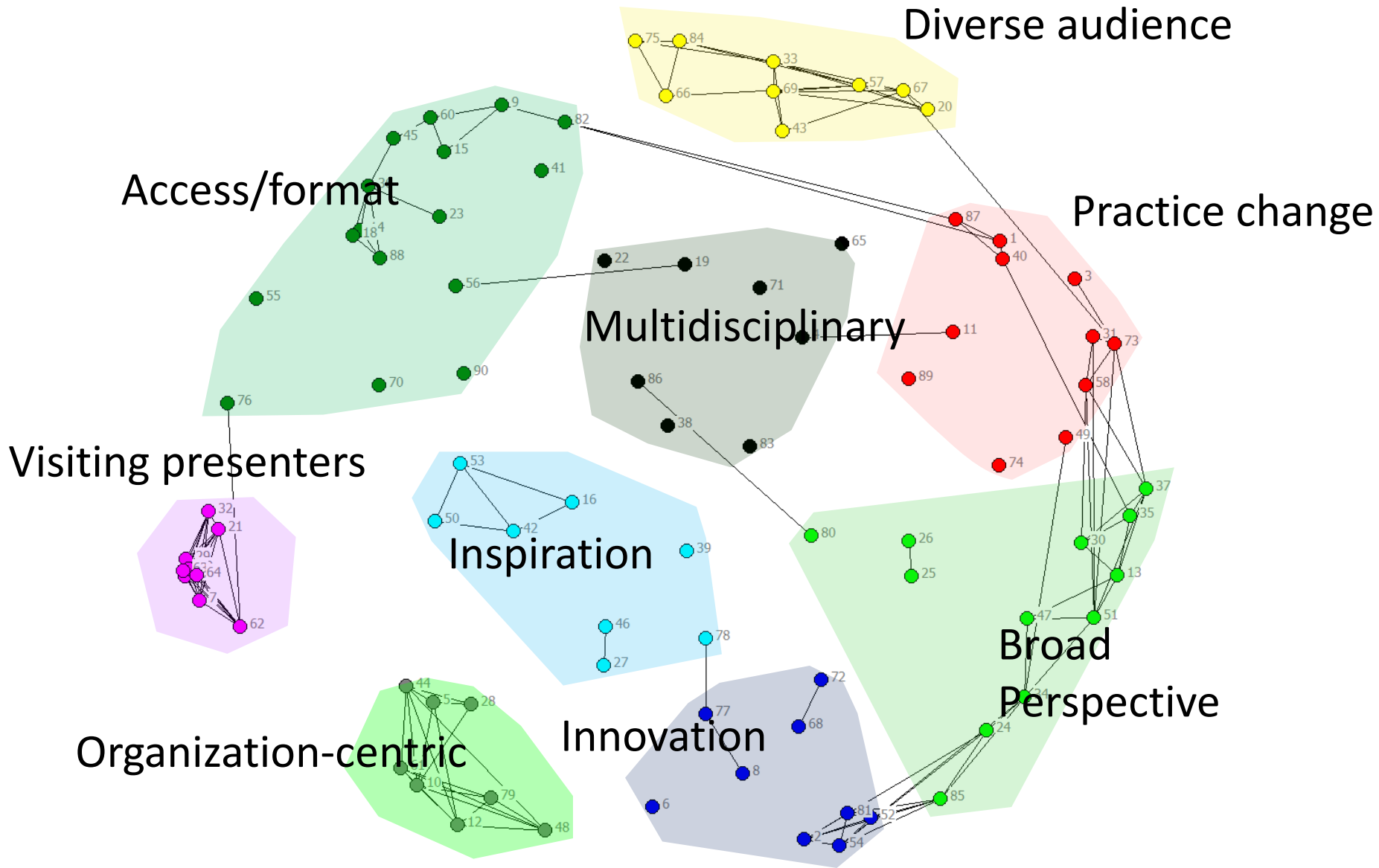
Borgatti, S.P. (2002). NetDraw: Graph Visualization Software, version 2.087. Harvard: Analytic Technologies

Visualize the network of ideas by examining the sorting of ideas*



* Dichotomized the sorting matrix, GE 11= 1, LT 11=0

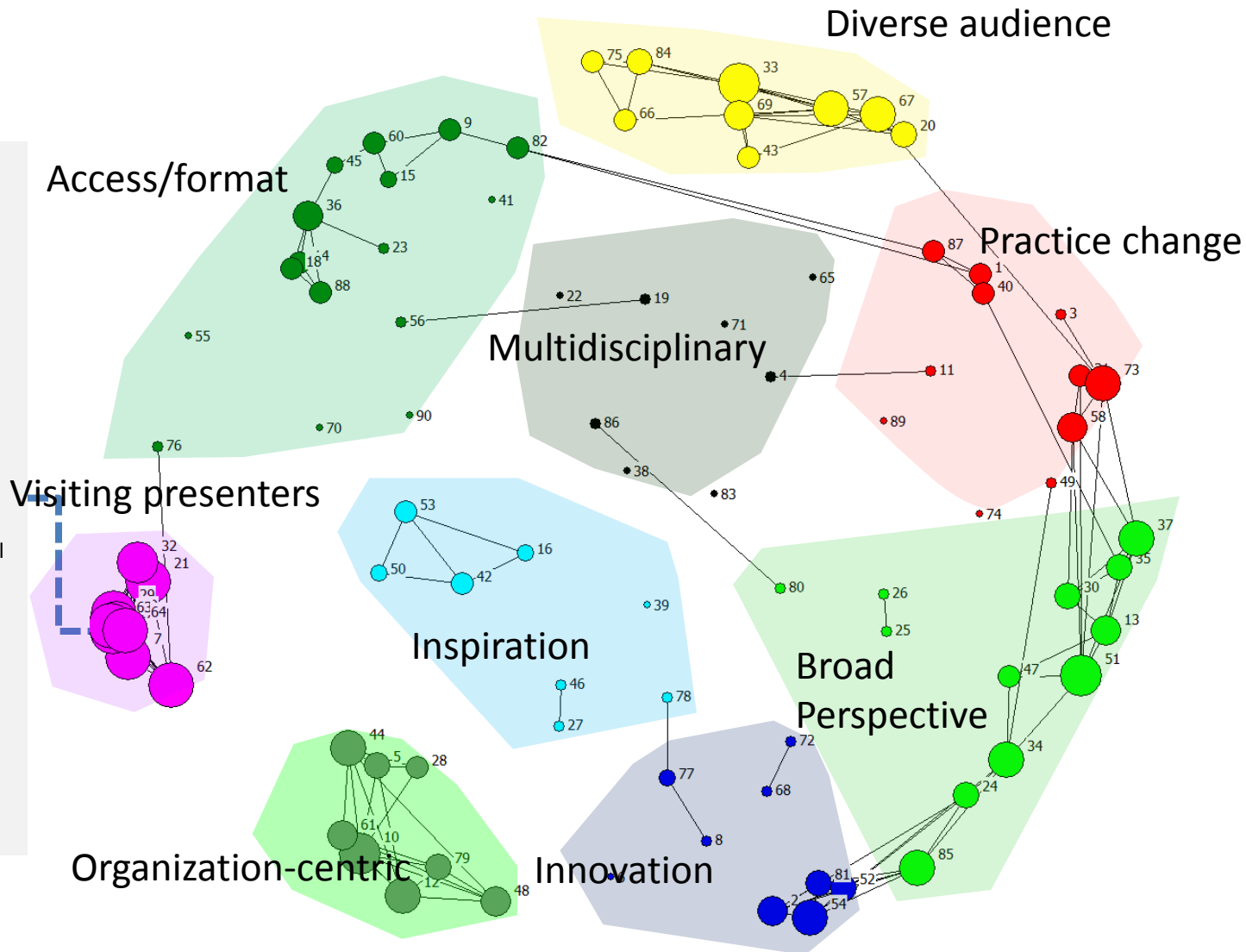
Visualize the network with the clusters



Degree centrality across the map*

Visiting Presenters

- 7. Provide an opportunity for presentations by visiting faculty who are national experts.
- 17. Have national speakers
- 21. Invite individuals from national organizations (i.e. AAP president) to speak on policy issues
- 29. Invite national and international experts to enhance our local knowledge and traditions.
- 32. Include international speakers to provide insights into disease and disease management in other countries.
- 59. Bring in national and international leaders in pediatric health care for presentations
- 62. Feature speakers who are recognized as the leaders or 'rising stars' in their respective fields.
- 63. Include invited speakers from other institutions
- 64. Have world-renowned experts present their research and innovations in their fields.



* Increasing point size corresponds to increasing degree centrality

Degree centrality within a cluster

36. Consider changing the time to make it easier for providers to attend.

33. Cover topics that are interesting to a diverse professional audience.

7. Provide an opportunity for presentations by visiting faculty who are national experts.

17. Have national speakers

21. Invite individuals from national organizations (i.e. AAP president) to speak on policy issues

29. Invite national and international experts to enhance our local knowledge and traditions.

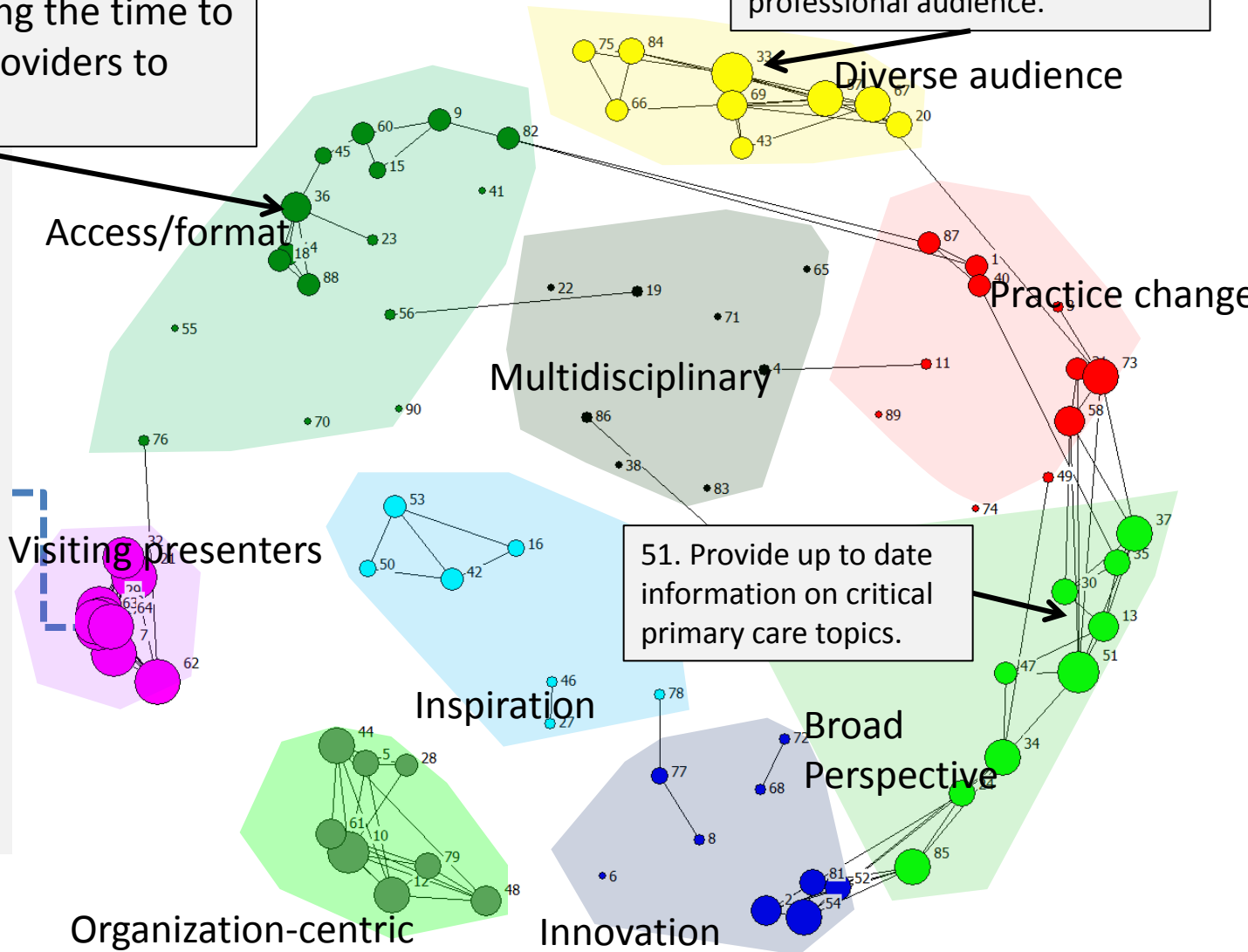
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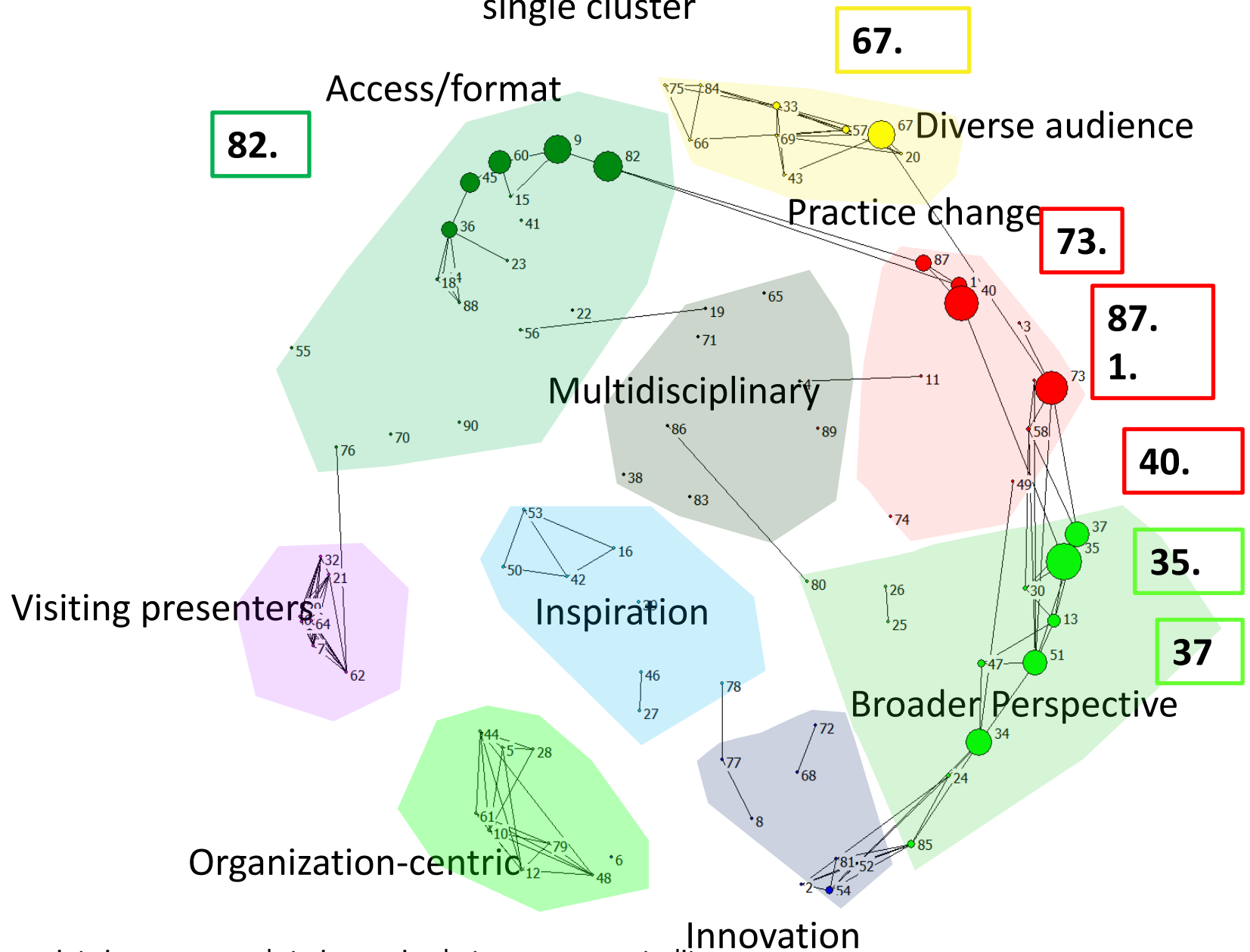


Organization-centric

Innovation

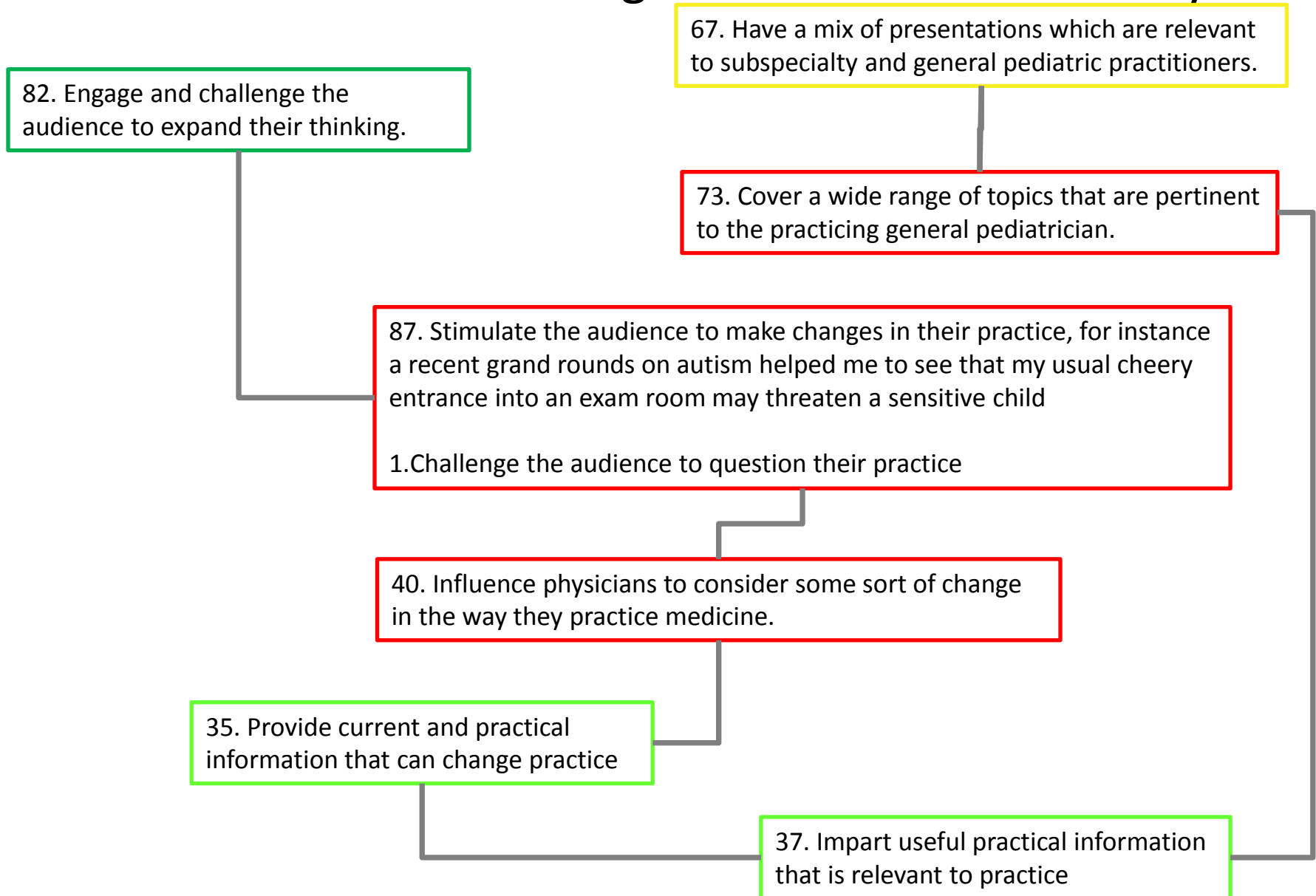
* Increasing point size corresponds to increasing degree centrality

Betweenness Centrality* illustrates emergent concepts not contained in a single cluster



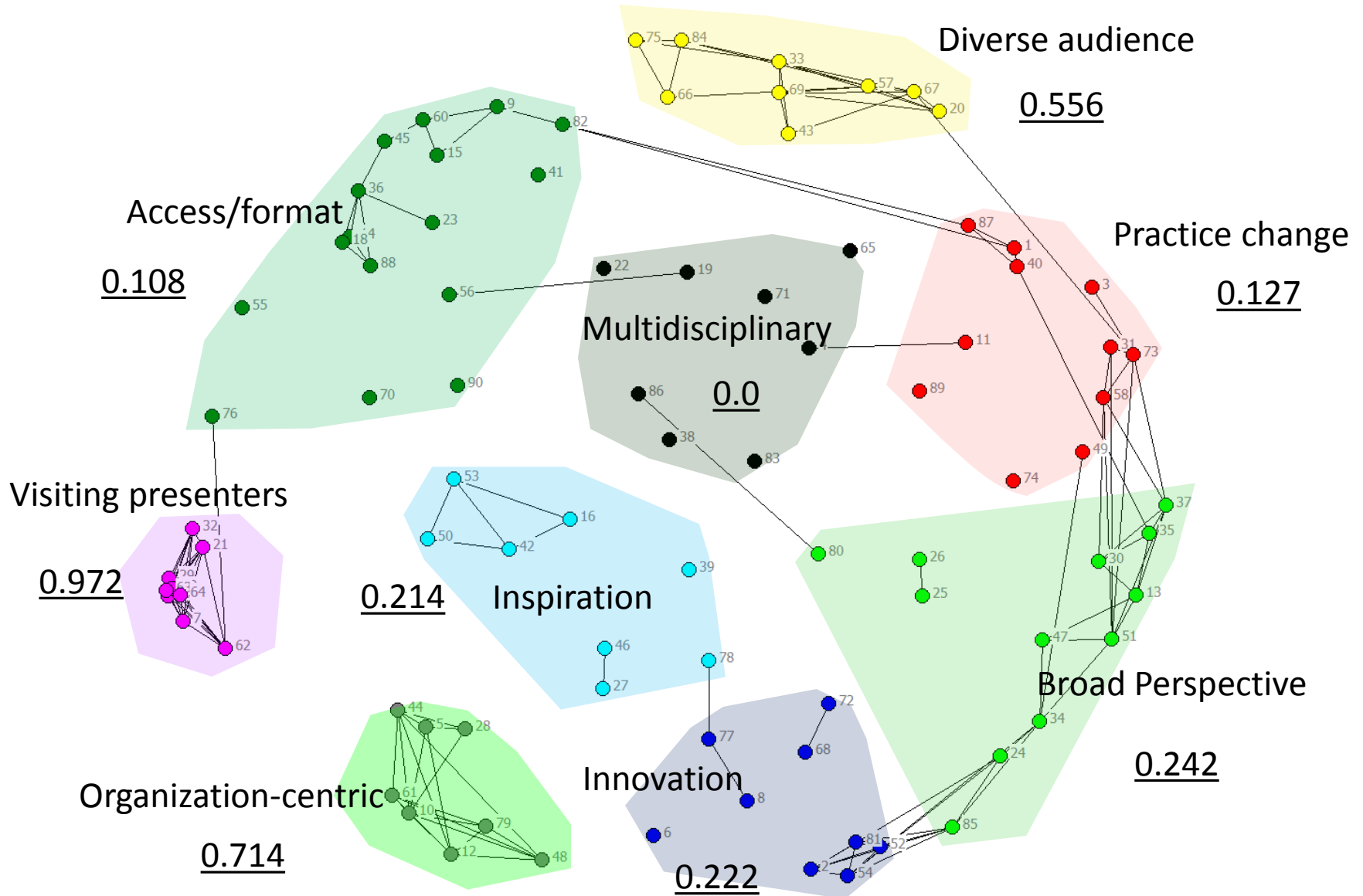
* Increasing point size corresponds to increasing betweenness centrality

Connected ideas with high betweenness centrality



Understanding the cohesion of ideas in a cluster

Density by cluster





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