A Social Network Analysis of a Teaching Science as Inquiry Online Learning Community

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Twitter Anyone?
Twitter: @truc99
Conference: #elearn

Curriculum Research & Development Group (CRDG)

Teaching Science As Inquiry – Aquatic Science (TSI-A)

• 3-year project to promote teaching science as inquiry (TSI), IES Grant
• Enhance communication and collaboration amongst the participating teachers
• Provide a mechanism by which resources could be shared

Purpose of Study

• Design an online learning community
  – vBulletin, Drupal
• Focus on interaction and support without CRDG faculty and staff prompting
  – Science teachers trained in various science curricula of CRDG
  – Potential advice for facilitators behavior and characteristics

Teacher cohort groups
Communities of Practice

“A group of people who interact, learn together, build relationships, and in the process develop a sense of belonging and mutual commitment” – Wenger, 2002

Research

teachers’ self-perceived use

the amount of use

Activity comment comparisons between preliminary and subsequent groups
(October 2010 to July 2012)

<table>
<thead>
<tr>
<th>Type of Comment</th>
<th>Preliminary</th>
<th>Subsequent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Activity</td>
<td>95%</td>
<td>48%</td>
</tr>
<tr>
<td>Teacher-teacher</td>
<td>5%</td>
<td>36%</td>
</tr>
<tr>
<td>Technical</td>
<td>16%</td>
<td>1%</td>
</tr>
</tbody>
</table>

interrater reliability Kappa = .99 (p<.000), 95% CI (.94, .99), Kappa = .81 (p<.000), 95% CI (.75, .86), Kappa = .76 (p<.000), 95% CI (.71, .80).

Use of OLC

• 49,587 visits to the current website

Social Network Theory

• Social ties between actors
  – Daly, 2012
• Analyzed through its explanatory mechanisms of their ties through structure or how resources flow
  – Borgatti & Foster, 2003

Theoretical foundation

• Actors in a social network are interdependent rather than independent
• Relationships are regarded as conduits for the exchange or flow of resources
  – Information, knowledge, materials
• Patterns of relationships may act as constraints or opportunities
• Embedded patterns of relations within and between groups
• Systematic collection and analysis of empirical data
• Graphic imagery as part of its tools
• Statistical inference using network measures

Social Network Analysis


Previous SNA Research
• Revealed influences in organizational performance, socialization, communication, knowledge, transfer, innovation, productivity
• Created strong ties within and across units — initiate and sustain successful large-scale change efforts
• Identified ties between sub-groups — facilitate knowledge transfer, cooperative relationships, and exchange of novel information
• Distinguished dense lateral ties — increase “absorptive capacity”

Carolan, Daly, Moolenaar, 2013

SNA in Education Research
• Invokes network-related theories and ideas
• Offers another way to theorize and explore and measure
• Provides language, perspective and empirical evidence to describe the structure of networks, nodes, and outcomes
• Complements theoretical approaches

Carolan, Daly, Moolenaar, 2013

The TSI Aquatic Science OLC

Data Sources
Online Learning Community - Drupal
Requested analytics
Mid program survey, post program survey — 14 items
Looking for

- Homophily
  - Extent to which ties are formed with those similar and dissimilar

- Reciprocity/Mutuality
  - Extent to which ties are reciprocated

- Propinquity
  - Tendency to have more interaction due to geography

“Actors”

N = 36

N_{Kauai} = 16

N_{Oahu} = 15

N_{Facilitators} = 5

Technical Demographics

High comfort level with technology (\(M=8.48, SD=2.17\))

All indicated they use Internet on a daily basis and use it for work purposes

Data from OLC Survey

<table>
<thead>
<tr>
<th></th>
<th>Mid</th>
<th>Post</th>
</tr>
</thead>
<tbody>
<tr>
<td>To interact</td>
<td>6.57 (±2.40)</td>
<td>7.78 (±1.69)</td>
</tr>
<tr>
<td>For course activities</td>
<td>8.32 (±2.16)</td>
<td>8.61 (±1.69)</td>
</tr>
<tr>
<td>For curriculum content</td>
<td>8.21 (±2.21)</td>
<td>8.46 (±1.60)</td>
</tr>
<tr>
<td>Recommend to others</td>
<td>7.54 (±2.33)</td>
<td>8.46 (±1.71)</td>
</tr>
</tbody>
</table>

Correlations

- No significance between level of comfort on the Internet and out degree
  \[ r = -.32, n=28, p < .093 \]
- No significance between level of comfort on the Internet and in degree
  \[ r = .093, n=28, p < .637 \]
Paired sample t-test

<table>
<thead>
<tr>
<th></th>
<th>t-value</th>
<th>df</th>
<th>p</th>
<th>Eta squared</th>
</tr>
</thead>
<tbody>
<tr>
<td>To interact</td>
<td>-3.5</td>
<td>27</td>
<td>.001*</td>
<td>.037</td>
</tr>
<tr>
<td>For curriculum content</td>
<td>-1.02</td>
<td>27</td>
<td>.316</td>
<td>.322</td>
</tr>
</tbody>
</table>

The TSI Aquatic Science OLC

3+ comments

Teacher K11 Ego Network

TeacherO2 Ego Network
Facilitator Network

Conclusions

- Facilitators are maintaining good periphery status
  - 35% interactions are teacher-teacher interactions
- Longer exposure to the site significantly increases likelihood to continue interaction
- Cannot assume comfort on Internet will lead to increased interaction

Future Directions

Data needs for more SNA
- Have the teachers taken courses together in teacher preparation programs?
- Do they teach at the same school as another teacher?
- Have they attended a workshop with another teacher in this workshop?
- Do they consider another teacher in this workshop a friend?
Facilitator perceptions of teacher interactions in the face-to-face workshop

Future Directions

Is there a relationship between number of “hits” in the OLC and mastery of content?
Can the pre-post gains in content mastery predict use of the OLC?
Is there a temporal factor to who receives (in degree) and sends (out degree) comments?

Mahalo for your time.
Questions?
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