The communication infrastructure during the learning process in web based collaborative learning systems

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1. Motivation

Transfering network perspective to education sciences

Diffusion of Information

Process of diffusion of information in communication systems
Source of image: C.M.Stuetzer in „Interpersonal Communication and Local Identities“, 2009

Constructivism theory
Connectivism theory

Learning is:

Learning theories
Source of image: G. Siemens, Knowing knowledge , 2006, S. 29

„Social systems do not consist of people, also not of actions, but of communications therefore.”
(Luhmann 1986: 269)
2. Goal

Conceptualizing communication structure in e-learning systems

*Previous work:* Exploration of discussion boards in distance learning networks and extraction of high “attractiveness” subnets *(Cathleen M. Stuetzer et al. (2010))*

- Exploration of **communication roles** (macro view)
- Identification of **emergent network roles** of actors via **social network analysis (SNA)** (micro view)

Identifying participant roles and their structural conditions in order to understand theories about *social learning under the impact of educational technologies*
3. Methods

Quantitative relational analysis via social network analysis (SNA)

1. Statistical relational analysis
   Exploring the entire network in order to find high attractiveness "giant component" cluster

2. Subnet analysis
   Exploring structures in macro view to explore communication roles

3. Subnet relational analysis
   Exploring positions in micro view to explore emergent network roles

Identifying emergent communication roles of participants in discussion boards within e-learning systems
Educational Portal Saxony (BPS), Germany (2001-2010)
(Source: J. Schwendel, BPS GmbH, 2009)

1 central web application
11 universities in Saxony, Germany

Using discussion boards to explore the structure

<table>
<thead>
<tr>
<th></th>
<th>Original</th>
<th>Selected</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of Users (U)</td>
<td>5808</td>
<td>834</td>
</tr>
<tr>
<td>No. of Forums (F)</td>
<td>2567</td>
<td>120</td>
</tr>
<tr>
<td>No. of Articles (W)</td>
<td>49863</td>
<td>11030</td>
</tr>
</tbody>
</table>
5. Results

**Structure of communication (N=834)**

- **Follower (49%)** – follows articles only → View (UxU)
- **Initiator (11%)** – instructs articles only → View (UxU)
- **Role Switcher (40%)** – follows and instructs articles depending on topic and discussion board → View (UxU)
5. Results

**Positional analysis: Emerging roles and positions (N=834)**

<table>
<thead>
<tr>
<th>Code</th>
<th>Emergent role</th>
<th>DC (U)</th>
<th>BC (U)</th>
<th>WC (U)</th>
<th>EC (U)</th>
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</thead>
<tbody>
<tr>
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<td>-</td>
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<td>-</td>
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<tr>
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<td>-</td>
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<td>-</td>
<td>-</td>
<td>-</td>
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</tr>
</tbody>
</table>

DC(U) = Degree Centrality \(\rightarrow\) Measurement for **communication activity** (Freeman, 1979)
BC (U) = Betweenness Centrality \(\rightarrow\) Measurement for **information flow control** (Freeman, 1979)
WC(U) = Weight Centrality \(\rightarrow\) Measurement for **strength of ties** (Granovetter, 1983)
EC(U) = Eigenvector Centrality \(\rightarrow\) Measurement for **group leader function** (Bonacich, 1972)
5. Results

Positional analysis: Emerging roles and positions (N=834)
6. Conclusion

**Conclusion**
- Extracting high “attractiveness“ subnet of users in discussion boards
- Exploring communication infrastructure

**Results**
- 3 communication roles
- 5 emergent roles → f.e. Broker are self-organized, underlie self-dynamics and self-organization, broker-network high complex connected

**Further work & limitations**
- evaluate emerging roles
- identifying scripted roles → semantic analysis of actor roles
- longitudinal analysis of evolution from emerging roles
- qualitative analysis of actor scripted roles through integrating balance theory aspects (Heider(1949); Kleinberg (2007))
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Thanks a lot!
Merci beaucoup!
Vielen Dank!
Mange Takk!
Muchas gracias!
Prego!
إِشْكُّراً
非常感谢!

This research is funded by the European Social Fund (ESF), Germany, and the SAB Sächsische Aufbaubank, Saxony, Germany.