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Learning Analytics: Passing fad or game-changer for higher education?

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What do we mean by 'learning analytics'?

Learning analytics has been defined as

the process of developing actionable insights through problem definition and the application of statistical models and analysis against existing and/or simulated future data

(Cooper, 2012)

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The Society for Learning Analytics Research (SOLAR) defines the core activities of learning analytics as

the measurement, collection, analysis and reporting of data about learners and their contexts for purposes of understanding and optimizing learning and the environments in which learning occurs.

http://www.solaresearch.org

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On the shoulders of giants

LA draws from, and is closely tied to, a series of other fields of study including

- Business intelligence
- Web analytics
- Academic analytics
- Educational data mining
- Action analytics

Elias, T. (2011). Learning Analytics: Definitions, Processes and Potential. http://learninganalytics.net/LearningAnalyticsDefinitionsProcessesPotential.pdf

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Factors driving the emergence of LA

The underpinnings:

- Socio-political factors
- Educational factors
- Technological factors

Ferguson, R. (2012). Learning analytics: drivers, developments and challenges. *International Journal of Technology Enhanced Learning*, 4(5/6) pp. 304–317.

New developments….

- **Converging developments in data availability and educational data science**
  - Even bigger “big data”
  - Increasing volumes of teaching- and learning-related
  - More, and more accessible, data
  - Parallel developments in educational data science
    - Data mining algorithms and approaches
    - Approaches to network analysis
    - Approaches to text mining and discourse analysis at scale
    - Increasingly user-friendly software

- **Moving beyond number crunching**
  - **EDM laid groundwork of** computation and modelling
  - **Recognition that learning cannot simply be understood by algorithms**, and that social and pedagogical theory, approaches and insights must also be brought to bear.
  - Technological, ideological, and methodological orientations of the field of learning analytics differentiate it from EDM

    "…technical, pedagogical, and social domains must be brought into dialogue with each other to ensure that interventions and organizational systems serve the needs of all stakeholders."

    Siemens, G., & Baker, R. S. J. d (2012). *Learning Analytics and Educational Data Mining: Towards Communication and Collaboration.* Paper presented at the Learning Analytics and Knowledge, Banff, AB, Canada.

Table 1. A comparison of LA and EDM

	Learning Analytics	Educational Data Mining
Discovery	Leveraging human judgment is key; automated discovery is a tool to accomplish this goal	Automated discovery is key; leveraging human judgment is a tool to accomplish this goal
Reduction & Holism	Stronger emphasis on understanding systems as wholes, in their full complexity	Stronger emphasis on reducing to components and analyzing individual components and relationships between them
Origins	LAK has stronger origins in semantic web, "intelligent curriculum," outcome prediction, and systemic interventions	EDM has strong origins in educational software and student modeling, with a significant community in predicting course outcomes
Adaptation & Personalization	Greater focus on informing and empowering instructors and learners	Greater focus on automated adaption (e.g. by the computer with no human in the loop)
Techniques & Methods	Social network analysis, sentiment analysis, influence analytics, discourse analysis, learner success prediction, concept analysis, sense making models	Classification, clustering, Bayesian modeling, relationship mining, discovery with models, visualization

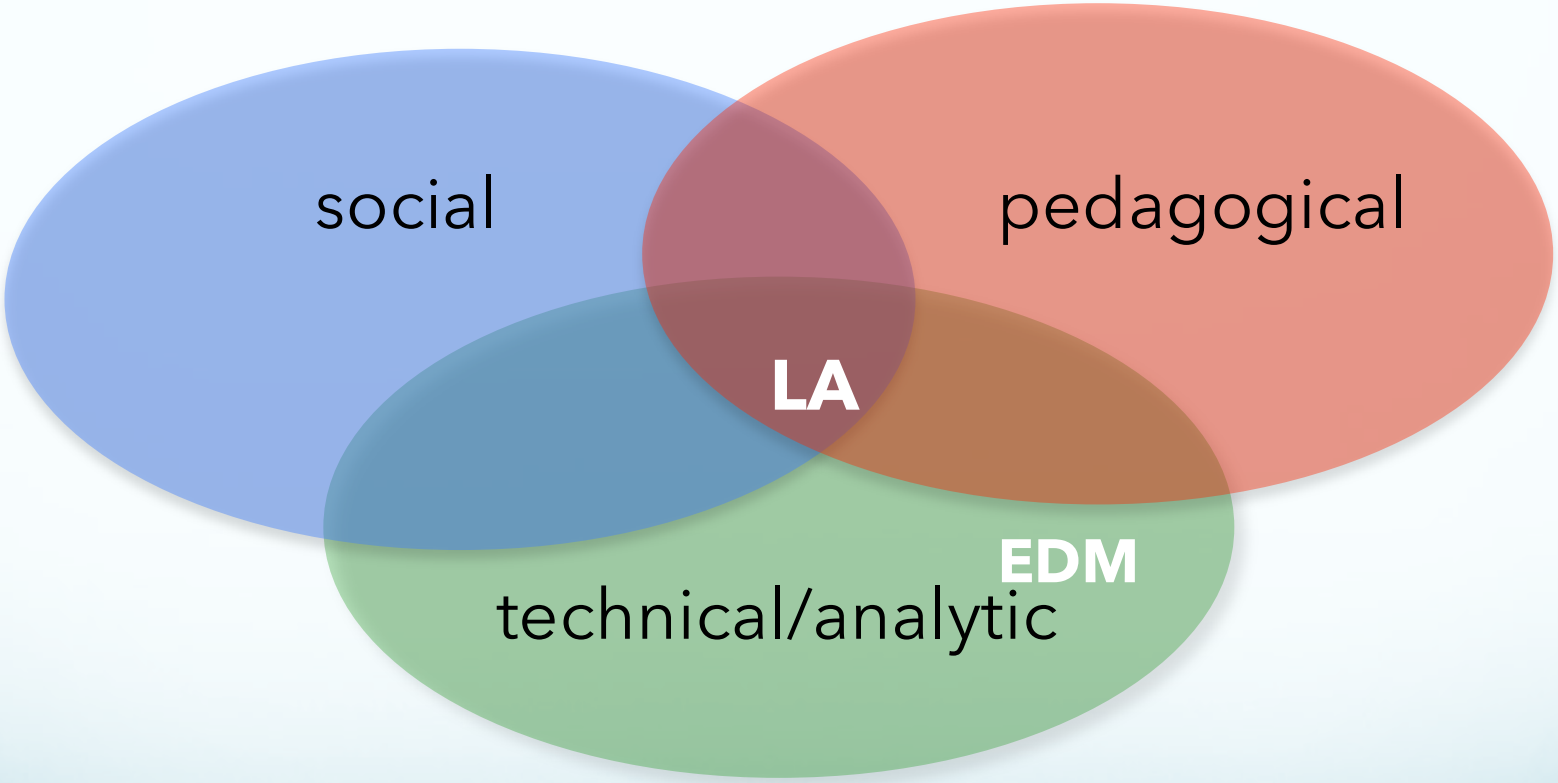

Figure 1. The interdisciplinary scope of learning analytics

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- **Interdisciplinary collaboration**
  - **technical/analytic**
    - statistics
    - data visualization and visual analytics
    - educational data mining
    - computer science
    - machine learning
    - natural language processing
    - human-computer interaction
    - and others….

- **social/pedagogical**
  - social sciences
  - education
  - (educational) psychology
  - psychometrics
  - educational technology
  - art and design
  - and others…

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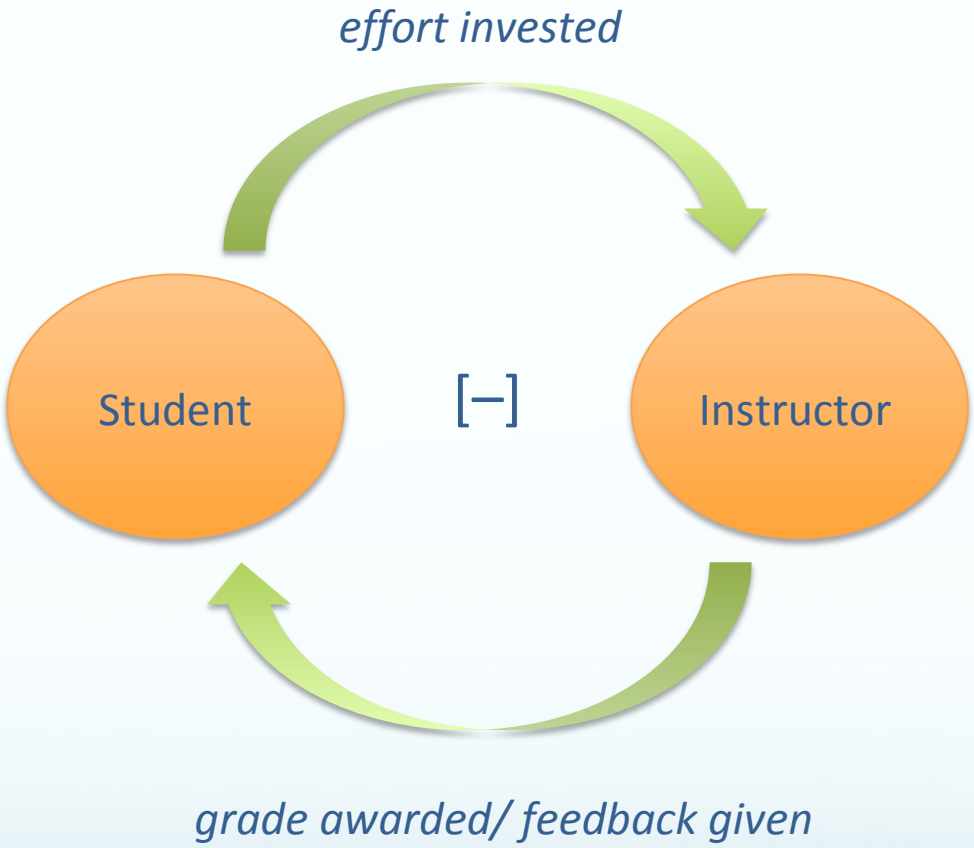
- **The rise of systems thinking**

systems of information-feedback control are fundamental to all life and human endeavor…everything we do as individuals, as an industry or as a society is done in the context of an information feedback system

(Forrester, 1961)


effort invested
Student
[–]
Instructor
grade awarded/ feedback given

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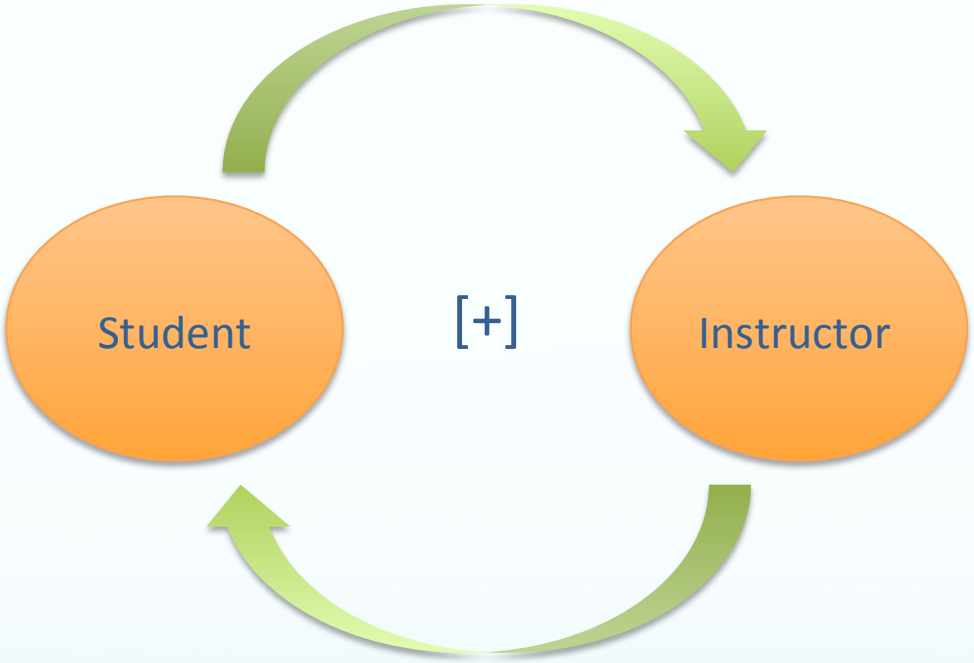
course/teaching evaluation



Innovation in learning design

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- LA investigates these information flows and feedbacks in an education system to

  - Identify which data may carry meaningful or actionable information about teaching and learning
  - Allow development of approaches and tools that make more and better information about teaching- and learning-related activities more easily available to the members of the system (teachers, learners…)

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Who are the stakeholders?

- Learners…but also…
- Instructors and faculty members
- Parents
- The wider community
- Administrators
  - Department Heads/Program Directors
  - Deans
  - Institutional administrators
- Governments and policy makers

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Different LA purposes for different stakeholders?

Table 2. Purposes and stakeholders in university learning analytics (adapted from Kay (2013))

LA tools or insights can facilitate…	Example stakeholders?
Learner awareness of own learning strategies and performance to encourage self-regulated learning and support metacognition	Learners
Monitoring and tracking for immediate decisions • Identifying problems early enough to intervene • Distinguishing students who are loafing, gaming the system	Individual educators

Reflection and research for recognizing long term issues
• Insights into learning processes and performance by many learners
• Education research
  o Attrition factors
  o Insights into individual performance
	Individual educators
	Educational researchers
	Administrators

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Planning • course design/re-design • curriculum and program planning • faculty-level planning with regards to course and program offerings • teaching assignments • decision-making with regards to management, staffing, etc.	Individual educators Administrators
Reporting and communication among and between stakeholder groups e.g.: • Educators to learners • Institution to parents • Institution to government • Peer to peer	Learners Educators Administrators Government

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Where to start?

- Clarifying purpose and goals
- Identifying stakeholders
- Planning for institutional buy-in
- Establishing/confirming data governance policy and tools
- Selecting your technologies
- Thinking about the data

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Prepare to discuss ethical questions…

- **Relating to research**
  - Ethical questions about purpose: Why is data being collected? To what end? (Financial? Educational?)
  - Ownership of data
  - Collection and analysis of data on students and learning
  - Informed consent, privacy, de-identification
  - Student and data privacy…how will data be handled and protected? Who should have access to it?
  - Ethics of surveillance - Foucault's panopticon - power imbalance between educators/institution and learners
  - …but in parallel with changing attitudes to privacy and self-disclosure

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- **Relating to deployment of LA tools and systems…**
  - Is there an obligation to act on new knowledge?
  - How do we find the balance between potential “individual harms" and greater scientific knowledge
  - Questions about the ethics of intervention…does this approach treat students as passive objects?
  - To what degree should we act upon findings from interpretation of incomplete data sets?
  - Use of collected data
    beyond educational purposes (e.g. fundraising)
  - Data management and governance – diff. types need diff levels of protection?

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Principles for Learning Analytics

1. LA as a moral practice
2. Students as agents (and collaborators), not just recipients
3. Recognition that student identity and performance (and thus labels and categories) are temporal constructs
4. Student success is complex and multidimensional - recognition of the incompleteness and biases of our data
5. Transparency of purpose
6. The necessity of using the data

Slade, S. & Prinsloo, P. (2013).
Learning Analytics: Ethical Issues and Dilemmas.
American Behavioral Scientist 57(10), 1510–1529.

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The Purdue Signals Project

http://www.itap.purdue.edu/studio//signals/

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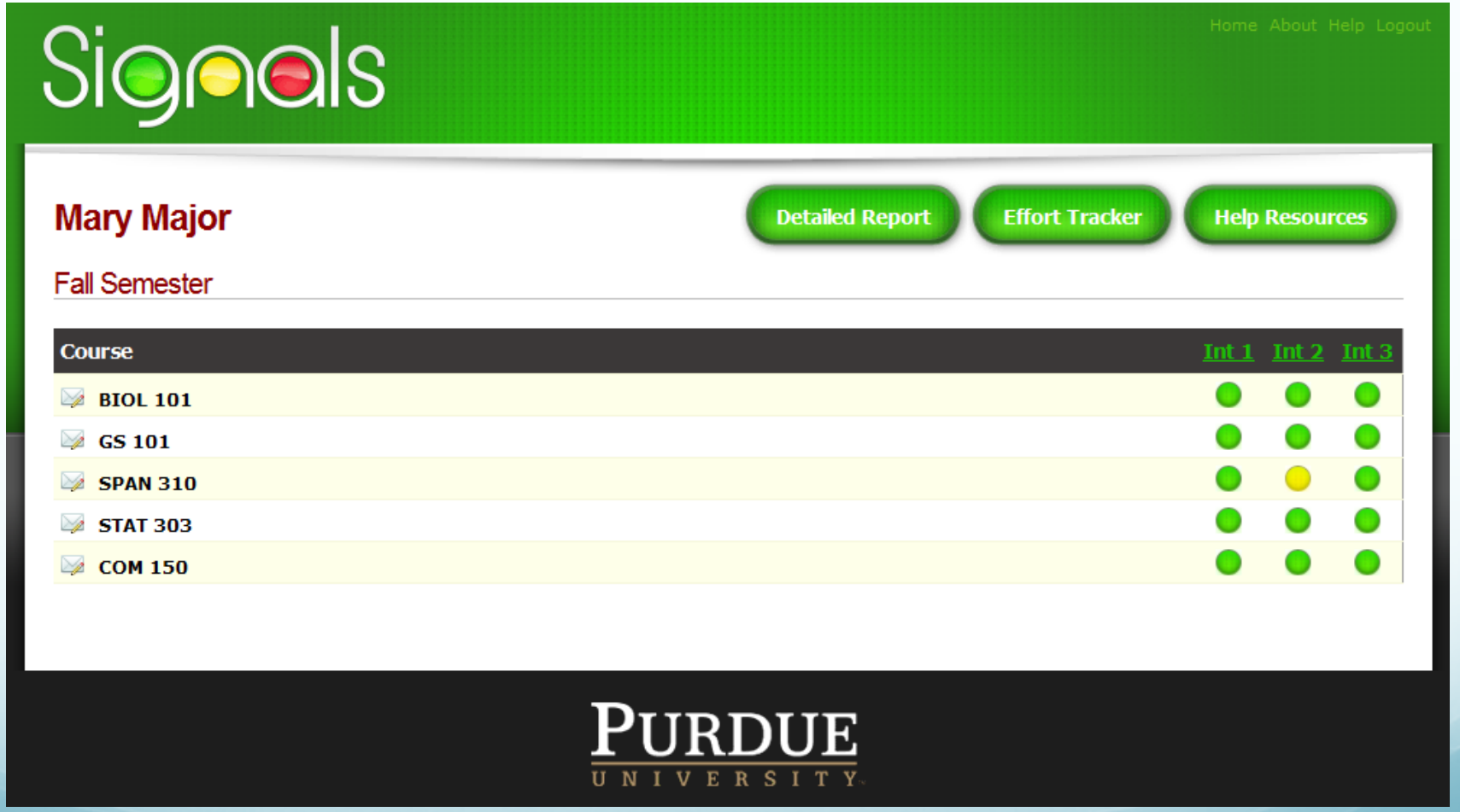

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UMBC's 'Check My Activity' tool

http://www.educause.edu/ero/article/video-demo-umbcs-check-my-activity-tool-students

UMBC
AN HONORS UNIVERSITY IN MARYLAND

Distribution for SCI100_3278_FA2010
For Gradebook Item: Nutrient Pollution
For Student: fritz
No Date Limit on Activity
Report Run On: October 3, 2010
Data Last Updated: October 3, 2010
Back to Blackboard Reports

Note: Your grade is indicated in red.

Grade	Hits	Users	Avg. Hits Per User	Sessions	Avg. Sessions Per User
0	1079	11	98	88	8
4	170	1	170	15	15
6	105	1	105	11	11
7.5	78	1	78	7	7
8	186	1	186	18	18
8.5	1102	9	122	97	11
9	1976	12	165	163	14
9.5	2514	18	140	192	11
10	3467	23	151	304	13
10.	243	1	243	22	22
Total	**10920**	**78**	**140**	**917**	**12**

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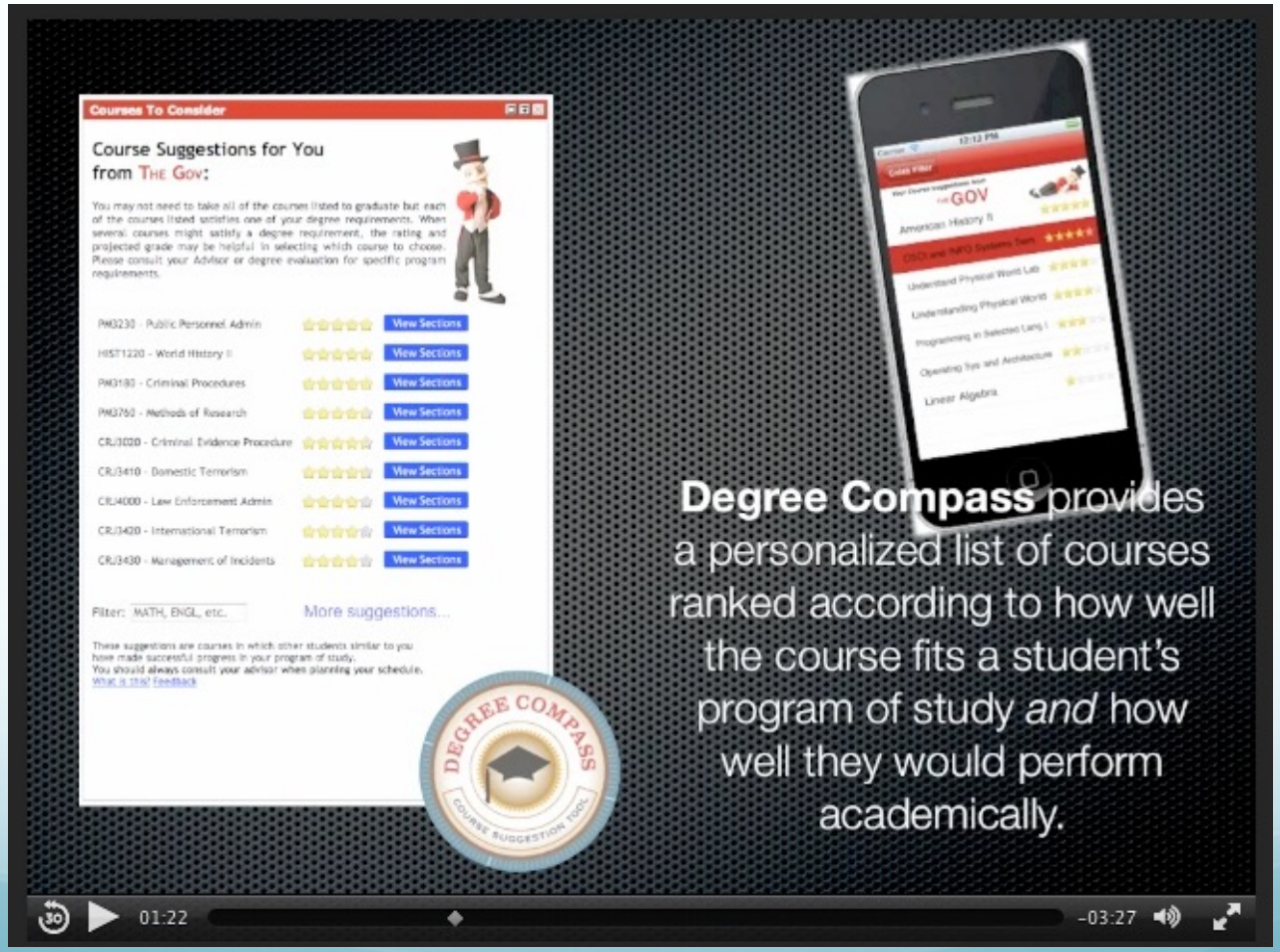
Austin Peay University's 'Degree Compass' tool

http://www.apsu.edu/academic-affairs/degree-compass-and-my-future



More enterprise-level LA tools

- Civitas Learning: http://www.civitaslearning.com

  Another recommender system that makes use of data from learning management systems, student information systems, and other sources, then builds school-specific predictive models that discover hidden connections and identify key decision points that affect student success.

- Desire2Learn's Insight Student Success System: http://www.desire2learn.com/products/insights/features/

  Designed to let instructors visualize and compare key learning and engagement factors – from course content access, to social learning patterns, to grades achievement.

- Knewton's Adaptive Learning System: http://www.knewton.com/platform/

  A combination learner tracking, course recommender and learning strategy advice system.

- Blackboard Analytics: http://www.blackboard.com/Platforms/Analytics/Products/Blackboard-Analytics-for-Learn.aspx

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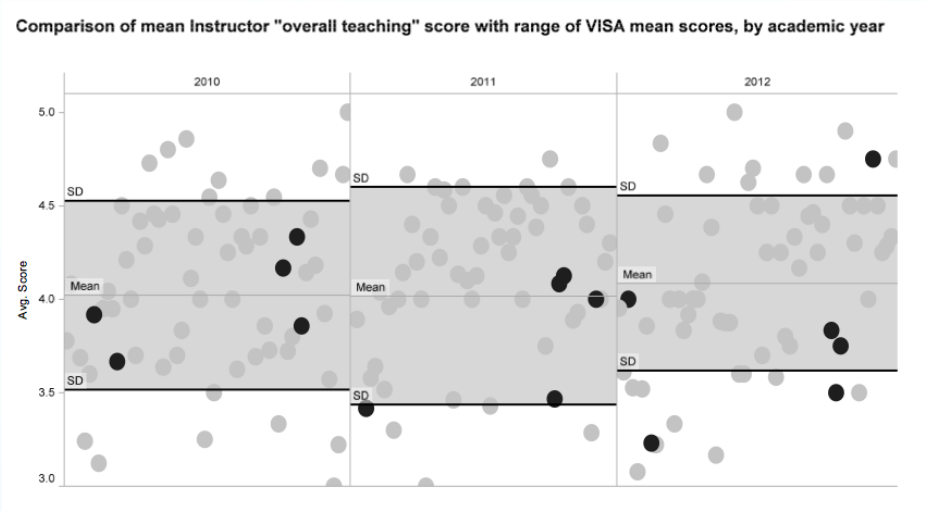
Finer-grained tailored LA implementations in the UBC Faculty of Arts

- Visual analytics tools allow easier exploration and representation of student evaluation of teaching data
  - For instructor reports (merit, tenure and promotion,
  - For departmental reviews
  - For planning instructional development offerings



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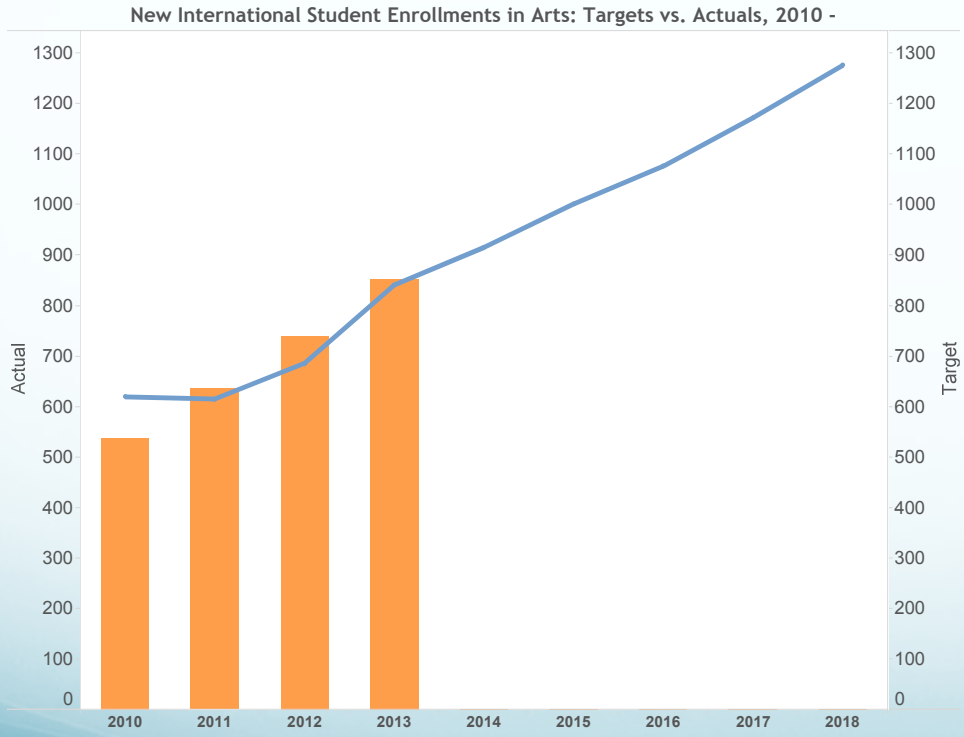
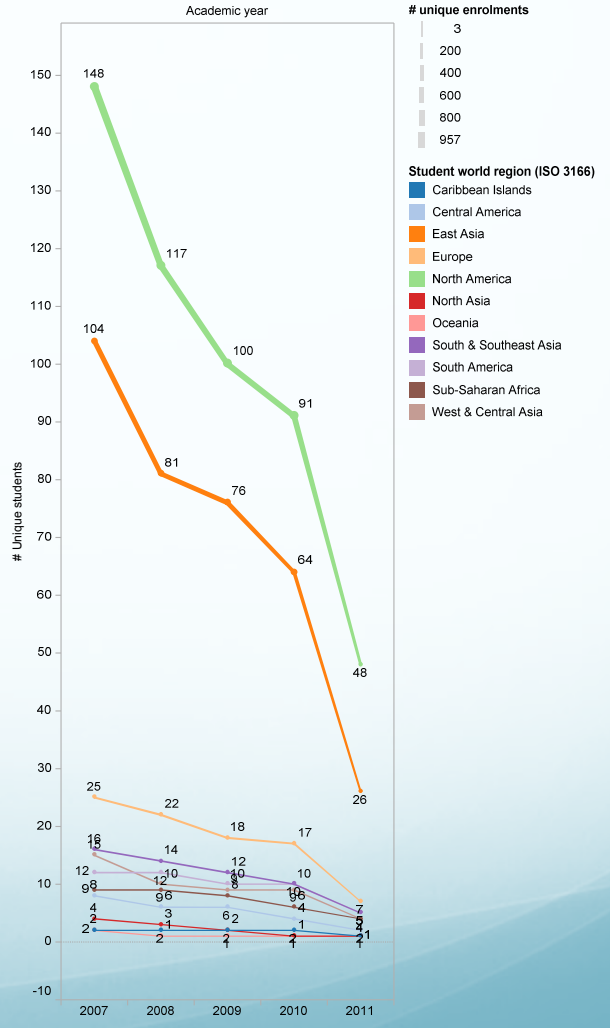
- Better understanding of our students



Blue line shows target ISI enrollments; bars indicate actual ISI enrollments 2010-2013.



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Using the SNAPP tool to investigate student networks and engagement

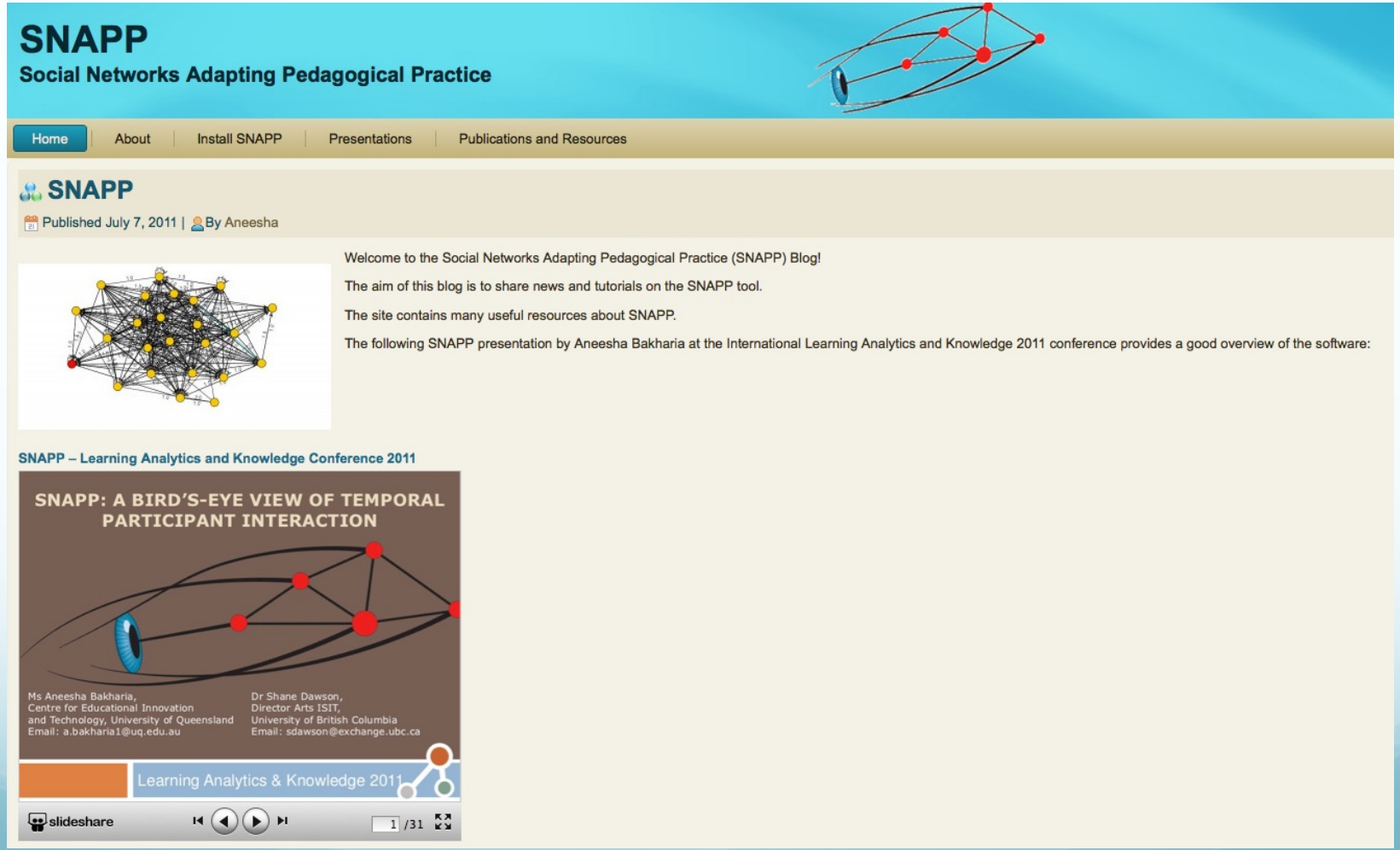
"[Social networks are the] single most potent source of influence"

(Astin, 1993)

- Perseverance
- Development
- Academic success

(Tinto,1993; Light, 2001; Brown, 2008)

Social Networks Adapting Pedagogical Practice (SNAPP)http://www.snappvis.org



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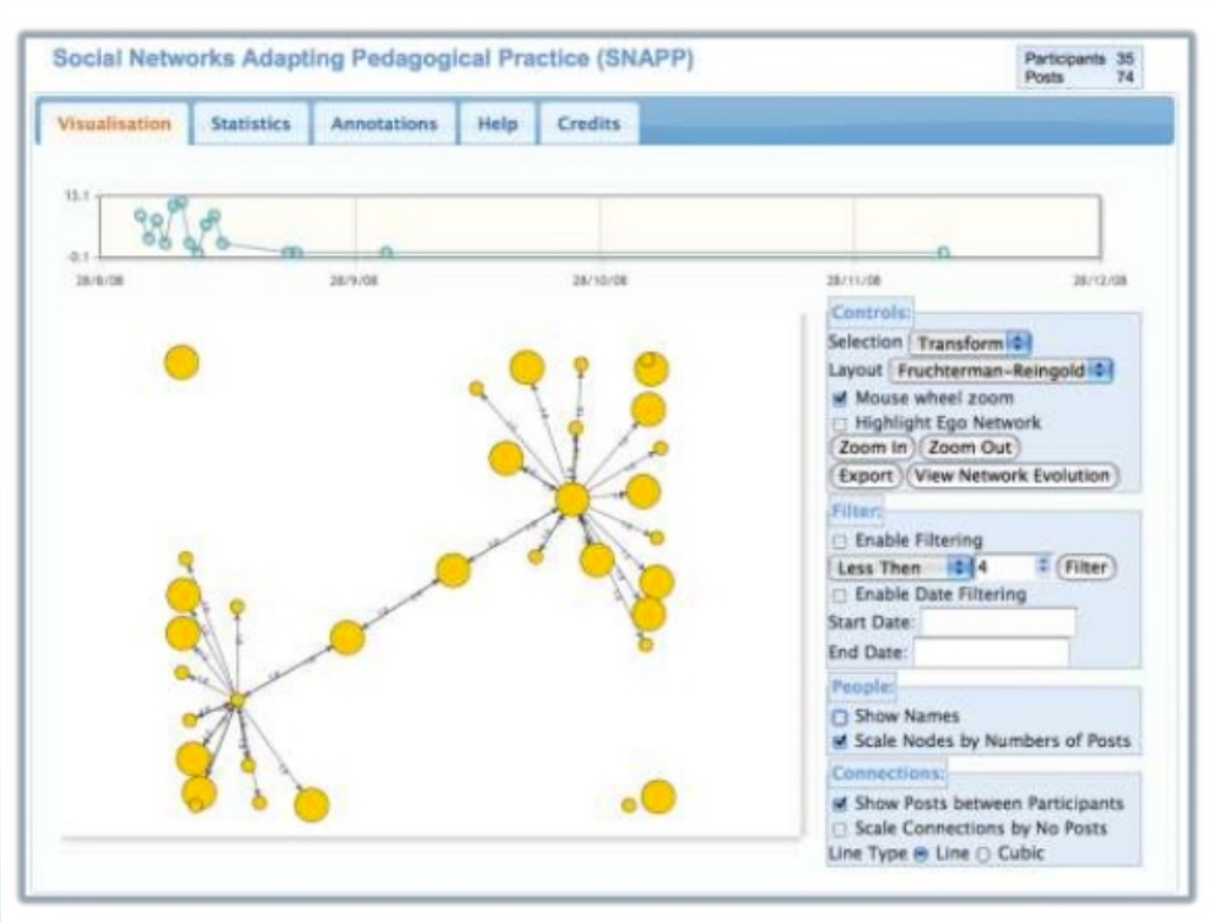

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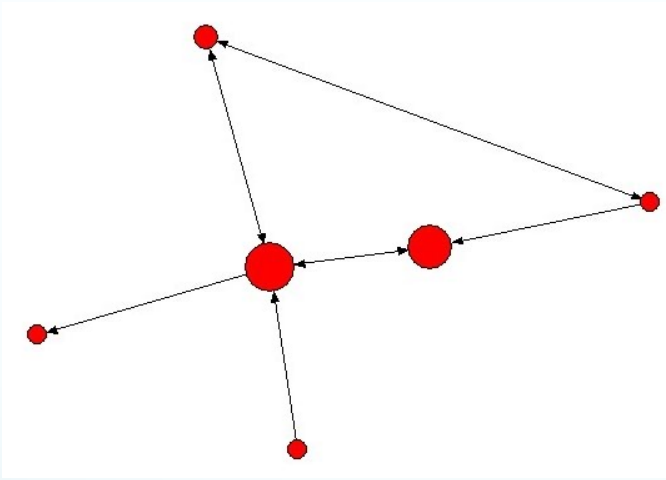
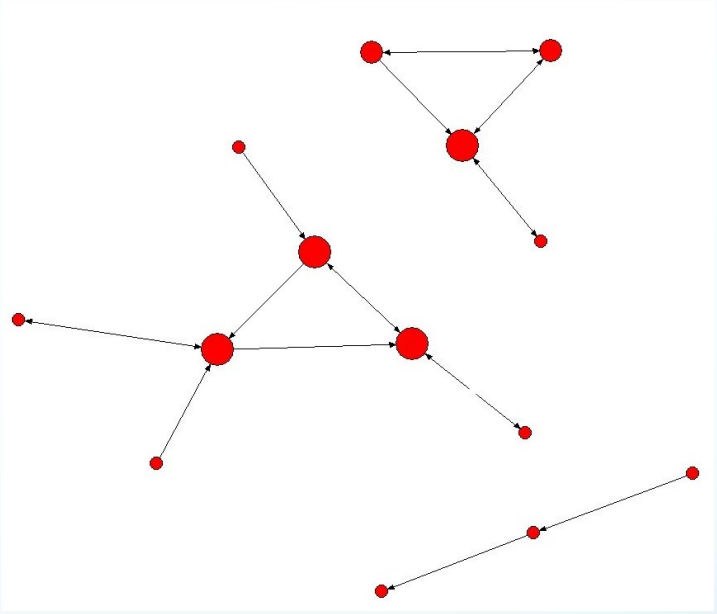
Seeing networks in action



Power of visualizations



Forum 1

Forum 2

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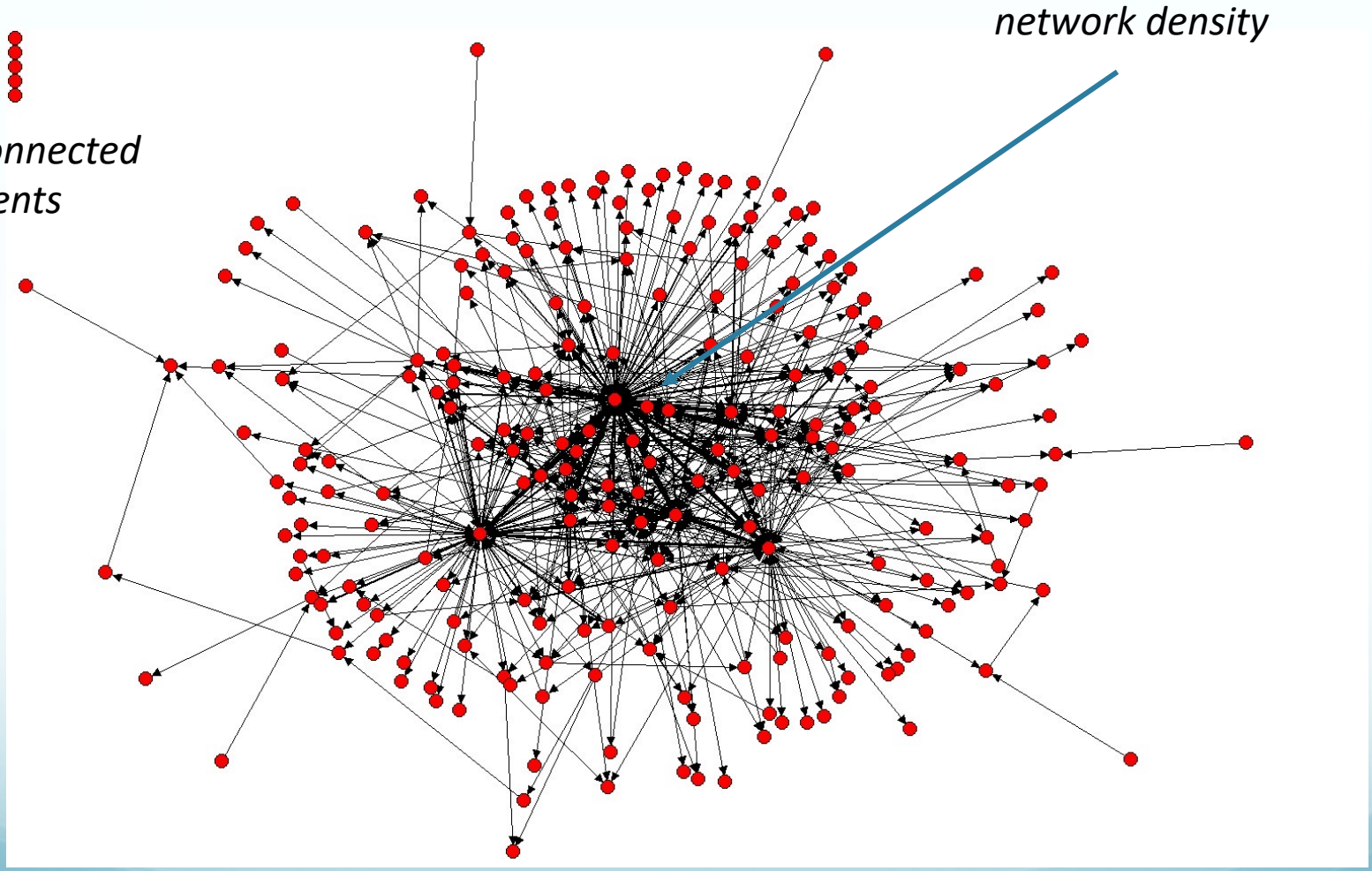
Development of Learning Networks



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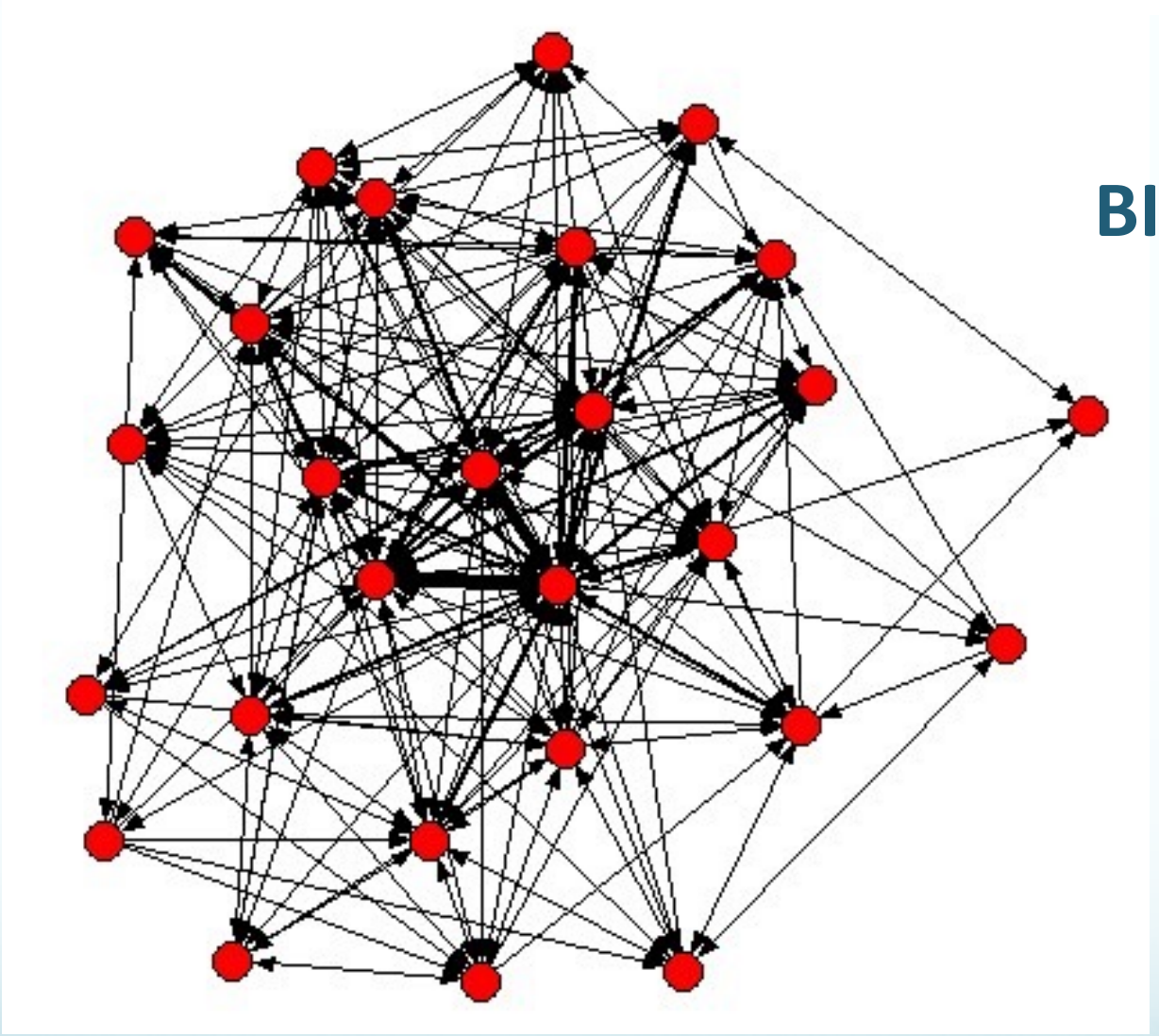

BIOL200

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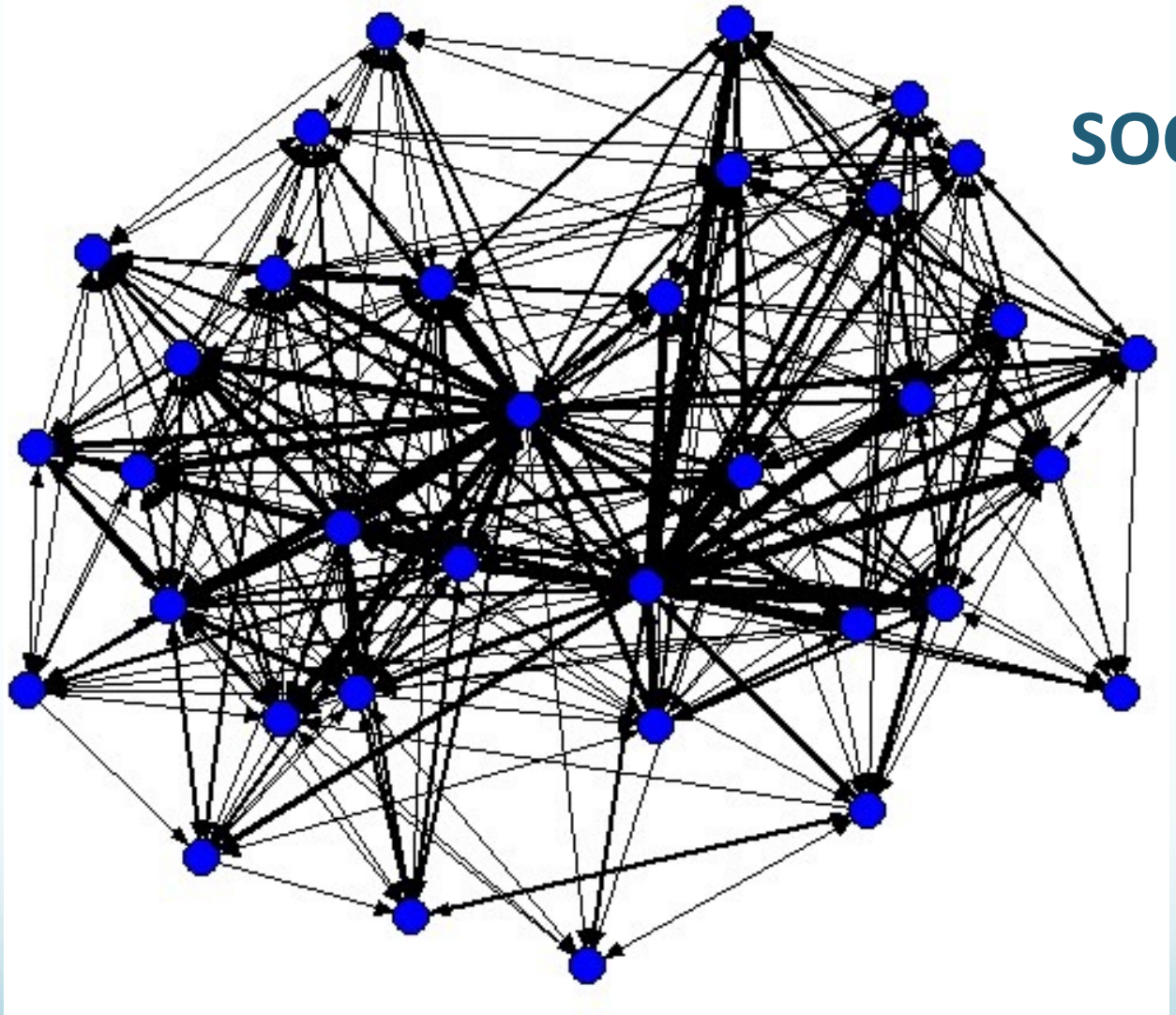

SOCI430

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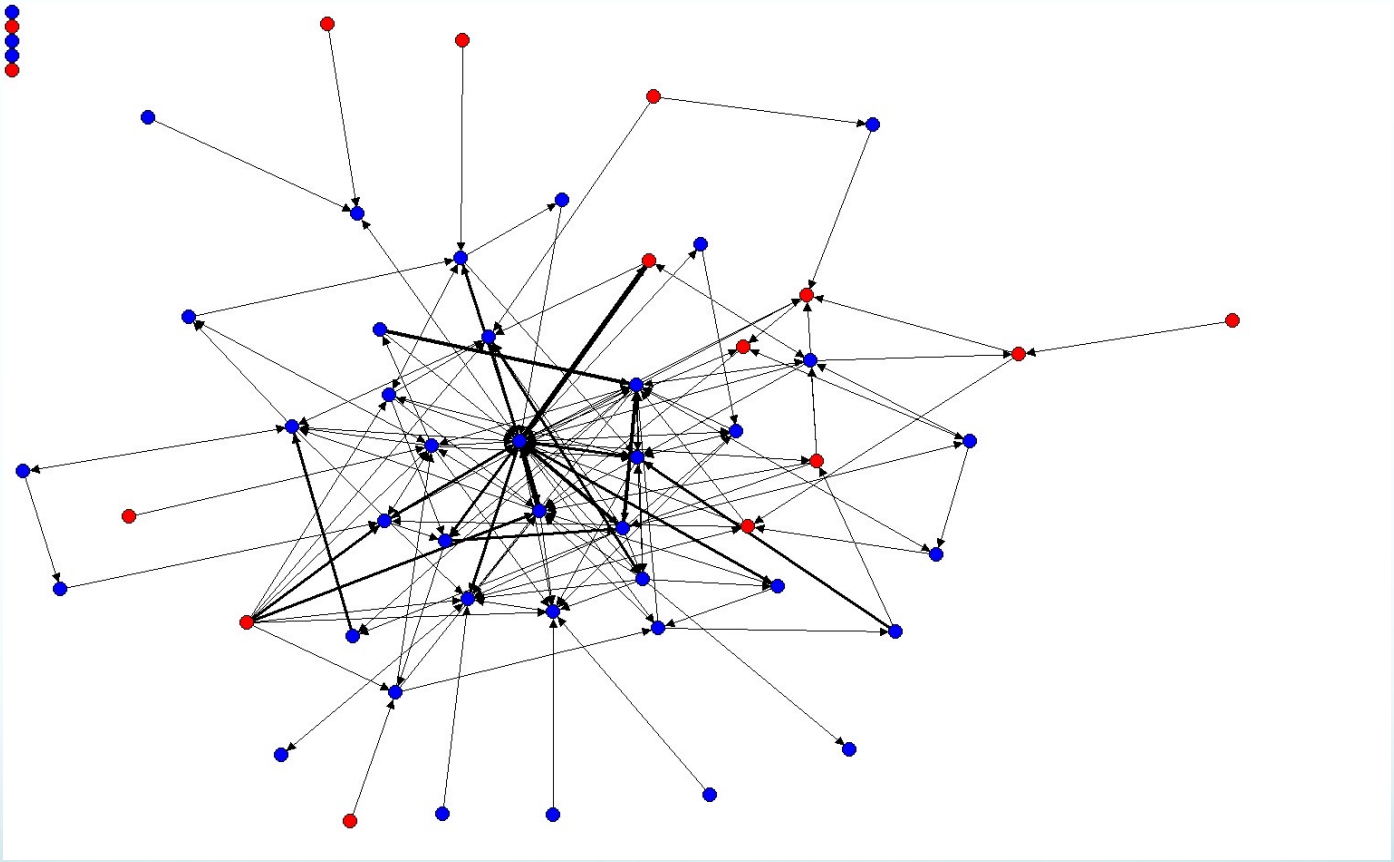
Cross-group communications



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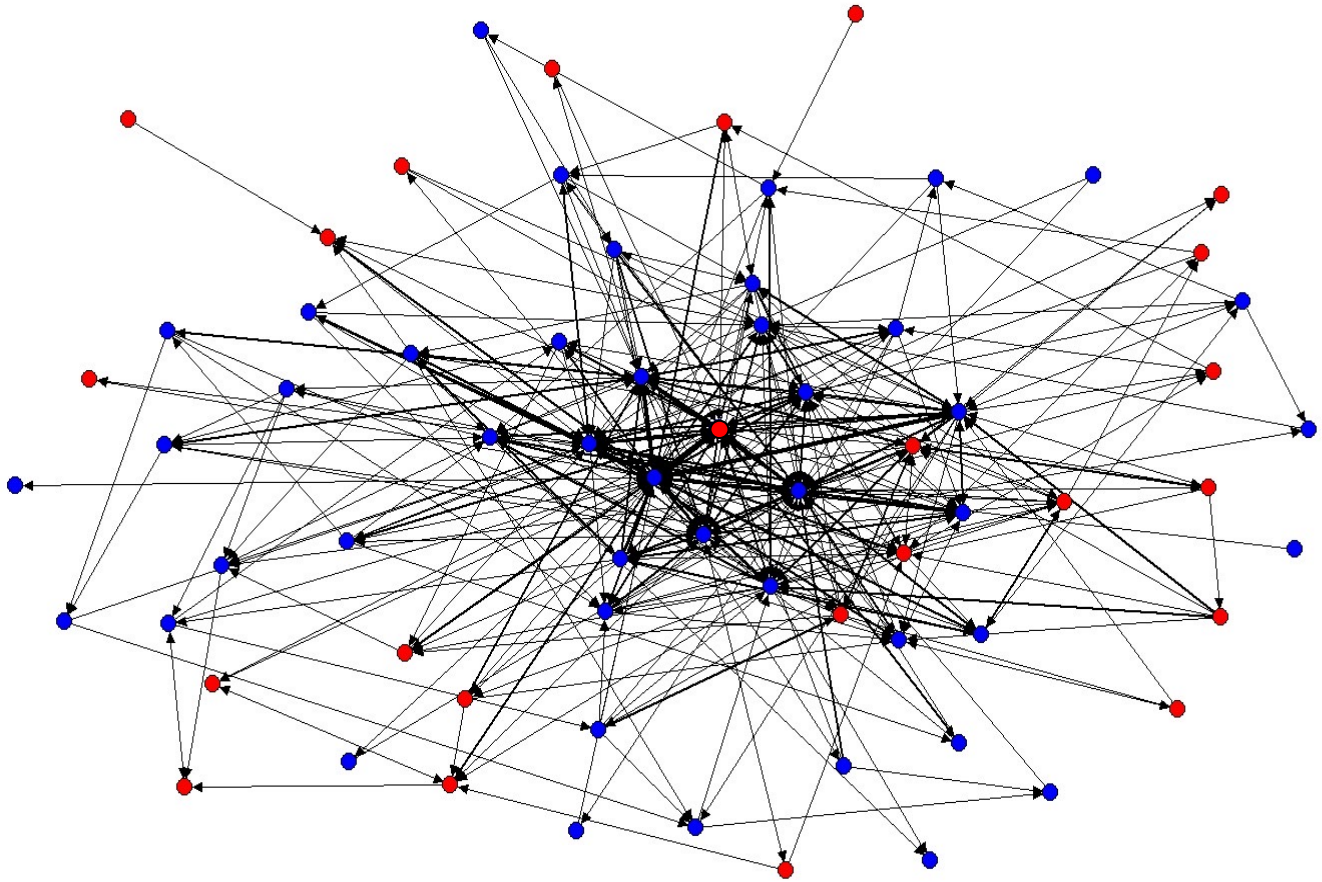
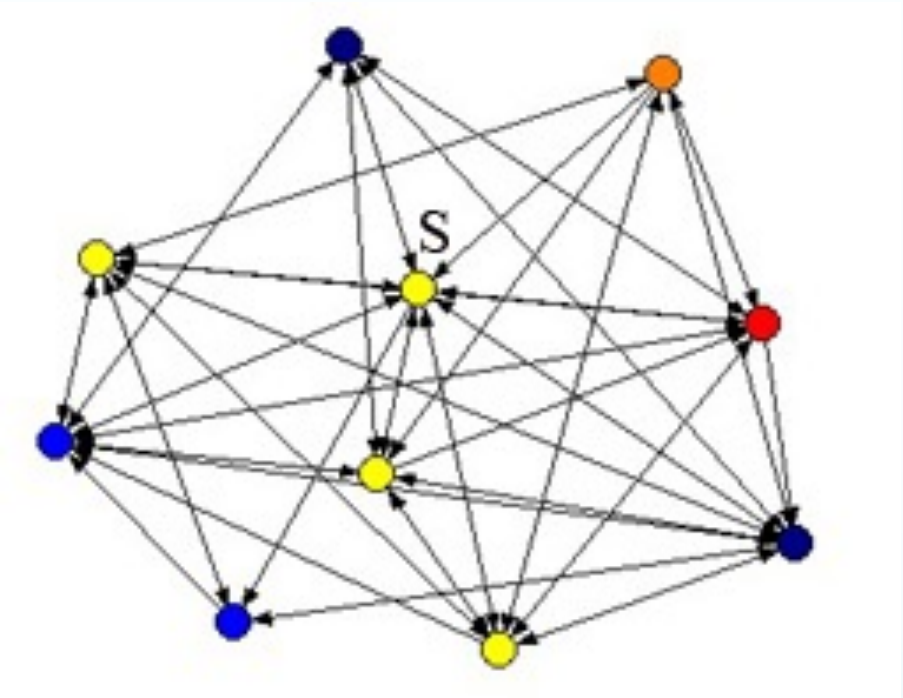
Cross-group communications



"Ego network" of a BIOL200 low-performer



Red = A; Orange = B; Yellow = C; Blue/black = D or Fail.

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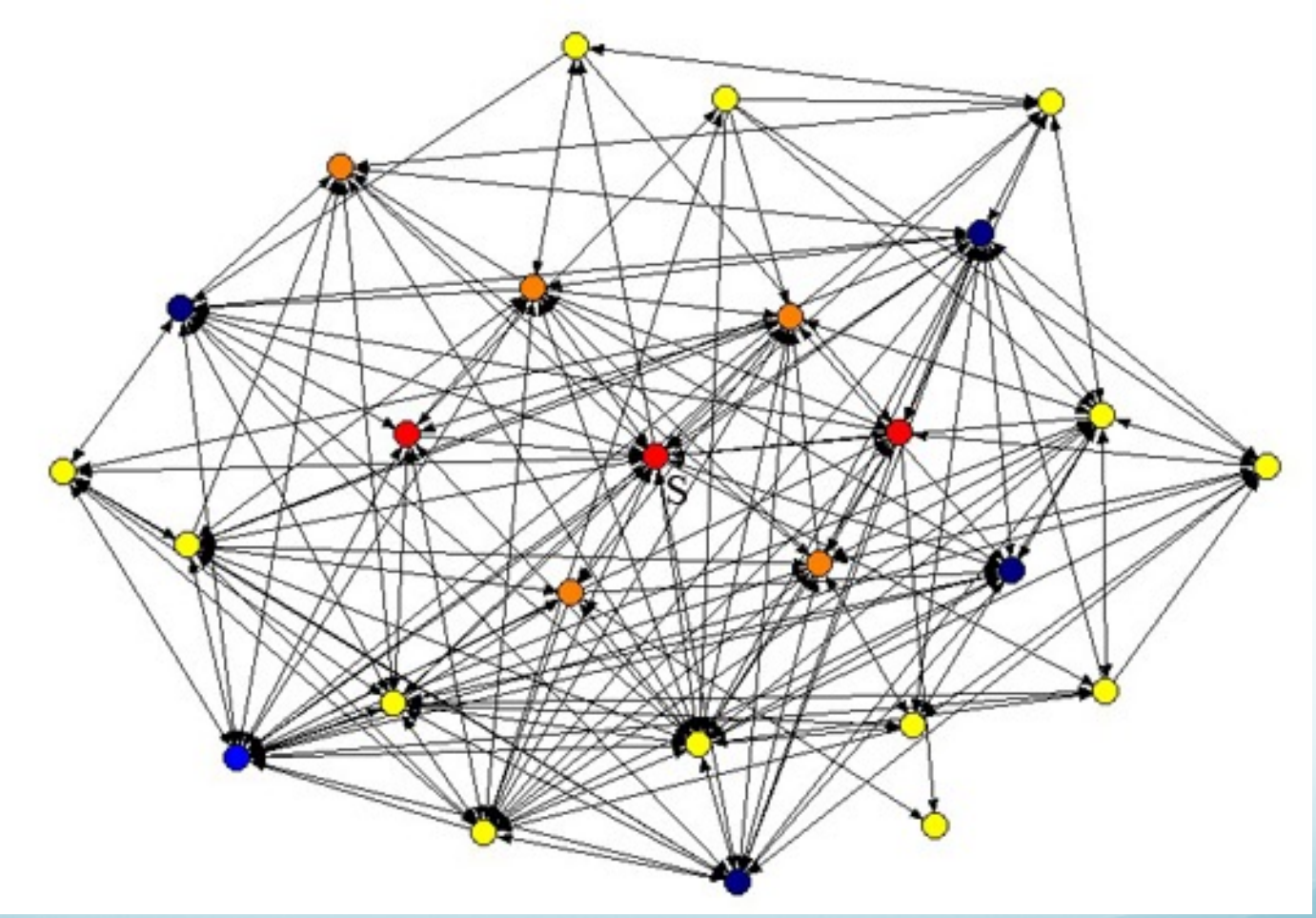
"Ego network" of a BIOL200 high-performer



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Visualising Instructor Activity