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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>

# 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.



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## 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
<b>Discovery</b>	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
<b>Reduction &amp; Holism</b>	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
<b>Origins</b>	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
<b>Adaptation &amp; Personalization</b>	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)
<b>Techniques &amp; Methods</b>	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

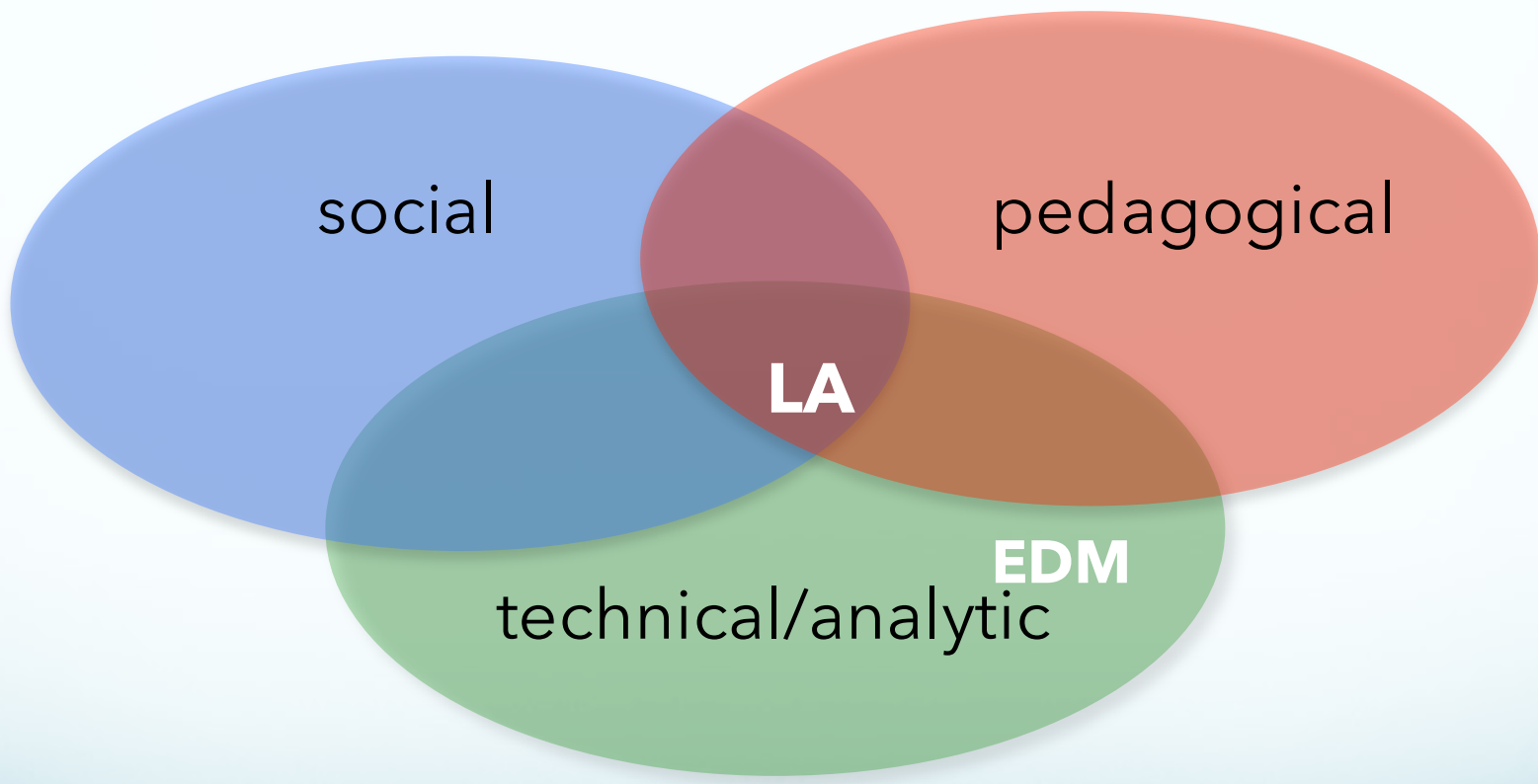


Figure 1. The interdisciplinary scope of learning analytics



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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....



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- **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*

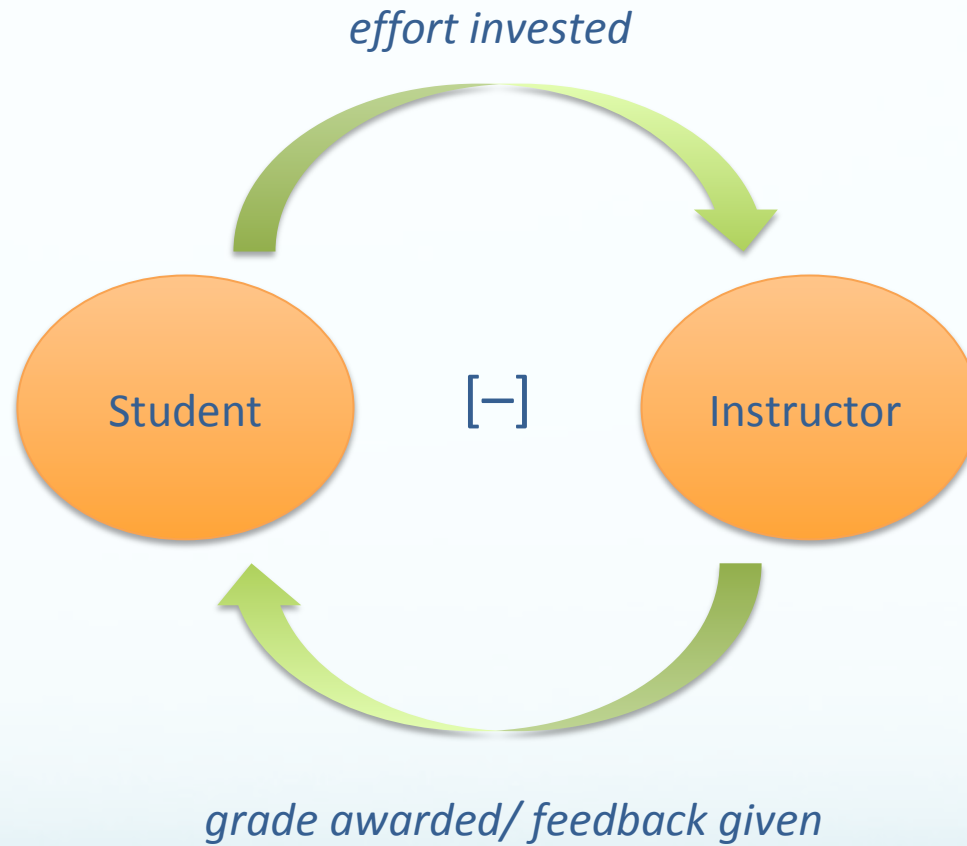
(Forrester, 1961)



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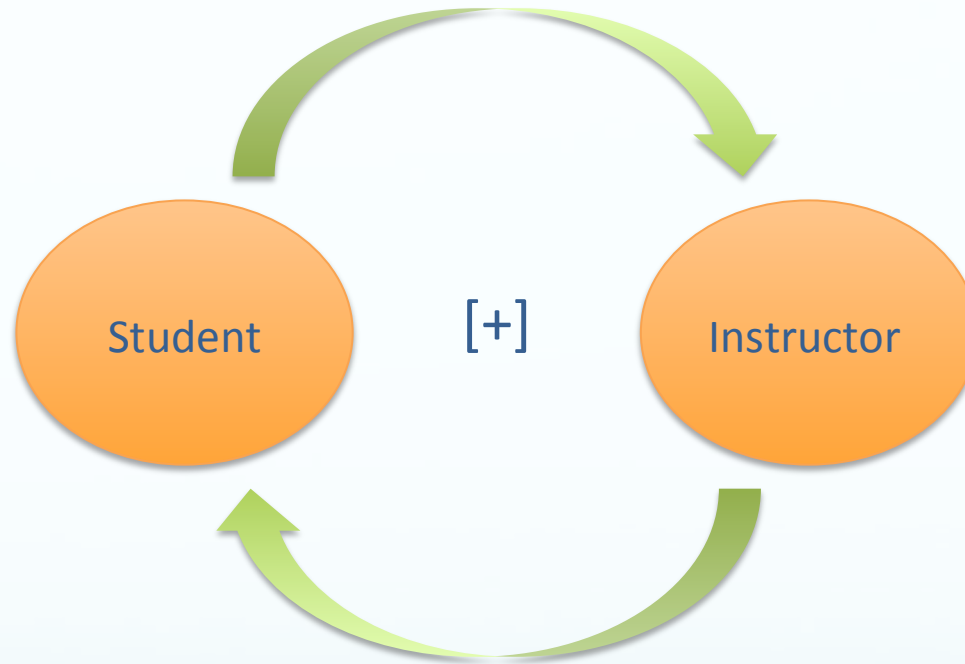


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*course/teaching evaluation*



*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



## 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?
<b>Learner awareness</b> of own learning strategies and performance to encourage self-regulated learning and support metacognition	Learners
<b>Monitoring and tracking</b> for immediate decisions <ul style="list-style-type: none"><li>Identifying problems early enough to intervene</li><li>Distinguishing students who are loafing, gaming the system</li></ul>	Individual educators
<b>Reflection and research</b> for recognizing long term issues <ul style="list-style-type: none"><li>Insights into learning processes and performance by many learners</li><li>Education research<ul style="list-style-type: none"><li>Attrition factors</li><li>Insights into individual performance</li></ul></li></ul>	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

---

## 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

# 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?

# 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.

# The Purdue Signals Project

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



Home About Help Logout

## Signals

Stoplights for student success

**Signals** helps you identify and communicate with at-risk students based on their performance in Blackboard.

### Customize

Pick from any of your grade book's columns. You have complete control on when your interventions are run, how many and how often.

### Create Reports

Reporting tools show you when students are at risk. Choose from specialized reports to help predict which students are in need of help.

### Take Action

Send personalized emails & release notifications to your student's course page in Blackboard

 **Before You Begin**

**Get Started!**

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# Signals

[Home](#) [About](#) [Help](#) [Logout](#)

**Mary Major**

Detailed Report

Effort Tracker

Help Resources

Fall Semester

Course	Int 1	Int 2	Int 3
BIOL 101			
GS 101			
SPAN 310			
STAT 303			
COM 150			

**PURDUE**  
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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
<b>Total</b>	<b>10920</b>	<b>78</b>	<b>140</b>	<b>917</b>	<b>12</b>



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# Austin Peay University's 'Degree Compass' tool

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

**Courses To Consider**

**Course Suggestions for You from THE GOV:**

You may not need to take all of the courses listed to graduate but each of the courses listed satisfies one of your degree requirements. When several courses might satisfy a degree requirement, the rating and projected grade may be helpful in selecting which course to choose. Please consult your Advisor or degree evaluation for specific program requirements.

PM3230 - Public Personnel Admin	★★★★★	<a href="#">View Sections</a>
HIST1220 - World History II	★★★★★	<a href="#">View Sections</a>
PM3190 - Criminal Procedures	★★★★★	<a href="#">View Sections</a>
PM3750 - Methods of Research	★★★★★	<a href="#">View Sections</a>
CRJ3020 - Criminal Evidence Procedure	★★★★★	<a href="#">View Sections</a>
CRJ3410 - Domestic Terrorism	★★★★★	<a href="#">View Sections</a>
CEJ4000 - Law Enforcement Admin	★★★★★	<a href="#">View Sections</a>
CRJ3400 - International Terrorism	★★★★★	<a href="#">View Sections</a>
CRJ3430 - Management of Incidents	★★★★★	<a href="#">View Sections</a>

Filter:  [More suggestions...](#)

These suggestions are courses in which other students similar to you have made successful progress in your program of study. You should always consult your advisor when planning your schedule. [What is this? Feedback](#)

**DEGREE COMPASS**  
COURSE SUGGESTION TOOL

**Mobile App Interface:**

12:13 PM

Course Filter

Your course suggestions from THE GOV

- American History II ★★★★★
- OSU and APD Systems Tech ★★★★★
- Understanding Physical World Lab ★★★★★
- Understanding Physical World ★★★★★
- Programming in Selected Lang I ★★★★★
- Operating Sys and Architecture ★★★★★
- Linear Algebra ★★★★★

**Degree Compass** provides a personalized list of courses ranked according to how well the course fits a student's program of study *and* how well they would perform academically.

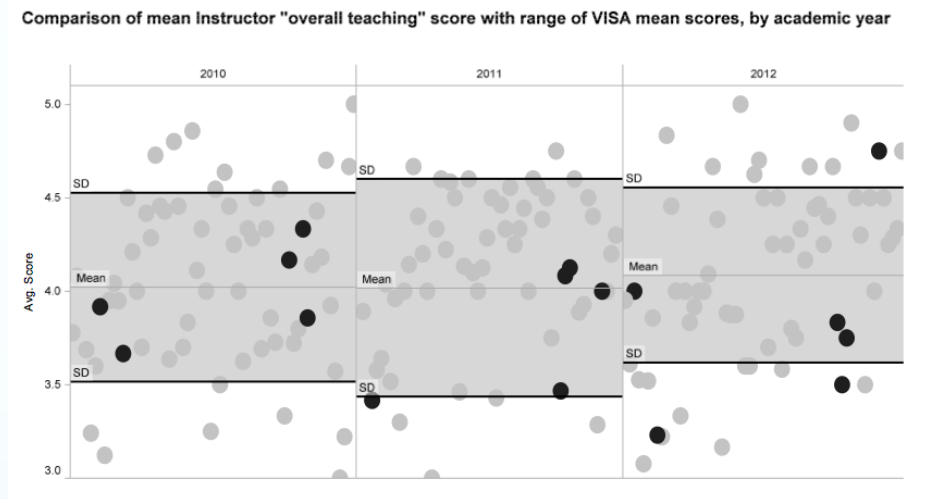
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## More enterprise-level LA tools

- 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>

## 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





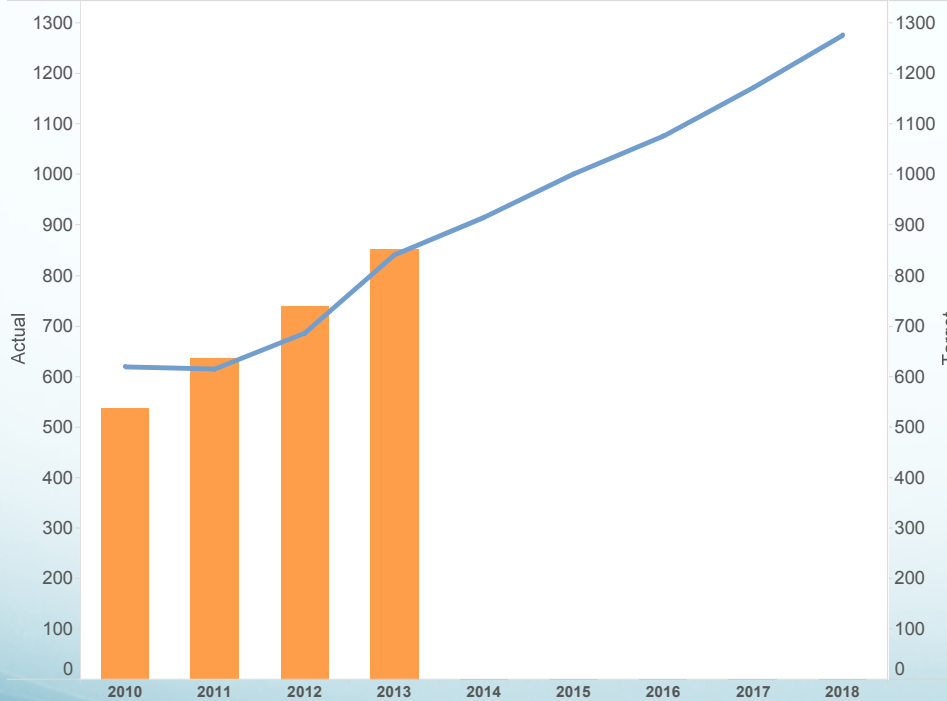
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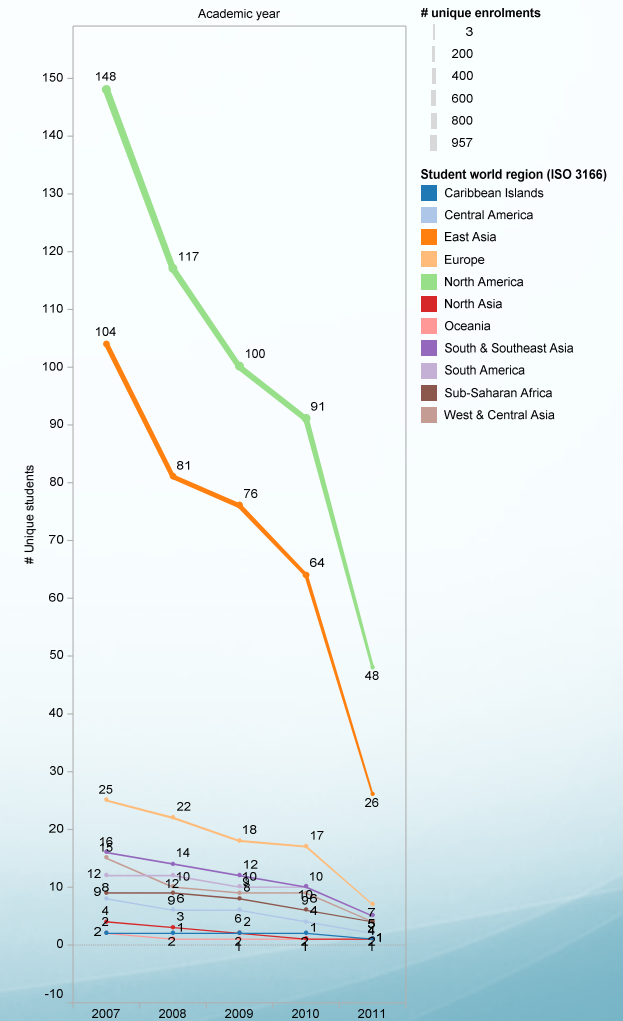
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- Better understanding of our students

New International Student Enrollments in Arts: Targets vs. Actuals, 2010 -



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>

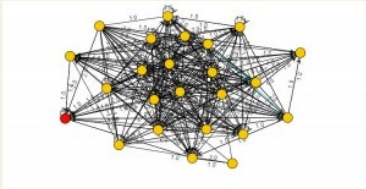
## SNAPP

Social Networks Adapting Pedagogical Practice

Home
About
Install SNAPP
Presentations
Publications and Resources



Published July 7, 2011 | By Aneesha



Welcome to the Social Networks Adapting Pedagogical Practice (SNAPP) Blog!


The aim of this blog is to share news and tutorials on the SNAPP tool.

The site contains many useful resources about SNAPP.

The following SNAPP presentation by Aneesha Bakharia at the International Learning Analytics and Knowledge 2011 conference provides a good overview of the software:

**SNAPP – Learning Analytics and Knowledge Conference 2011**

SNAPP: A BIRD'S-EYE VIEW OF TEMPORAL PARTICIPANT INTERACTION



Ms Aneesha Bakharia,  
Centre for Educational Innovation  
and Technology, University of Queensland  
Email: a.bakharia1@uq.edu.au

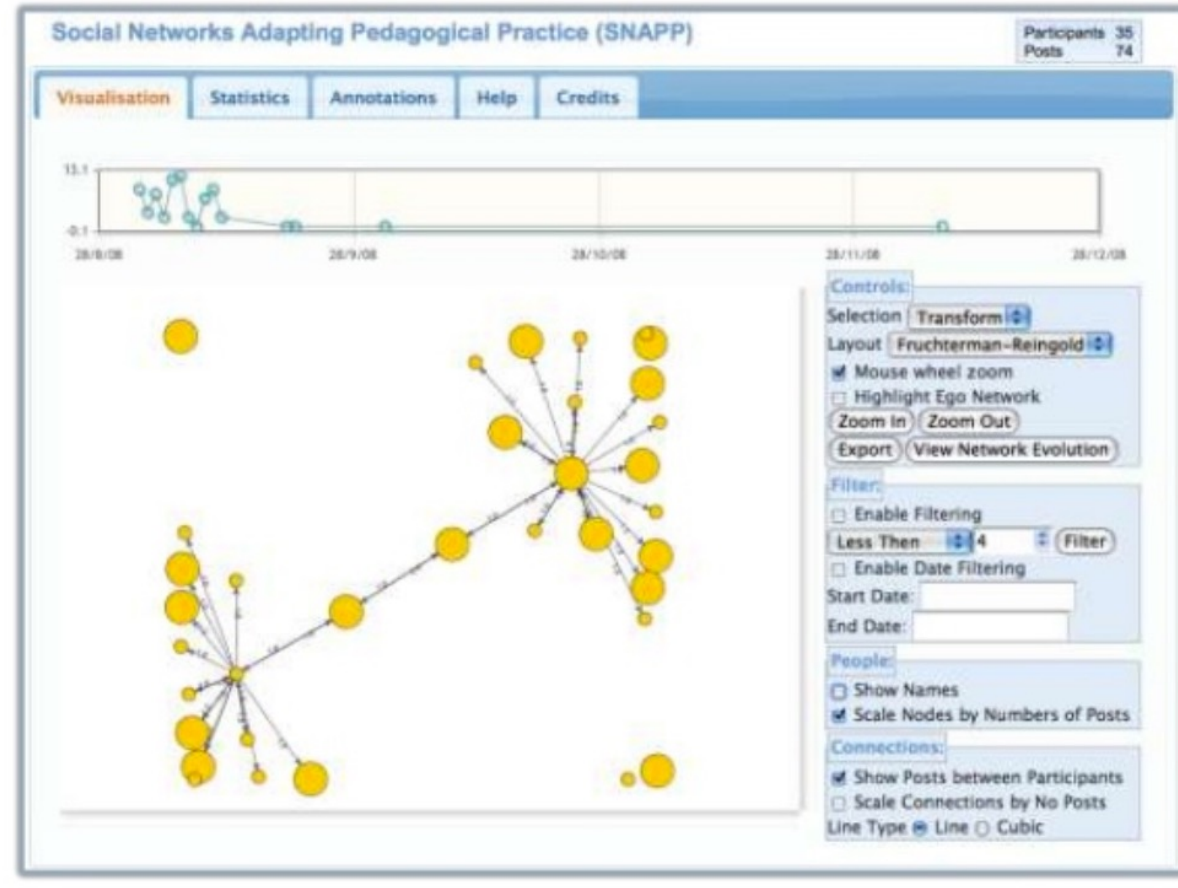
Dr Shane Dawson,  
Director Arts ISIT,  
University of British Columbia  
Email: sdawson@exchange.ubc.ca

Learning Analytics & Knowledge 2011

slideshare 1 / 31

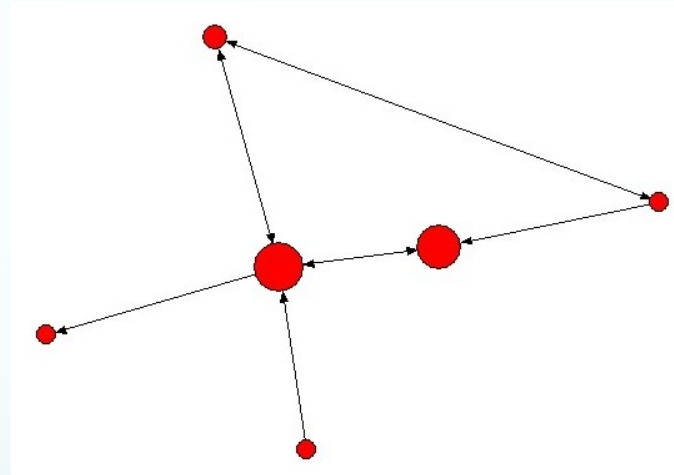


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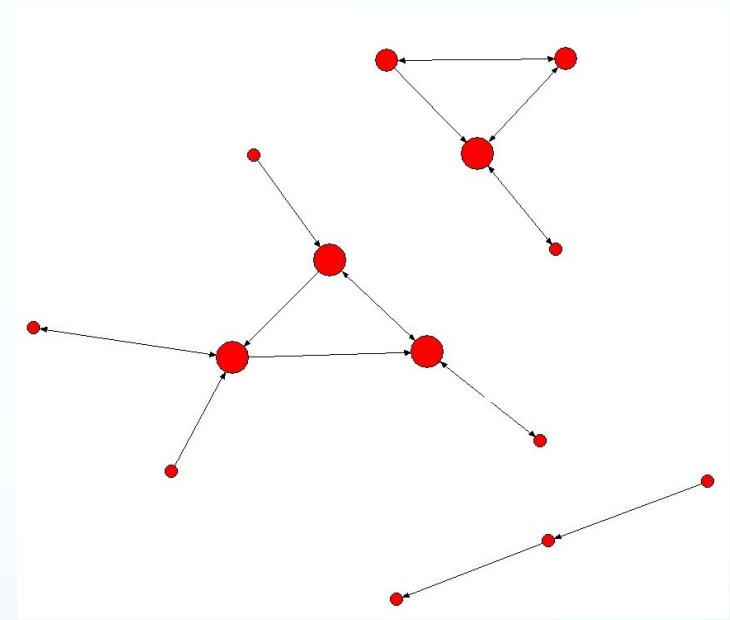


# Seeing networks in action

Power of visualizations



Forum 1



Forum 2




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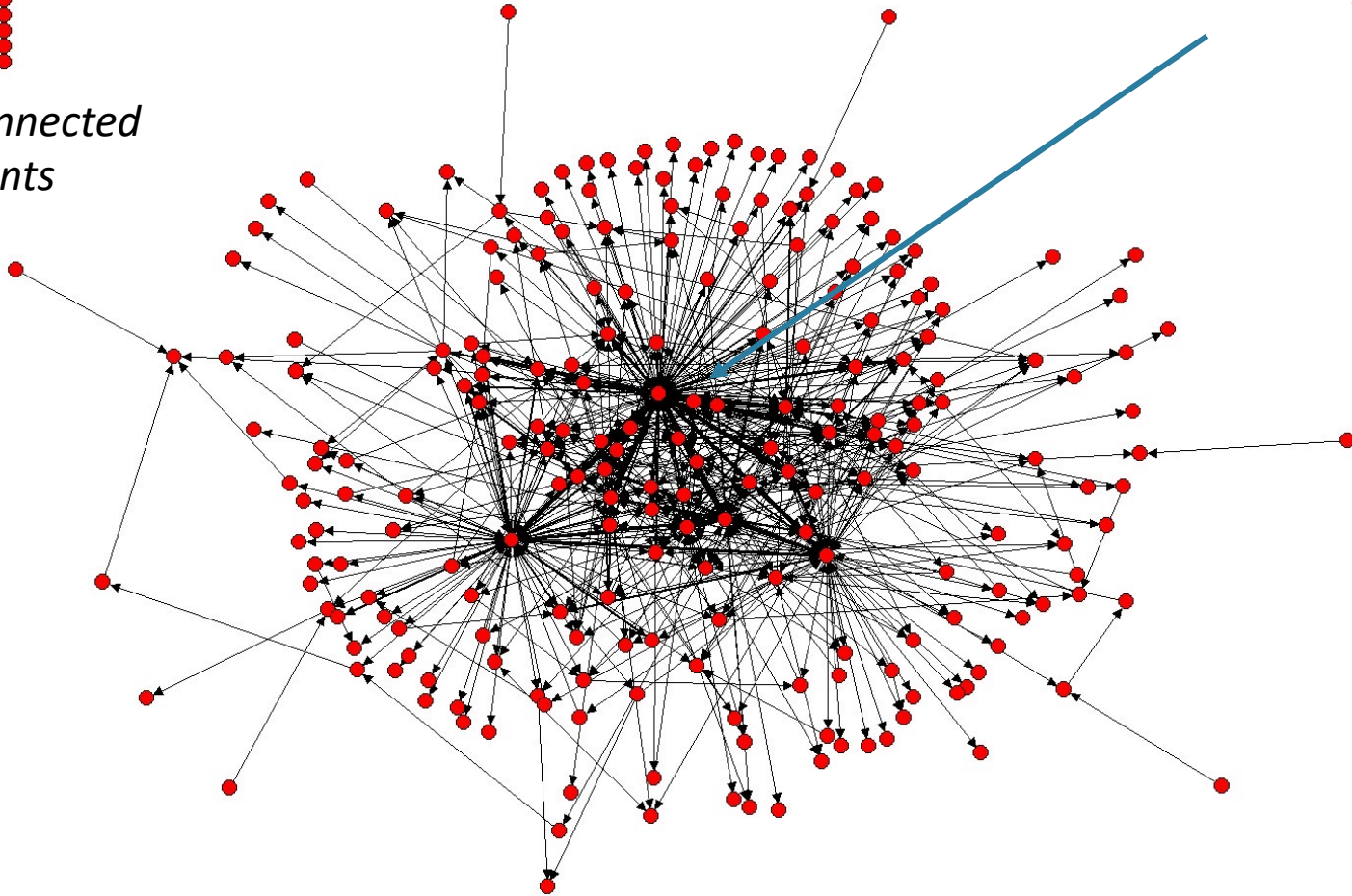


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# Development of Learning Networks

  
*disconnected  
students*

*network density*

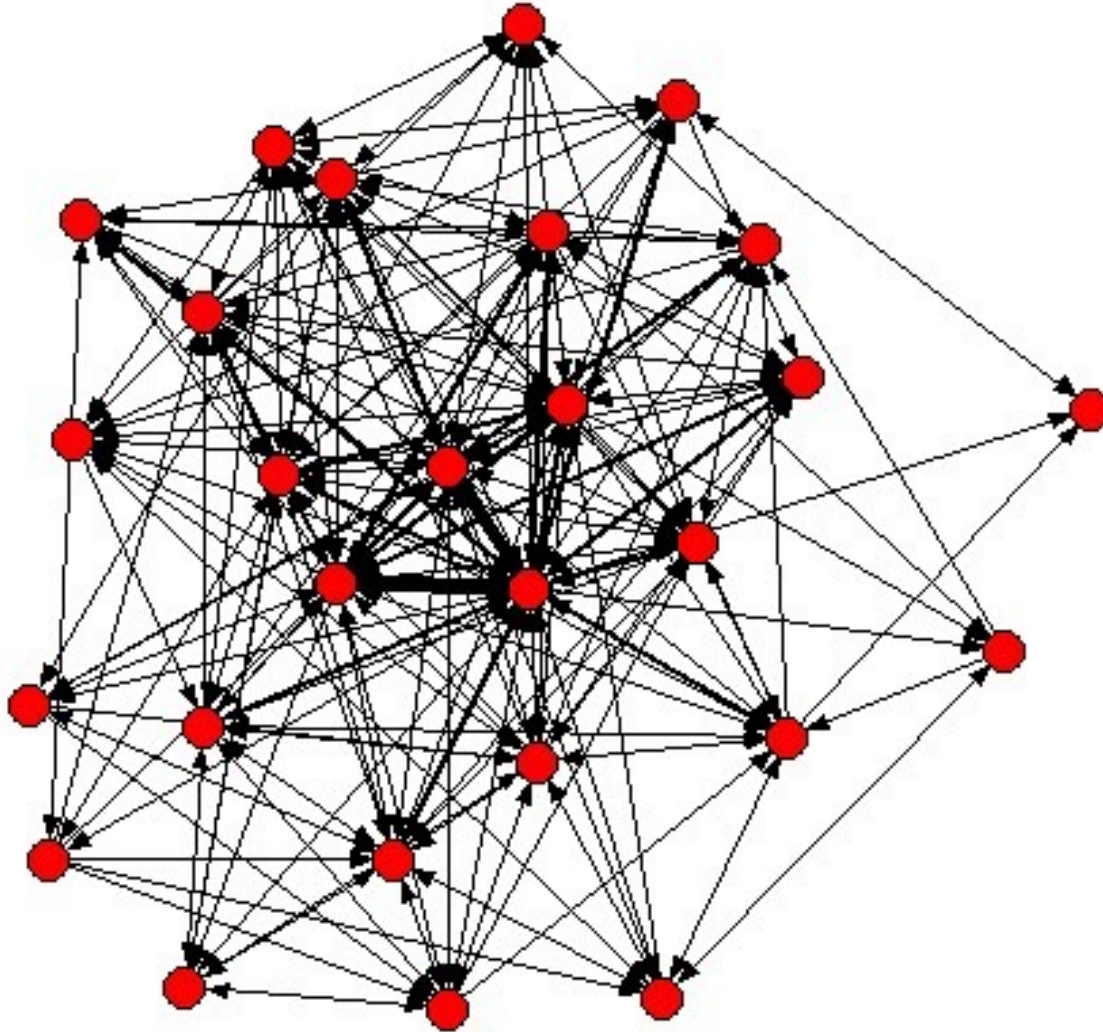




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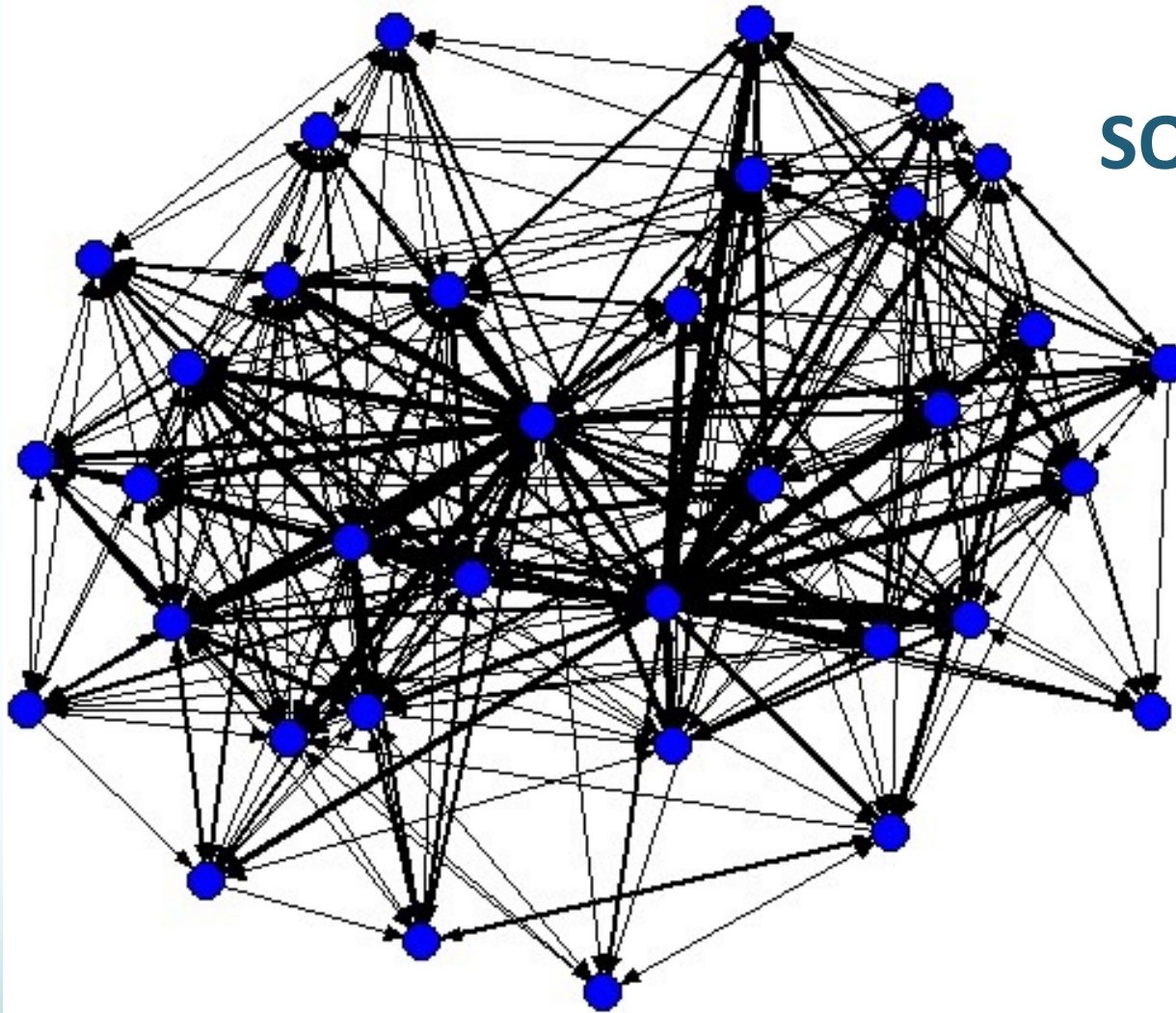
**BIOL200**



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**SOCI430**

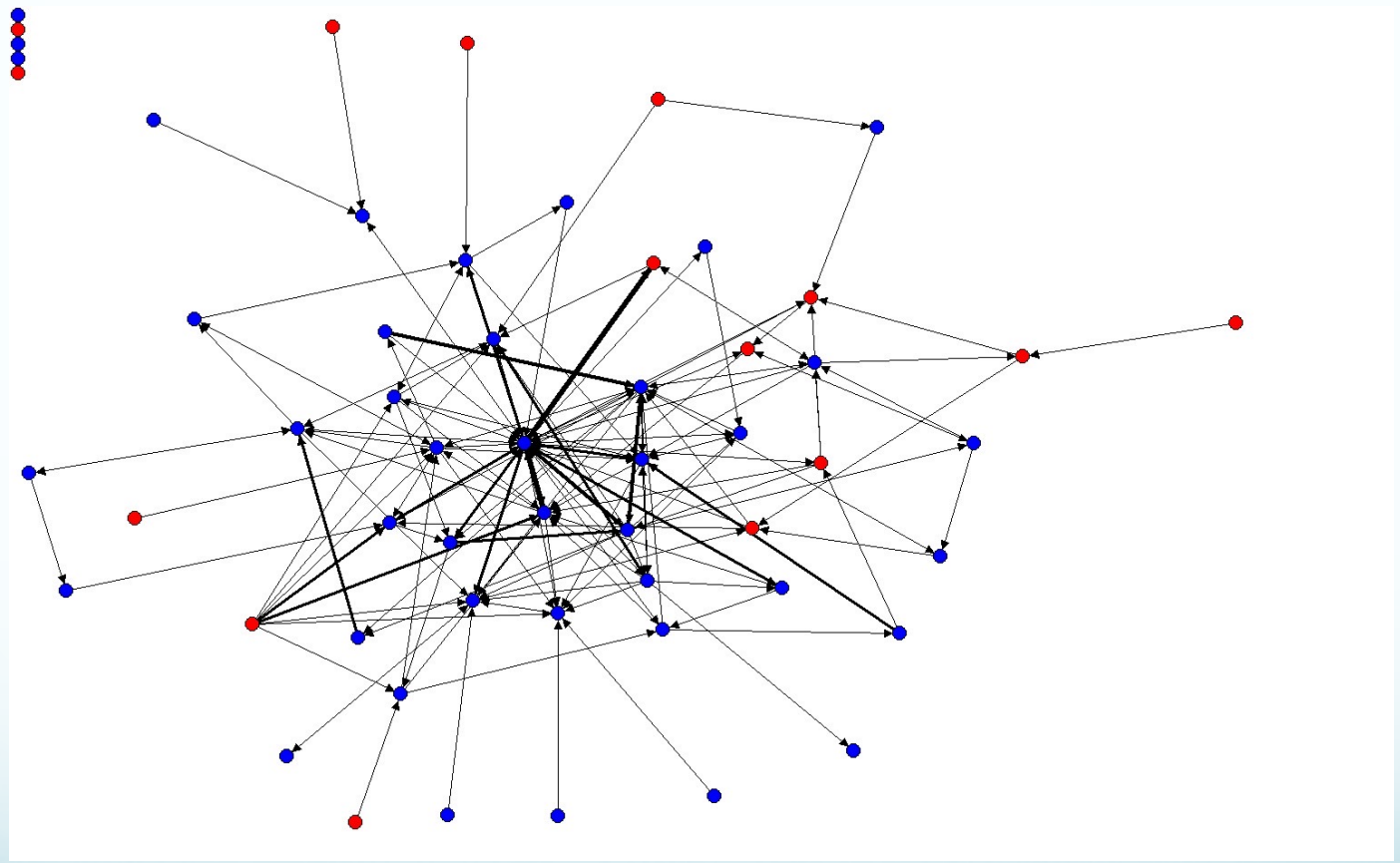


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# Cross-group communications



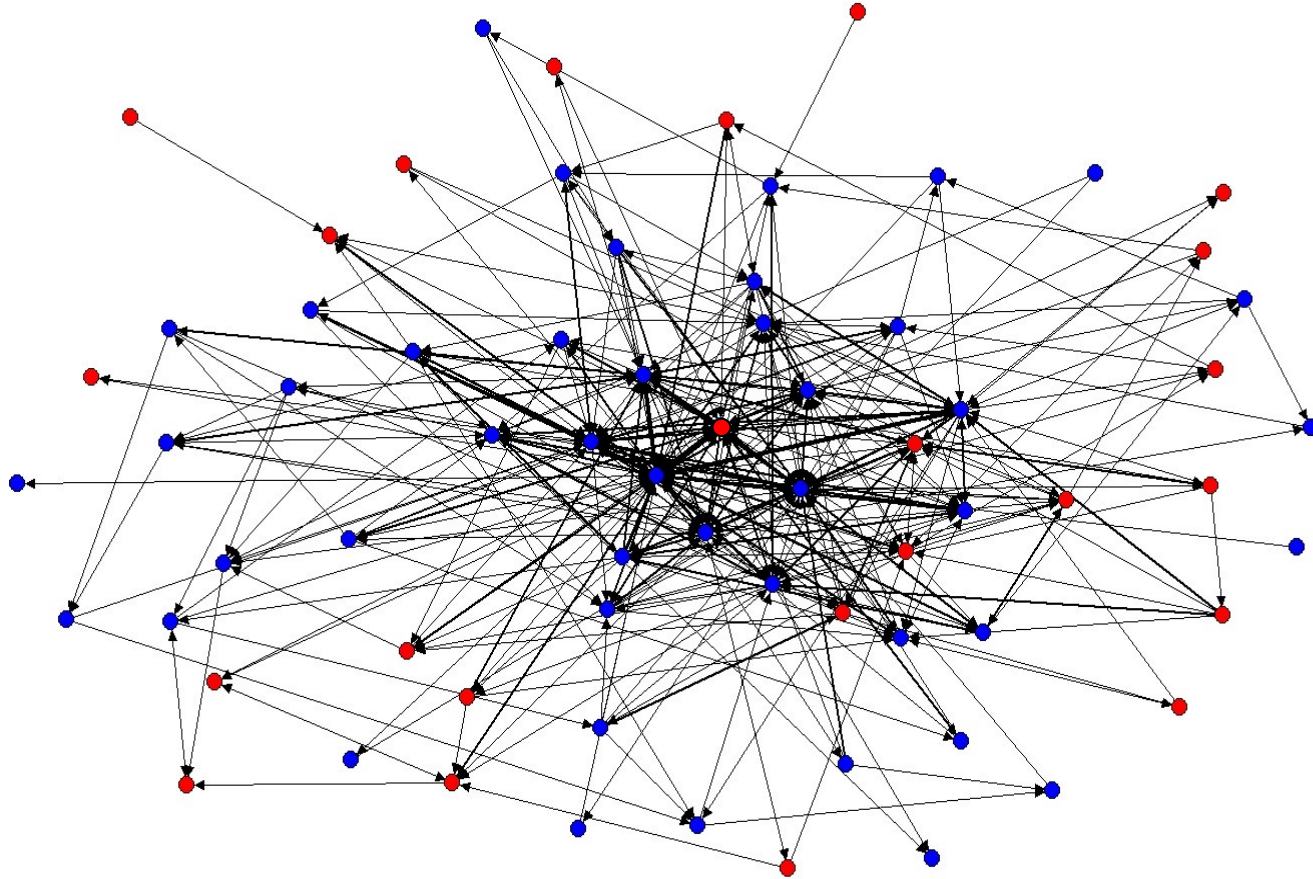


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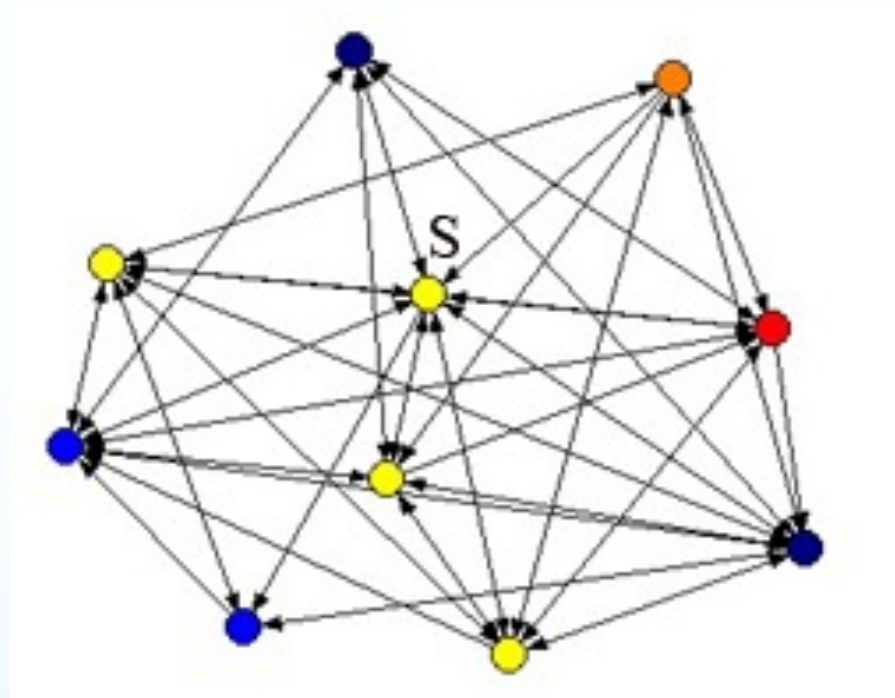


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# Cross-group communications

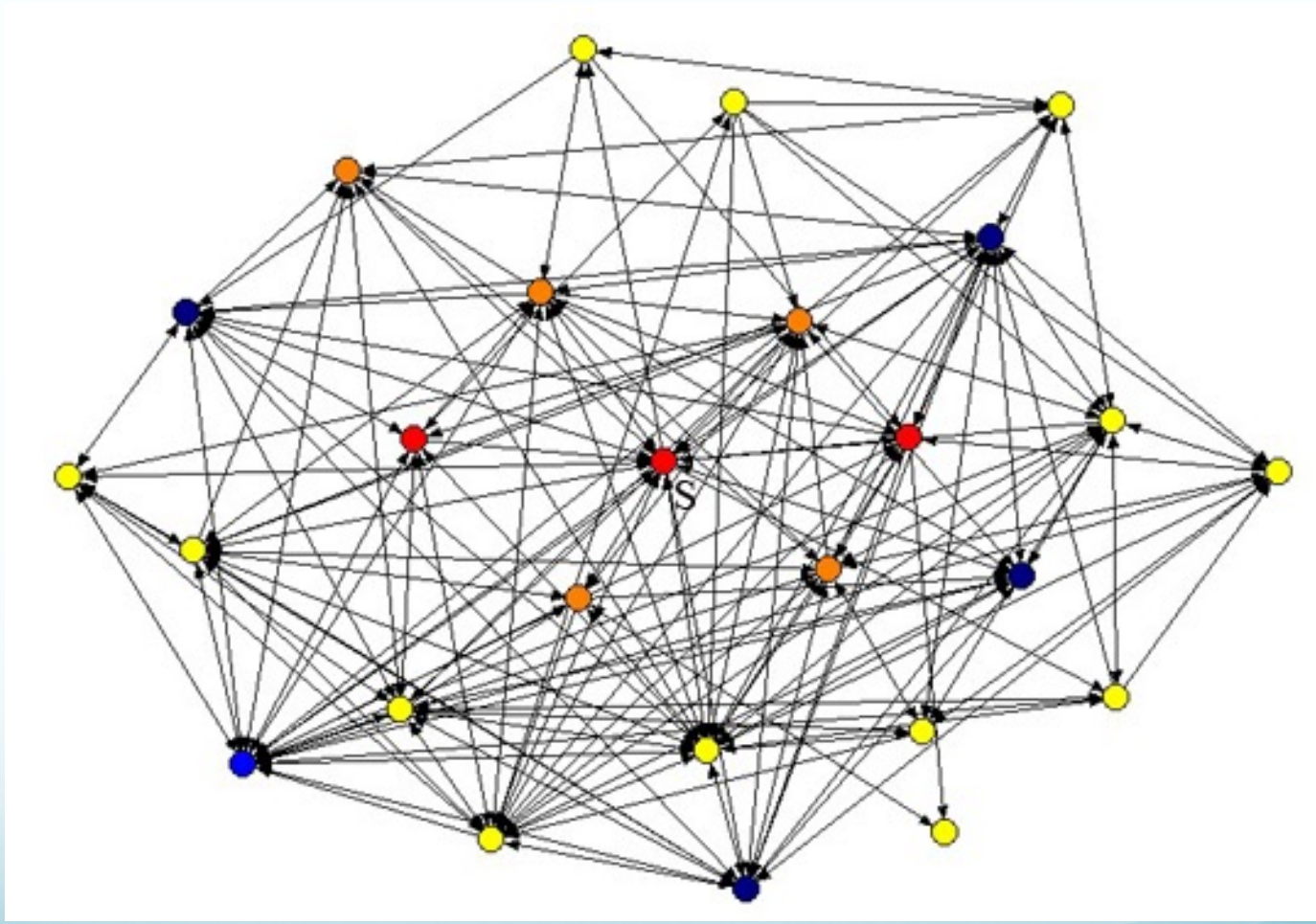


## “Ego network” of a BIOL200 low-performer



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

# “Ego network” of a BIOL200 high-performer



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

# Visualising Instructor Activity

