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Experiences at the teaching-research interface

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Research and teaching

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"In universities, learning should not be [defined] in terms of the passing on of well established knowledge, but always in terms of not yet completely solved problems."

Wilhelm von Humboldt, 1807

(Thanks to Lewis Elton)

" the true and adequate end of intellectual training and of a university is not learning or acquirement, but rather, is thought or reason exercised upon knowledge"

John H Newman, 1858

Shape of this talk

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1 – The Motivations

4 - Conclusions

2 - Background

3 – Findings and Analysis

Common beginnings ...

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Scholarship's four domains

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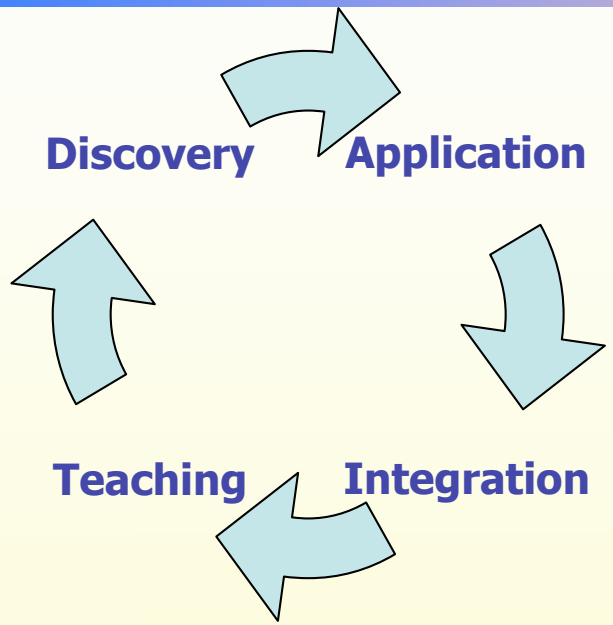

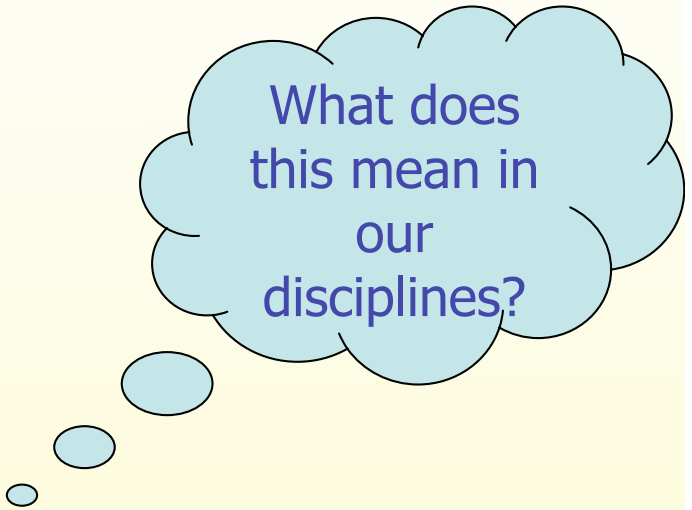

"[Teaching is not a] routine function, tacked on, something almost anyone can do. When defined as scholarship, teaching both educates and entices future scholars"

Scholarship Reconsidered, Boyer 1990
Reinventing Undergraduate Education, A Blueprint for America's Research Universities
Boyer Commission 2000 http://naples.cc.sunysb.edu/Pres/boyer.nsf/

Curriculum design and the research-teaching nexus

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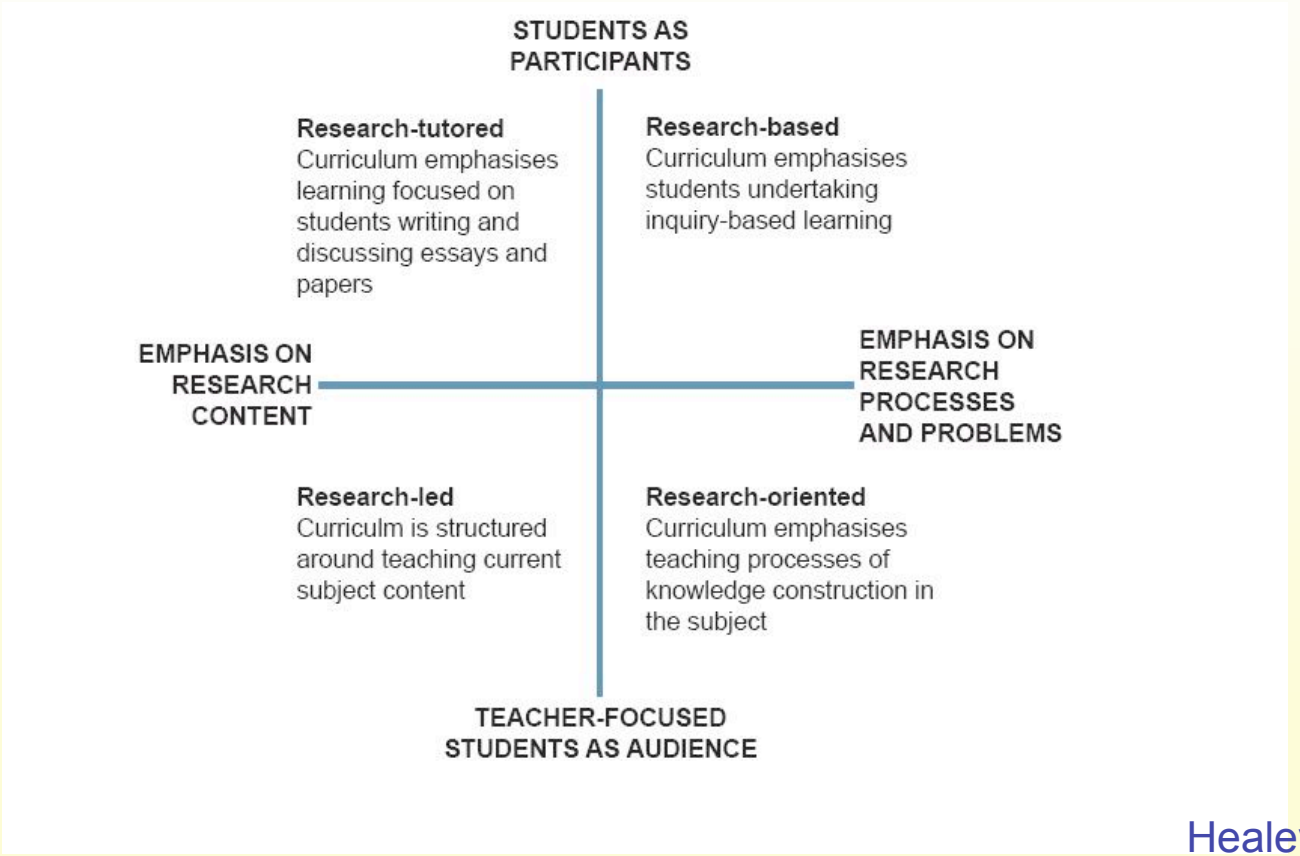

Healey, M. (2005)
Linking research and teaching: disciplinary spaces

Comparing two models

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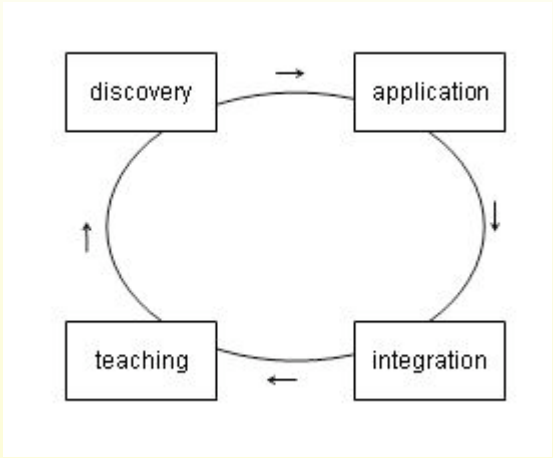
Start with the academic?
Scholarship of education

Student Experience (Boyer)	Curriculum Design (Healey)			
	Students as Participants			
		**Research-tutored**	**Research-based**	
	Research content	Curriculum emphasises learning focused on students writing and discussing essays and papers	Curriculum Emphasises students undertaking inquiry-based learning	Processes and problems
		Curriculum structured around teaching current subject content	Curriculum emphasises teaching processes of knowledge construction in the subject	
		Research-led	**Research-oriented**	
	Student as Audience			
Adapted from Boyer's Four Scholarships [7]	Adapted from Healey [24]			

Start with the student?
Curriculum innovation

Multiple perspectives

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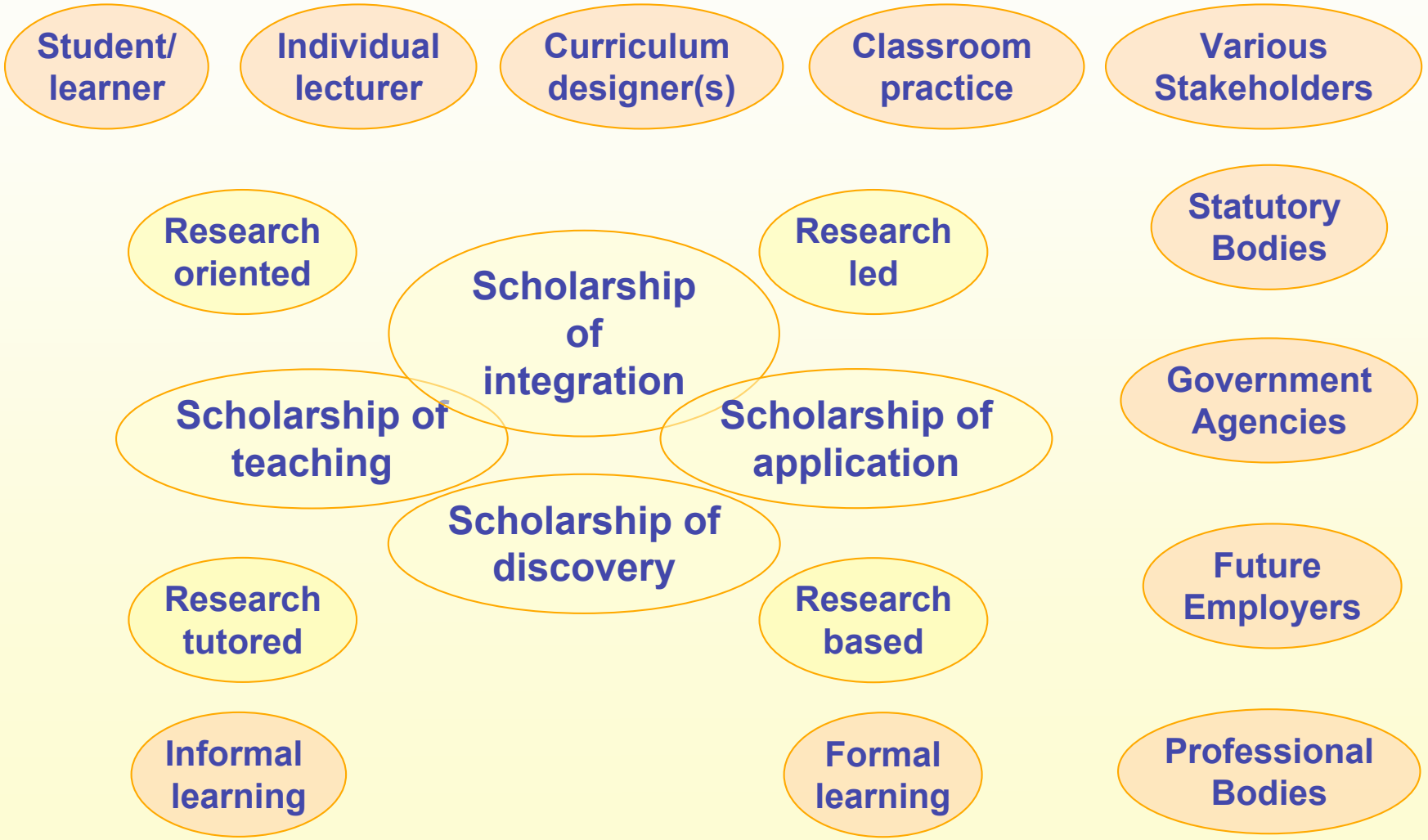

Classroom practice

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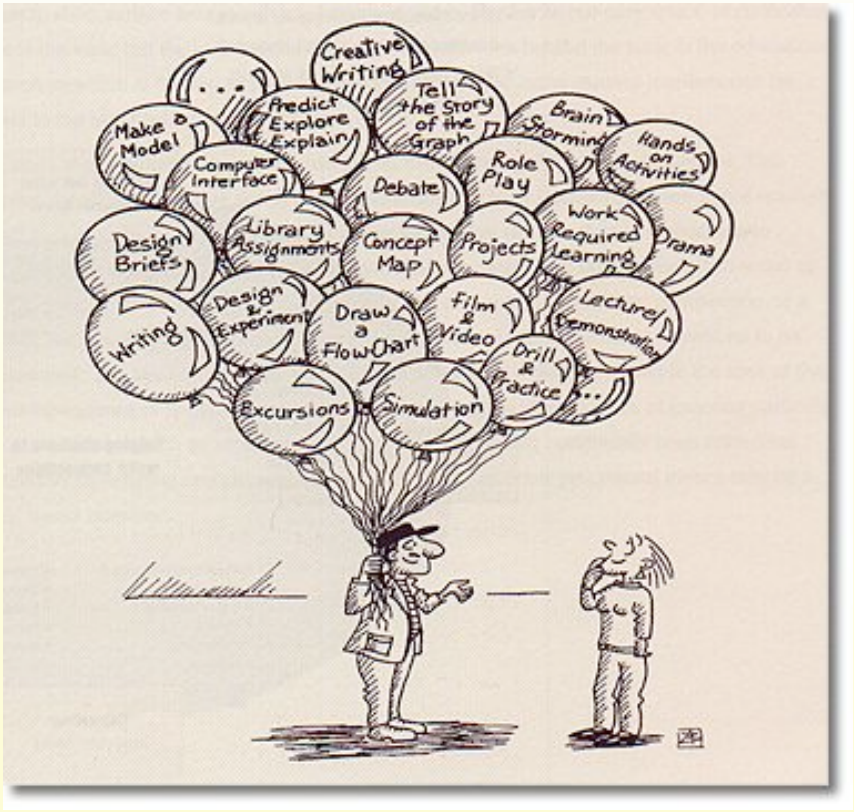
Knowledge, skills and understanding

Domains of learning

- Cognitive (knowledge)
- Affective (attitudes)
- Psychomotor (skills)

Other Considerations

- Student's journey
- Curriculum map
- Disciplinary demands



http://www.discover.tased.edu.au/sose/essay.htm

Aims and views…

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This course aims to develop critical thinking, effective working within teams, peer-learning and discussion, and individual responsibility as these are transferable skills that are essential within a highly competent technologist, computer scientist, software engineer or researcher"

"**Artificial Intelligence**, for the philosophy of AI part, I give students directed reading, which then forms part of their expected background knowledge for the examination.

Sometimes the required reading is classic stuff, like Turing's 1950 paper in Mind, but sometimes it is up-to-the-minute commentary, and so could be counted as `***research***'"

How do you relate teaching and research?
Is your teaching: research tutored, research led, research oriented, research based?

More views

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"the lecturers, xxx in particular, is able to explore the concepts with clarity and make the content interesting by displaying a genuine passion for the subject"

The colleague concerned commented

"I believe this reflects my deliberate use of research related material/knowledge..."

Where we come from…?

I have taught you a concept – now write me a program to demonstrate that you understand this concept…

To…Transformative learning?

"The experience of taking the [xxx] course was a strong influence in my decision to undertake a PhD. This course was my first in-depth exposure to undertaking research using peer reviewed publications and to the rigour involved in authoring a paper for peer review.

With the exception of my final project it is the most student centred piece of learning I have experienced. Both types of lectures included lots of opportunity for group discussion.

In the process lectures "it felt" as if the students were teaching each other, with small summaries and conclusions by the lecturer.

The seminars were of a high standard and of the same quality as the schools own lunchtime staff seminar series".

Learning journey

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Year 1

Establish basic skills, knowledge, understanding

Large lecture classes

- Lab work
- Think like a computer scientist/software engineer
- Work towards unknown (to the learner) outcomes
- Examples from current research in class
- Tutorials – research as a motivator
- …heterogeneous skills

Year 2

Consolidate basic skills, knowledge understanding

Large lecture classes

- Prepare for independent work
  - Teach research methods
  - Peer reviewing
  - Reading courses
- Small group teaching
  - Mimic the behaviour of researchers

Greater homogeneity

Learning journey

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Year 3 – final year bachelors

Small group teaching

- Independent study
- Higher cognitive levels
- Prepare research-style papers
- Reading course – sense making, guide
- Disciplinary variations

Year 4 Masters

Explicit/intentional research links

- Small demonstration pieces
- Peer review, revise, present
- Participate in research group activities
- seminars

Disciplinary exemplars

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Students as participants

Research Tutored

- Supervisions take students through recent publication(s)
- They are invited to discuss/debate their understanding of the activity
- Possible at each level of study
- For organisational/management reasons may only apply to all

Research Based

- Practice and understanding of skills
- Equivalent skills to those used in authentic research
- May be practiced at any level of study, typically advanced level

Research Content

Processes and problems

- Most typically advanced level options
- Can also be a component of teaching at any level
- Students are exposed to state of the art
- research concepts

Research Led

- Typical of capstone courses
- Students undertake some research activity, individually or as a group
- Students at less advanced levels may practice skill as part of research based activities

Research Oriented

Students as Audience

Students as audience

Boyer

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Discovery
- Core to enquiry based curriculum
- Natural in lab based courses
- Well aligned to conventional approaches in teaching programming
- Internships
- Final year projects

Application
- Final year options
- Masters curriculum
- Proxy activities in follow on courses – apply previously learnt skills, knowledge, understanding
- Proxy discovery in lab classes
- Internships

Integration
- Capstone modules
- Final year projects/dissertations
- Synoptic assessments
- Design classes

Teaching
- Professional issues
- Skills modules
- Peer instruction
- Small group teaching methods

Conclusions/reflections

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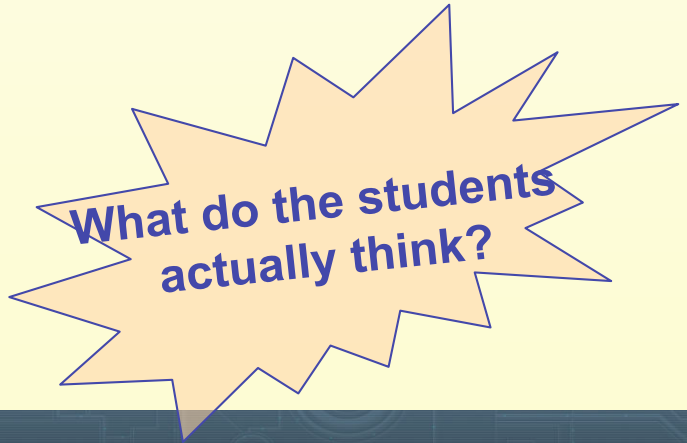
- There is evidence of activities which create a link between research and teaching at each year of study
- Some colleagues have difficulties with the concepts
- Some issues are related to Disciplinary Differences or Engineer/Scientist tensions

- Academics in engineering are not social scientists
- Many found it easier to relate to Boyer's explanation than to Healey's

- Probably need a whole curriculum approach
- But not whole institution because of disciplinary preferences?
- I don't think so… but
- For the future we need to consider additionally activities for Millennials



Future work

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Looking for more data:

- Evidence of current practice
- Academic perspectives
- Student Perspectives
- Educational approaches
  - Technology based
  - Enquiry based
  - Traditional face to face

Possible Perspectives?

- National
- Curriculum type
- Institution type
- Educational Objectives

Want to collaborate?

Sounds like a working group

Thank You ☺

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Acknowledge:

Contributions of colleagues at our respective institutions

Questions?

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Appendix

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- Research teaching nexus matrix
- Mindmap
- Survey monkey – to use for online survey
- CPHC Learning Development Group

Context and background

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Ideas in the ether….

- Nathan - My freshman year
- Wesch - Digital ethnography Kansas State University
- Frand – Information Age Mindset
- Prensky – Digital Natives, Digital Immigrants,
- C. Haythornthwaite & M. M. Kazmer (Eds.) Learning, Culture and Community in Online Education: Research and Practice

Digital ethnography
http://mediatedcultures.net/ksudigg/

The Machine is Us/ing Us (Final Version)
http://youtube.com/watch?v=NLlGopyXT_g

Information r/evolution
http://youtube.com/watch?v=-4CV05HyAbM

A vision of students today
http://youtube.com/watch?v=dGCJ46vyR9o&feature=related

The hyperland videos featuring Douglas Adams on YouTube
http://youtube.com/watch?v=rOsPKjbMvxY

Digital natives data
http://www.digitalnative.org/Introduction_to_the_Life_of_Digital_Natives