

**The scope of academic training and  
degrees at the University of Arizona: is  
there an opportunity for an Institute for  
Open Knowledge?**

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# Question

- Is there an opportunity, even a necessity, to implement an academic offer on **environmental & water** issues that is compatible with the SWAN mission?
  - **Training-focused**
  - **Community-oriented**

# In order to answer

- Review of academic offer at the University of Arizona

# Special interest

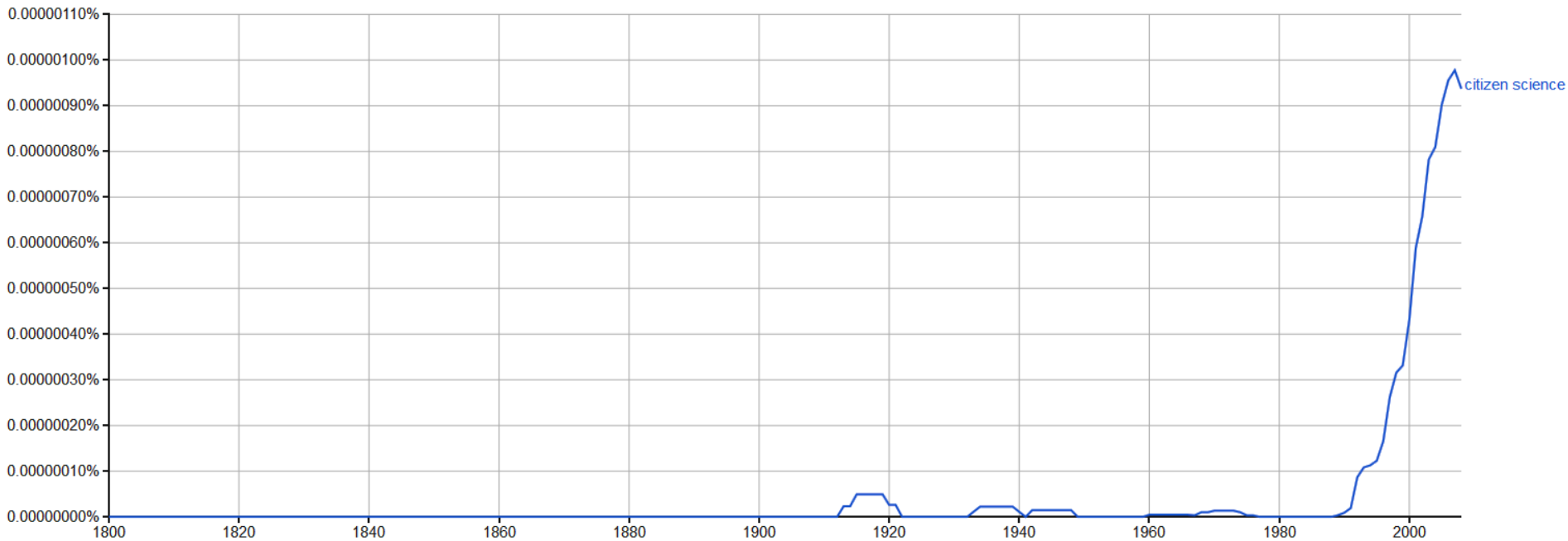
- Citizen science
- Open knowledge
- Possibly, big data

# Citizen science

- “Scientific work undertaken by members of the general public, often in collaboration with or under the direction of professional scientists and scientific institutions.”
  - Oxford English Dictionary

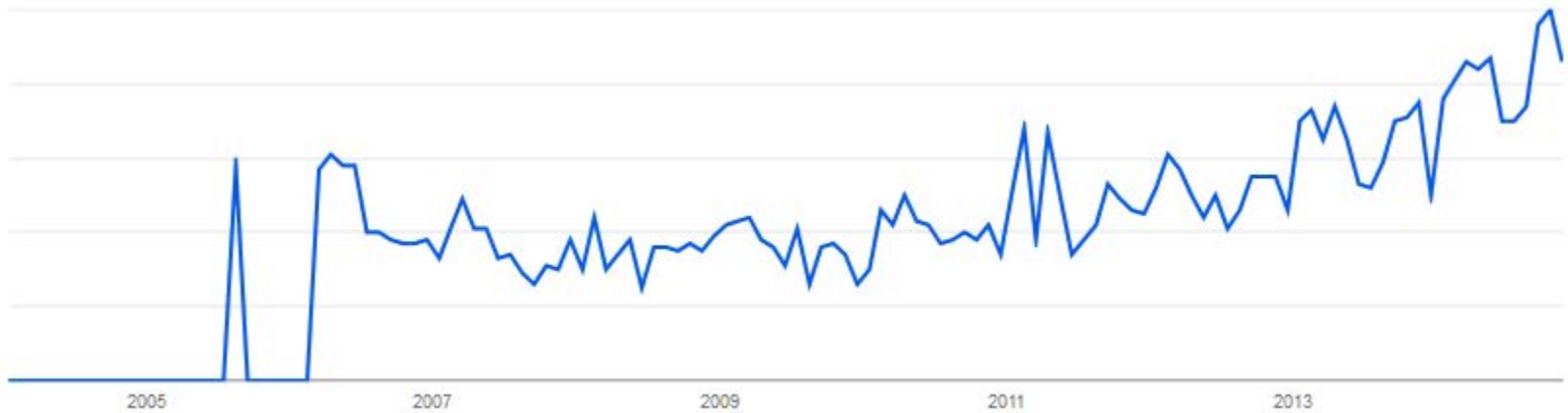
# Citizen science is growing

- Google Ngram



# Citizen science is timely

- Google Trends
  - Peak in October 2014



# New term, old practice: return to little science?

- Little science
  - “... early-modern ‘invisible colleges’ of scientific amateurs and enthusiasts engaged in small-scale, informal interactions and personal correspondence”;
- Big science
  - “... dominated by professional scientists and wealthy institutions, where scientific information (primarily in print form and its analogues) was mass-produced, marketed and circulated on a global scale” (Lievrouw 2010)



# Tech revolution

- 1990s: Internet
- More recently: Web 2.0 and social media

# Opportunities, issues, and implications

- Immediacy, data collection
  - “... venues and affordances for scientific communication that combine the relational qualities of immediacy, trust and credibility...” (Lievrouw 2010)
  - “The ability to cope with extremely large data sets – in its first six months Galaxy Zoo provided the same number of classifications as would a graduate student working round the clock for 3.5 years.”  
(<http://www.citizen-science-alliance.org/philosophy.html>)

# Opportunities, issues, and implications

- Contested knowledge and evidence
  - “... may also raise significant new issues of contested knowledge and priority claims, fugitive or sabotaged evidence, originality and authenticity, and the reliability and authority of scientific information” (Lievrouw 2010)
- Privacy and surveillance
  - “The process of being observed is likely to raise the privacy concerns of people and organisations. [...] It is notable that the formation of the police force in the UK in the 19th century emerged out of volunteers and so-called watchmen” (Purdam 2014)

# Opportunities, issues, and implications

- Scientific Publications 3.0?
  - “... implications for traditional documentary forms of scientific communication such as the journal article. [...] “... a turn toward a style of publication that not only is produced and distributed across different platforms (print, electronic), but is also **more immediate, provisional, and even epistolary—perhaps more a return to an older tradition of journal publishing than an entirely new form.** We might think of some of the earliest scientific publications, often called *bulletins, briefs, letters, reports, and acts (acta in Latin).*” (Lievrouw 2010)

# Key question: evaluation and training

- “The majority of studies indicate that, when given proper training and materials, volunteers can collect data comparable to data collected by professional scientists (Au et al., 2000; Canfield et al. 2002; Fore et al., 2001; Delaney et al., 2008) [...] Evaluations have also revealed that quantitative measurements appear more reliable than qualitative assessments made by citizen scientists.” (Gommerman and Monroe 2012)
  - <http://edis.ifas.ufl.edu/pdf/FR/FR35900.pdf>

# Back to question

- SWAN academic offer?
- Review of courses offered at the U of A

# How many courses does the U of A offer?

- Exact answer: unclear
  - “The University of Arizona offers a wide variety of academic programs, many of which are among the nation’s best. Students can choose from more than 300 undergraduate and graduate degrees through 20 colleges and 11 schools on three campuses.”
  - <http://admissions.arizona.edu/freshmen/majors-degrees>

# How many courses does the U of A offer?

Select Institution

Course Fees

\*Select Term  [change](#)

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z  
0 1 2 3 4 5 6 7 8 9

Select subject code to display or hide course information.

**SUN#** = [Shared Unique Number System](#)

- ▶ ABE - Agric & Biosystems Engr
- ▶ ABS - Applied Biosciences
- ▶ ACBS - Animal & Comp Biomed Sciences
- ▶ ACCT - Accounting
- ▶ ADVR - Advisor Approved
- ▶ AED - Agricultural Education Main
- ▶ AEDV - Agricultural Educ UA South
- ▶ AFAS - Africana Studies Main
- ▶ AGTM - Agricultural Technology Mgmt
- ▶ AIS - American Indian Studies Main
- ▶ AISV - American Indian St. UA South
- ▶ AME - Aerospace & Mechanical Engr

- Rough answer: a lot
- 2014-2015 Academic catalog



# Only letter “A”

- 2324 courses
- Only Anthropology: 411 courses
  - There is some redundancy

# Reviewing the courses

- Catalogs
- Course title
- Course description
- Buzzword: water, environ\*, hydr\*
- This is a work-in-progress

# Reporting

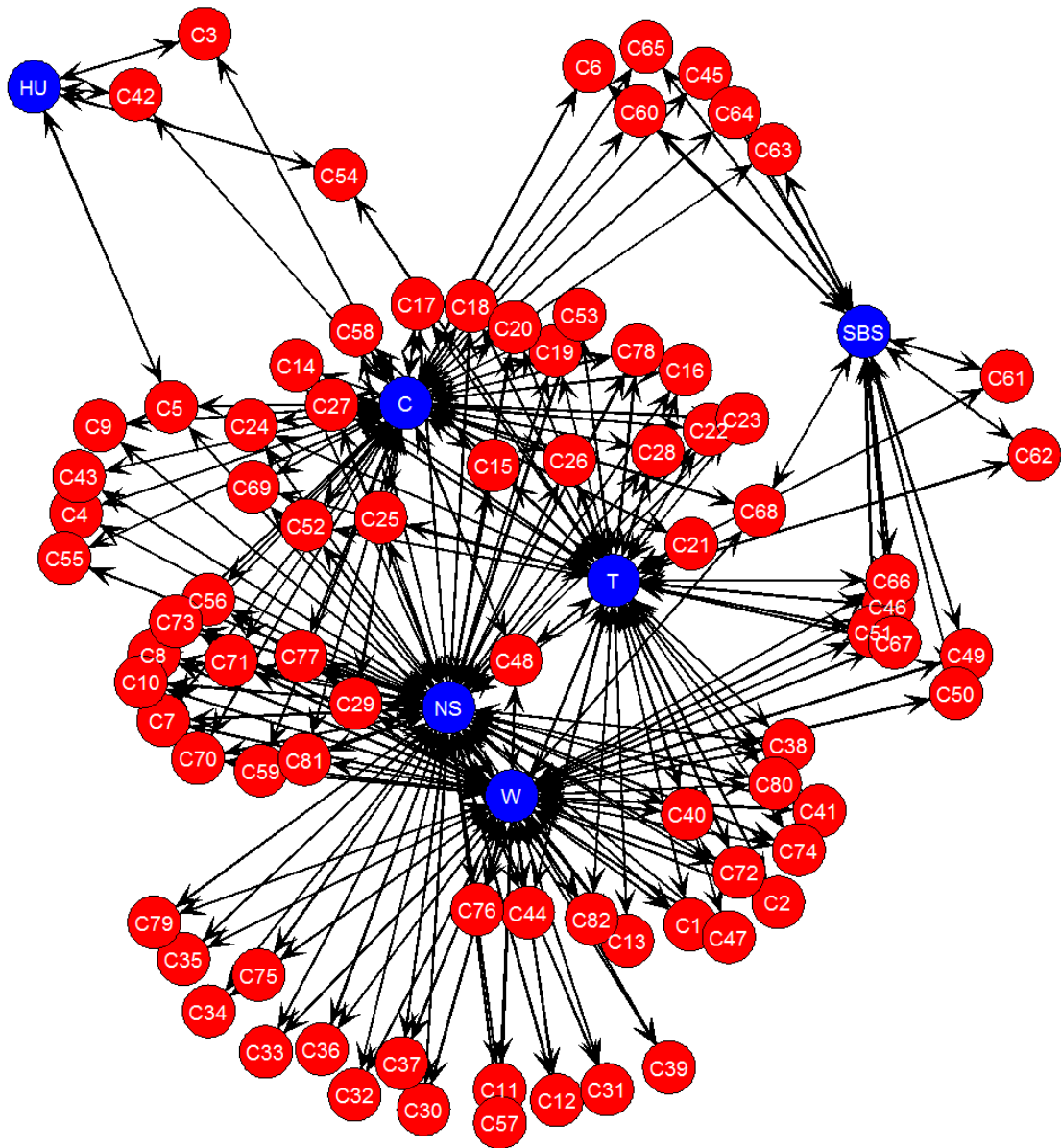
- Emphasis on water (1) or not (0)
- Emphasis on practical, hands-on training (1) or not (0)
- Emphasis on community, stakeholders, nonprofessional scientists (1) or not (0)
- Humanities, social/behavioral sciences, or natural sciences

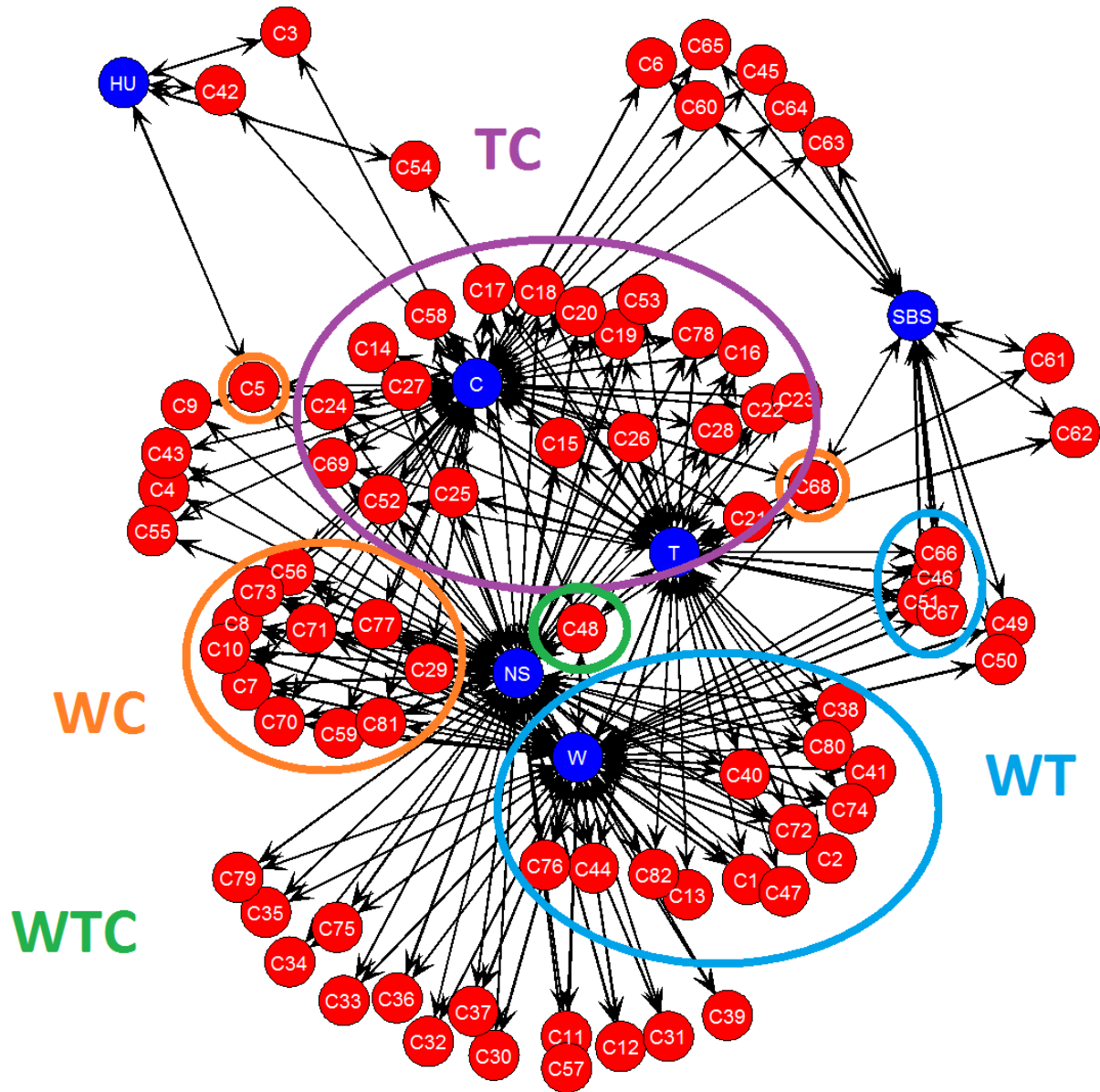
# Assumptions

- Best is three 1s: water + training + community
- Multidisciplinary approach is valued

# Descriptive statistics (n=82)

	N	%
Natural Sciences	63	76.83
Humanities	4	4.88
Social Behavioral Sciences	15	18.29
Water	47	57.32
Training	41	50.00
Community	46	56.10
Water + Training	18	21.95
Water + Community	14	17.07
Training + Community	21	25.61
Water + Training + Community	1	1.22





# Water + training

- HWRS – Hydrology and Water Resource
- HWRS 249A – Principals of Hydrology
  - Introduction to the hydrologic cycle and review of main processes, such as precipitation, evaporation and transpiration, runoff, infiltration and ground water. Some concepts and tools for water resources management are discussed. Laboratory techniques complement lecture topics



# Water + community

- ENV5 – Environmental Science
- ENV5 195C – Water Resources in the Tucson Basin: Natural Resources
  - Description: In the Western U.S. it is said, “Whiskey is for drinking and water is for fighting.” History has proved this to be all too true. Here’s a chance to see what all the fighting is about, while developing library and presentation skills. The semester’s results will be posted on class web page. Join us!

# Training + community

- BIOC – Biochemistry
- BIOC 471 – Ecological Principles for Teachers
  - Principles of ecology with a focus on applications and current research appropriate for teachers of secondary school biology. This course is designed for prospective and in-service science teachers who wish to develop a deeper understanding of ecology. Basic themes include how organisms interact with other organisms and their environment, factors that influence the size and stability of populations, how geography affects biodiversity and the application of these principles to current ecological issues including global warming and invasive species. This course is designed to be on-line. In-service science teachers may take the course for graduate credit by completing additional graduate-level course work

# Training + community

- ENVS – Environmental Science
- ENVS 497F – Community and School Garden Workshop
  - This workshop-based course is designed to enable UA undergraduates and graduates students to work in Tucson-area schools helping students and teachers to undertake the design, construction, planting, harvesting and preparation of foods from a local school garden. The workshop also involves preparing or assembling curriculum materials to enable teachers and students to teach and learn about food production, food histories and geographies, and food politics. The course includes an intensive workshop sponsored by the Tucson Community Food Bank. In addition to attending that workshop, students are also expected to attend at least one fieldtrip among the two that are organized during the semester as well as attend monthly meetings of the group on the UA campus. Most of the workshop, however, revolves around consistent and engaged involvement with a Tucson school and its teachers and students supporting the development and maintenance of school garden and attendant curriculum

# We have a winner

- ECOL - Ecology & Evolutionary Biology
- ECOL 454 - Water Harvesting
  - Course focuses on water harvesting principles and techniques. Students will learn how to apply concepts at their own residences and participate in applying them on the UA campus

# Conclusions

- Limitations
  - Analysis is still incomplete
  - But findings are suggestive

# Conclusions

- Three 1s is best: this can be improved!
  - Many courses at the intersection of two variables out of three
  - Only 1 course showed emphasis on WTC
- Multidisciplinarity: this can be improved!
  - SBS/HU are very peripheral: there is definitely room for their contribution
- Online training is an option