

# The Madsci Network

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As the Internet evolves, it transforms human society in a multitude of ways. In fact, the possible effects of the Internet on human cognition and science education become apparent when examining how students use the Internet to learn about science. Our goal is to provide a positive social impact on science education and add societal value to how students use the Internet to learn about science.

Given the prevalence of pseudo-science and filtered scientific reporting, an Ask-A-Scientist site such as The Madsci Network can give both students and the general public direct access to legitimate scientific knowledge in an easily comprehensible manner. This dissemination of knowledge directly from a scientist to the average person promises to transform how societies interpret scientific knowledge and how that knowledge is used in a social, cultural, and political sense.

To support such efforts, The Madsci Network makes available its dataset for processing under the Creative Commons Attribution (CCA) license as described herewith.

## 1 Introduction

A seventh-grader in a rural, Indiana town hears his science teacher talk about dark matter and negative energy; he is fascinated but utterly confused by the mention of negative energy. Intrigued, he goes home and searches frantically on the web only to be frustrated after finding hundreds of links on “removing negative energy from your aura” but nothing about the physical ideas of negative energy or dark matter.

Indeed, it is often very difficult to find answers to specific, specialized queries on the web, especially when they are scientific in nature. Virtual communities like The Madsci Network, which can be defined as Internet-based volunteer communities, are

indispensable in such cases since finding reliable scientific information is not easy on the web; harder still is to discern legitimate science from pseudo-science. This is especially significant for children, who are fast becoming consumers of science online [1, 2, 3, 4].

As the Internet evolves, it transforms human society in a multitude of ways. Given the prevalence of pseudo-science, filtered scientific reporting, and conflicting ideas, virtual communities such as The Madsci Network can give both students and the general public direct access to legitimate scientific knowledge in an easily comprehensible manner. This dissemination of knowledge directly from a scientist to the average person promises to transform how societies interpret scientific knowledge and how that knowledge is used in a social, cultural, and political sense.

Such a virtual community is not just another site to give yet another answer but helps provide a way to *think* about the facts and engage in critical thinking; this approach not only helps provide insight to students but builds techniques to engender lifelong learning.

## 1.1 Background on The Madsci Network

The Madsci Network (<http://www.madsci.org>) is a Virtual Organization, an Internet-based volunteer community, that functions primarily as a human-mediated Question & Answer (Q&A) site. It is an online, non-profit, Ask-A-Scientist website, a subset of Q&A websites, with over 700 volunteer scientists and 28 volunteer moderators distributed globally fielding 90-150 questions a day from visitors from all over the world. It handles questions in 26 different scientific disciplines and consistently gets over 650,000 unique visitors and 4,000,000 page views per year.

Established in 1996, The Madsci Network processes questions from students, laymen, and scientists covering topics such as Physics, Astronomy, Biology, Computer Science, Earth Sciences, etc. and maintains a searchable archive of over 40,000 answered questions, experiments, and other areas of interest to learning science. It has received recognition from many organizations (including the U.S. Department of Education, Science magazine, New Scientist, and the BBC) and has received numerous awards, as well.

## 2 Research Efforts/Goals

Our ongoing research addresses three broad goals: to improve the efficiency and quality of Q&A sites like The Madsci Network, to explore the archives of these sites to identify social patterns and trends, and to create novel structures to support emergent eLearning in many different contexts.

The direct exchange between scientists and students on The Madsci Network has already shown great promise for transforming how students learn and how societies cope with scientific and technological change. The inter-disciplinary nature of this enterprise has led to collaborations with experts from fields as diverse as Computer Science to Psychology to Science Education; we fully expect to continue and expand these collaborations across multiple disciplines.

These collaborations in the analysis of over 10 years worth of data on The Madsci Network had surprising revelations, including a startling dominance of female contributions among K-12 students (contrary to offline situations). This female enthusiasm was observed in different countries, and had no correlation to the level of equality in those countries: Iranian girls, for example, turned out to be greater users of madsci.org than Iranian boys, although their direct environment does not necessarily promote such interest in science. This may indicate that the Internet and sites like The Madsci Network play a potentially empowering and democratic role as a free-choice science-learning environment, which is especially relevant to populations which are deprived of equal opportunities in learning formal science.

Our research with The Madsci Network can transform learning methodologies by incorporating the democratizing aspect of the Internet and allowing students, regardless of gender, socio-economic background, and educational level and resources, direct access to scientists and scientific resources in order to examine how this affects learning and the resulting societal changes. We look to find novel ways of incorporating this direct access to scientists in classrooms and curricula. Already, The Madsci Network fields numerous requests from teachers and schools for direct access to our scientists, through either a physical or virtual medium, thus transcending traditional geographical and cultural boundaries.

This multi-disciplinary thrust is expected to transform the human-computer interaction experience as it relates to learning; we expect the The Madsci Network Ask-a-Scientist virtual experience to empower students at school and the layperson at home or work. This research will lead to the design of an environment that will allow for greater granularity of data acquisition which can then be used in mining for social and educational trends, in addition to contributing to the development of a platform to further allow transformation in learning modalities. This spread of direct scientific knowledge may prove transformative for closed societies with limited access to scientific information.

Finally, the algorithmic analysis underlying the processing of questions will lead to theoretical advances in the field of computing and online Ask-A-Scientist websites; the application of these algorithms can, in fact, go well beyond crowdsourcing and wisdom-of-the-crowd in question/answer forums to social computing, in general, including collaborative filtering and reputation management of distributed collaborative intelligence.

### **3 Dataset**

The Madsci Network makes its data available at <http://research.madsci.org/dataset/>. The Madsci Network maintains an online archive of more than 40,000 answered questions. These question/answer pairs are available from 1996-2011, organized in directories named YYYY-MM (where YYYY is the four digit year and MM is the two digit month), as .zip or .tgz archives. The archive is released for research purposes only and all rights are reserved by The Madsci Network.

An additional 110,000+ submitted questions from 1995 - present are maintained offline with associated meta-data. Full names and email addresses are not included. Access to partial or full components of the 150,000+ question dataset may be provided per request for research purposes only.

In addition, we release the following code under the Common Public License. You are welcome to use the code under the terms of the license for either research or commercial purposes; however, please do acknowledge its use with the above citation, as well.

## References

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