The Quantified Self (QS) Movement and Some Emerging Opportunities for the Educational Technology Field

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The Quantified Self (QS) movement is a growing global effort to use new mobile and wearable technologies to automatically obtain personal data about everyday activities. The social and material infrastructure associated with the Quantified Self (QS) movement provides a number of ideas that educational technologists should consider incorporating and using. This article discusses some recent efforts to bring the movement to the practices of the educational technology field and presents some issues to consider in the future.

Introduction

Lately, we have heard the word "data" pretty much everywhere in public and academic discourse. Data are the assortments of information that are automatically and silently being collected by businesses and agencies to track our behaviors online. They are the stuff that policymakers and executives have been insisting should drive more and more of our decision-making, be it in schools, hospitals, business, or public policy. Data can be "Big," and if current policy and research rhetoric is any indication, then this "Big Data" that we keep hearing so much about will serve as an important input into the equation that will allow the next generation of online teaching, training, and learning to be truly personalized and fully customizable to the needs of each individual.

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For data enthusiasts, these developments are incredibly exciting. We are getting to a point where we have so much data available to mine, so much interest in how to best collect and analyze data, and such tantalizing early returns from it such that it is hard to not be drawn into the excitement (Bienkowski, Feng, & Means, 2012). But it is worth noting that the dominant ways that the data community thinks and talks about how to use data goes something like this: On one side, we have a body of people (for example, the users of some Web service) who, often unwittingly, produce data by simply going about their business. On the other side, we have some other group of people (for example, data analysts, statisticians, and data scientists) who are collecting and scrutinizing these data, often with the aim of bringing back some information of value to the organization that employs them.

That is the standard relationship we have right now, and we can expect that relationship to continue to exist for the foreseeable future. But those relationships and responsibilities with respect to data can change. In fact, those relationships and responsibilities with respect to data already ARE changing. That is basically the heart of what has been called the Quantified Self (QS) movement.

The QS movement has individuals dispersed across the world—"self-quantifiers" or "quantified-selfers"—who are not only producing troves of data by virtue of simply going about their daily business, but also they are now becoming conscious consumers of the data that they themselves are producing. Self-quantifiers are leveraging what they already know about how and when they generated their uniquely personal datasets, and they are posing questions and sharing their own personal data discoveries.

For example, we can see if physical activity data collected on the Saturday and Sunday parts of three-day weekends result in more exercise and more sleep than a standard weekend and begin to form some explanation for ourselves as to why a difference does or does not exist. This growing interest in the quantification (and subsequent inspection) of self through personal data is not a top-down business, nor is it a policy dictate (although businesses and policymakers are definitely beginning to take notice). Rather, the QS movement is yet another instance of the people-driven, participatory models of technology innovation and adoption that have become characteristic of the last decade. And educational technologists need to be aware that this movement is happening, that it is growing, and that it is also opening up new opportunities to innovate in the world of educational technology.

What Is the Quantified Self Movement?

The label of "Quantified Self" is attributed to Gary Wolf and Kevin Kelly, both editors with *Wired* magazine, who used it informally in 2007 as a name for a local collaboration of users and technology tool makers who were interested in automating the collection of data. Interest grew, and high-profile articles that spoke to the new

opportunities to obtain automatically collected data about personal activities were published in *Wired* Magazine and in *The New York Times* (e.g., Wolf, 2010), along with a well-received TED talk, all of which helped to increase public awareness of the movement.

At roughly the same time, new devices and technologies had been growing in market presence and were becoming more familiar to consumers, such as the Nike+ system, which would embed a sensor in the sole of one's shoe and communicate with Apple devices (iPods) and services. In the competitive athletic and physical training worlds, there were also a number of efforts to automate physiological data collection of a specific individual. For example, wearable heart rate monitors have been a mainstay in professional athletic circles and had entire exercise philosophies associated with them. But throughout the 2000s, they became much more familiar and frequently used by more casual athletes and everyday users, as more consumer-friendly devices became available.

One of the most appealing qualities of these new technologies is that they free the user, who was often also the "wearer," since these devices were often worn on clothing or on the body, to engage fully in some activity of interest—and the device would take care of data collection. Typical devices of this sort include the Fitbit activity tracker, the Jawbone Up, the Nike+ FuelBand, the BodyMedia Fit, or Garmin Forerunner smart watches. For a runner, wearing one or more of these meant that rather doing the computational work of estimating mile times and pacing, he or she could let the wearable technology do the work. For busy working professionals who did not have time scheduled to run but were simply curious about how much they moved during the day, the data could be captured automatically by a Fitbit and prepared for them online to inspect later.

Not all QS technologies are wearable, nor do they need to be. The proliferation of mobile devices made smartphones valuable self-quantification tools, as their accelerometers or GPS units could be accessed through specialized and custom apps. Moreover, they provided easy access to new services that let people access their data and examine it in new ways. For example, Garmin and Nike both have online services that provide easy access to data, and other promising Web services exist to access and display data in a multitude of formats.

Also, QS technologies could quantify so much more than exercise. Sleep quantification became a real possibility and a favorite activity among self-quantifiers, as did quick self-loggings of mood or energy levels. Food and caloric intake also became popular. There has even been interest in DNA sequencing, with the growth of services such as 23andMe. The technological landscape quickly moved to enabling people to take everyday experiences and turn them into numbers.

Socially, the QS movement had its start with Wolf and Kelly and the initial press they received, and was then advanced through Meetup groups and through promotion via social media. Meetup groups now exist in most major metropolitan areas across the United States, and there are now groups on five continents. From 2010 to 2013, Meetup membership grew over 1000% (from 893 to 10,456). A support organization, QS Labs LLC, was formed in California and helped to organize an annual international conference for quantified-selfers to gather and share their quantification activities. This conference is now on its fourth iteration and has both been growing and selling out. QS Labs also maintains an actively updated Website and message forum for the distributed community (*quantifiedself.com*) that helps keep interested parties abreast of new products and services and what some self-quantifiers are up to. In the spirit of keeping this a people and community driven movement, QS Labs also provides some tips for anyone interested in starting their own QS Meetups, but still recognizes and supports the idea that those Meetups can take whatever form they need to, given the local needs of different communities. With these public gatherings and activities, 'self-experiments' have become important opportunities to share what people have learned through the practice of self-quantifiying, and these are featured online as well. The groundswell is there. Now, given this support and interest, what should educational technologists do about it?

Opportunities for QS and Educational Technology

The work of educational technologists can be summed up as follows: we look at socio-technical systems that support knowledge building and knowledge sharing and then devise new, principled ways of understanding, building, and improving those. Often, but not always, computational technology is involved. The work of the educational technologist can often involve formal educational bodies—such as K–12 schools—but it can also involve workplaces and informal learning environments. Given that as a foundation, what opportunities are there to innovate, given the growth of the QS movement and its associated infrastructure?

QS and K–12 schools

One area of innovation would be in K–12 schools, particularly in the STEM (Science, Technology, Engineering, and Mathematics) fields. In STEM, one of the key goals is to help students develop sophisticated ways of working with data, comparable to what they will encounter in higher levels of education, at work, or elsewhere in their adult lives. QS seems uniquely well positioned to support that work with data. In school activities, such as science labs, the work of collecting and recording data is repetitive, laborious, prone to much individual error, and frankly boring. QS technologies have the potential to remedy much of that. Also, having automated data collection doing otherwise time-consuming work frees up time for students to do some of the more complex intellectual work of making

sense of the data that they have collected. Restructuring science in this way can lead to surprising and exciting results.

For example, in my own research, I have worked with elementary school students using activity tracking and body monitoring devices associated with the QS movement. Students participate in some regular physical activities, obtain data, and then devote class time to looking at their own and their class's pooled data to find regularities and engage in mathematical, scientific, and statistical reasoning. We have been quite encouraged by our efforts thus far. Namely, our approach to using QS technologies and appropriately designed classroom experiences has produced significantly greater learning gains than traditional instruction on the same material offered in the same amount of time (Lee & Thomas, 2011). Also, in an activity we have called "Quantified Recess," in which students use Fitbit activity trackers to get numerical records of their activity levels during recess and then participate in a competition to see who can improve the most over a week, we saw elementary students learning about statistics content that usually does not get approached until the undergraduate level (Lee & Drake, 2013). These kinds of activities, which we are continuing to develop and refine, are scratching the surface of what is possible in schools.

QS Out of Schools

One of the most compelling things about the QS movement is that it provides a way for people to get data about everyday activities without having to consciously think about the process of data acquisition. This can be done during school time, but it can also serve as a way to help people to reflect on their activities and their experiences. New technologies to support behavior change are exploring this. For example, researchers at the University of Washington have explored and tested new QS technologies and visualizations to track and report on the amount of exercise adults were getting during the day. Their approach was to take that exercise information and translate motion information into a virtual "garden" that grows best when the activity levels are high (Consolvo, McDonald, Toscos *et al.*, 2008), and this visualization is intended to help people learn about their own exercise habits and to improve in their consistency with personal wellness.

At the University of California, Davis, a team of researchers and designers has been designing a virtual game environment in which the players' attributes and game tokens are determined by the amount of activity that the player actually participates in outside of the game (Ching & Hunicke, 2013). This crossover of virtual game and QS technology is a way to get people to be reflective about their bodily activities and the health implications in ways that can leverage the motivational and pedagogical support structures associated with gaming (Gee, 2007).

The University of Maryland Human Computer Interaction Lab has also been expanding on QS in education and been involved in the design of new QS technologies and clothing that can help track body information for educational purposes as well and can serve as a vehicle for learning about body systems and other related science content.

These projects just scratch the surface. Merging games and health has become an increasing area of interest broadly (see *gamesforhealth.org*), and a number of technologists and designers who have not historically considered themselves to be in the realm of educational technology are getting involved as well. New devices and services are being explored and developed at this very moment. Although Apple is notoriously secretive about what is coming next in their product lines, word of an "iWatch" has been circulating among Apple watchers. It shouldn't be too surprising if the iWatch is yet another tool for QS activities, and something that can be adapted to support the design of instruction and learning environments.

What to Be Watching in the Future

The opportunities enabled by the Quantified Self movement are numerous and exciting, but there are some things we should be looking for and thinking about as educational technology takes a careful appraisal of all things QS. First is the issue of privacy. Much of QS takes information that is personal and returns that for subsequent inspection. At the level of the individual, this can be a fine arrangement as their own are the only eyes on the data. However, this can get complicated as more people have access to the personal data. (We may not want everyone to know that we stopped at the donut shop in the middle of our morning run!)

Current services allow self-quantifiers to store and access their data online and choose whom among their friends and contacts they wish to share information. This is one way to manage privacy, but in situations like the ones described above with classrooms, there is something to be gained from having access to data from others in the immediate community. Indeed, this is what I would argue to be one of the most critical aspects of the QS movement: it's not simply the presence of new, wearable tracking technologies that makes the movement. The movement is about people and it is about sharing what we can learn with each other by looking inward. Therefore, some privacy compromises will need to be made. Educational technologists who seek inspiration from quantified self will need to think carefully about the cost/benefits about what data should be obtained, what data should be shared, and who should make those decisions.

Also, the ability to see data about one's self is initially very exciting, but for educational technologists to get some real purchase out of QS tools and approaches, they need to know that the collection and reading of data needs to be situated in meaningful and motivated learning activities. From personal experience, I can easily think of specific instances where someone buys a tracking device or app, uses it for about a week and is very excited to see what it tells them, and then ceases to use the device because it

stops telling them anything beyond what they learned in the first week of use.

The QS community has a spirit of self-improvement and a curiosity about how different things they are intimately familiar with change in response to different conditions. Hence, the self-experiment model that is common in the QS movement becomes an important driver of continued use. Also, the larger community that has wisdom and tips and new ideas is important too. It supports social engagement and cultivates the development of relationships to both data and to other people. Exchanging ideas, sharing free tools or hacks to make devices or services do new things, and coming up with new homegrown visualization strategies are all part of the ecology of QS.

Educational technology as a field should certainly be sitting upright and paying attention to the model that QS provides, as there are a number of valuable lessons to be learned, both for integrating QS technologies and approaches in the worlds of education and for helping us to understand how one develops and sustains a community driven socio-technical knowledge-building and knowledge-sharing enterprise. □

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The Little eLearn Centre with a Big Impact

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The Open University of Catalonia (UOC) was established as public, online university and thus has grown quickly with the global interest in online courses. However, like other dedicated distance-education institutions, UOC has had challenges adapting to MOOCs, and the emergent world of Web 2.0 learning technologies. To meet these challenges, UOC has established a dedicated eLearn Centre (eLC) that not only teaches graduate courses in eLearning, but also is challenged with engaging faculty throughout the University in eLearning research and professional development.

Introduction

You might think it was the weather, the beaches, the Gaudi architecture, the museums, or the tapas that are attracting a growing number of educational technology experts to Barcelona. But you would only be partially correct. The real attraction is the thriving eLearn Centre (eLC) at the Open University of Catalonia (UOC).

The UOC was established in 1996 as perhaps the first public university in the world to be completely online. It currently enrolls over 60,000 part-time students in mostly undergraduate programs, but it also attracts a growing number of professional masters and doctoral students. UOC teaches in three languages, Catalonian, Spanish, and English, and it is increasingly involved in partnerships and recruiting in Latin America. The eLC is a support and faculty development unit to all UOC staff, at the same time as it conducts research in eLearning and teaches large masters, certificate, and doctoral programs in eLearning.

Like other online universities, UOC faces a demand for faculty development to ensure that staff (including the over 2,000 part-time tutors) are continually sup-

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