

Running a Question-and-Answer Website for Science Education: First-Hand Experiences

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Abstract The online learning and outreach resource *Ask A Biologist* (AAB; <http://www.askbiologist.org.uk/>) has been operating for three years, and this paper reports our initial experience of running the site. To date, AAB has answered and archived online over 3,500 questions from the general public with contributions from more than 50 researchers, and attracted an estimated audience of half a million, all with relatively minimal investment. Simply, questions are posted by visitors to the site, and one or more of our registered academic experts then provide their answers which are available for all to see and browse. The system is simple and provides direct contact between the public and scientists on subjects that are guaranteed to be of interest. In this paper, we review the benefits and

drawbacks of such a system based on our first-hand experiences, detailing how the site was originally conceived and built and how it operates. We offer this as a model for future projects and to highlight both the benefits and pitfalls of such a system.

Keywords Question-and-answer · First-hand experience · *Ask A Biologist* · Online learning · Outreach resource · Internet · Informal learning

Introduction

Recently, Kazilek (2010) presented the impressive achievements of the Arizona State University *Ask A Biologist* learning resource (<http://askbiologist.asu.edu>). Proving that good ideas can express convergence, we would like to draw attention to our own independently created UK-based *Ask A Biologist* resource. While the two sites have identical names and similar objectives, they attempt to achieve their aims in rather different ways, and both can provide useful case studies in the approaches that can be successfully applied in online science communication. Our site (for convenience and to avoid confusion is referred to as AAB and the other as AAB-ASU) is primarily concerned with taking questions from the public and answering them: importantly, all questions and answers are archived online with a searchable database, which enables general access to interested parties.

Note that our review of the benefits and drawbacks of the site and our assessment of the effectiveness of AAB are drawn from personal experience and feedback from a variety of sources. We have not performed any formal analysis of these issues nor are we drawing from the published literature in this area.

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Site Origins

The origins of AAB lie in founder David Hone's experiences of outreach work with schools and youth groups. He found that while his talks were well received, the subsequent question-and-answer sessions provided the greatest opportunity for children to engage with the subject matter. The only downside was that there was no opportunity for further questions or the development of ideas once he had left. This led to the realization that children were being left with unanswered questions in the intellectually fertile aftermath of visiting a zoo or museum, being visited by a researcher or even watching a documentary, and so provided the inspiration to develop a service that could answer those questions. By tapping into the enthusiasm of professional scientists, children could be given access to information beyond the classroom, facilitating engagement with science when they might otherwise lose interest due to a lack of support and information. Interest can be piqued at any time, including when it cannot be readily addressed, and a lack of support or available knowledge may cause interest to wane. Even the very best “primer” books and websites can be badly out of date, or can lack the detail necessary to answer the esoteric questions an inquisitive mind can come up with.

Development

A pilot project set up on a blogging platform in late 2006 showed that there was a demand for a biology-centered Q&A service. This initial test site was staffed by a small number of colleagues based in a variety of locations (although primarily at the Bristol University, UK) who were quickly recruited to help answer the questions. From the outset, it was clear that archiving answers online allowed ongoing discussion of responses by the experts, and that making the answers to common and popular questions available to new visitors added to the appeal of the site and reduced the number of repeat questions. The pilot project was presented to the Palaeontological Association (a professional body of academic paleontologists based in the UK), that offered server space, a domain name, and a small amount of funding (£750) to support the creation of a dedicated Web site. This was launched in early 2007.

The name of the site was chosen because it seemed to best represent the structure and aims of the service offered, and the URL was available. It was some years before we discovered AAB-ASU: clearly, both the concept and the name were appropriate on both sides of the Atlantic. The improved AAB site maintained the same broad approach as the first version with a target audience of school-age children (although we soon discovered that the site was popular with people of all ages and educational back-

grounds). A word-of-mouth advertising campaign yielded both new recruits to answer questions and more questions to answer from the public.

More recently, additional funding was sought from a number of organizations who support public engagement in science, all of whom were very impressed with the work AAB had undertaken thus far. A total of £3,000 was secured from the Physiological Society, the Applied and Integrated Medical Sciences Centre for Excellence in Teaching and Learning at the University of Bristol, and the Above and Beyond Charity of the University Hospitals Bristol National Health Service Foundation Trust. This enabled us to upgrade the site, making it faster, easier to navigate (for both contributors and visitors), and more visually appealing, improving the functionality and increasing esthetic appeal—for example, by creating a formal logo (Fig. 1).

To keep the site fresh, and keep us “on our toes,” we continually recruit new contributors, as well as the continual submission of new questions. Conventional advertising is prohibitively expensive, but we have managed to publicize the site in other ways. We had a lot of initial interest in 2006/2007 from local radio stations, and several of us went on early Saturday morning radio in Bristol. When the site received a facelift in 2010, and was starting to reach out internationally, we gave interviews on National Public Radio (WRVO) in New York State. On both of these occasions, we saw an increase in questions, as well as offers of help from new experts. In addition to this, we stay in touch with our colleagues, encouraging them to get involved too; we use the Web by encouraging science-literate websites, bloggers, and so on, to link to our site. Several of us run our own widely read blogs or science communication sites, and use these to publicize AAB.

Key Ideas

AAB enables effective science communication by providing a direct link between the general public and active researchers or “experts” in the field. (Our rule of thumb is that an expert must have a PhD or MD or be working toward one, have a track record of research publication, and/or be employed in science education). These experts endeavor to provide timely, up-to-date, and authoritative answers to current questions, while the archive of previously answered questions provides a substantial and constantly growing and increasingly comprehensive online resource. It is the intention of AAB to complement, rather than compete with, the classroom (or lecture hall) by providing information beyond what is readily available: a system is in place to prevent the service from being abused by those attempting to find a shortcut to doing their homework and assignments.

In a typical exchange, a user will go to the site, perhaps search for an archived question related to the question on

Fig. 1 The iterations of the *Ask a Biologist* site. Original version (above) and the current, revised version (below). Key features on the front page are: the mission statement of the site, large *Ask us a Question* and *Browse Answers* buttons, the AAB logo, links to important parts of the site, a search bar, a randomly determined set of recently viewed questions, and a random set of the microbiographies of some of experts on the site



their mind, and then post the question in one of the 14 categories (Mammals; Birds; Reptiles and Amphibians; Fishes; Invertebrates; Plants and Fungi; Microorganisms; Fossils; Genes, Genetics, and DNA; Human Biology and Evolution; Ecology, Biodiversity, and Behavior; Evolution; General Biology; Research and Careers). This results in a new page containing the unanswered question, which experts subsequently discover—perhaps via the “recent questions” or “unanswered questions” link. Experts can also set up automatic alerts that e-mail them when questions in a given category or containing a specific keyword are posted.

If a question is deliberately offensive or “trolling,” it is simply deleted. Homework questions (which are far more common, but still only compose a small part of the traffic) will get a brief “We don’t answer homework” answer and be marked for automatic deletion in a week’s time, giving the person who posted the question time to read the reply. The decision as to what constitutes a homework question is made by the various experts on the site and is entirely dependent on their judgment. Homework questions are generally easy to spot as they do not read like genuine questions, e.g., “Name the major blood types in humans?” or “Describe the process of DNA replication.” More often than most readers would find credible, students have included the mark schemes associated with their question.

Assuming a question passes these simple human filters—as more than 90% of them do—then it receives more attention. If the question’s title is too broad or uninformative—titles like “Biology” or “Dinosaurs” are all too common—it will be replaced with something more descriptive. Likewise, the question itself may be edited for clarity if it has spelling or grammatical mistakes. Time commitments vary between experts, but as each question simply needs to be read and then have a box ticked if necessary to delete it, this is simple and quick to do. The total administration input from all the experts is only a few hours a week for editing, arranging, and deleting problematic questions.

Then over the next few hours and days, answers are given by various experts. These often turn out to be more informative than the initial questioner may have envisaged: for example, the somewhat frivolous question “What’s the best way to stop *Velociraptor* attacks?” (<http://www.askabiologist.org.uk/answers/viewtopic.php?id=988>) attracted six answers. The first noted the general principle that it’s best not to go near large, fierce animals in the first place; the second went on to suggest climbing a spiral staircase, because dromaeosaurids such as *Velociraptor* had stiff tails that would have made them unable to negotiate tight bends; subsequent answers pointed out that the orientation of dromaeosaur wrists would have made it difficult for them to open doors as depicted in the *Jurassic Park* movies, and that, “in life” *Velociraptor* was much smaller than depicted on screen. It’s not unusual for a pop-cultural question like this to lead into answers that turn on

details of anatomy: this we feel, can engage a child’s attention far more readily than conventional teaching methods and takes them farther than they might expect from what may have been a tongue-in-cheek question.

Benefits

The system that AAB uses provides enormous benefits for both the researcher and the audience. Most notably, it brings the audience into direct contact with researchers and works to break down the “ivory tower” concept of aloof academics. Furthermore, the audience can have confidence in the answers provided, as they come from an authoritative source that can clearly present its credentials (biographies of each of the contributors are available on site), as opposed to anonymous contributors in online chat-rooms or the generic Q&A websites. Disruptive elements are minimized as inappropriate questions are blocked by the spam filter or quickly identified and deleted. With answers provided only by experts, there is no platform for bad behavior, “trolling,” or deliberately misleading and inaccurate answers. Most importantly, unlike many science education sites, the researchers are providing information that the audience is definitely interested in since they are responding to direct enquiries.

The format of the site also allows the audience to see how science works as a cumulative body of knowledge grows, with multiple answers being given, discussions taking place, and additional evidence being provided to improve accuracy. This allows an effective peer review of the answers being provided, and on many occasions, it has led to fruitful reassessments of evidence among the experts when disagreements over answers arise—in itself a valuable example of the scientific process where answers are not always black and white. Many of the users have commented that reading posts where the experts disagree with each other is one of the “best bits of the site.”

For the experts, AAB provides a simple way to engage with a lay audience from anywhere in the world, without being dependent on the formal support of their institution or the need to visit other locations (like schools or museums) for their outreach activities. It takes literally moments to sign into the site, check for new activity, and write a reply or two. This makes AAB a quick, easy, and accessible mechanism for engaging with the public and with other biologists.

Limitations

Naturally, such a simple system has some drawbacks.

First, there is no mechanism for continued interaction with visitors—they must post a new question to follow up a previous one, and they cannot join the discussion in the forums directly. An optional registration system would

ameliorate this issue but has not been implemented as yet. This keeps the public at a greater distance than we would like, but it does prevent nonexpert answers or disruptive comments, and thus avoids the need for excessive moderation of the pages.

Second, the current system is a “free-for-all” for the experts answering questions, which means that sometimes questions are addressed by contributors who are most active, rather than those who are best placed to provide up-to-date and accurate answers. This is particularly problematic in subject areas with a low rate of questions being asked, since some experts can go for long periods without having relevant questions and so tend to check for new activity less frequently than those fielding questions about more generalist or popular subjects. The existing system enables a rapid response to the public, but sometimes at the cost of quality of response received. However, this approach removes the need for a moderator or person to direct every question to a specific expert, and since multiple answers are often given, new information can always be added as necessary. It is not unusual for a question to receive a quick, brief answer, only to be followed up in more detail a few days later by a specialist in the relevant field.

Beyond the limitations of the site structure, there are operational restrictions that have caused problems. Without a budget for advertising, awareness of the site is slow to spread. As a grassroots service and one not formally supported by any major establishment, it has been hard to generate the ongoing media interest that is required to keep publicizing the site. A lack of formal organization also hinders decision making at times, and group apathy can be an issue. This is ameliorated in our case by the existence of a small, informal committee of around half a dozen particularly active experts, who discuss AAB issues by e-mail.

However, many of these problems are inherent to the scale of the current AAB operation and would not be an issue with more funding for infrastructure development and/or if time was available to address promotion of the site. The problems experienced by AAB need not necessarily affect other similar setups.

Success

Ask A Biologist has had great success given the size and nature of the operation. While not being formally sponsored by a university or research body limits the support available, it also gives us real freedom. Contributors largely use their free time to provide this service, occasionally with the active approval of their institution, but often without, either because permission is not sought (since this is done in the individual's free time) or, sadly, on occasion because some institutions see AAB as competition to their own outreach efforts, rather than as a mutually complimentary service which would promote the work of the institution

itself, and enhance other ongoing projects. Despite this and without any formal leadership or organizational structure, in three and a half years, AAB has provided over 9,000 answers to over 3,700 valid questions (i.e., not counting duplicates, homework questions, etc., which are deleted from the archive). We estimate from front-page traffic and hits on individual question pages to have had around 500,000 visitors in this time. For a total outlay of £3,750, this works out at roughly one question answered and 133 visitors informed per £1 invested. These figures will only improve, as we require no additional funding at the moment, but continue to accumulate readers and questions. As noted recently, this is an exceptionally favorable return compared to *Science: So What? So Everything*, which had the full support of the former British government and offered a return of about one visitor for every £10 invested in the project (Mendel and Holmes 2010).

We continue to get positive feedback from visitors, researchers, and educators who use AAB as a resource. Teachers use the site as a source of extra information or as a tool to handle difficult questions from pupils. Several societies of educators link to us as a teaching resource (e.g., www.schoolscience.co.uk and www.growingschools.org.uk), and our answers have been used as a source of data for web resources such as Wikipedia. AAB has also been acknowledged as a valuable resource within the wider science communication community, being presented as a case study in a panel discussion at the Science Online London conference 2009 by PV.

In summary, AAB provides a quick and easy method of engagement for researchers, and a conduit that enables the public direct access to the expertise of biologists and paleontologists, to see what those people do. Moreover, AAB provides this service in a cost-effective manner that has provided an excellent return on both initial and subsequent investment.

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