

ourWikiBooks – an experiment in co-production of Open Educational Resources in Computing

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Background

The OurWikiBooks (OWB) project addresses key concerns in the continued professional development of computing teachers, and the uptake of Computing as a subject at GCSE, A-level and in universities.

Particularly, recent reports¹ from both Computing At School (CAS)² and the Council of Professors and Heads of Computing³ acknowledge the challenges currently facing the discipline of Computing, in schools, HEIs, and industry. Most worryingly, there is lack of student take-up of and engagement with the subject at A-level and in HE. This is of significant concern in industry, where there is a predicted skills gap in the IT labour market. Because of the centrality of IT this is increasingly seen as a significant problem for the future development of UK economy. The proposal here is to address systemic problems in the development of IT-knowledgeable members of the future workforce, particularly the following:

- Computing is seen as a boring subject by many school-age students.
- There is a lack of learning materials that contribute to positive student learning experiences.
- Schools often only have, at most, one computing teacher who can feel isolated and struggle to keep their skills updated, which in turn diminishes learning experiences and leads to negative student perceptions.

The OWB project is based on the possibility of an intervention to address these cyclic problems, by engaging teachers, school pupils and undergraduates in the generation of two interrelated sets of Open Educational Resources: classroom materials for teachers and learning support materials for Computing students. The medium for these inter-related materials is a wiki, which can enable architectures of participation that lead to co-production.

Why a wiki?

Wikis are examples of so-called 'web 2.0' technologies, characterised by their participatory nature. Through such technologies, people can be producers as well as consumers of online content. Wikis have been used for many purposes. Some wikis are publicly accessible spaces, while others operate away from the public eye – for example, within an organisation. Despite their diversity of purpose, wikis represent a common, collaborative way of working, and they are often introduced into a given context as drivers for increased collaboration (Bryant, 2006).

Wikis can in part be characterised as a technological tool, a medium, and/or interface, which has particular affordances. Like all innovations they originated from a specific

¹ http://www.computingatschool.org.uk/files/CAS_UKCRC_report.pdf and <http://www.cphc.ac.uk/docs/reports/cphc-itlabourmarket.pdf>

² <http://www.computingatschool.org.uk/>

³ <http://www.cphc.ac.uk/>

context (Cunningham 2005) but has been adapted and assimilated since, evolving as it does so. These adaptations have been driven by social needs as well as technological change. And as the wiki enters new contexts, the social structures within those contexts will encounter the tool - learning about the continuities and discontinuities the tool causes in its practice (cf. Wenger, White and Smith 2009).

Thus, wiki's exist as part of sociotechnical systems, and like any systems, to work effectively, the sociotechnical systems' different elements need to harmonise.

Within the general domain of sociotechnical systems, we are interested in sociotechnical systems for learning, and, particularly, within these systems, the use of wikis in learning: A 'wiki way' of learning (Lawler 2011) centers around the collaborative use of wiki's for learning. This not just about, in the process of constructing knowledge, about being able to read and edit the work of others, but being open to others editing one's own work; it is therefore more than just an editing task undertaken by individuals, but requires discussion with and learning from peers. In short it requires *participation* in the work of a community. Content must not just be produced, but must be *validated* by the community which grows up around the wiki. Such validation is not a one-off process, as it would be in traditional publishing, but is ongoing, and always subject to review.

Thus, the 'wiki way' is not just about contributing to the content, but the governance of the communal space (Forte, Larco and Bruckman 2009; Forte and Bruckman 2010).

The principal resource required to sustain the wiki is *participation* (Lawler 2011). The wiki space has to appeal to potential participants to have them contribute in the first place. Appeals can be initially instrumental - that is, participants have some kind of obligation to engage with the wiki - but it is unlikely such an approach can be sustained over a long period. Ultimately, for an individual or community to sustain its participation over time, some benefits need to be seen, and the individual and community need to learn what these benefits are and how they can best be manifested, then sustained, within the sociotechnical system that is the wiki.

With a wiki used for educational purposes it is logical to assume these benefits would need to come in terms of learning. Thus, the participation in a wiki used for learning purposes needs to not just produce content, but help the participants construct knowledge - about both the content (the subject matter of the wiki), and the processes involved (learning about teamwork, communication, and the affordances of the medium).

Therefore, the OWB project intends to evaluate not only the produced content but the processes involved in its production. In this evaluation the principal questions are:

- What content is produced?
- Who has produced it? How evenly is this effort distributed across the community?
- What procedures do the community evolve in order to validate produced content and the process itself?
- What learning has taken place as a result? How does this learning impact on the participants' attitudes towards Computing as a subject, and wikis as a communication medium and/or learning environment?

Project design

OWB involves teachers, school pupils and undergraduate students collaborating in the development of online content in the project wiki at <http://www.ourwikibooks.com>. To

manage participation, this was not made fully open access; all potential participants need an account in order to edit the wiki.

Through links with the Computing at Schools project, several schools in the Manchester area were approached and three agreed to participate. In each case we worked with a teacher of Computing at A-level and his/her class. Classes vary in size from around 15-20 students and all will be able to use the wiki, which began operating in November 2010. OWB as a project will run until spring 2011, but there is no reason why the wiki cannot stay operating beyond this.

Undergraduate participants were recruited through the Manchester Leadership Programme (MLP). Students registered on the MLP can receive course credits for community engagement, this constituting their incentive to participate. Students were provided with OWB as one optional route through MLP and at that point, self-selected to participate.

Prior beliefs and assumptions

The evaluation of OWB is, as stated above, interested both in what content will be produced, and the process by which it is produced. To begin this evaluation we conducted early interviews with groups of school pupils. We wanted to check what assumptions they held when going into the project, about wikis; about Computing; and generally, about the project itself and their participation in it.

Three focus group interviews were held at different locations in January 2011, each with 3-4 participants, all A- or AS-level pupils (16-17 years old). To retain the anonymity of the schools and the participants, the groups have been given the identifiers, River; Oak; and St. T. Because of our interest in group opinions, no attempt has been made to differentiate individuals' responses. Because of the format of this report, no attempt has been made to describe coding or other forms of qualitative data analysis: the following should therefore not be considered generalisable data, but merely a summary of our particular subjects' views prior to working on the wiki.

Section 1: Opinions about wikis.

** Have you used wikis before? Which?*

All focus group participants were aware of Wikipedia, but only one other wiki was mentioned, one related to computer gaming. Some have edited Wikipedia; the ourWikiBooks wiki was favourably compared to Wikipedia due to being easier to edit. In summary, there is a general awareness of wikis and that they can be edited.

** What do you and others get out of contributing to a wiki?*

There is recognition that wikis are a useful tool for sharing knowledge, and collaborating. Wikis are not seen as just another tool for individual expression, like writing an essay, creating a program or other file. Nor are they seen as an end-in-themselves, but as a tool which could be useful at the time (when trying to solve a coding problem), or later (when revising for exams):

“When it comes to exam time, it will help, because we have used our own notes to put this wiki together so it should be helpful for revision in the summer.”

“In computing there are lots of analogies used to explain things. Seeing how these compare with other people’s, which they have come up with to explain the same thing, that will be interesting.”

The students appreciate the notion that, as with open source software, many eyes may see bugs in the work (here, the produced content) where an individual would not. The value of participation as a resource is thereby appreciated. Finally, wikis are considered a less threatening and hostile environment than discussion fora on which there can be ‘flaming’ and other anti-social behaviour which may be off-putting and discourage participation:

“It’s people at the same level as you helping each other. Some forums you go on them and ask a question and get a lot of abuse, like ‘you don’t know that’, you are lagging behind them. Not very helpful sometimes. So working with people at the same level is probably better.”

Section 2: Opinions about Computing

How do you see Computing as a subject?

What prior experience have you had in Computing?

Students saw Computing as an interesting subject in its own right, and one which taught problem-solving skills and logical thinking. One used the term ‘kinaesthetic’. It was recognised that there were plenty of applications for the skills outside the classroom.

One interviewee also noted that the subject was getting less popular, with a lot of students having dropped it after the first year of A-levels.

The study of Computing on these courses is differentiated from ‘ICT’ as studied in earlier years at school, the main difference in their eyes being the learning of programming. One group recognised that Computing was about learning theory, as well as practical skills. The subject is seen as relatively difficult by the pupils - difficulties which may have contributed to a high rate of dropout after their first year of the two-year A-level syllabus - but they enjoy the problem-solving aspect, and recognise that, like learning a human language, practice is key.

The students also exhibit a range of abilities and prior experience, from several years to none at all. Some have physically built computers.

What textbooks or teaching materials are you currently using in Computing?

Students clearly recognise the problems which exist with creating set texts in a subject as dynamic as Computing:

“The problem is that the textbooks aren’t very helpful, there’s a lot of code in it that doesn’t correspond to the new stuff in the programs. It’s from 2005, it has moved on from then.”

And:

“The book offers a really longwinded way of doing things. Some of the stuff takes 3 or 4 lines of code whereas you can do it in just one function, one word.”

Different approaches to resolving this are mentioned, including the teacher putting together his own source pack, self-guided information searches, and the use of online fora (compare this with the earlier comment about potential hostility in these fora, however):

“I’ll post the code I’ve written and people can see what’s wrong with it... someone will reply to say how to make it work”

Section 3: Opinions about the OWB project

What do you think you will get out of the project?

Again, there is recognition that the wiki is not an end-in-itself but a way of learning: learning by doing, and indeed teaching by doing. However, the pupils also recognise that through creating the wiki-book, they are developing a resource that will subsequently have value to others. The fact that this content will have been created by students, rather than teachers or text-book writers, is valued also, as is the contribution of the undergraduates, who are seen as more experienced and with access to knowledge that the pupils may not have.

One comment from Oak school does suggest that the goals and form of the project were only explained to them in vague terms.

Obstacles to participation

In principle, students recognise that participation is an essential resource for a wiki and is what gives the content value both to themselves and to others. The wiki, and the project generally, is not an end-in-itself - simply something to be created because the teacher says it should be, or which will be assessed in its own right - but as something which will help the students learn, at the time and at the end of the course, to pass the exam. Arguably these factors should help provoke and sustain their participation in creating the wiki content.

However, these interviews took place while the wiki spaces were active and open for editing, and in actuality, participation was infrequent in these early stages. Students’ apparent recognition of the value of the wiki was not being translated into activity upon it. Two principal reasons can be suggested:

- the students were telling the interviewer what they thought he wanted to hear;
- when it came to actually working on the wiki there were obstacles in the way of their participation which were not anticipated or addressed in the interview; more generally, the costs of participation turned out to outweigh the benefits.

The first reason is possible but difficult to avoid: in fact this is a general limitation of the interview method, and assessment of actual rates of participation (a form of observation) is itself a way of triangulating and thus checking this.

As the project developed, however, we were able to see obstacles to participation emerging in four distinct ways:

- technical obstacles - e.g. don’t like the interface

- content obstacles - e.g. nothing to say, no reason to edit (note: reasons could be positive, e.g. a feeling that the content is already as good as it could be)
- resource obstacles - e.g. lack of time
- meta-obstacles - not engaging with the project in the first place, e.g. cannot see relevance, dissuaded by CRB requirement⁴

Edit patterns and histories

The wiki history provides a form of observational data that can both support and be supported by the interview data. We analysed the edit history to check: who has been contributing? On what subjects? When? How frequently? What has actually been produced?

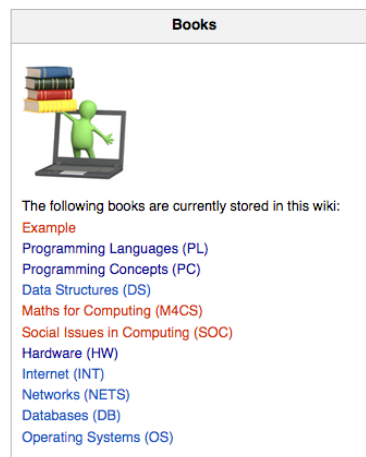
The structure has been put in place for several wikibooks, as shown in this screen shot from the main page:

Each book is to be divided into parts, each part has a number of chapters, and these chapters are in turn divided into pages. Most of the books had a structure in place (the exceptions being the two red-linked books here, plus the example), but few substantial pages of content were created in the course of the project, though there were several stubs. The pages with the most revisions were:

[HW:Input Devices](#) (151 revisions)

[HW:Output Devices](#) (63 revisions)

[HW:Storage Devices](#) (38 revisions)



[Main Page](#) (33 revisions)

The 'Internet' book also had content developed in the 'Web page design' part, mainly by an MLP student. Content in the 'Databases' book was authored by a member of the project team.

There is some evidence of schools collaborating on books. The 'Input Devices' page did have an early edit made by a pupil at St T school before most of the subsequent work was undertaken at River school. The 'Output Devices' page, similarly, has been worked on by a

⁴ One potential undergraduate participant was enthusiastic at first but the requirement that all MLP participants are CRB-checked seemed to dissuade him.

pupil from St T as well as three from River. This is interesting and suggests that this kind of cross-school collaboration is possible.

Project team reflections

Our final source of data for this report, then, are the opinions and reflections of the project team themselves, particularly those of us (Lawler and Banks) who worked most directly with the teachers and pupils. The remainder of this section is drawn from these reflections.

Our expectations of student and teacher contributions were higher than the level of contribution that was realised in practice. We believe that there are several reasons for this, including topics such as the adoption of wiki-based learning as classroom practice under circumstances where the syllabus is already full.

However, the most crucial issue for the project was timing, which came to be a significant obstacle. We suffered severe knock on delays as a result of a month's delay in project funding. This delay occurred at a critical time in the annual holiday and term cycle that interfered with our initial teacher contact and teacher training: Particularly, we weren't able to arrange the initial workshops with teachers until after the summer holiday. These workshops were supposed to inform set up and development issues that could have been worked on over the summer, but we missed our window of opportunity. The knock on effects of this delay probably delayed the development of project outputs by some six months, and resulted in underuse of the wiki.

At the beginning of the project, some teachers requested a space specifically for their class/school to develop. Later, one teacher attempted to coordinate with other schools' work so as to work on books collaboratively. However, some books seem to be duplications of others: coordinating activity has been a problem. Nor has there been much use of the wiki itself to coordinate activity, e.g., through using discussion pages - by teachers or pupils. (One critical comment on a discussion page was not responded to or addressed.)

The same teacher, via an email to other involved teachers, recently suggested introducing a competitive edge to wiki development so as to motivate pupils to contribute - this was felt by other teachers to be a good idea, but wasn't actually acted upon.

Some of the images that have been added to the wiki are in violation of copyright, and we saw some signs of plagiarism of Wikipedia content. These are the kinds of things that students are likely to do, albeit in good faith, and addressing this is something that requires further training and preparation.

The MLP programme could have been a big benefit to the project but clearly hasn't been. With hindsight, focusing on involving Computing Science students would have been more beneficial, but it was difficult to get volunteers even through offering incentives: and making it compulsory, by, for example, linking it with a module, would need considerable planning and CS school support.

We have spoken informally with one teacher who clearly sees this as an ongoing project and very much in its initial stages, but with a lot of potential given time. Again, teachers have such a full timetable and the opportunity for them to really focus on this is so short, it is bound to take a while for the resource to develop and any community connections between schools and schools/university to grow on the back of it. As they are so busy,

teachers showing interest need to be "aggressively pursued" and supported, which is time consuming - this was certainly the case when recruiting the initial teachers. We found they became much more engaged once we had visited their schools to speak to them face to face.

Conclusion

The ourWikiBooks project has produced mixed results, from, on the positive side, seeing early enthusiasm by teachers and pupils, to, on the negative side, not obtaining significant wiki-based outputs. We believe that a major impediment to wiki-based output was that we missed, for good reason, a critical point in the yearly cycle where we could have worked with teachers to assist their later classroom practice with the wiki.

We have some feeling that there were two further impediments to the projection of outputs that we class under obstacles. Firstly, that the Mediawiki interface (which we have improved) is still difficult for non-wiki specialists to use, particularly in its use of markup language, and, secondly, that there is a resource obstacle in that teachers do not have enough time to adopt novel and experimental classroom practices given the pressure on them to cover syllabus topics and ensure that their pupils do well in exams.

Further there may have been a 'cold start' problem, in that perceptions of the wiki may be negative until sufficient content is in the wiki so as to make it seem a useful resource to contribute to.

Given these problems, we wish to address as many of these as we can in a continuation of the project by the University of Manchester's School of Computer Science as an outreach project. We can address the yearly timing problem in this year's summer holidays, can supply specialist support for teachers in changing classroom practices in an effective manner, and continue to populate the wiki to avoid any cold start problems.

The remaining problem, Mediawiki's interface, is something that we cannot do anything about (this is a well known problem, that even the Mediawiki Foundation has been unable to address). Here the only possible approach is to look for and adopt alternative wiki technology or adapt exiting technology; here, in the longer term, we have interest in further developing alternate open source technology to supply suitable facilities for projects like ourWikiBooks.

We would like to thank JISC for funding the ourWikiBooks Project which we hope, with our continuing support and pupils and teacher's use over time will develop into an important OER resource in the study of Computing in the UK.

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