The Web and information literacy: scaffolding the use of web sources in a project-based curriculum

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Abstract

In this article we describe and discuss a three-year case study of a course in web literacy, part of the academic literacy curriculum for first-year engineering students at the University of Cape Town (UCT). Because they are seen as ‘practical’ knowledge, not theoretical, information skills tend to be devalued at university and rendered invisible to the students. In particular, web-searching skills are problematic, given the challenges that the Web poses to academic values and traditional research practices. Consequently, the technical skills of web searching are often taught separately from academic curricula or left entirely unaddressed. We illustrate an alternative, integrated approach to the development of this aspect of information literacy. We apply a critical action research methodology to document, evaluate and reflect on students’ use of evaluative frameworks. Focusing on the facilitation of critical and evaluative use of the Web for exploratory learning, we interrogate the role of ‘cultural capital’ and evaluate the effectiveness of the scaffolding provided by the course design. We find important connections between developing knowledge of academic discourse and successful academic use of the Web, and note that, for students to transfer their skills to a range of contexts, these skills will require sustained attention throughout the undergraduate curriculum. We present evidence that the most effective strategies integrate everyday practical knowledge of research techniques with teaching about academic discourse and building students’ knowledge in a specific domain.

Academic literacy, information literacy and web literacy

From an anthropological perspective, students acquire a broad set of competencies, termed academic literacy, through internalising the tacit beliefs and complex customary practices associated with academic research (Ballard and Clanchy, 1988). What counts as knowledge? What is a reliable source? What sources are relevant?
One aspect of academic literacy has been termed information literacy, and this includes web literacy. Information literacy has been defined as the ability ‘to access, evaluate, and use information from a variety of sources’ (Doyle, 1992, 2). Information literacy is often associated with a resource-based curriculum (Behrens, 1994) and exploratory learning: students who can access, sequence and derive their own meaning from information are more likely to achieve enduring and transferable learning (Snyder, 1997).

Given the difficulties of introducing students to the academic value system, it is surprising that there are few detailed guidelines for educators wanting to develop their students’ information literacy during their courses. Those that exist tend to preserve the traditional librarian’s emphasis on locating information, while glossing over educational problems that arise when students need to evaluate, analyse and synthesise information into their own writing.

Developing students’ web literacy, as part of their information literacy, is a specialised activity because the conceptual difficulty of evaluative tasks required of students using the Web for research is considerable: they are challenged by the ‘primary evaluative activity more often done by advanced researchers’ (Sorapure et al, 1998, 410). Yet once they graduate, their dominant mode of learning will be self-directed and exploratory, and the Web will be a key information source.

Web literacy in a South African academic literacy course

In this article we reflect critically on the web literacy section of an academic literacy course for first-year engineering students at the University of Cape Town (UCT). Many such students face particular challenges. For them, problems with web literacy are merely the latest manifestation of a more general problem experienced by South African students whose disadvantaged schooling often leads to academic difficulties with information access and use (Sayed, 1998, 9). Differential levels of access to information technology and skills are a particularly worrying legacy of apartheid education (Sayed, 1998, 12). As Burbules and Callister (2000, 32) explain, access to information is not a switch that is either on or off, depending on whether people have the requisite technological infrastructure. Instead, they suggest, the quality of access people enjoy is influenced by their interpretive skills and their beliefs about knowledge.

The critical literature fails to provide details about teaching students how to evaluate sources. Nor does it specify what it means to teach ‘critical’ approaches to information. The phrase ‘teaching critical thinking’ could be tautological if it means ‘teaching through instruction’. Critical pedagogy has often failed to achieve its goals, for precisely this reason: Prain asserts that ‘Too often [critical pedagogy] has functioned in practice as an imposition on students of “correct” or “approved” negative stances towards the (seductive) pleasures of surrender to “mainstream” ideologies’ (1997, 463). Rather than simply teaching politically correct stances, we believe it is necessary to show students why critical evaluation is important, and to provide them with models and opportunities for practising evaluation of sources and for developing their own critical
frameworks. We have also noticed that critical evaluation often requires prior knowledge of a discipline and the cultural capital associated with it.

Teaching a critical approach to web sources is particularly difficult when students are only partly socialised into academic literacy. Our own experiences confirm the insights of Angelil-Carter (2000), who describes South African students’ problems with referencing and their use of plagiarism as an index of their difficulties in acquiring academic literacy. Their problems with referencing are intensified when they encounter web sources. Most students’ somewhat shaky grasp of academic conventions does not survive a meeting with the Web’s garrulous carnival of unregulated information, much of it originating from Western culture. The resulting plagiarism is not always dishon est in intent.

Poor referencing and plagiarism are the only aspects of student research practice visible to most lecturers, however, and they tend to be the focus of considerable and disproportionate ire. As Angelil-Carter (2000) shows, such wrathful reactions do little to assist students in understanding academic practice and values associated with research.

### Aims and methods
We set out to evaluate, using critical action research methods, a three-year intervention by a team (that included us) teaching first-year engineering students. Our aims were to:

1. Develop a deeper understanding of our students, their information-seeking practices and what motivated them to learn
2. Understand more about our own practices as teachers in online classrooms
3. Design, evaluate and iteratively refine a scaffolded curriculum for exploratory learning, through drawing on our improved understanding of our students and our own practice

The team-teaching culture was characterised by regular weekly meetings, extensive discussion of teaching experiences, and critical evaluations of our intervention, based on annual reviews and student responses. In writing this account, we have drawn on:

- **Online discussions**: These used synchronous discussions in archived forums, and were conducted via the course web site, primarily during class time
- **End-of-term interviews**: Small samples of students participated in in-depth interviews about their experiences at the conclusion of the course
- **Course evaluations**: All students were asked to reflect on their experiences after each session and at the end of term
- **Participatory evaluations**: Technical and teaching staff met weekly to plan, discuss and evaluate the success of the classes, and at the end of term to reflect on the experience as a whole
- **Textual analysis of student assignments**: Assignments were selected and analysed in relation to use of web and library sources. We looked at in-text referenc-
ing, bibliographies, selection of sources and evidence of critical evaluation of sources (see Archer et al., 2000, for a full discussion)

- **Web-searching case studies**: Two longitudinal case studies of student web-searching practices were conducted. These consisted of introductory interviews and observations of most of the students’ web-searching processes, both during and after class time (6–14 hours/student)

- **Web-searching exercises**: Ten students selected by lecturers as representing a range of academic abilities were recruited at the end of the course and observed completing an hour-long set of web-searching exercises

**The students**

Three cohorts of first-year UCT engineering students from previously disadvantaged schooling backgrounds were the focus of this study. Most had English as a second language and demonstrated varying levels of proficiency in spoken and written academic discourse. UCT lecturers’ pedagogical approaches always have to take into account that South Africa is not a print-immersed environment: students have widely varying access to economic resources and to cultural resources such as newspapers, books, letters and computers. In general, access is limited to educational resources such as textbooks and extra reading materials. Needless to say, this resource-impoverished environment impacts on what students read, how much they read and their attitudes to reading. Problems with access to computers are particularly serious.

Most students in these three cohorts had little experience of computers during their school years; once they arrived at UCT to study engineering, however, they had access to a well-equipped faculty laboratory and quickly developed general computer literacy. Though they had limited academic experience of the Web, our interviews revealed that they were using the Web extensively for social and personal reasons, primarily for web-based email and for sending short text mobile phone messages.

We have observed that for many such students, their future success and social mobility depends on successfully crossing the ‘digital divide’ in their first year. The knowledge we have gained from these three cohorts may be of value to those teaching many other students, in South Africa and elsewhere, who have to cross the same divide.

**The course ‘Introduction to Communication’**

‘Introduction to Communication’ is an integrated and obligatory academic literacy course within the Academic Support Programme for Engineering, Cape Town (ASPECT) and the Engineering Foundation Programme at UCT, which caters for 80–110 academically disadvantaged students each year. The course focuses on sustainable rural development as content while teaching communication skills. Students are divided into teams of four ‘consulting engineers’ and investigate the upgrading of the infrastructure of an existing rural settlement. Each team member selects and researches an aspect of development such as housing, transport, water and sanitation, or power.
Our critical action research methodology led to a series of adjustments to the curriculum and how it was taught. Before the intervention students had relied heavily on web sources, but their web searching was unsupported and took place out of class. Students complained about the unrewarding nature of their searches, and lecturers worried about students’ lack of success in finding and referencing appropriate academic sources. As a result, the online curriculum was introduced, some classes were moved to a computer lab, and scaffolding was introduced to support student research.

Educational scaffolding ‘enables a child or novice to solve a problem, carry out a task or achieve a goal which would be beyond his unassisted efforts’ (Wood et al., 1976, 90). In this sense, scaffolding identifies elements of a task that are initially beyond a learner’s capacity, and allows learners to focus on aspects of the task that they can manage. Through this process, they should develop a deeper understanding of the task as a whole.

Methods of scaffolding include teaching strategies, web materials, and the curriculum structures that encourage participation in a community of enquiry-supporting students engaged in knowledge construction. Scaffolding equally refers to making tasks meaningful by building on and recruiting what learners already know.

Figure 1 depicts the relative levels of emphasis on exploratory learning and scaffolded practice in the curriculum over four consecutive years. Our initial designs overemphasised exploratory learning (Years 1 and 2). After conducting detailed case studies and observations of student web-searching exercises (Year 2), we de-emphasised web searching, and provided more scaffolded practice in searching and the critical evaluation of sources. As we discuss below, even with extensive scaffolding of web searching, students spent too long looking for information with minimal success.

![Figure 1: Curriculum evolution over four years](image)

Scaffolded web searching

General observation of individual students in class and our detailed case studies indicated that free web searching presented almost insurmountable literacy-related challenges to the students entering the course. They spent inordinate amounts of time searching, with the majority not finding any significantly useful sources. It was clear that we could not rely on exploratory learning without adequate scaffolding of the research process at all stages: (1) formulating a research question, (2) searching for information, (3) selecting relevant information, (4) analysing information and (5) synthesising ideas.

We scaffolded the process in an online discussion by encouraging students to think through their research question, their keywords, and possible appropriate sources. Our own scaffolding enabled the students to scaffold one another’s understanding of sources and questions. Online discussions also revealed students assisting each other in practical ways, such as in navigation around the library. One student calling herself ‘u lucky fish’ suggested the following:

‘i wuz in tha library yesterday ‘n there wuz this section full of books about waste problems and things like that. it wuz in the engineering section towards the wall closer to Jameson step. You know there is rows of book shelves in tha middle of eng. section? Yeah, it’s at towards the end there. Good luck.’

We tracked in detail the searches of two students, Nomusa and Mbuso. Mbuso, an academically confident student, managed to complete most of his searching during the three hours of class time that we had set aside, and spent another hour searching after class. He found useful and appropriate sources relatively easily.

Nomusa, a conscientious student who received four distinctions in her school-leaving exam, had an altogether different experience, spending more than seven hours web searching and reading sources she found on the Web. She read sources painstakingly, seldom using speed-reading strategies such as skimming or scanning. She read sources in a linear fashion, taking careful notes and recording search terms for future reference. Despite this effort, she eventually used only three web resources in her final assignment, one of which had been shown to her during class. Only one source was used for information, the other two serving a more rhetorical function (ie, a quote from a speech by Nelson Mandela and an illustration on the title page of her report).

Despite this relatively barren harvest, Nomusa’s searching skills showed a considerable improvement over the three months. At the start of term, her searches were entirely unfocused – she began searching by using single-term queries such as [housing], and was unsure what to do when these proved unsuccessful. Soon she had mastered more complex queries such as [infrastructure Duncan Village in ‘South Africa’]. Her use of keywords outstripped her general knowledge. This search brought up a promising list of results, including a study by UNESCO, but Nomusa dismissed the UNESCO report without clicking through to it. Instead she selected an altogether less appropriate site.
By the end of term, Nomusa’s improved command of academic discourse in the target area allowed her to formulate the following sequence of queries:

- [sustainable building material] (sees nothing interesting in list of results)
- [sustainable livelihoods] (explores two search results)
- [sustainable livelihoods building materials] (finds a target source)

Employing this type of sequence is a common strategy among experienced web searchers who generally rely on repeated queries with slight variations in the query terms. The discourse Nomusa commanded was crucial to her success, and echoed a key source that she read in detail and cited in her report.

While showing us the very real challenges faced by novice searchers in an unfamiliar domain, Nomusa’s experiences also illustrate the importance of a teaching approach that developed her understanding of domain-specific academic discourse and vocabulary along with her more technical web-searching skills. From our observations of student performance in web-searching exercises, we believe the more technical skills such as Boolean logic are considerably less useful to students at this level than a sustained focus on developing a command of academic discourse in the subject area for keywords and phrase searching.

Our observation of Nomusa and others suggested that some of the time that students had spent web searching had been unnecessarily unproductive, particularly when compared with using a carefully selected print source. We developed a more focused and scaffolded approach to searching, reducing the amount of ‘free’ web searching. At the start of the course, we provided students with ‘canned searches’, or pre-planned detective-hunts for information. Prior to the beginning of classes, we set up and tested these searches using a range of keywords, eventually presenting students with pre-formulated queries which we knew would lead them to at least one useful source, but where individual students were responsible for interpreting the search results and making selections.

We measured the success of the ‘canned searches’ according to whether students were able to find the target source (or ones of comparable relevance) in the time allotted. If the keyword searches proved too laborious for students, or required too much prior knowledge, we substituted tasks designed to help them discover information essential to their research, such as finding a specific government policy document or establishing rural income figures. If tasks are well chosen, this approach saves time but still enables students to construct their own meaning.

**Inadequate transfer of searching skills**

We found that the major weakness of our modified curriculum in web searching was the poor transfer of searching skills from one context to another. Strategies that worked in one context might not be appropriate for another, and students were overgeneralising from their somewhat limited experience in our course. They needed opportunities to work on a wider range of tasks and use other information retrieval tools.
Most students did not differentiate searching for geographically specific information (such as information about poverty and rural development in a particular village in South Africa) from searches that could use information from elsewhere in the world (such as finding alternative sustainable technologies). We observed many students struggling to make sense of highly inappropriate foreign sources. For example, in one interview Nolitha mentioned finding many web sites, mostly from India, which she found confusing. By the end of the course, most students we observed were over-narrowing their research, and prematurely dismissing sites that seemed ‘too broad’ or which were not obviously relevant to local conditions.

Transfer problems of a different kind occurred when students used searching tools inappropriately. Most commonly, students used strategies that worked to narrow down the number of results in Google when they were searching the library catalogue for books. We observed that students who adopted this strategy found fewer rather than more sources, and they were invariably unable to explain why their searches had failed. For students to generalise sufficiently to a wide range of other research contexts and tools, throughout their university curriculum, they need more sustained practice and guidance in acquiring these undervalued skills.

Critical evaluation of web sources

Online sources challenge conventional academic disciplinary values. The Web turns academic conventions on their head through the absence of traditional publishing gatekeepers and quality indicators, unclear or collaborative authorship, absence of dating information, and finally the transience and mutability of online texts in a medium where retrievability is not guaranteed (Leverenz, 1998). Leverenz argues that these traditional academic measures of quality are dubious, and are strongly bolstered by print’s ‘illusion of certainty’, and a discipline’s hierarchical scrutiny of new knowledge. Instead of simply teaching students to apply traditional academic conventions to web sources, Leverenz suggests that lecturers should use the opportunity to question knowledge claims in general. Researchers need to admit the difficulty of being exhaustive, and explain to students how difficult it is to know much about the authors that they cite and that their claims to knowledge are tentative at best. Similarly, Burbules and Callister (2000, 82–3) have discussed the rise of new evaluative criteria for the Web, and differentiate between ‘critical users’ and more sophisticated ‘hyperreaders’, who are able to question standards of judgement, and interrogate their own purposes in the use of information.

Such approaches are particularly suitable for students whose ‘cultural capital’ already gives them insight into academic values (Bourdieu, 1990). However, it is a difficult balancing act to teach traditional academic evaluations of sources effectively while simultaneously deconstructing their truth claims. We decided to err on the side of caution and used a web-searching task to introduce students to traditional academic criteria for reliable information. We attempted to develop critical awareness of the situated nature of all information, including that found on the Web.
Meeting Dr Jojo
On visiting the course web site, students met Dr Jojo, a cartoon character who introduced herself as a ‘writing consultant’ for the rural village engineers (Figure 2). Dr Jojo modelled the critical process by critiquing a number of web sites, including a commercial site, a government policy document site and an Indian non-governmental organisation (NGO) site. Students voted on the credibility of these sites and used online forums to discuss their evaluations of the web sites. A framework structured around the questions Who, Why, What, When, Where, and For Whom was used to interrogate both the online texts, as well as articles in refereed journals, as illustrated in the two examples below.

Who?
Who is the person or institution responsible for publishing this information?

Note full details of author (person or institution), and, if necessary, publisher, journal, or web address.

Ask yourself: Why should you believe this person?

Why?
What are the possible motives behind the publication of this information?

Note any commercial or political affiliation.

Evaluating the Development Alternatives web site
‘Sustainable Livelihoods’ is the title of the promotional web site of Development Alternatives, an NGO in India (http://www.dainet.org/livelihoods/). This site was selected for evaluation because it provided a wide range of information about rural development projects and emphasised the social and human issues involved in rural development.
Students’ perceptions of the site’s audience and motives were crucial to their understanding of the information it provided, since the NGO site was used to communicate with the NGO’s funders. The student responses appeared to depend primarily on their knowledge of the funder–NGO relationship, and were equally divided between a naive (or possibly empathetic) stance and a more critical one. The naive view displayed an egocentric notion of the Web, where students imagined that the site was deliberately set up to communicate with ‘us’ or ‘those working on rural village projects’. Empathetic students felt that the site existed simply to provide “‘new and innovative ideas’, to communicate ‘the importance of rural development’ and, perhaps most uncritically, to ‘support and help rural areas’”. In contrast, students who took the critical view identified the site’s function as reporting to and soliciting funders: students referred to them as ‘sponsors’, ‘investors’or, most graphically, ‘people with (phat) big wallets’. Rather than displaying mastery of some abstract skill of ‘critical thinking’, the latter responses seemed to us to be based on some background knowledge about the funder–NGO relationship, which many students simply did not have.

On the whole, we found that the combination of evaluative frameworks and online discussion was highly successful in raising students’ awareness of the criteria to use when evaluating web sources. We have repeated our approach with three cohorts. Nonetheless, work with primary sources is still a new activity for most of our students at this level: their limited domain knowledge and poor academic literacy set the ceiling of their evaluative insights.

Referencing and the class bibliography

For the third cohort taking this course, we scaffolded the students’ work on referencing throughout the research phase and they contributed to a collaborative online bibliography. Lecturers noted significant improvements in students’ referencing skills in comparison to those documented in our initial analysis of the students’ writing (Archer et al., 2000). Our students found this resource very useful too. According to our web server logs, the class bibliography was one of the top 10 pages requested from the web site. As Nobathembu explained, ‘When I started doing my project, I didn’t know where to start. I got an idea from the bibliography’, while for Leshoto, the bibliography was the ‘first thing I did’. Eight of the 10 students interviewed were positive about the role played by this shared resource, although two had reservations about trusting the judgement of their peers. Fortunately, we were able to offset this valid concern by adding good resources and weeding out inappropriate sources at the end of every year. Our observations of the search exercises revealed that students gravitated strongly towards known and trusted sources from the class bibliography or towards ones that they had already ‘digested’ during previous searches.

Cultural capital and evaluative frameworks

Students were expected to identify criteria for evaluating possible rural technologies and to consistently and appropriately apply these criteria when recommending a devel-
development strategy. Most students chose appropriate criteria but used them inconsistently. We think they have difficulty in critically framing situated knowledge, and the inconsistencies revealed their preference for the ‘known’.

Initially our teaching probably underestimated the role played by domain knowledge in the development of evaluative frameworks, or what Bourdieu (1990) terms ‘cultural capital’. As they accumulate this cultural capital, students develop resources that are valuable and relevant when encountering new kinds of knowledge and processes. We found that many students’ prior evaluative frameworks were remarkably durable, dominating their logical processes and outweighing any newly acquired information. New concepts such as sustainable development were often displaced by belief in technological ‘progress’ and modernisation. In particular, this kind of limited domain knowledge hampered the evaluative process, as can be seen in the following extract from Mzi’s report, in which he shows he is probably unaware of the geographical location of Czechoslovakia:

The supplies of these materials are limited, but fortunately there some supplies that are around South Africa, which are Jandu plumbers Ltd TANZANIA and Skoda from Czechoslovakia.

We noticed in one fascinating case that academic criteria for determining the most appropriate form of renewable energy were ignored, as the student, Annah, relied on a more familiar, trusted authority—a group of rural community members. She had grown up in the rural areas and based the recommendations in her report on her own observations of rural life. When preparing a list of sources of renewable energy, she ignored all other possibilities and focused entirely on solar technologies. When asked why she had not considered other alternatives, she explained that solar power had been endorsed by the group of rural community members in the photograph on the Web site depicted in Figure 3.

After this experience, we focused students more carefully on defining and applying evaluative criteria. An interview with Leshoto shows a critical sense well above the average for the class. Leshoto commented that while she felt wind energy was an option for South Africa, she had discovered that there would be serious problems. She had reached this conclusion despite the fact that the sources she had consulted (from Denmark) had promoted wind power extensively:

They say it is not expensive, but if we used it, how would you transport the turbines? You need some area, a flat area, but our area is mountainous. If it wasn’t mountainous, wind power could have been a possibility.

Leshoto resists the seductions of the images of wind turbines, which had initially made her very enthusiastic:

It was the cost that put me off, though they looked quite good... you have to have a backup system when there is no wind, and that is expensive.
She seemed to be asking particularly good questions about the web site that had been her major source of information. “It’s mostly about what Eskom is doing, but I thought, “what about what Eskom is not doing?”’

Conclusion
The formulation of searches, the interpretation of search results and the effective evaluation of web sources are all competencies that require advanced knowledge of academic literacy practices. Such research practices are important but often-invisible dimensions of academic culture. Our study has shown that these practices can be made visible and carefully mediated to students, and that the development of domain-specific academic discourse is integral to developing information literacy. In our course we combined exploration and scaffolding in order to facilitate critical and evaluative use of the Web. Students are likely to acquire web literacy if they are provided with a strong, meaningful framework that helps to focus their attention appropriately.

We found that, in the absence of well-developed academic evaluative frameworks, students tend to trust sources that have been recommended to them by lecturers or peers,
or which resonate in some way with their pre-existing evaluative frameworks. We recommend that evaluative criteria should be explicitly discussed, search tasks should be designed that lead students to discover helpful resources, and shared collaborative resources (such as our class bibliography) should be provided. Critical literacy in this sense is not about oppositional thinking or an alignment with politically correct positions. Rather, educators should highlight the need for critical evaluation and acknowledge the role of cultural capital as they help students construct and apply meaningful critical frameworks.

The stakes are high in building quality access to information literacy and academic literacy practices. As Castells reminds us, 'Information technology, and the ability to use it and to adapt it, is the critical factor in generating and accessing wealth, power, and knowledge in our time' (1998, 92). Only when academic staff join librarians in addressing information literacy across the curriculum will we be able to provide students with a less mystifying apprenticeship to the academic discourses, practices and values underlying research in the disciplines.

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**References**


