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A Project-Based Learning Approach to the Integration of Internet Resources in Education

Cameron Richards

INTRODUCTION

Many teachers have a general awareness that the Internet offers a rich source of potential learning resources. Even an Internet-resistant "traditional" teacher cannot deny that the World Wide Web houses endless and ever-current information on all manner of topics. Yet the Internet is often used as an "add-on" in the classroom or as demonstrations of cutting-edge programs and possibilities which often intimidate rather than encourage educators. The starting point of this paper is the idea that it may be a mistake to view new Information and Communication Technology (ICT) resources as merely an extension of "traditional" print resources, classroom practices, and "curriculum-as-content" transmission. In other words, the challenge for teachers to effectively integrate web resources in the teaching and learning processes of their classes and classrooms is not simply a problem of teachers finding sufficient time to develop sophisticated computer skills or even think about potential applications. Relevant contexts or frameworks for practical integration are also needed. As this paper will discuss, there are good reasons why the concept of "project-based learning": (a) exemplifies the possibilities of integrating Internet resources in and across the curriculum, and (b) also encourages a more integrated curriculum in terms of generic skills, applied knowledge, and other convergent aspects of learning.

BEYOND THE WEBQUEST MODEL

The term "webquests" has become for many teachers almost a generic term for getting students to interact with information on the Internet. Indeed, it was originally conceived by Bernie Dodge (1997) as a general criterion of learning: "a webquest is an inquiry-oriented activity in which some or all of the information that learners interact with comes from resources on the Internet". Many educators still see the Internet as basically a reference resource. Dodge (1997) helped to promote and develop the idea of integrating Internet resources in terms of the teacher design of student-centred activities with the potential to encourage more immediate, relevant, interactive, and authentic learning through the Internet. His co-developer March (1999) went on to develop a
framework for web-based learning activities which included webquest (alongside topic Hotlist, Multimedia Scrapbook, Treasure Hunt and Subject Sampler) as the one category which covered an integrated use of internet resources.

As reflected in the online template, Dodge (1997) set up for teachers [see link below], a model of a webquest which incorporates the progressive structure of introduction, task, internet resources, process and outcomes. He also conceived it as a collaborative activity where a group divides into different roles and perspectives to search for information in order to produce a report or some sort of product which addresses a particular topic or task in terms of focus questions. For instance, “the webquest about a webquest” linked to Dodge’s site The Webquest Page would have a group of four students develop their activity across a couple of lessons through the distinct roles of efficiency expert, affiliator, altitudinist, and technophile (see also Dodge’s original webquest Investigating Archaeotype and his co-developer March’s (1999) Tuskegee Tragedy). As the basis for a report to the teacher, each member of the group could make use of online resources which are ideally current, authentic, well-informed, or balanced in their reporting or interpretation.

- Dodge’s initial webquest Investigating Archaeotype
  http://edweb.sdsu.edu/edweb_folder/Courses/EDTEC596/WebmodelsbQuest1.html
- March’s Tuskegee Tragedy
  http://www.kn.pacbell.com/wired/BHM/tuskegee_quest.html
- A webquest about a webquest
  http://www.biopoint.com/WebQuests/webquest2.html
- A draft rubric for evaluating webquests
  http://edweb.sdsu.edu/webquest/webquestrubric.html
- The Webquest Page
  http://edweb.sdsu.edu/webquest/webquest.html

There are several related reasons why it is helpful to go beyond the webquest model in order to appreciate “project-based learning” as a larger, more integrative context of learning involving Internet resources. If you think about Dodge’s definition above, you will appreciate that it really covers all manner of uses of the Internet as an information resource for teaching and learning purposes. Even its use as a mere reference resource still involves some degree of inquiry where there is a need to search and evaluate quality information. Yet Dodge himself
also attempted to define webquests in terms of a particular method and even template with an associated assessment rubric and framed in the manner of a self-contained lesson. Thus the term “webquest” is often used interchangeably in confused fashion as an alternative general approach to a particular method associated with his personal authorization and online models. In other words, should any classroom learning activity which makes use of Internet resources be referred to as a “webquest”? If not (and clearly not), where do you draw the line and how do you distinguish a “genuine” webquest?

Although webquests were further defined by Dodge (1997) as “inquiry-orientated activities which include both specific or short and long-term projects”, his examples were all short activities, resulting in his plea for people to send him longer activities. It would seem that Dodge conceived his notion of webquests in the context of a traditional self-contained lesson, and was thus confused about how this might be reconciled within Internet projects. In short, the concept of “webquests” is ultimately a rather narrow and specific one, and is not able to encompass extended and varied notions of learning activities which make use of Internet resources.

On the other hand, a “project-based learning” (PBL) approach usefully goes beyond the notion of webquests because it represents a general integrative approach which can include as well as be exemplified by specific learning activities, methods, and outcomes. Whilst a specific learning activity may organize the plan for up to several classroom lessons, a project has an educational focus which is able to provide an organizing framework across and beyond a series of lessons with quite distinct or related activities. A project may also include the collaborative emphasis of webquests, but ultimately encourages personal motivation for and “ownership” of the learning process. Any teacher who has used project-based learning well should be able to attest to the power of a project topic (especially if negotiated) to capture a student’s energies and enthusiasm for exploring knowledge. As an aspect and model of “problem-based learning”, project-based learning with the Web represents an exemplary focus and framework for the integration of ICT in education in terms of being a “general approach” which also embraces various types of web-based learning activities or teaching methods.

PBL AND THE INTEGRATION OF INTERNET RESOURCES

As the Challenge 2000 Multimedia Project (1999) states, “project-based learning is a model for classroom activity that shifts away from the
A Project-Based Learning Approach to the Integration of Internet classroom practices of short, isolated, teacher-centred lessons and instead emphasizes learning activities that are long-term, interdisciplinary, student-centred, and integrated with real world issues and practices. As a context for discussing the integration of Internet resources in teaching and learning, PBL also goes beyond the webquest model in terms of emphasizing that problem-based and inquiry-based contexts for transforming information are ultimately part of a larger communication framework of learning, interaction, and presentation focusing on the Internet as a gigantic database as distinct from telecommunications media. While the student webquest report is typically produced for the teacher alone, influential models of Internet "project-based learning" emphasize the sharing of a wider publication or presentation of activity outcomes and products.

As a communication tool, the Internet extends the process of learning in terms of a range of "telecomputing activity structures" which may be grouped under generic headings such as interpersonal exchanges, information exchanges, and problem solving projects (Grabe & Grabe, 1997: 44). Particular types of activities ranging from "key pals" or "electronic mentoring" through to "tele-fieldtrips" and "social action projects" may be adapted and extend the specific contents of different subjects. Whether or not a particular project makes use of email, web-forums or even "chat" and other conferencing Internet functions or programs, influential organizations such as the Global Schoolhouse, which has pioneered telecollaboration projects since 1984, use the World Wide Web itself as a communication medium to advertise projects and to link classrooms across the world, besides developing online educational communities. The Oz-TeacherNet similarly provides a useful example of a community context and teacher resource for locating and considering a range of classroom projects. Various communication options from email lists through to Internet chat provide contexts of interaction on these sites for teachers to discuss possible projects and for students to undertake projects (e.g. Lerman, 1998). Likewise, within a communication framework of collaborative projects, student websites provide a focus for reporting and interaction as well as developing information resources. This is typified by the 2001 International Schools Cyberfair.

Many Singaporean schools are increasingly involved in Internet resource projects (Singapore MOE, 2000). One exemplary school in this respect is Radin Mas Primary School which is not only participating in, but also initiating innovative projects. Its "Travelling Around the World" project involved groups of students visiting different countries online. Participating students return with useful information ready to be transformed into travel brochures as a focus for learning about other
countries and cultures.

- Global Schoolhouse registry of projects, linked to 
  http://www.lightspan.com/

- 2001 International Schools Cyberfair
  http://gsh.lightspan.com/cf/people.html

  http://web66.coled.umn.edu/schools.html

- Oz-teacher Net

- Traveling buddies

- Monster exchange
  http://www.monsterexchange.org/

Organizing metaphors such as the “travel buddy” and the “monster exchange” exemplify the dynamic and flexible potential of Internet projects to inform specific or larger-scale learning activities on one hand, and also provide an umbrella for learning communities, collaborations and activities. While designed for primary school contexts, such projects allow thematic and topical foci for “across-the-curriculum” interactions. These are organized online such that they are also relevant for secondary school classrooms embracing the communication possibilities of using the Internet for interactive learning. After all, even the most abstract mathematical formulation or scientific theory can be productively related to the concrete metaphors of some imaginative, real-life context.

The basic idea of the “travel buddy” is that, after connecting up virtually over the Internet, a classroom in one country (e.g. Australia) sends an actual representative “buddy” (often a cute, cuddly character like a toy kangaroo or koala) to another classroom, for example, in Singapore. A folder with guidelines of use and possible activity collaborations and ideas is also sent by mail or email. This will provide a focus for local classroom activities for different subjects in both classrooms – as well as for direct collaboration between the classrooms and their respective students. For instance, the classroom which received the toy kangaroo might take it on a local outing to a historically or geographically important site such as the Singapore Padang. A resulting photo and accompanying report sent to the first classroom could potentially provide the focus for an imaginative writing activity
or even a mathematics activity of, say, calculation, as well as activities directly relevant to history or geography. In short, travelling buddies can provide "triggers" for all manner of learning activities in all sorts of ways limited only by the interest and imagination of a teacher and the students. Likewise, the monster exchange directly encourages students in collaborating classrooms to create and share "monsters" as written or drawn activities directly linked to curriculum learning, captivating the attention of even bored or distracted students.

Teachers are often sceptical about the Internet because they associate it with children playing games, as well as with the danger of students accessing inappropriate materials. Indeed, any Internet learning activity whether it be a webquest, a telecollaborative activity or even a larger project, needs to be linked back to the curriculum and the learning process in some substantial way if it is ultimately to be integrated into learning and not just an "add-on". Similarly, just as "traditional" teachers might focus on the rote learning of content, some "progressive" teachers may also reinforce a gap between learning as applied process and as content acquisition if an activity or project is undertaken as an add-on, as play for play's sake, and not linked to the curriculum as some form of applied knowledge. An integrated approach must be able to make productive connections between learning and assessment and also teaching and curriculum, as well as between skills or information acquisition and applied knowledge.

THE LEARNING IMPLICATIONS AND POSSIBILITIES OF INTERNET PROJECTS

The Internet projects offer a potentially creative and powerful focus for motivating students in the learning process. This need not be immediate but may indirectly link to the curriculum in the form of applied knowledge. In other words, Internet 'play as learning' need not be seen as diametrically opposed to "work as learning". Fun activities are an effective way to introduce more applied or disciplined learning through the Internet. For instance, it may be a good idea to allow students to learn about the skills and processes of putting up a webpage on a subject of their own choice, choosing their area of interest (e.g. a personal homepage with references to hobbies, pets, and favorite pastimes) as a precursor to developing or publishing a project as an online site.

Another obvious implication of the use of the Internet as an applied focus of learning through activities and projects is that the teaching of knowledge and the assessment of learning will be different from traditional contexts where the focus is on the transmission of
information or skills in isolation. Discrete skill, that is, specific and subject-specific learning objectives or goals might be better attained where complemented also by holistic, across-the-curriculum, and "generic skill" learning objectives. Various modes of project-based learning with the Internet (and ICT generally) potentially "ground" the rationale, the curricular content, and the assessment of the teaching-learning interaction in more relevant, flexible, collaborative, and interactive modes of both thinking and doing (Challenge 2000 Multimedia Project, 1999).

This paper has argued that a "project-based learning approach" lends itself to the notion of "the Internet as an educational resource", and vice versa. Going beyond the useful but limited webquest model, PBL provides an exemplary context and approach for harnessing the endless resources of the Internet for educational purposes. Conversely, the resources of the Internet are a most useful vehicle for extending and further refining the concept of project-based learning. The reason for this lies in how it is becoming clear that the Internet and ICT in general represent powerful new media of literacy and learning which extend rather than replace the printed word of books as well as face-to-face communication. On this basis and in terms of the Internet as a communication tool, PBL thus extends the facility of webquests to encourage immediate, authentic, relevant and interactive learning in and across the curriculum.

How might the traditional notion that assessment drives learning be reconciled with the implications of PBL for learning using the Internet and ICT? Many Singapore educators already worry about how the current push for project-based learning can be reconciled with many of the traditional learning objectives and the concept of measurable outcomes in particular. There should be no denial that the Internet and ICT extend the obvious facility of PBL for connecting with student interest and motivation in a more effective way than rote learning methods. If PBL provides a vehicle for integrating the Internet in teaching and learning, then it also brings to a head an inherent dilemma of assessing the use of ICT in education. This is the challenge of distinguishing between and reconciling higher-order learning and applications on one hand, and lower-order competencies and questions of taste (e.g. in contrast to the standards of print publishing, judgments about "well-designed" websites are to a significant extent a matter of personal taste, current fashions, and concepts such as "visual appeal") on the other.

Again, what may seem like an intractable problem might also be reviewed as an opportunity. In other words, in the Internet age where
notions such as innovation and adaptability are increasingly being valued by governmental agencies as well as by the commercial sector and students themselves, we are being forced to revisit the question of what sort of learning schools should be encouraging and how assessment methods might encourage this kind of learning. There is the further danger that information on the Internet is easily plagiarized and various ICT programs provide advanced functions and templates which can make any student’s work look good with little effort or learning taking place.

It should be reasonably clear that Internet projects provide an exemplary learning context for students to master the new literacy of the “digital screen” and become competent in a sufficient number of the associated skills of computing, networking and various programs or functions. As well as being a great way to motivate important functional and skills-based learning, such projects may also encourage innovation and applied learning at the same time – not to mention collaborative, independent, and problem-solving modes of learning. What kind of assessment then can frame project-based learning in a way which connects student learning to the product or demonstrated outcome, as well as to relevant curriculum contexts? The short answer is that the assessment must encourage and recognize work in terms of the process of learning, and vice versa.

The project-based learning approach and ICT as new media both lend themselves to two further concepts of assessment which together can provide a sufficient guarantee of quality as well as competent learning. The concept of an activity-reflection cycle provides the important connection between higher-order, applied and innovative thinking on one hand and competent, hands-on, functional learning on the other. Developed as progression, a basic practical or functional familiarity with ICT tools and media should inform relevant theories and criteria of evaluation as the basis for applied design relevant to transferable contexts. In other words, asking students to put ideas or problems in their own words is a good test not only of their understanding these ideas but also, realizing the quality of creative, critical, and applied learning or thinking.

Students may and usually do learn a lot from doing Internet activities and projects, but the products by themselves are not necessarily a reliable indicator of this. When the product is matched or seen in a triangulated context with reflections about the process and further applications in the students’ own words, then teachers are much better able to assess the quality of learning. This is perhaps most effectively facilitated by the model of an electronic portfolio which
encourages the activity-reflection cycle in terms of a collection of items (competent activity products and higher-order written reflections) providing a comprehensive picture of general learning and specific achievement by individual students linked to a particular project or even module of related activities, across part of a school term. Above all else, such an approach provides a way of distinguishing and reconciling "lower-order" competent or literate practice and "higher-order" reflection and innovation. It further develops the convergence of ICT and PBL in a way which answers legitimate concerns and issues raised against the use of PBL and the integration of ICT in education.

**MAKING A START: DESIGNING CLASSROOM PROJECTS**

The alternate challenges of integrating the internet and ICT in education on one hand, and encouraging innovation and applied thinking in students on the other, are helping us to appreciate that the new "literacy and learning" skills of the electronic age revolve around the organizing concepts of design and evaluation. This paper has already argued that the project-based learning approach is an exemplary vehicle for this kind of student learning. However, there is a similar need to reconstruct the role of the teacher as a designer and evaluator of learning activities, contexts, and environments in a way which effectively links the learning process to the curriculum — especially when using the Internet or ICT generally. In short, teachers need to consider the "design" aspects of PBL when outlining or setting up specific assignment contexts, criteria, and outcomes.

As illustrated in the example of webquests referred to earlier, there are two simple but effective ways to begin designing the context for classroom projects. Hypothetical or typical scenarios help provide an applied and authentic context for student inquiries and problem solving about a subject-specific topic or issue. Dodge's *Investigating Archaeotype* projects a situation where students have to report back to a family meeting about a topic. March's *Tuskegee Tragedy* asks participating students to imagine an amazing and terrible situation e.g. a US government study of people with syphilis who were not told of their condition, and were denied appropriate treatment as they died of the disease or passed it on to family members. This scenario turns out to be a true set of events which students are asked to investigate. Secondly, initial focus questions serve to refine a topic focus and also provide a connection between a topic and curriculum-related learning. Both Dodge and March outline a set of focus questions for the group to pursue in the respective webquests. In *Tuskegee Tragedy* one main focus
question is identified which integrates the various sub-questions and activities of what appears to be a social studies curriculum context: *Is the Tuskegee Study unique or are the same kind of tragedies happening all around?*

These questions indirectly trigger curriculum-related investigations that focus on a range of activities and skill or knowledge acquisition, as well as student interest and commitment to effective learning. In the subject *Design and Technology* students are typically given “design briefs” which may be either general or quite specific—for instance, an advertising poster for a movie or a chair made of a new material. Teachers across the curriculum using a PBL approach need to extend the term not only to embrace notions of a learning rationale and objectives, but also to make sure that overall design goals embrace and connect effective, interesting, and worthwhile learning activities (e.g. a useful new term for this is “rich tasks”) with their own curriculum content.

PBL might productively be considered as one useful sub-category of “problem-based learning” not only in terms of designing a specific focus and context for student projects but also in terms of getting students themselves to: (a) identify project constraints and feasibility; and (b) plan and apply a “design” approach. Sternberg’s (1997) “six A’s of designing projects” provides a useful overview of relevant criteria for an effective PBL context—*authenticity, academic rigour, applied learning, active exploration, adult relationships (effective guidance) and assessment practices*. Student projects should also be expected to address basic design principles in terms of planning or development (see the great set of PBL models and resources set up on the Global SchoolHouse links below).

- Project design briefs  
  [http://pblmm.k12.ca.us/PBLGuide/Samples/DesignBriefOrg.htm](http://pblmm.k12.ca.us/PBLGuide/Samples/DesignBriefOrg.htm)
- PBL planning  
- PBL development  
- PBL handbook  
- Evaluation of PBL (and research)  
  [http://pblmm.k12.ca.us/PBLGuide/pblresch.htm](http://pblmm.k12.ca.us/PBLGuide/pblresch.htm)
NetPBL and Educational reform
http://gsh.lightspan.com/web/pbl/reform.htm

Old School Vs New School
http://gsh.lightspan.com/web/pbl/newold.htm

In the last link above, the Global SchoolHouse compares an increasingly less effective and relevant “old school” model with that of a new model of teaching and learning. A simple contrast is made between a teaching and learning context where student work and performance is done for their class teacher alone, and a situation where “the new school incorporates projects that have intrinsic value to the students and a life beyond the confines of the classroom”. The diagram on this webpage depicts the Internet and ICT as a cornerstone of productive change in terms of its facility for living documents, authentic tasks, collaboration and teacher facilitation.

CONCLUSION

This paper has discussed how and why project-based learning provides a useful framework as well as suggested methods for more effective integration of Internet resources in school curricula. In contrast to the Webquest model, PBL provides a more flexible, comprehensive and diverse approach which includes and goes beyond the latter. PBL also provide an umbrella for connecting the process of learning (and also assessment) with a content or even outcomes focus in terms of the various stages and aspects of practical and reflective learning. At a time when many educators are pessimistic about the role of ICT in education and also about the future of education, a project-based learning approach thus represents a productive strategy of change for integrating ICT in and across the curriculum. In short, it provides a framework for reconsidering a number of perpetual issues – the role of the teacher, the function of assessment, and the changing nature of the student – which inform debates about the reform of school teaching and learning in the Internet age.

Cameron Richards is an Assistant Professor in the Instructional Science Academic Group at the National Institute of Education, Nanyang Technological University. His current teaching and research interests revolve around the challenge of effectively integrating new Internet and multimedia technologies in education.
REFERENCES


