Affordances of a Digital Library as a Publishing Medium in a Project-Based Learning Environment: The *Coredev* Approach

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Abstract

Project-based teaching methods are increasingly used in Malaysian secondary school classrooms with the expectations that students will be engaged by the chance to use different information sources creatively and will especially benefit from the use of various presentation types to improve learning. But the challenges of conducting research project independently are considerable. In project-based learning students formulate authentic, meaningful questions, plan tasks, gather resources and information, evaluate information, collaborate with others, and report findings. To support students in these types of activities, students need a full compliment of tools designed to meet the unique needs of learners. This paper examines the affordances that a digital library can bring to bear on supporting students in these activities. In this paper, we identify some of the reasons why a digital library for school projects, built in a collaborative basis, is needed in project-based education at the secondary school levels. The collaborative environment would provide the platform for the educational community to participate in e-publishing of resources that can be shared by others. In the implementation of this project, the use of the digital libraries would be an integral part of classroom activities. Students should be enabled to publish their own documents in the digital library and share them with others. In this case, students should be allowed to create and submit their project report in the electronic format. Teachers would be given the opportunity to utilise their ICT knowledge by validating the quality of submissions to maintain content quality of the digital library, grade projects online, and add links to other useful resources found in the Internet. A special feature in the digital library that allows the generation and submission of project report is highlighted. Some preliminary research findings regarding students' reception of the digital library and their willingness to publish in the digital library are presented.

INTRODUCTION

The Internet has created new learning opportunities for the educational community and the increasing availability of the online resources for the K-12 (Malaysia's Pre-school to Form 6) classroom has created a need for research to explore new limits and possibilities. The growth of the Internet is undeniably affecting the K-12 school environment and access to the Internet has been widely seen as an important development for schools. A few statistics concerning Malaysia may be in order to document this impact. In Malaysia, the environment for ICT market, regulatory and infrastructure are already in place and Malaysians are appreciative of utilising ICT. Although Malaysia is ranked 26th in the overall Networked Readiness Index

(NRI) among 102 countries (Dutta & Jain, 2003), the fact that Malaysia takes the 6th and 7th place in the government readiness and usage dimension respectively is a reflection of the policies and actions taken by the government to promote ICT in the country and in particular in the government. Schools connectivity and ICT penetration is growing and at the end of the year 2003 Malaysia had about 2.6 million Internet subscribers and an estimated of 8,692,100 Internet users, with an ICT penetration rate of 34.0% (Miniwatts International Inc., 2004). Infosoc Malaysia (2000) reported that 30.5% of primary and 53.8% of secondary schools have PC facilities and among these, 10.2% of primary and 34.0% of secondary schools have Internet access. Most urban public schools in the country now have access to the Internet. Another 1,500 schools will be connected when a broadband satellite communications network to provide high-speed Internet access to these schools will soon be supplied (ViaSat, 2004). The increase of Internet access over these recent years has been aided by the allocation of funds by the national ministries of education, telecommunications and finance, as well as through a joint effort with various international ICT organisations such as IBM and ViaSat.

Recent surveys of various population pockets have indicated high computer ownership (Noor Bathi et al., 2001; Narisma & Zamree, 2002), but low Internet use. Various reasons were given by respondents, which include insufficient skills and not connected to the Internet. Among the younger population, Internet use is higher. Recent studies have delved into Malaysian students' motives for using the Internet (Musa & Narimah, 2001; Roslina & Fauzan, 2001; Safar & Fatimah, 2000; Latifah & Samsudin, 2000). To date, apart from media commentaries, there have been no systematic local studies on the scope of 'using Internet for academic purpose'. Musa & Narimah (2001) noted that the most common Internet activities among the 2015 Malaysian students sampled were chatting, e-mailing and playing games - a far cry from 'academic discourse'. A parallel study of 800 students in the Klang Valley noted that 76.5% used the computer mainly for playing games; and if they were connected to the Internet, about 88% noted chat mails, or Internet relay chat (IRC) as their main activity. More than half (55.5%) said it was mainly for entertainment and information search (Safar & Fatimah, 2000). Roslina & Fauzan (2001) found that the majority of the 442 teenagers in their study did not consider Malaysian Websites as their favourites. The findings also suggest that the sample hardly access online database, Malaysian online newspaper, and Malaysian government agencies, ministries, as well as universities. The most common activities are chatting, followed by e-mailing and playing games. These most common activities, even if they involved knowledge, suggest that the Internet was heavily used only at the basic level of knowledge activity that is for exchanging of information. Activities that seem to be directly related to academic work include information seeking, assignment, and job search.

These occurrences may reflect that although schools connectivity and ICT penetration is growing and various population pockets have indicated high computer ownership, as well as high Internet use among school children, the opportunity for Malaysian students to access the Internet for academic purposes is still limited. The fact that Malaysia is placed 47th in the individual readiness and 31st in the usage readiness of the NRI (Dutta & Jain, 2003) reflects these occurrences. As the World Wide Web is making it possible for students to access knowledge and to learn in new and different ways, as well as expediting ICT usage and inculcating information literacy among students, schools should seize this excellent opportunity and embrace Internet-based technologies by embedding it in the current school curriculum. This can be implemented by incorporating various models of how to use the Internet in schools that can determine the course of usage for a long time to come.

There are a number of emerging models of how Internet-based technologies may come to be used in the school curriculum. Teachers are using telecommunication databases to experiment with in-classroom learning communities and sharing data with students. Another popular way to use the Internet for teaching and learning is to create a "portal" site that features an extensive catalogue of Web sites and other Internet resources, and a search engine. Since the late 1990s, the use of online resources in education has grown

rapidly. Everything that teachers once displayed on bulletin boards, from traditional essays to student artwork, can be posted on this portal site. As overwhelming volume of learning resources become available online, new materials and curricular development possibilities also open up, along with opportunities to reuse, repackage, and repurpose the digital learning resources. Primary resources, whose availability to date has been bound by place are also increasingly becoming available online. Recognising the opportunities in this area, various initiatives have brought together people to explore ways in which library and archive holdings may be appropriately leveraged in support of educational materials for the K-12 community.

The development and widespread of availability o the World Wide Web as a learning resource for secondary school students is a key impetus of this article. The World Wide Web however may be in danger to of evolving to support mainly data access by students, rather than continuing to support more interactive models of usage (Bos, 1998). The last few years have seen the increase of professionalisation of Web portals, Web publishing and construction of technologically advance digital libraries. Bos (1998) expressed his concern on the thing that may be left behind in this increasing professionalisation, that is, the possibility of K-12 students being contributors to the growing Web collections. Students should be given numerous opportunities to use the resources and tools in autonomous, creative, and collaborative ways. This article adds to the continuing development of the World Wide Web as a research tool by exploring the educational and technological possibilities of using the Web as a medium for Malaysian secondary school students to publish their project work. It furthers this idea by presenting an approach of how a digital library can be used for student online publishing.

AFFORDANCES OF DIGITAL LIBRARIES IN SUPPORTING STUDENTS' PROJECT-BASED LEARNING

This section examines the affordances that a digital library can bring to bear on supporting students in conducting their school-based projects. Affordances is a term used by cognitive scientists, interface designers and educators to describe potential interaction between technology and people in a variety of settings, including educational setting. A digital library possesses an affordance if it allows, or makes easier a valued action by the user. Two key affordances of a digital library are its distributed authorship and distributed organisation. Distributed authorship means that the digital library does not have central producers or gatekeepers of information (Cunningham, 1997). Distributed authorship has the affordances of students to become authors, as well as users of knowledge (Marchionini & Maurer, 1995); it also affords students the opportunity to access information from a variety of perspectives. Also, as a result of its decentralised authorship, the types of resources available in digital libraries are different than more traditional K-12 resources, such as books, because of the identity and purpose of the publisher, and because of the media type of the information. Much of the content of a digital library, especially research and educational digital libraries, is published by individuals or organisations who are not professional publishers, but who may have some vested interest in the subject matter. What this means is that when a students performs a Web search on a specific topic, they will find resources that vary widely in source, quality, level, audience, and purpose. The second unique characteristic of digital library is its distributed organisation. The main affordance of this is that it allows multiple ways for the digital library to be navigated, and it allows for students to be contributors to the digital library by creating their own linked lists, or contributing to collection of reviewed sites. The distributed authorship ad distributed organisation are exciting affordances of digital libraries. Especially interesting is the potential for K-12 students to become authors or content providers, and also contribute to the distributed organisation of the Web. Research is needed to develop and test model of digital library usage and to examine what the benefits for students might be.

The affordances of digital libraries as a publishing medium take place within the framework of project-based learning. Project-based learning is an instructional method centered on the learner. Instead of using a rigid lesson plan that directs a learner down a specific path of learning outcomes or objectives, project-based

learning allows in-depth investigation of a topic worth learning more about (Harris & Katz, 2001). Through the construction of a personally-meaningful artifact, which may be a report, a multimedia presentation or a poem, learners present what they've learned (Harel & Papert, 1991; Kafai & Resnick, 1996). In addition, learners typically have more autonomy over what they learn, maintaining interest and motivating learners to take more responsibility for their learning (Worthy, 2000). With more autonomy, learners "shape their projects to fit their own interests and abilities" (Moursund, 1998). So, project-based learning and the construction of artifacts enable the expression of diversity in learners, such as interests, abilities and learning styles. Accordingly, the essential feature of a project-based pedagogy has been the use of student-designed artifacts to represent knowledge.

Project-based teaching methods are increasingly used in Malaysian secondary school classrooms, in subjects such as Science, History, Geography and Living Skills, with the expectations that students will be engaged by the chance to use different information sources creatively and will especially benefit from the use of various presentation types, in most cases, reports in the form of scrapbooks, to improve learning. The students are given increased freedom and responsibility in choosing topics in the hope that they will gain an increased understanding of the information seeking processes by taking a more active role in inquiry. But the challenges of conducting research project independently are considerable. What are the sources students use to obtain information? How do students conduct research in unfamiliar content areas? What is the unexpected problems students face in getting the information for their project? Do students engage in high-level synthesis and transformation between presentation forms, or do students simply copy and assemble information from different sources? In project-based learning students formulate authentic, meaningful questions, plan tasks, gather resources and information, evaluate information, collaborate with others, and report findings. To support students in these types of activities, students need a full compliment of tools designed to meet the unique needs of learners.

The subject of history in Malaysian secondary school integrated curriculum is compulsory for all lower secondary students (ages 13-15). The history curriculum for lower secondary emphasises knowledge of history of the Malaysian nation and the inculcation of values that help build the Malaysian spirit and identity. The learning of local history is also emphasised at this lower secondary level. Students have to conduct a study focuses on various aspects of historical interest at the local level. This study involves project work by students on the topic of their choice. The assessment in history comprises two components. The first is the MCQ-type (multiple choice questions) of assessment conducted centrally by the Ministry of Education. The second is research on local history which is conducted in the form of school-based project.

The purpose of the project is to give students experience conducting research, expose students to information searching, gathering and analysing skills, as well as to instill students' interest towards the history subject (Ministry of Education, 2002). Information and communication technology skill is a generic skill expected of students when conducting their history project. Although projects are evaluated at the school level, the marks attained are submitted to the Malaysian Board of Examination. In secondary one, students are given the choice to either research on their family genealogy or their school history. In secondary two and three, the students are required to research on historical buildings, local events, local administrator or historical figures.

We are developing a digital library for collaboratively building digital resources that can be used by our secondary school students, in particular those conducting their school-based projects. We named the project CoreDev (Collaborative Resource Development), and it is one of a number of repository architectures that have been proposed over recent years for use in various digital libraries initiatives. CoreDev aims to provide an electronic system to help educators as well as students obtain information on local history; collect, store and organise information in digitals format; publish and share electronic resources; learn how to use IT to obtain historical information. CoreDev is building upon a rich source of historical information resources

created by secondary school students in a form of project work, advanced technical infrastructures at the faculty, and the participation of students as content developers and teachers as content managers. We expect CoreDev to serve the needs of anyone with interests in the wide-ranging domain of Malaysian history.

DIGITAL LIBRARY TO SUPPORT STUDENTS IN HISTORY PROJECT

For years, educational libraries and resource centres have flourished and they have fulfilled their mission to support the K-12 population. Recent developments in technology and resource sharing capabilities have brought about opportunities for meaningful collaborations among educational institutions worldwide through digital libraries. High levels of attention and funding were first given to digital libraries in the early and mid 1990s, which led to a booming era with large number of visions and projects. Recent years have seen a steep rise in the number of digital library initiatives across the world, and it is impractical to review all of them here. Some digital libraries have been developed for a profession or a particular area. American Memory is such an effort for the field of history. It is a National Digital Library Programme initiated by the US government to digitise and deliver historical resources held at the Library of Congress. The resources include photographs, manuscripts, rare books, maps, sound recordings and motion pictures. Another fine example is Canada's SchoolNet Digital Collections, which provides more than 400 hundreds sites of mutimedia digital resources about Canada's history, landscapes, scientific discoveries, technology and culture, produced by thousands of young Canadians. The New Zealand Digital library project was the result of a research programme to develop the underlying technology for digital libraries and making it available publicly so that those interested could create their own collections. This digital library provides several types of materials, which includes historical documents, technical reports, bibliographies, literary works and magazines.

Most of these digital libraries grew from grassroot efforts of teachers, students and scientists working collaboratively to create a library of educational resources and services to support teaching and learning. In lieu of their potential use by the educational community and their assumed potential to improvements in education, digital libraries have been developed with the goal of distributing learning materials in order to promote dissemination of educational innovations. Malaysia's national attempt at developing a digital library is exemplified by Mylibrary, which is a pilot project developed under the Malaysian National Digital Library initiative comprising partnerships between National Library of Malaysia, Multimedia Development Corporation, Telekom Malaysia, selected government and state public libraries. MyLib's digital collection is organised into seven categories, books, e-zines, newspapers, multimedia, conferences, maps and reports. However, this digital library does not in itself develop its own e-resources but create hyperlinks to other digital resources available on the Web (both Malaysian and foreign).

Why is a digital library needed for the K-12 school students conducting their school projects? And why are the particular needs of the K-12 educational communities being taken into account in the design and development of digital libraries? The wide range of reasons why it is useful, interesting and important to study and plan the provision of digital library service for them may be thought of in terms the following:

a) Addressing information needs of school children in cyberspace
   There is a broad, publicly recognised need for more high quality education materials for children on the Internet. The K-12 is a group of people that are generally open to and familiar with technology and it seems ideal to provide this "Net Generation"with technology based reference services (Caywood, 1998). In fact, literature contends that the future of libraries depends on this generation's acceptance of their relevance. It seems, therefore, that using technology to get and keep these users using the library is an ideal fit. It is commonly known that it is during the teen years that people are most likely to stop using the library despite their high information needs. Therefore, it is

worth investing in digital library services if they help the library maintain a connection with this group of users. There have been various initiatives by child advocates, academics, and federal government officials in building partnerships to improve the quality of Web content to address the information needs of school children.

b)   Discovering resources for learning and teaching
Although there may be thousands of educational materials on history distributed on Web sites across the Internet, in many instances, these valuable resources are difficult for most teachers and students to find in an efficient and effective manner. One of the purposes of digital libraries is to help elucidating this resource discovery problem by providing standards, services, and gateways to quality collections of educational resources. When students use the historical database, rather than an Internet search engine, users are able to locate resources they need quickly and efficiently. A related problem is assessing the scientific and pedagogical quality of resources. The participating digital library providers must have mechanisms for ensuring quality. When teachers and students connect to the digital library, they are able to access the Internet-based educational resources of participating providers.

c)   Learning to conduct inquiry in learning
To develop understanding of particular phenomena and learning skills, it is important for students to engage in inquiry. The Malaysian School Curriculum on History emphasises the importance of inquiry and they are most of the time exposed to the questions: What? Why? How? When? and Who? every time they learn History (Ministry of Education, 2002). When students ask meaningful questions and design investigations, they need resources beyond the four walls of classroom for conducting these investigations. Digital libraries can provide a broad range of resources – electronic and human -- that make it possible for students to engage and be supported in meaningful inquiry. The challenge for teachers and librarians is to help students develop strategies for collecting, evaluating and analysing information which they find in digital libraries and observe in the physical world. When students are using a digital library for conducting inquiry, they need to collaborate with other students, interact with a wider community of knowledgeable people, create projects, reports or other artifacts, publish their work, and have access to appropriate technological tools for making meaning of data and information, to manipulate, construct, and revise their representations and share them with others (Wallace, 1996). Digital libraries have been designed to support all of these activities and functions, and to assist its member providers in implementing these functions in a way that is consistent across many different multimedia collections.

d)   Expanding the repertoire of high quality historical resources available
Assuming that CoreDev achieves it goals over the next few years, its presence will result in the continuing development, aggregation, assessment, and delivery of a wide range of high quality learning materials on Malaysian history suitable for use by learners and teachers in K-12 educational settings as well as by young Malaysians in other settings of formal and informal learning. While the mechanisms and rubrics for evaluating "quality" may vary from one collection to another within CoreDev, there will be assurance of some collaborative methods among teachers for making quality assessments visible to all users and thereby assisting in the continual improvement of reusable learning materials.

The approach to use digital libraries in Malaysian educational context is no doubt forward-looking. The digital library has the affordances to serve as the context for new types of authentic activities by allowing students to publish their work online. In this research, an approach for how publishing on the Web may be an authentic task with potential benefits for student learning and motivation is set forth. Three features of authentic instruction are: learning occurs in the context of problem solving, learning occurs in social

situations, and learning tasks have meaningful connections to life outside schools. Students publishing in digital libraries can exhibit each of these features. However it is very important to investigate the individual and school readiness, and the individual and school usage in order to determine the students' readiness and reception to use digital libraries in finding information for their school projects and assignments, as well as to ascertain the basic features needed for the digital library.

THE USE OF COREDEV IN THE HISTORY CURRICULUM

The purpose of this digital library research is to provide the learning community with an experience in collaboratively building a digital library of history projects, which indirectly allow members of the community to be aware and be actively involved in e-publishing as well as enhances member's ICT literacy skill. The digital library would benefit both the students who would be the creator and publisher of digital history project works and teachers who would be given the experience of managing digital information.

In the implementation of this project, the use of the digital libraries would be an integral part of classroom activities. Students should be enabled to publish their own documents in the digital library and share them with others. In this case, students should be allowed to create and submit their project report in the electronic format. They are the content developers of the digital library. Reports that are submitted in the form of scrapbooks could be digitised and published in the "space" allocated for participating schools. Students may build dynamic Web pages automatically from templates available in CoreDev. With respect to end user access using the digital library, they may create query specifications, use the simple or advance search to submit descriptive text information, retrieve collections of search results, and display the contents of result items consisting of multiple media items.

Unlike research digital library collections, educational digital libraries depend heavily on the direct contributions of materials from their communities of users. In order to facilitate this, the main difference in the system when compared to other digital libraries in Malaysia will be in the system architecture that allows collaborators such as students and teachers from partner schools, organisations, associations and individuals to cooperatively develop electronic resources and upload the resources to a hosting system. CoreDev uses the three-tier client-server architecture to provide the platform for building resources collaboratively by member partners in three ways: creation of original digital works, digitisation of paper-based resources and providing linkages to other relevant Web sites The system incorporates many types of digital resources in different media (text, images, audio and video clips), from different servers, with different levels of quality and metadata. The schools, teachers, students, the public, universities, and depositories are the expected stakeholders, with the helm of the system being hosted by the Ministry of Education. Students and teachers will be partners in digital resource development as content developers (in creating and submitting history projects) and content managers (grading, reviewing, indexing ad validating information) respectively, and it is these partners who will form the nucleus of the collaboration (Figure 1).
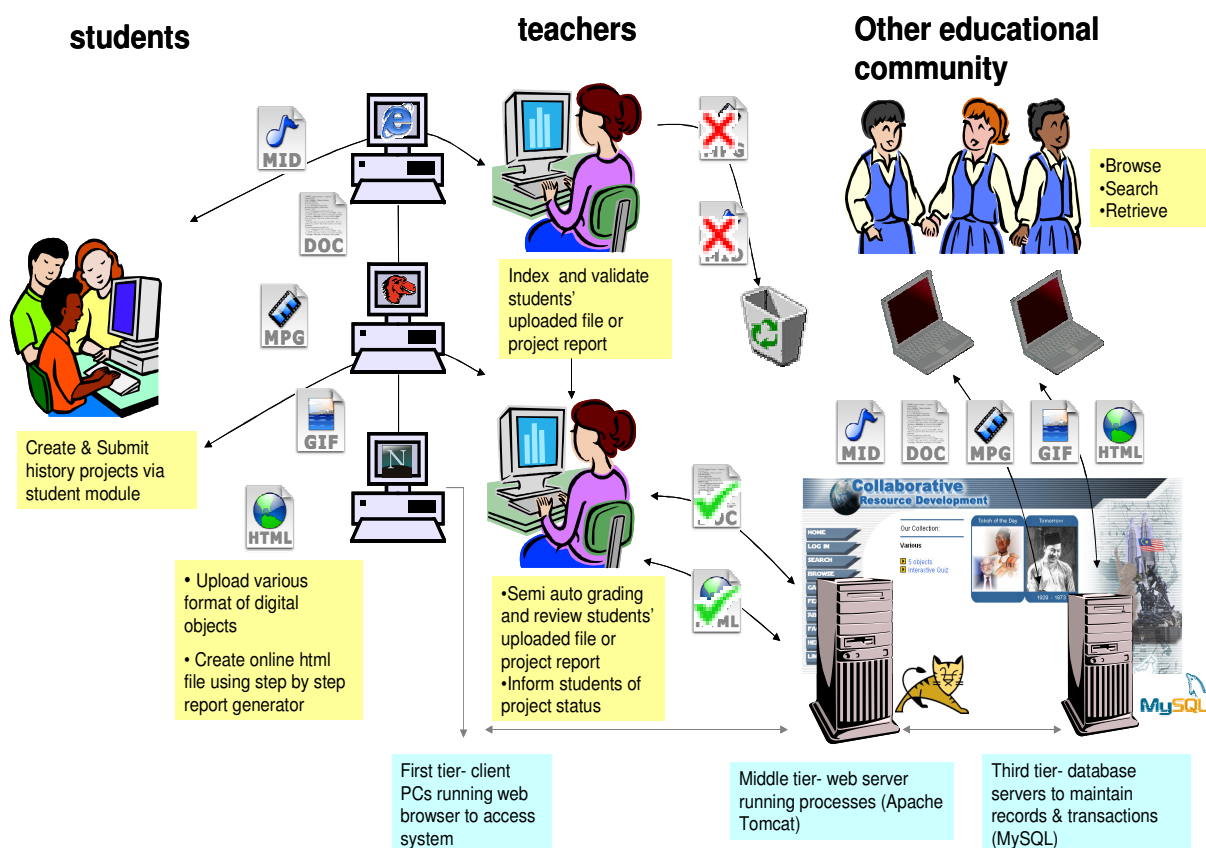
Figure 1 Content developers and managers and their respective roles

User-created materials are candidates for addition to CoreDev. The goal is to allow members to also be content developers. Users who wish to author reports, presentations and other types of school projects are able to do so by publishing their works in CoreDev. At present, the system supports two classes of authoring tools: the first supports uploading of reports and presentations for expert users, and a user-friendly template to generate reports for novice users (Figure 2). Reports may incorporate one or more types of multimedia contents. For example, a biographical report of Tunku Abdul Rahman may include a scanned photograph of the personality, a video of the Merdeka declaration, and a sound clip of Negaraku. The second class of tools supports creating of description portion of the works. However, concerns about the quality or perspective of the contributed work by individuals and the quality of the object descriptions must be met. Therefore, building on typical review and publication procedures, the students' work will be subject to community review and acceptance before the digital objects are incorporated into the collection. Figures 3, 4 and 5 present the screenshots for indicating a step-by-step procedure to describe portions in the students' work and generating the report using the Report Upload and Report Wizard Modules.
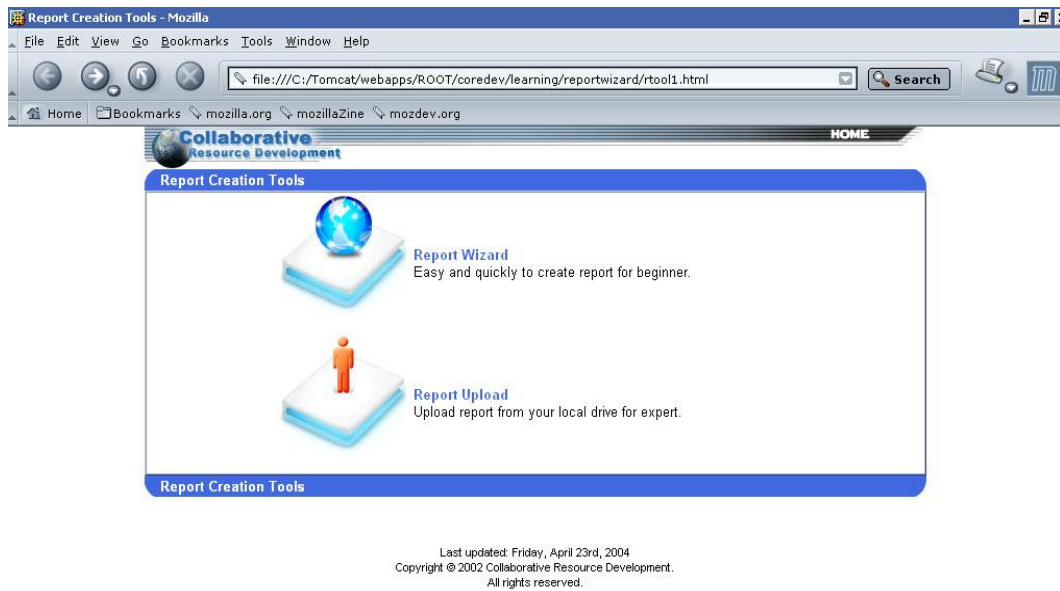
Figure 2 Publishing in CoreDev via report wizard and report upload

Figure 3 Uploading report in CoreDev and describing portions in work

Figure 4 Describing portions in work in Report Wizard

Figure 5 Generating a report via Report Wizard

When a student's project has been reviewed and the material is added to the collection, the original source documents are first brought into the system through a process known as "importing". This involves

converting documents into a simple HTML-like format, which includes any metadata associated with the document. Once imported, each document is stored in its own subdirectory of archives, along with other associated files, for example images. Authorised systems administrators indexes digital collections to facilitate retrieval queries. Indexing is based on ranking. The index function would create a set of keys or an index of terms so that searches can be performed. Textual data would be indexed in detailed metadata. The multimedia contents would be indexed according to their properties, which would include descriptions, categories and keywords. Teachers or content managers input these properties when an item is introduced to the database using templates that facilitate the indexing process. This approach would "push" teachers and students to be active players in building the digital library and indirectly inculcates ICT literacy among the education community.

CoreDev caters for the needs of secondary school students and teachers who want to access quality, grade-level appropriate historical resources that would help them move beyond the traditional text-and-test approach to education. The ultimate value of the CoreDev project will be measured in the number of students and educators who use and contribute to the collection, and the richness in content of the digital library is dependent upon their active participation as partners. The good work of students can be proactively showcased to the whole nation.

ARE OUR STUDENTS READY TO USE DIGITAL LIBRARY? – A PRELIMINARY FINDING

Digital libraries serve communities of people and are created and maintained by and for people. All efforts to design, implement and evaluate digital libraries must be rooted in the information needs, characteristics and contexts of the people will or may use those libraries. (Marchionini et al., 2002). To make effective audience adaptations, a researcher must have some conception of what the audience already knows, what their misconception and problems might be and what they should be interested in learning. Therefore, we conducted a pilot survey on 60 Secondary Two and Three students from two schools in the Klang Valley who have conducted their History Project. The schools are chosen because both provide Internet connections and the schools are situated near numerous cyber cafes, putting the stakeholders in an ICT rich environment. Subjects comprised students with a more or less equal divisions of girls and boys, and were ethnically and culturally diversed.

Participation in the survey was voluntary. The survey used the questionnaire method to obtain the information needed. All parts of the questionnaire were assessed for content and face validity by a faculty member from the library and information science programme, a faculty member in research methods and statistics, two secondary school teachers teaching information technology and another two teaching history. The questionnaire was then field-tested on 30 secondary three students who were not part of the sample for reliability assessment. The 10-page questionnaire was administered a week after the students had submitted their history project to their teachers. The first part contains questions which provided the demographic information about the respondents. The second part comprises questions that aim to ascertain student's level of computer and Internet literacy, the method and resources used to gather information for history projects, their readiness to use digital library and the requirements for the digital library. The survey yields a usable response rate of 100% (n=60). Data were analysed with descriptive statistics.

The following question is of particular interest in this survey: What are the factors related to stake holder's condition and reception of the collaborative digital library for history projects? This research question seeks to elicit specific procedures and processes of the digital library, as well as identify the resources (information, people and technology) used in the processes. The specific questions about student readiness and usage include:

(a) What do students use the computers for?

(b) Where do they use the computers?
(c) Do they use the Internet? What do they use the Internet for?
(d) Do they have experience in creating any digital resource Web development over the Internet?
(e) How do students choose their project topics?
(f) How do students get all information needed for the project?
(g) Did students use the Internet to obtain information?
(h) Are students skilled in searching the Internet?
(i) Are they satisfied with the information obtained?
(j) How do they handle or utilise the information they obtain from the Internet?
(k) Among all the resources they use which gave them the most satisfaction and why?
(l) Are students willing to share or exchange information they found? Is sharing good practice? How can sharing be done?
(m) Do students acknowledge information resources they use from the Internet?
(n) Do students know about digital libraries?
(o) Are they willing to participate as partners in developing the content of a digital library?

Computer and Internet Use

At this early stage some interesting findings are already emerging. Responses from the students on computer and Internet usage were quite similar and provide insight into the great diversity of IT penetration, especially in Malaysian homes. Preliminary findings indicated that students are ready to utilize digital libraries as computer ownership is high and all respondents in the sample indicate having used computers. All respondents have used the computer for word processing, creating slideshow and the Internet. A total of 28 students have used it for creating spreadsheet, 6 for creating database, 2 for creating multimedia, 15 for editing photo, 14 for scanning images, 29 for drawing, 5 for basic programming and 1 for developing system.

A high majority has access to the Internet. The majority (90%, 54) has Internet access from their homes, and they also use the Internet from their friend's houses (63%, 38), cyber cafes (50%, 30), public libraries (20%, 12), parents' office (17%, 10), community centre and schools (7%, 4 respectively). A total of 43% (26) have an Internet usage experience of 3-4 years, whereas 40% (24) have more than 5 years. The students sampled are also frequent users of the Internet with 27% (16) logging on everyday, 20% (12) at least every alternate day and 40% (22) at least once a week. Most of the students rate themselves as moderate users (1-3 times per week). Generally, the main uses of the Internet are to chat (97%, 58), e-mail (93%, 56), computer games (90%, 54), browse for information, (70%, 42), finding information for project work (48%, 29), using search engines (47%, 28), finding information for school work (43%, 26), downloading music (40%, 24), and downloading image (35%, 21). These data suggest that computer and Internet usage is pervasive with over half of the respondents reported using the Internet in a variety of setting multiple times per week.

Most students have never had formal instruction in Web searching. These students indicated that they learn searching the Web on their own (50%, 30), from parents (27%, 16), from friends (13%, 8) and from other siblings (10%, 6). Although all respondents reported not having their own personal Web page, a group Web page, or created Web page as a service to others, a total of 27% (16) indicated having experience in creating digital resource Web development over the Internet. In terms of Internet searching skills, most reported having intermediate skills (63%, 38), while 20% (12) and 17% (10) rated themselves as a beginner and advance respectively. It is interesting to note that the advance users are all boys, having more than 5 years of experience using the Internet.

When asked about their experience is using specific Websites, only 3 students reported are familiar with and have used *Portal Pendidikan Utusan* (www.tutor.com.my) and CikguNet (www.cikgu.net.my) before, two popular educational portals hosted by the Ministry of Education Malaysia. Eight students have used Utusan Online (www.utusan.my), one of Malaysia's leading online newspaper. However, a total of 29 students

indicated having used the MSN portal (www.msn.com). Students who reported having experience of using any government and library Websites is quite low, i.e. only 2 and 6 respectively. However the number of those using entertainment Websites, especially online games, is high, that is 68% (41). Efforts were made to ask a group of students, after the administration of the questionnaire, on why they have not accessed the two Malaysian educational portals, and common reasons given were that they do not know that the portals exist. A student who had used the two portals said that the portals are very useful for examination purpose; however most of the information there can be obtained from books and newspapers.

One question asked students to indicate which subjects they use the Internet for. Of interest here is to find out if students use the Internet to find resources for their History projects. Students sampled mainly use Internet resources to get information for the following subjects: History (90%, 54), Science (67%, 40), and Geography (57%, 34). A total of 90% (54) use the Internet to find resources for their History project. This clearly indicates that students use Internet resources for project-based school subjects only. Only 22 students use the Internet to search information for Living Skills and 8 for English Language. The samples do not use the Internet at all for Mathematics, Malay Language and Religious Education.

Resources Used for Project Work
In conducting their history project, students are given the freedom to select their own topic based on a list of categories such as prominent personalities in history, historical buildings and historical events. However, when asked how they select the topic for their project, only 2 students indicate that they choose the topic themselves, 9 students choose a topic that they are familiar with, 4 choose the topic that many friends write about, 5 choose the topic that none of their friends choose, 13 choose topics that parents suggest, 11 choose the topic that have been written by their siblings before and 16 choose the topic that they have enough materials to write about. This gives us a picture that students in general rely on secondary data (from books) and tertiary data (from friends' and siblings' projects) for their project work.

The most popular resources are Web pages, images, charts as well as tables, and audio files. Students in the sample are versatile in their downloading skills of resources from the Web. Most reported having experience downloading plug-ins (e.g. *Adobe Acrobat*, *RealPlayer*, etc) and install them on a computer. An open-ended question asked what types of materials respondents would find most useful for themselves in conducting their project work. Web pages and images lead the category, with 46 and 40 responses respectively. A few respondents were verbose in describing specific materials. One respondent likes to have *"Web pages with lists of (relevant) resources on a topic and these lists are linked to the resources";* another student wrote "*I want something like Yahoo! that can take me to specific topics*". This clearly indicates that the students like to browse for information and find directories of specific subjects useful for searching. Regarding their search strategy of the World Wide Web, the common search strategy used is by keywords (40), and subject (38); there are also students who search by images (10) and combination of the search strategy (7)

For preferred information seeking pattern, the students reported using the following method or resources to gather information for their project work in ranked order: the Internet (87%, 52), read chapters from books (80%, 48), read articles (67%, 40), from parents (60%, 36), and from friends (50%, 30). About 50%(30) of students indicate going to actual sites such as the personalities' house, historical buildings, museums, national archive and relevant municipal council offices to obtain information. Other methods such as reading pamphlets and brochures, interviewing persons, and distributing questionnaires are also used. However, only a small number reported using the public library (37%, 22) and school library (12%, 7) as a source of information for their project work. This was not the case in our earlier study, conducted 2 years ago where the libraries were the most frequently resource for students conducting project work (Zainab et al., 2002). A rich picture is indicated in Figure 6 to show the methods of gathering information among students when conducting their project work.
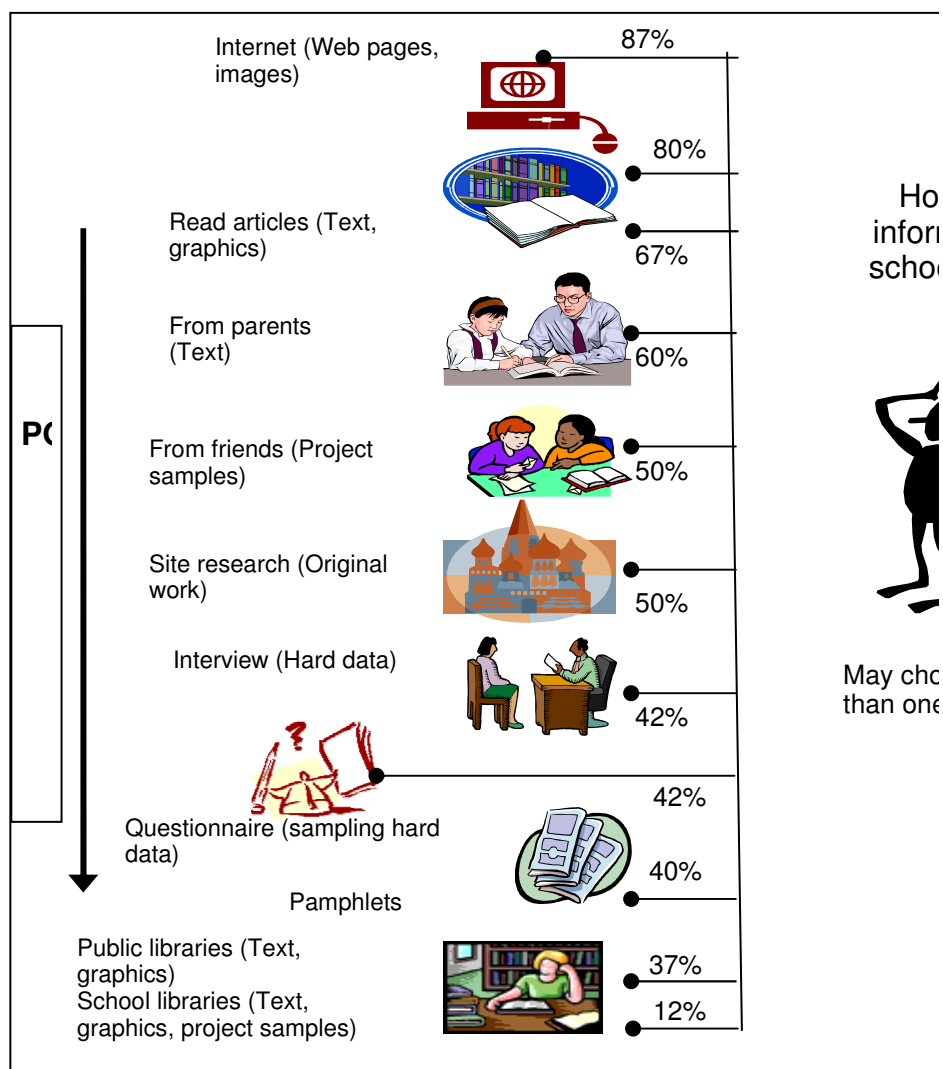
Figure 6 Methods used by students to gather information for project work

The students like to share the resources they create or found with others, and the common method to do so is by e-mailing the URL of Websites. They generally find a particular Website by using a default search engine that appears when they click the search button of the browser. Other methods of sharing or exchanging and finding information they found are presented in Table 1.

Table 1 Methods of sharing or exchanging and finding information found on the Internet (n=60)

Sharing / exchanging information	*f*	Finding information	*f*
E-mailing the URL of Websites	24	Use search engine that appears when I click the search button of my browser	15

Inform other via chat room	16	Use my favourite search engine	10
Create links to the Websites	2	Links from the home page I usually use	5
Click to the "send to a friend" button of the Website	10	Browsing from Internet directory such as Yahoo! and MSN	30
Others: Communicate with friends via other means : the telephone, SMS and word-of-mouth	8	Others:	-

Students in general reported that they do not encounter problems in getting information from the Internet for their history project. The samples were asked to select from a list of ten problems they face when searching the Internet. The problems indicated by the students are: *I do not know how to locate relevant resources; I had problems getting relevant information for the project; I get a lot of irrelevant information on the Internet, It took me so long to search for sources in the Internet* and *I had problems getting good picture for the project.* However these five statements were selected less than 33% at all times.

The survey indicated students' need for a digital library and they are willing to participate in the development of the prototype. Over 90% of students feel that there is a need for digital libraries of local history information and this would definitely benefit them, however only a small majority is willing to be the content provider to the portal of historical projects. Students were unified in their responses about the usefulness of a digital library and the need to create portals for historical project works. A total of 77% (46) responded '*Yes*' to these two questions. We have reasons to believe that these 46 students are the most active, engaged, or interested respondents and therefore provided a realistic representation of those who would take part in being a digital library of historical resources user community. There was less unanimity within the respondents about the willingness to participate in the project; only 37% (22) students agree to participate and are willing to produce and submit their project work to the digital library. Even less agreement was reported for "willing to be a content provider to a portal of historical projects" and "willing to be trained on how to publish projects in the portals". An open-ended question asked the reasons why and two most popular responses are "*shy to let people see my work*" and "*not ready to let others see my work*". These responses indicated the need to have students' work reviewed and approved before the digital objects are incorporated into the collection.

The questionnaires solicited ideas about features that the students would like to see in a digital library. Across the board, almost everyone wanted a digital library where they could easily find sample of good projects reports and guide on how to write a good report. They also wanted historical information accompanied by good quality images; current information that is updated continuously; accurate, precise, useful and detailed information; and information should be retrievable in the shortest time as well as options that make it easy to search for relevant items. Other preferred features are bilingual information; notes on history lessons taught in schools; opportunities to submit question or inquiries; and linkages to other local history Web resources. This feedback helps to ascertain the main features required for the historical portal. As they were asked to check all that apply, the total number of responses was as presented in Table 2.

Table 2 Suggested functions for the digital library

Items	No
Historical information plus picture and graphs	26
Information that are current	33
Information that are concisely written	34
Information that are correct	23

Information which I search for and retrieve in the shortest time	34
Information that are provided in two languages –Malay & English	19
Options that makes it easy to search for relevant items	21
Options for question & answer sessions	14
Guide on how to write a good report	66
Links to other resources not in the library itself	18
To have a look at sample of good projects reports	52
Guide on how to make reference to each resources looked at	22
Information with a lot of animations	13
Indicate to me the degree of relevance items retrieved are to my search	8
Discussion	21

Our initial findings also indicate that students want teachers and specialised people in this history domain to be able to share their teaching materials and writings at CoreDev. This calls for a possibility to create another functionality for another type of user (i.e."knowledge developer") whose role will be to contribute knowledge and evaluate the content for pedagogical effectiveness, quality, ease of usage, suitability and conformity to the area of submission.

CONCLUSION

This article has presented our arguments on the affordances of a digital library as a medium for students to publish and present their project work, and an approach on how it can be integrated in the school curriculum. We also presented our preliminary survey aimed to understand the existing students' conditions and environment that would ensure the reception of a collaborative digital library for history projects for schools use. The survey has provided invaluable information about information gathering behaviour and the students' reception of digital libraries. Although we do not have systematically recorded evidence of user reactions, our general impression is that:

a) the Internet and digital libraries have been accepted in a very favourable way by the students. Students are Internet users and have access to the Internet. Students use digital resources for academic work. In the survey, it became apparent that users' concerns and priorities were centered on searching for information and participating in a digital library community as content providers. Primary findings of the user study revealed the need for search and publishing tools in the digital library, as well as the need for a community around the digital library. The survey revealed that students not only desire a digital library where they can find historical resources but also willing to be design partner and part of the community which they can communicate with others about history projects.

b) digital libraries need to be useful and usable. There is, as yet, no consensus on what key criteria should be used to reason about the usefulness and usability of digital libraries. However, we foresee that in the successful implementation CoreDev, it should be exposed to students and used as a integral part of classroom activities. Students should engage in meaningful activities when using the digital library. In the case of CoreDev, we propose that students should be enabled to publish their own documents in the digital library and share them with others. In this case, students should be allowed to create and submit their project report in the electronic format. Reports that are submitted in the form of scrapbooks could be digitized and published in the "space" allocated for participating schools. Teachers would be given the opportunity to utilize their ICT knowledge by validating the quality of submissions to maintain content quality of the digital library, grade projects online, and add links to other useful resources found in the Internet. This would "push" teachers and students to be active players in building the digital library and

indirectly inculcates ICT literacy among the education community. The success of this project depends on the willingness of schools to participate and changing the mind set concerning the delivery or submission of historical projects.

Because the number of participants in this study is small, and the study is still at a preliminary stage, the generalisability of results is uncertain. What the results do provide are promising paths for future research, and they suggest significant variables in information behavior. Insights from these studies will then be used to establish a set of framework and design principles that we could use in our continuing design work. Subsequent phase of this digital library research will further investigate the requirements of users by applying the survey instruments to a wider sample groups; expanding contents to include resources on historical buildings and sites; incorporating a digital library history lessons, teaching tools, and examination questions bank on history for lower secondary schools.

Digital libraries offer a wealth of opportunities to improve access to information resources in support of both 'traditional' instruction and independent learning. We are still at the early stages of realising the potential of digital libraries in educational contexts, however. CoreDev is building upon a rich source of historical information resources created by secondary school students in a form of project work, advanced technical infrastructures at the faculty, and the participation of students as content developers and teachers as content managers. What have been described in this paper are avenues for participation, anchored in real-life experiences. We need more forums for exploring the issues on the digital library enterprise, more demonstration projects, and more legislative efforts. That is the work ahead.

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