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Nine year old pupils' progression in their use of websites in enquiry based learning and curriculum. | 2011

Nine year old pupils' progression in their use of websites in enquiry based learning and curriculum.

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Keywords: Website choice, enquiry based curriculum, Self Organised Learning Environments (SOLEs), critical thinking, pupil autonomy, web literacy.

Introduction

In England there has been over 20 years of heavily prescribed curriculum and assessment, backed by a powerful inspection regime. This has created a particular problem in England with pupil disengagement from school and decline in motivation from about the age of 9 (Sodha & Gugliemi, 2009). Two of the factors which counteract this decline in motivation are choice (Patall et al, 2010) and a curriculum which relates more strongly to students' interests, questions and experiences (Payton & Williamson, 2009). This paper describes the development of the use of websites and their content by 9 year old pupils given a high degree of autonomy and choice in their curriculum over a school year.

Self Organised Learning Environments (SOLEs, Mitra and Dangwal, 2010) is a co-operative learning format in which groups of 3-4 pupils work collaboratively to answer challenging questions. The questions can be set by the teacher, especially in the early stages of using the method, or they can be decided upon by the class as they develop confidence with the approach. The SOLE method was developed by Sugata Mitra in India for 'remote' areas, and has been adapted for schools in England, as an enquiry based teaching approach to combat declining motivation and engagement.

There is widespread concern about plagiarism and 'cutting and pasting' through use of ICT. Going back only 10 years, there was a lack of clarity, perhaps reflecting context, about the level of student sophistication in using the web. Lorenzon (2003) reviewing a number of studies by librarians found a diversity of (high school) student expertise. This ranged from poor information-seeking skills to clear criteria for distinguishing between bad and good sites, flexible behaviour and a competence to withdraw from bad searches quickly (Fidel, 1999). By 2010 there is a more consistent picture from observational studies in 4 countries (Nielsen, 2010). For college students the account refutes three 'myths', that students are technology wizards (they are reluctant to use new interface styles), that they crave multimedia and fancy designs (they like clear and simple without too much movement and flashiness) and that they are addicted to social networking (they keep that for social life). A particularly interesting observation was that some students develop 'scepticism' and don't trust the first website they read.

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Background

The research took place at St Aidan's Primary School in Gateshead, UK with a class of Year 4 students and a teacher in her third year of the profession. St Aidan's School is a small school in an area of above average social deprivation, judged Outstanding by Ofsted in the most recent inspection.

The teacher, Emma Crawley had an existing relationship with Newcastle University and Sugata Mitra, having practised the SOLE method for a year with a different class during 2009-2010. During this time, the students were asked to organise themselves into small groups and attempt to answer challenging enquiry questions using the internet. At the end of the enquiry, students were asked to present back their answers to the class.

A key research question at the heart of the SOLE methodology investigates the degree to which students are capable of teaching themselves. During the 'self organised' section of the enquiry, the teacher takes a back seat, observing the students and taking notes. A student is selected to be a 'police officer', participating in the research and helping to mediate student issues. The teacher encourages students to discuss and mediate their own issues, and over time, students begin to become more comfortable with self organising. The teacher's notes and observations are used as points for discussion during the presentation section, leading students to reflect on their progress as a self organising group. The teacher was, on average, setting a SOLE enquiry for students once every fortnight.

A tension within this approach concerns the degree of teacher intervention. The research questions in this paper reflect a disposition towards minimal intervention. This paper gathers data that could lead to another research question – 'To what extent should teachers intervene in the development of students' web literacy?'

The class are mixed ability and formed their own groups within the SOLE enquiries. Students are allowed to swap groups during the enquiry sessions. The students were introduced to SOLE methodology from October 2010 and continued to complete enquiries up until the end of term in July 2011. On average, the students were completing one per fortnight, occasionally more often.

In this study, the teacher and researcher provided limited web searching instruction to the pupils. A limitation of this study is that students were prompted to think about what web sites they visited and the decisions influencing their choices as a result of the researcher interviewing them on a periodic basis. All students were given periodic ICT lessons from Year 1 as part of their normal schooling.

A significant intervention on behalf of the researcher and teacher was to pose the following question to students as a SOLE enquiry question: 'What makes a good news report?' As part of this SOLE enquiry, many students researched journalistic concepts, which clearly link to web literacy, although the teacher and researcher did not ask the students to link the two.

As part of the research, the students used the standard class 'Fizzbooks'- small, robust laptops designed for primary school use. In April 2011 the students switched to using standard sized laptops for the SOLE enquiries. Google was set as the default search engine on both sets of machines, and Internet Explorer was the default browser. The new laptops also had a newer version of Internet Explorer, which contained a smaller search box as part of the interface, within which 'Bing' was installed as the default search engine. There were usually 5 laptops used by the class for each enquiry – one per group of 4-5 students.

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The researcher adopted the role of 'critical friend' to the teacher, discussing the progression of the methodology and offering suggestions when appropriate. On average, the researcher observed SOLE enquiries once every 2-3 weeks between October 2010 and July 2011.

Questions:

1. What websites do Year 4 pupils use in particular enquiries?

2. What factors do they consider in their selection of websites?

3. What progression do they show in the processing of information retrieved and 'critical literacy'?

Methodology

The paper is a result of collaboration between the class teacher and researchers at Newcastle University. The teacher observed that in the previous year 2009-10, there was significant change in the pupil's criticality, to handle information in the process of deep understanding. We have used a case study methodology (Yin, 2003), as the pupils' work using the SOLE approach is now a very natural embedded part of their working week guided by a teacher for whom the pedagogy and resultant curriculum are finely tuned to her values. Multiple data sources were collected:

- Teacher Diary;
- Video of the 17 pupils working (and observation by university researcher);
- Computer records of websites visited for particular enquiries;
- Pupil work;
- Three Stimulated Recall Interviews (SRIs) with selected pupils, exploring their use of and reaction to certain sites and the transformation of information into their final enquiry 'product'.

Around 20 SOLE enquiries occurred over the year. The teacher took notes after most enquiries, documenting thoughts, instances of behaviour issues, student – student interaction, opportunities for planning and reflections on the SOLE process. Although the teacher was not using the diaries specifically to look for evidence of web literacy progression, some entries referred to students talking about web searching and information retrieval.

The HE researcher periodically recorded video of the 17 pupils working in SOLEs. Aspects of the footage were transcribed, and observations of student web searching behaviour were recorded.

The web histories of 17 students were periodically recorded between April and July 2011. The histories were either photographically recorded to save time in between lessons, or copied from the screen. It was not possible to print or export this data within the school within the time allowed for a research visit. The web histories are complete records of each page a group visited, although does not indicate whether the student typed in the address to the URL bar, or clicked on a link to view it, or indeed, how long they visited each page. This is significant in terms of assessing the student web search process. For the later stimulated recall interviews, the researcher monitored student activity in addition to recording the web history, so that a more accurate account of student web-search behaviour could be recorded.

Each web history was coded using an existing list of web site categorisations. The category terms were then reduced to omit the large amount of website categories that students did not visit. Each page that

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students visited was counted as a 'visit'. For example, if a student visited www.google.co.uk and searched for 'what is an electron?' and then re-searched for 'what is an electron wiki answers', that would constitute two visits to a search page.

Student work was periodically photographed by the researcher and recorded by the teacher.

Groups of 4-5 students took part in three SRIs between 14/6/11 and 8/7/11. One group was photographed and observed for the duration of a 1 hour SOLE enquiry. Due to the nature of the SOLE methodology, some students left or joined the 'group' during the course of the enquiry. In this case, the researcher asked all of the students connected to the observation group to take part in the interview. Each website the students visited was photographed and used as the stimulus for the interview. The interviews were semi-structured, and used the following pre-set list of questions as a prompt for students to talk about their reasons behind visiting the websites:

- What website is this?
- Tell me about this website/How would you describe this website?
- What led you to visit this site?
- What were you thinking when you first saw it?
- Was this website helpful?
- What made you think it would be helpful?
- What information did you find?
- What were you thinking at this point?
- How did you know if this information was trustworthy?
- What advice would you give to someone about to answer the same question – what sites should they visit?
- How did you avoid sites that weren't trustworthy?
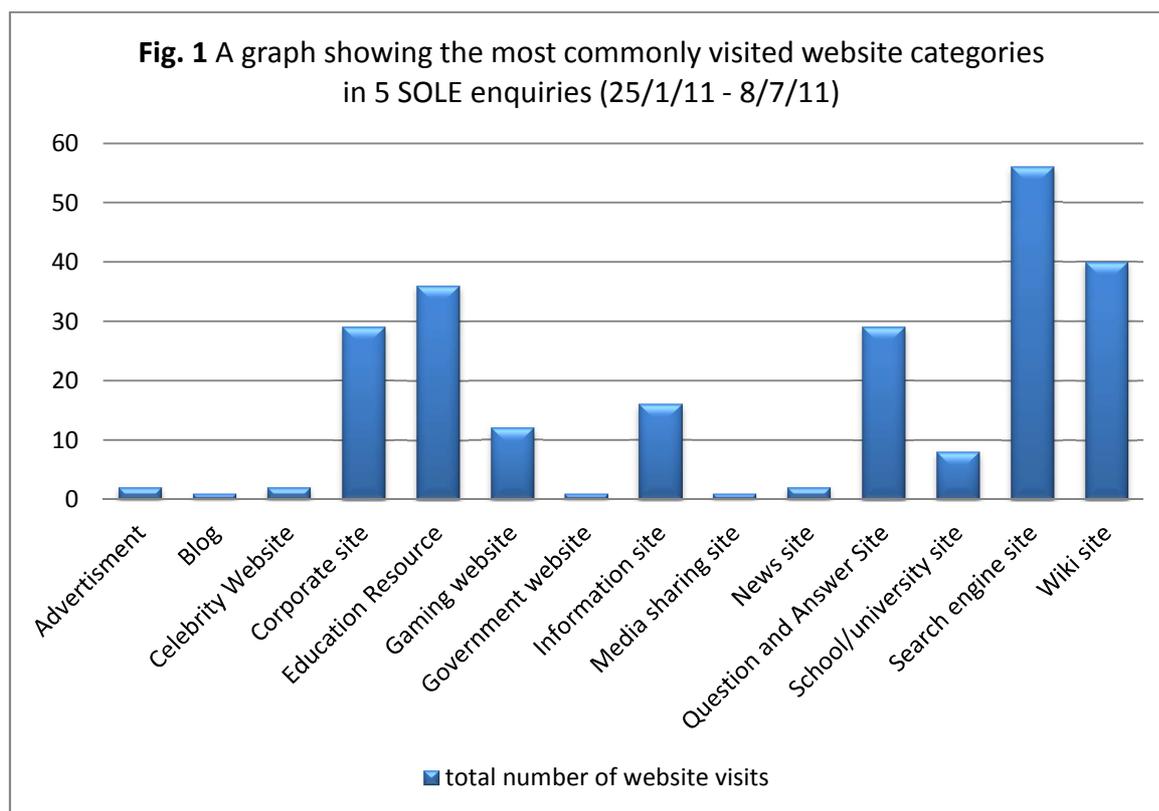- How can you tell if a site is untrustworthy?

The interviews were transcribed and coded for factors that students felt influenced their web searching behaviour. The frequency of how many times students mentioned these factors across the three interviews was then calculated.

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Results

1. What websites do Year 4 pupils use in particular enquiries?

Student website histories were photographed and transcribed between February and July 2011.

Fig. 1 A graph showing the most commonly visited website categories in 5 SOLE enquiries (25/1/11 - 8/7/11)

The enquiry questions students answered in the sample were:

- What are muscles and what do they do? 25/1/11
- Why do we slip on wet surfaces? 14/3/11
- Why did coal mining stop in the North East of England? 3/5/11
- What is Electricity? 17/6/11
- What is an Electron? 8/7/11

Fig. 1 shows the most frequently visited sites were search engines, wiki sites, education resources, question and answer sites and corporate sites. This data fits with student interviews and the researcher's observations of students using search engines as their 'window' to the internet. Students used Google to direct them to website addresses instead of typing in the web address into the browser URL bar. Although students did occasionally visit games sites, the majority of these visits were to a 'Mathletics' site, a 'legitimate' site used by the school to teach Mathematics.

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Analysis of students' website histories and video documentation of enquiries show students were unlikely to browse beyond the first page of search engine results. Students were more likely to modify their search terms instead of browse through a second page of search results.

The website histories and SRIs with students showed that students were prone to using search engines and 'question and answer sites' such 'answers.com', 'wikianswers.com', 'Wikipedia.com' and 'YahooAnswers.com'. The web histories showed that students' were not directly visiting these sites, but using the site name as a keyword in their Google search term. For example, students modified the 'what is an electron' search term with 'what is an electron answers.com' in order to visit the site via Google.

Photographs of student searches and teacher observations showed that students regularly used age-related suffixes to filter information at an appropriate level. For example, students would suffix their search term with 'kids' to find age appropriate materials, and filter out over complex information.

2. What factors do they consider in their selection of websites?

The SRIs were transcribed and coded for factors that students felt influenced their web searching behaviour. The frequency of student citations of these factors was then calculated across the three interviews.

Table 1. *Factors mentioned influencing web searching behaviour of students from 3 Stimulated Recall Interviews.*

Factors	Times cited by students as a factor that influences website decisions
Amount of information on page	4
Expected time taken to consolidate information	4
key words visible, title visible	4
Search engine used	3
website reputation	3
Readability of information during final stage of SOLE enquiry	3
Perceptions of authors/contributors/posters (age, authenticity)	2
Relevance to question	2
Search terms used	1
Network access - functioning internet	1
Explicit/Inappropriate Material	1
Style of site - wiki, answers site, commerical, etc	1

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Interest	1
Speed it takes web site to load	1
Date written	1
Access to Interactive content	1
Writing style - casual/formal	1
Browser used	1
Mistake i.e. Mispressed button/misclicked link	1
Search engine results	1

The first three factors and the fifth reflect readability and ease of use. The fourth and the sixth indicate a growing sense of the quality and reliability of the information found.

The teacher was able to support aspects of these factors with anecdotal evidence. One example included the teacher's observation of students talking about the authenticity of the author: "I heard students talking about a page that 'looks like it was written by a kid'. I asked them why they thought that and they said 'because there's loads of spelling mistakes'. I asked 'Don't adults make spelling mistakes as well?' and they all answered 'No! Of course not!'"

3. What progression do they show in the processing of information retrieved and critical literacy?

Comparative analysis of conversation and student interviews

A comparative analysis was made using transcripts of video footage recorded in October 2010 and SRI interview data from June and July 2011.

Analysis of video from October 2010 shows students type entire enquiry question into the Google search engine (selected as the default home page on all the school computers), copied verbatim from the teacher's handwriting on the whiteboard: "You go onto Google, type in the question, and find each website and just type it in... and we found out what we're doing and then we write it down."

Students included 'unsearchable' words such as 'and', 'the' and 'to' in their search terms, which search engines are designed to remove before searching. However, even at this stage a smaller number of students were able to articulate strategies to check the validity of information they found online:

> **Researcher:** How do you know if that information is correct or true?
> **Pupil:** Because we go on different websites and see if it's the same.

> Although some students were naive in conceptualising the multi-authored nature of the internet and the inherent varying degrees of reliability:

> **Researcher:** So you know how WikiAnswers works? Is everything on there 100% true?
> **Pupil:** Yeah

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...there were also students capable of articulating a degree of uncertainty about the reliability of online information:

> **Pupil:** I don't know but I think that the internet is mostly right... sometimes it's wrong.

The greater proportion of the 17 pupil sample, with allowances for sickness and absence, took part in approximately 20 SOLE enquiries between October 2010 and July 2011.

The researcher's observations and separate analysis of the SRI data from June-July 2011 suggests that students were able to describe the process of web enquiry in greater depth than in October 2010. Students discussed the following web searching tactics during the SRIs:

- Being able to state a partial URL, or 'address' of a website;
- Use of different search engines;
- Modification of search terms to yield more relevant results;
- Use of key words;
- Skim reading web texts for key words;
- Use of image search for finding diagrams and illustrations;
- Cross checking of information across different websites (and other groups of students);
- The development of a language to explain 'trustworthiness' and reliability of web information.

Although most students interviewed still had difficulty with basic aspects of web literacy such as reading the full address of a website, there was a clear difference with students' abilities to describe the importance of using key words and search terms.

> **Pupil:** We wrote it in because it was key words, instead of typing the full sentence in.
>
> **Researcher:** So what happens when you write in the full sentence?
>
> **Pupil:** You never get any information, it just brings up...
>
> **Pupil 2:** ...Cos they don't know what you're on about.
>
> **Pupil:** It comes up with rubbish.
>
> **Researcher:** I'm interested in when you said 'they don't know what you're on about'. Who do you mean when you say they?
>
> **Pupil 2:** The Google.
>
> **Pupil:** Google.
>
> **Pupil 2:** It has a little mind of its own.

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The above conversation suggests limited awareness of web authorship and its implications. The interviews indicated some students had their own methods for finding diagrams, that despite being different to my suggestion, would have much the same outcome:

> **Researcher:** I noticed today, at the beginning of the search someone wrote in the question, and then 'wiki answers' after it. Have you ever tried typing in 'diagram' in after the question, so that you can find a diagram?
>
> **Pupil:** Well, erm, we don't do diagrams because we on (Google) images and there's diagrams there.
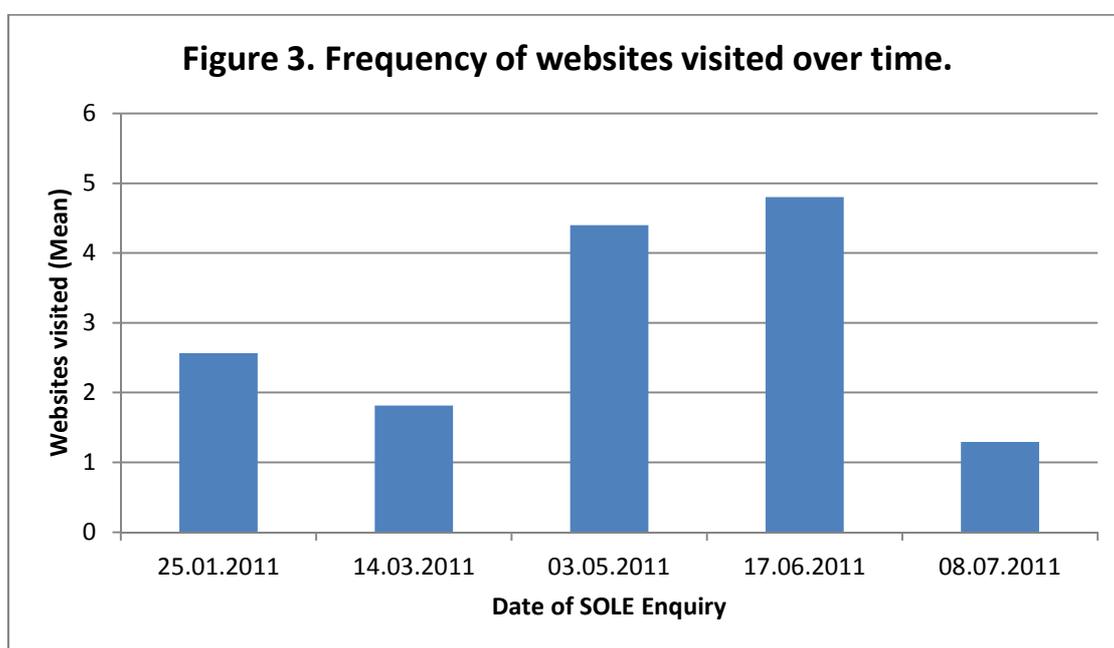

Figure 3. Frequency of websites visited over time.

Fig. 3 shows inconclusive evidence of the number of websites students visited over time.

Discussion

1. *What websites do Year 4 pupils use in particular enquiries?*
2. *What Factors do students take into account?*

There are a variety of reasons why the types of website would change on an enquiry to enquiry basis:

- The way in which the teacher phrased the question and their choice of words;
- The students' prior knowledge of the enquiry question topic;
- The complexity and 'Googlability' of the enquiry question, i.e. How well a search engine was able to locate web pages containing related search terms;
- The quality of existing answers online and their accessibility through Google search engines;

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- The results that the search engine (mostly Google) presented students based upon the search engine algorithms.

Teacher Impact on Pupils' web searching behaviour.

"Dewey argued that thorough inquiry can only occur if the need felt for it is personal" (De Vries et al, 2007) The first stage of a SOLE enquiry is to create opportunities for students to connect the topic with prior knowledge frameworks. The teacher shows pictures and asks preliminary questions about a topic to students before she poses the primary SOLE question. Even at this stage, before the student even opens the laptop to start searching, teacher behaviour could be impacting upon the success of the students' web searching behaviour.

The effect of task construction and 'end product' on students' web searching behaviour.

Interestingly, in their 2007 study, De Vries et al, focus on the importance of end product in a web search process. 'If the answer did not have to be written down, would the student have formulated it?' We suggest that student perception of the end product affects the quality of their web searches. Although students are capable of developing search behaviour that references information from multiple sources, the length of time required for them to achieve this independently may not be feasible. The results of this study indicate that students perform only as much as the task requires, and only occasionally more.

The worksheet used in De Vries et al's 2007 study could also help focus the nature of the end of a SOLE session. A structured differentiation between 'what you found on the web' and 'what you think' prompts students to translate findings into their own words instead of copying and pasting. If students are working backwards from the 'end product', in this case a presentation back to their peers –we must ensure that the format of, and teacher facilitation of the 'end product' constantly challenges students to reflect on the quality of their web searching skills.

Students were unable to describe the full URL for a website, and often gave the title of the website as the web address. This could be traced back to the lack of necessity conveyed by the SOLE enquiry. At no point during a SOLE enquiry are students explicitly required to read or remember web site addresses.

Other Factors

A rise in visits to corporate websites seems to correlate to web questions that contain key words that directly relate to industry and business –'What is electricity?', 'Why do we slip on wet surfaces?'

A lack of visits to media sharing sites such as 'YouTube' can be explained by network administrators blocking the site across the Gateshead area.

Looking at the website categories over time in *Fig. 2*, an upwards trend develops with visits to search engine sites, before a downwards move during the final SOLE enquiry. This final drop could be explained by significant class absence and pre-holiday excitement effect during the final weeks of term.

The main factors students took into account when choosing websites could be generally grouped into the following categories:

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Student Ability to Analyse

- Amount of information on page;
- Visibility of key words;
- Reputation of site;
- Perception of authenticity

Task related

- Readability of information during SOLE presentation;
- Expected time to consolidate information given time allowed for task
- Relevance to enquiry question.

Technical

- Functioning internet access;
- Speed at which the page loads.
- Sites blocked by network administrator/school council

3 – What progression do they make with critical literacy?

Student used a search-engine based method to finding and locating information. This complicates the idea of a standardised concept of Web Literacy, as there are many ways to achieve the same result, depending on the operating system, browser, search engine and personal preference of the person doing the search. The constant update of software such as web browsers also complicates the standardised concept of Web Literacy. Whereas, only a couple of years ago, typing in a search query into the URL bar of a browser would have yielded an error page, now it is common practice for web browsers to simultaneously allow URL and search queries in the 'address box'.

Fig. 3 shows a steady increase in sites visited followed by a sharp decrease. The 8/7/11 Enquiry question was particularly challenging – 'What is an electron?' and may have disrupted developing trends. In isolation, *Fig. 3* does not reveal much about the development of students' criticality. An increase in website visits could indicate students were becoming worse at finding information as much as it could suggest an increasing dissatisfaction with the quality of the information retrieved. Visiting less websites could suggest reduced student criticality and becoming more quickly satiated with less. However, it could also indicate that students are becoming better searchers and finding more useful information quicker. A more sophisticated methodology is required to more accurately assess the development of students' criticality.

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<u>What kind of Web Literacy development can pupils achieve by themselves/with limited intervention from the teacher in a SOLE?</u>

Despite methodological differences, our results compare with previous research in this area. Spink et al (2009) found students engaged in complex web searches, including 'use of key word searching and browsing, query formulation and reformulation, relevance judgments, successive searches, information multitasking and collaborative behaviours.' An earlier study (Calvert et al, 2005) reported 'that children as young as 3 have the technical competency to use computers and the internet'. Although Calvert et al describe their study as 'more naturalistic' than other literature in the field, there is still significant adult intervention throughout the student web search process.

'Although many students show adequate use of particular web searching, reading and evaluating skills after the project, inconsistency, impulsiveness and impatience are also typical of their behaviour'. (Kuiper et al, 2008) Our own data set shows a similar pattern. Students use a variety of cues when making decisions about which site to use. They are able to adequately perform web searches with minimal instruction, however their ability to do so seems in part motivated by the 'end product' of the task, and they are unlikely as a class to go beyond what will sufficiently solve the task at hand.

<u>Web portals & teacher constructed knowledge routes vs naturalistic open access and crowd sourced knowledge routes.</u>

This study has suggested that students exhibit enough critical web searching behaviour without significant teacher intervention to counteract the need for 'restricted web searches' and teacher constructed web portals favoured by De Vries, van der Meij and Lazonder (2007).

Advocates of restrictive web searching would argue that 'spending lots of time on searching and locating relevant information comes at the cost of processing it' (Jones)(2000). The development of student's web searching skills within a SOLE context takes a different perspective. The data from this study suggests that allowing students to search the web in an open fashion, not guided by pre-constructed portals and teacher intervention, can be a worthwhile learning process in itself. Teachers' use of the SOLE review stage as an opportunity to discuss the challenges and issues students' face in their web searching is likely to necessary and also affective of the speed at which students' criticality develops.

Longer, more complex web searches create problematic and challenging situations that students must develop social solutions to in order to mediate. In a SOLE, such an approach is part of the teachers's agenda to develop students' Web Literacy. The naturalistic problems associated with web searching can be used as genuine stimulus for discussion and the development of student-created solutions to common problems such as accurate data retrieval and use of multiple sources.

Kuiper et al (2008) state that 'the web has not been designed for use by children, nor for use in educational settings' and therefore 'the web is a better learning tool when it has been modified for children'. This research suggests that it is not the web that needs altering, but the teacher's methods for supporting students to use the web as a learning resource.

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Conclusions

1. Year 4 students most commonly visited search engines, wiki sites, education resources, question and answer sites and corporate sites during their self organised research.
2. The websites they visited changed on an enquiry to enquiry basis, depending on a range of factors, such as:
   a. Previous reliability (a website successfully used to provide information for a presentation that the teacher deemed of good quality in a previous SOLE enquiry);
   b. Complexity of text and information;
   c. Length of text and information;
   d. Readability;
   e. Expected time to consolidate within time constraints of the lesson.
3. The factors that students deemed important in their selection of websites could generally be divided into External (internet access, blocked sites), Task Centred (How long there is to do the task, what has the teacher instructed students to do with the information once retrieved?) and student centred (Analysis of web page style, length, readability, complexity and potential reliability).
4. Students' web searches are heavily directed by Google results pages, and students rarely, if at all, browse beyond the first page of results.
5. Students develop a sense of criticality without teacher intervention although is often poorly rationalised and based upon erroneous logic.
6. Although year 4 students are capable of teaching themselves web search skills and limited critical behaviour, teacher intervention during the 'question setting' and 'review' phases of a SOLE enquiry is necessary to stimulate genuine development.

Postscript - Emma Crawley

Having read this paper, my knowledge of the student's web searching behaviour will inform and impact on my future planning of SOLE sessions. The results and data in the paper were really interesting to see as they supported behaviour I had observed myself. Some of the details I hadn't expected and this is where the research has been especially useful. I have begun to develop a series of enquiry questions that will hopefully increase the student's understanding of the internet as a research and learning tool. I intend to ask the enquiry questions using the SOLE method in order to allow students the opportunities to develop their understanding with minimal intervention from myself.

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