

EXPLORING WIKI TECHNOLOGY IN TEACHING AND LEARNING

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ABSTRACT

A wiki has the ability to be used by a teacher to: deliver content for blended student learning; deliver a wide range of media in a web based environment; allow students to extend content; and is capable of including new and emerging technologies. This provides a rich environment to conduct research into enhancing opportunities and learning outcomes for teachers and learners.

Previous research by the author explored technologies desirable in a blended teaching and learning environment to support the teacher, and a framework, known as the virtualMe, described features desirable in this context. This research was conducted using a customized software solution.

This paper describes the development of a wiki based artifact as delivery tool to investigate whether a wiki could be used to effectively deliver content in a blended teaching and learning environment, presents a wiki teacher architecture model, and describes how the wiki has been integrated into a blended teaching and learning environment.

Keywords

Wiki, Wiki Teacher, Teaching, Learning, Media Wiki, virtualMe

INTRODUCTION

When teaching students two complementary knowledge systems interact: that of the teacher, and that of the student. The overall direction of a student's learning is designed by a teacher (or learning designer) and usually includes the content that the student is to learn, and activities for the student to do. Within a group of students, however, some of them may possess knowledge that could provide an important contribution to the content being studied. The ability to allow a student to interact with content is seen as a cornerstone of a teacher focused information and knowledge system.

Previous research undertaken by the author, into developing a teacher centered information and knowledge framework (coined “the virtualMe”), included the development of a web-based software artifact (Verhaart, 2009). The artifact was custom built and when presented to peers the inevitable question was asked, “When will it be available for others to use?” In part to address this question, and also to provide a stable development platform to continue the research, the use of existing software was investigated.

There are many Web based content and/or learning management systems that can provide us with the tools necessary to capture, manage and distribute information and knowledge. Content management systems such as Joomla, or learning management systems providing specific functionality for teaching and learning (such as, Moodle), are possible candidates. The decision as to which software package to use depends on many factors. These will be considered later in this paper.

Two tools that are having a significant impact on managing content on the Internet are the blog and the wiki. Both of these tools were explored as possible candidates to manage content for teaching and learning, however this paper deals with the use of the wiki.

Brief literature review

The purpose of the case study described in this paper was to consider whether there are existing systems that could be adapted to meet the functionality identified by the virtualMe framework described by Verhaart (2009).

The framework is shown in *Figure 1* , and includes:

1. a user management sub-system,;
2. a taxonomy structure, to organise the content;
3. a snippet model to store the content;
4. a multimedia object (MMOs) model;
5. an annotation framework; and
6. a presentation layer.

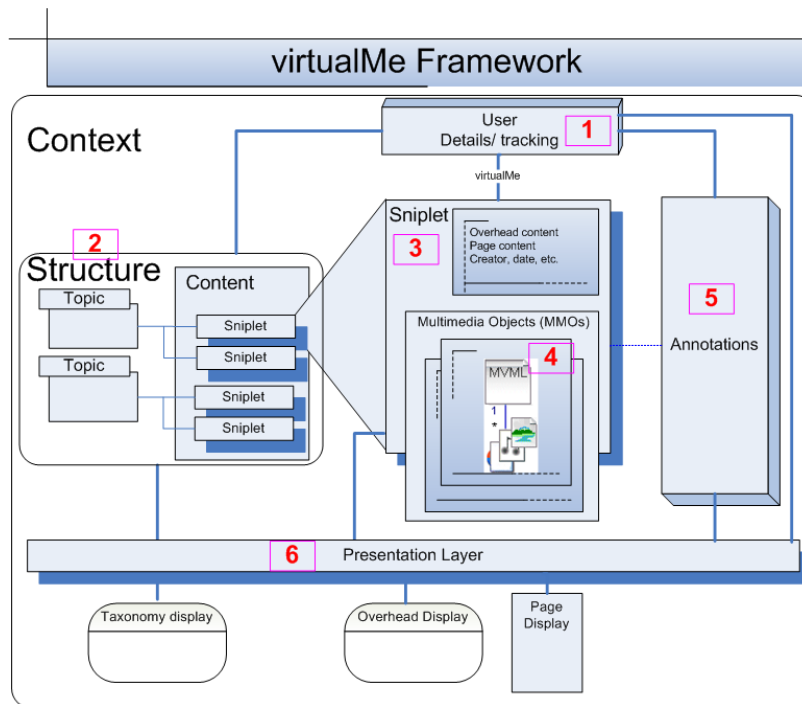


Figure 1: virtualMe framework

In the virtualMe framework a customised solution was developed and student knowledge was captured through annotating the content in a way that maintained the context of the student's contribution.

Advances in wiki technology have made their application in education more popular, and have the potential to create online environments which support social activities and interactions, and to promote collaborative learning activities (Choy & Ng, 2007; Wheeler, Yeomans, & Wheeler, 2008; Lin, Sajjapanroj, & Bonk, 2009).

Three significant collaborative projects using wiki technology for teaching and learning are: WikiEducator (<http://www.wikieducator.org>) Wikiversity (<http://www.wikiversity.org>), and Wikibooks (<http://www.wikibooks.org>). An alternative to open collaboration is where a lead educator would manage their wiki and users would contribute to the wiki. An example of this is Wikispaces (<http://www.wikispaces.com>). Additionally many learning management systems, such as Moodle, provide wiki functionality.

WikiEducator was initiated in 2006, and is a collaborative global community project working towards a free version of the education curriculum by 2015 (WikiEducator:about, 2009). "WikiEducator is a global community resource, based at Otago Polytechnic, with servers hosted by Athabasca University. The Commonwealth

of Learning provides financial support to the OER Foundation” (WikiEducator:Main Page, 2009).

“Wikiversity is a Wikimedia Foundation project devoted to learning resources, learning projects, and research for use in all levels, types, and styles of education from pre-school to university, including professional training and informal learning” (Wikiversity:Main Page, 2009). As at December 8, 2009 the Home Page indicated there were 11,705 learning resources.

Wikibooks, also from Wikimedia foundation has a focus on creating a free library of educational textbooks, and as at February 2010 there were over 36,305 pages (Wikibooks: Main Page, n.d.)

WikiEducator, Wikiversity, and Wikibooks use the Media Wiki engine from the Wikimedia Foundation, which is also drives Wikipedia. In Verhaart (2009) Media Wiki was compared to the customized virtualMe framework.

Wikispaces hosts over 3.4 million users and 1.3 million wikis, and has “given-away” over 230,000 wikis for K-12 education (Tangient, 2009a). While Wikispaces does provide a level of free hosting (Figure 2 shows an example of wiki that is hosted free on their website), commercial hosting is available, for example, the Higher Education package cost US\$6,000/year for an unlimited number of users. (Tangient, 2009b). Wikispaces uses its own engine to deliver the wiki.

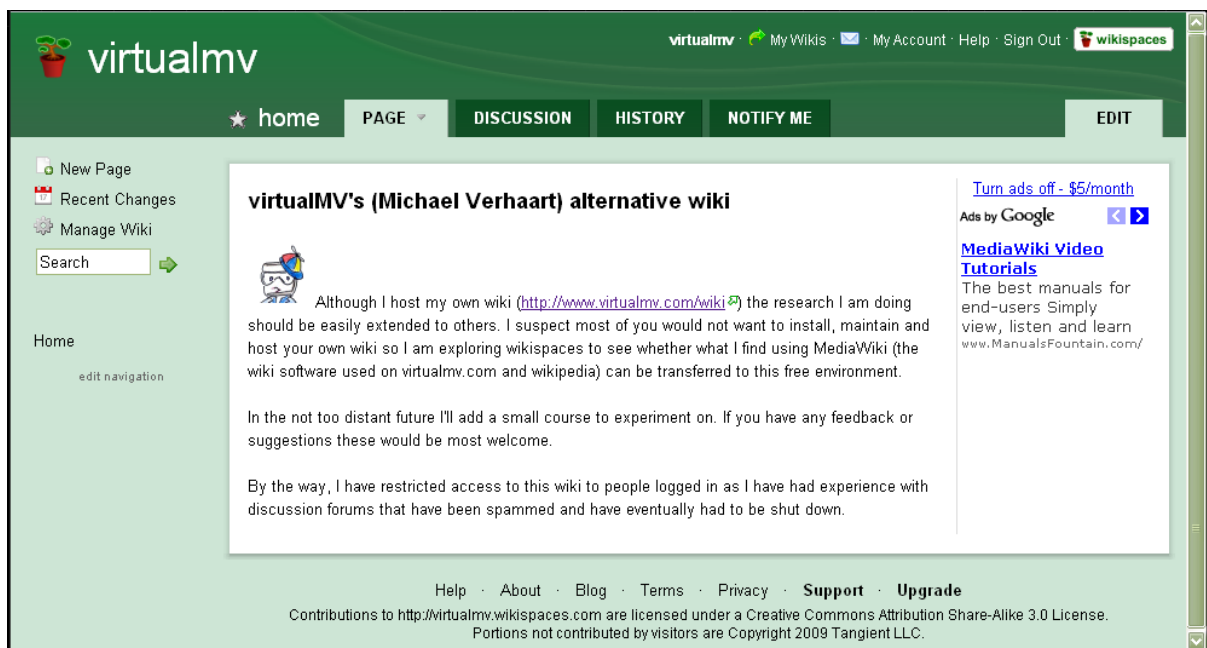


Figure 2: Wikispaces sample (<http://virtualmv.wikispaces.com/>)

Moodle is an Internet based system for delivering e-Learning programmes for educational and training organisations. Moodle has a learning focus, based on sound pedagogy, and can be used to present online content for virtual classrooms, as well as in blended learning environments (Moodle, n.d.). Wiki functionality is available in Moodle and an example is shown in *Figure 3*.

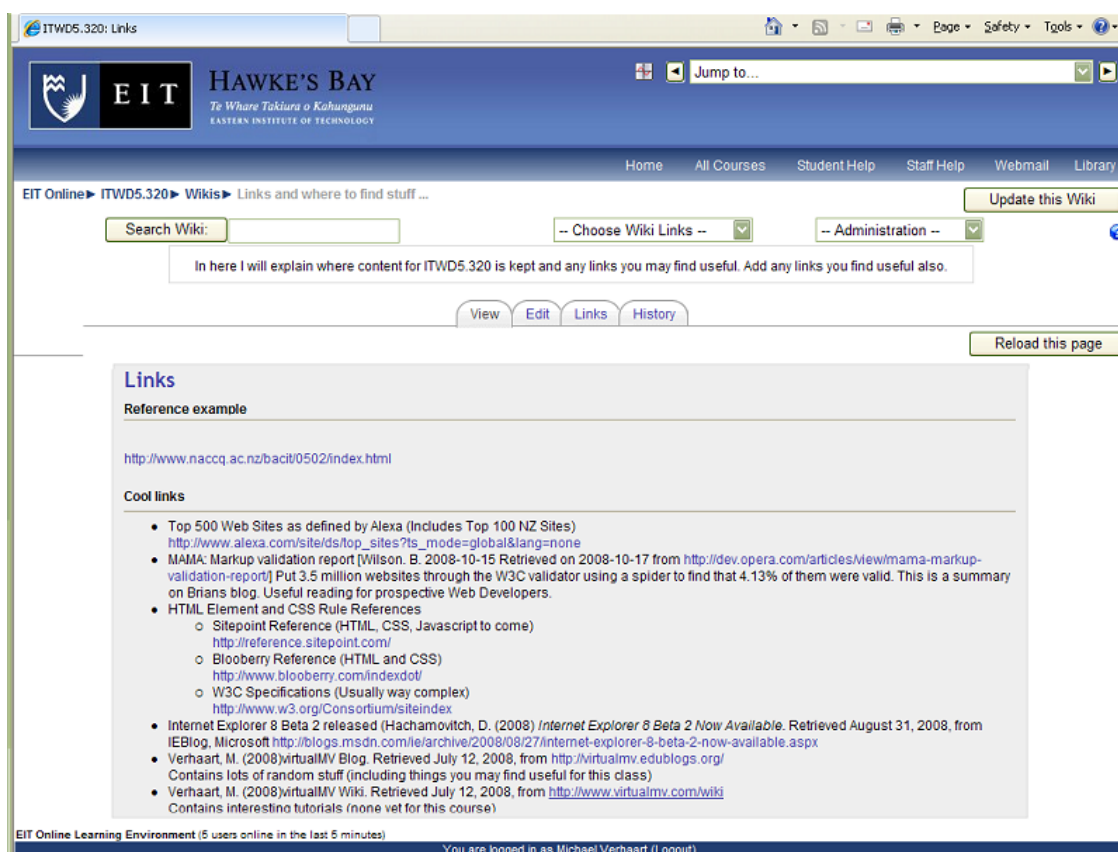


Figure 3. A wiki in Moodle

The virtualMe framework essentially is teaching and learning content centred on an individual educator, so the Wikispaces model would be a closest match. However, with the impact of WikiEducator, Wikiversity and Wikibooks it was considered prudent to investigate the adaption of the virtualMe framework using the wiki technologies as this would also provide the ability to compare features and develop skills that could be useful in these projects.

What is a Wiki?

First coined in 1995 by Ward Cunningham, wiki means quick in Hawaiian (Louridas, 2006).

“Wiki is a piece of server software that allows users to freely create and edit Web page content using any Web browser. Wiki supports hyperlinks and has a simple text syntax for creating new pages and crosslinks between internal pages on the fly” (Leuf & Cunningham, 2002).

In a wiki a visitor is capable of editing and modifying the actual content.

Wiki's in teaching and learning

Parker and Chao (2007) provide a literature review into the way wikis can be used in a teaching and learning environment, and indicate that the use in teaching and learning is fairly current. They explain wiki usage, investigate how wiki can be used in various learning paradigms, examine the current literature on wiki use in education, and suggest additional uses in teaching software engineering. They discuss how collaborative learning becomes powerful when taking place in a community of practice, and how they can become a knowledge platform for the community. They further consider its use in constructivist learning, and highlight the importance of students being able to make their learning explicit. The use and potential of wikis in the classroom, and the collaborative activity potential has been described by several authors (Ferris & Wilder, 2006; Choy & Ng, 2007; Wheeler, Yeomans, & Wheeler, 2008).

Couros (2006) described “The Networked Teacher” and diagrammatically shows the relationship possibilities between the educator and ranges of communicative structures, of which the wiki can be part.

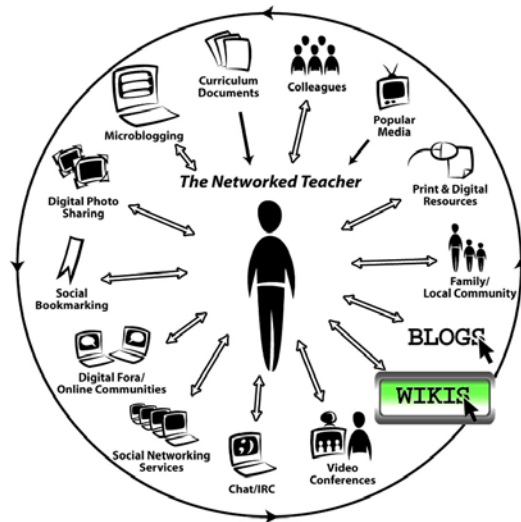


Figure 4: *The Networked Teacher* (Adapted from Couros (2008) - Creative Commons)

This paper focuses on the use of the wiki as a teacher delivery mechanism that includes features found useful in the virtualMe framework.

Methodology

Verhaart (2009) describes three action research cycles, for a Web based teacher centered teaching and learning environment. This paper is a continuation of the virtualMe action research project and describes the development of a wiki artifact to be used in the fourth cycle, where existing Web based tools are investigated as to their suitability to include the virtualMe framework.

The overall research question to be addressed by the fourth cycle is "Can a wiki be used to effectively deliver content in a blended teaching and learning environment?". In order to provide an environment to address this question a wiki was installed and has been used to deliver teaching and learning content. This is presented in the following case study.

Case Study

The case study can be broken down into three parts (*Figure 5*).

1. Hosting
2. Content construction
3. Content delivery

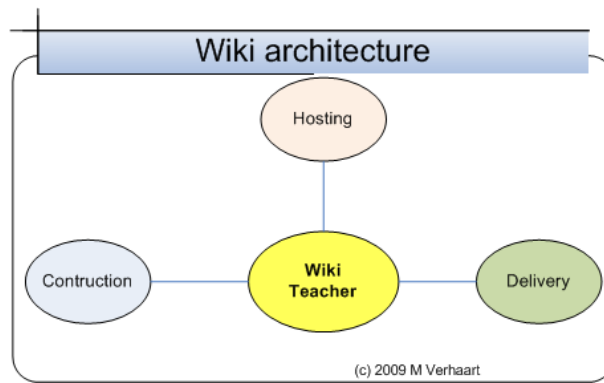


Figure 5: Basic wiki architecture

As described previously, using a wiki as a tool to incorporate the virtualMe framework makes logical sense as there are existing and significant projects in the teaching and learning domain currently underway (WikiEducator, Wikiversity, and Wikibooks).

While there was the ability to actually use these live systems, from a research perspective this constrains investigation to the features made available in the live system.

Hosting

First a wiki environment and a Web host needed to be chosen (open, corporate or private as illustrated in Figure 6). For this development, two main wiki requirements were identified:

- to be publically available, and
- extendable to add features matching some of the findings of the virtualMe framework. Extendibility effectively excluded both the open and corporate hosting solutions.

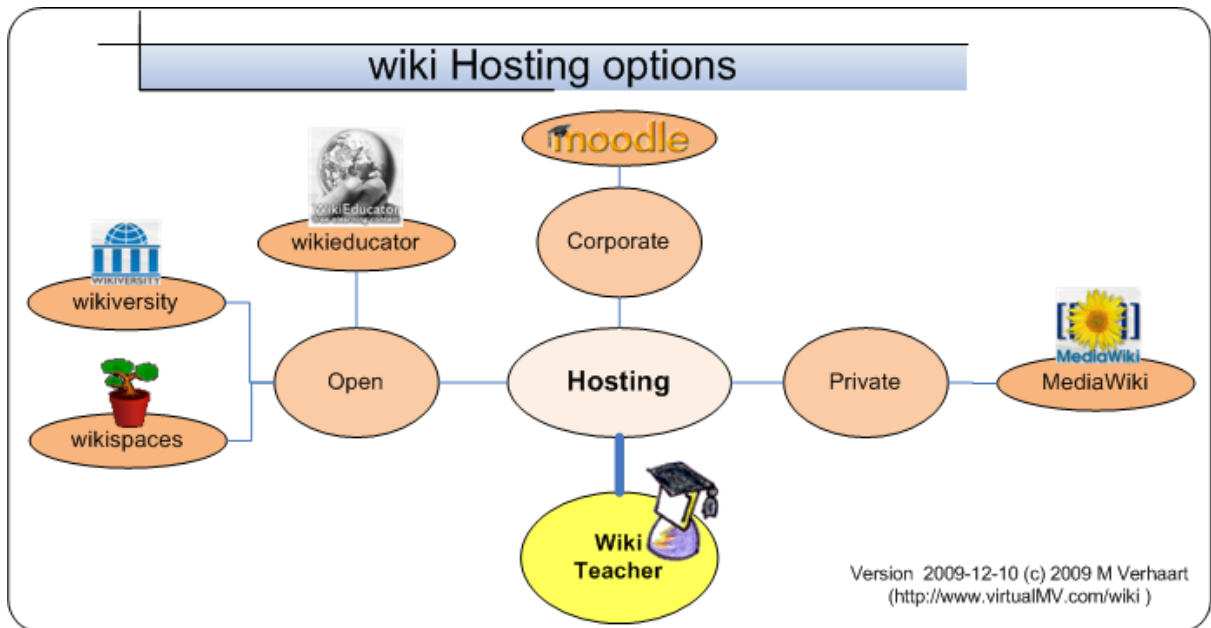


Figure 6: Wiki Hosting options

After comparison of various wiki systems Media Wiki was chosen for the following reasons:

- Media Wiki has extensive use, as the environment used by Wikipedia the largest global wiki.
- It is used by WikiEducator, Wikiversity and Wikibooks.
- The software is Open Source.
- Has an active extension community continually adding new functionality.
- Supports a wide variety of multimedia types, and has the capability to be extended (e.g. add YouTube and Flickr functionality).
- Would enable the researcher to offer an informed contribution to the existing wiki communities.
- As the software can be installed on a private host, this enables the researcher to gain an understanding of the technology underpinning the wiki.

Media Wiki was installed on a private web host, and made available to students and web surfers via the Uniform Resource Locator (URL) <http://www.virtualmv.com/wiki>.

Privately hosting and managing the software to drive the wiki involved handling site and software administration. For Media Wiki this included: managing updates and conflicts (email was a problem); and adding extensions.

Content Construction

Once the wiki software was installed, teaching and learning content was constructed (Figure 7), and several issues surfaced.

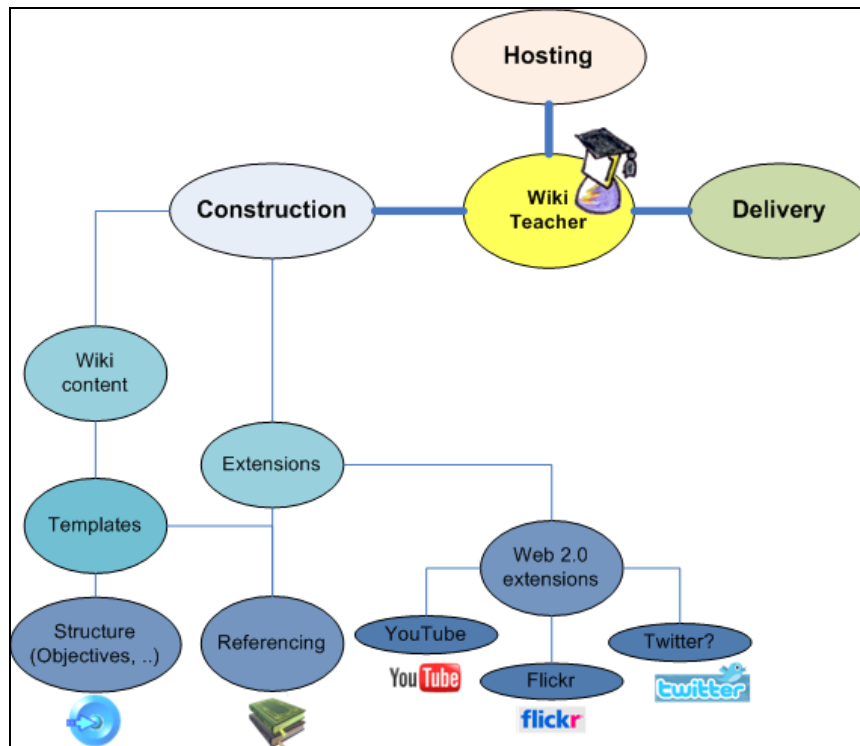


Figure 7: Content construction for a wiki

Learning and understanding the wiki syntax was the first obstacle that needed to be overcome (also observed by Choy and Ng (2007)). Unfortunately, Media Wiki does not provide a “What you see is what you get” (WYSIWYG) user interface. A potential future research project would be to identify whether this is a barrier to the adoption of the wiki by educators. Adding basic content can be achieved by understanding three things

1. Creating headings (using the equals notation).
2. Adding a hyperlink (using the [[notation).
3. Adding images (png, gif, jpg, jpeg).

To format the content, however, requires “cryptic” wiki markup (see Appendix A for examples).

In this stage pedagogical structures were developed, and as WikiEducator had existing teaching content, the way in which content was presented was explored. WikiEducator provides a selection of pedagogical templates (Quickstart guide/pedagogical templates,

2009), and similar templates were developed for the virtualMVwiki. The Objective template is shown in Figure 9.

Developing a consistent look and feel greatly assists users understanding and navigating a Web site. Since the context of the wiki was teaching and learning a standard format was developed. This structure can be seen in Figure 9, and Appendix A, and includes:

- Navigation bar, to display the context of the page, and provide upper-level hyperlinks.
- Introduction
 - Overview, to introduce the page
 - Objective(s), to describe what will be learnt by reading the content
- Content, includes: information, examples, exercises.
- References, a list of references cited on the page
- Footer, an APA style reference for users who wish to reference the page in their own research.

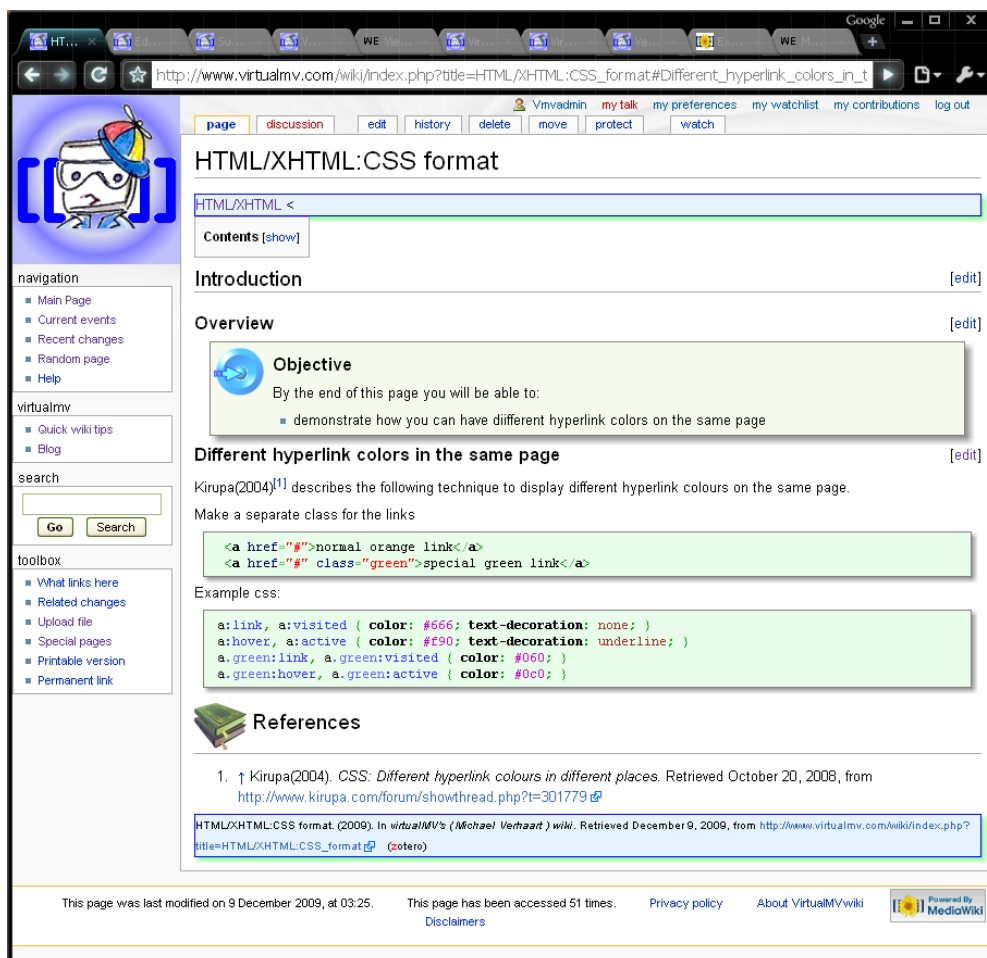


Figure 8: virtualMVwiki showing layout, pedagogical templates and referencing (code shown in Appendix A)

Media Wiki allows the user community to add extensions. The following extensions have proved to be useful in a teaching and learning context:

- **SyntaxHighlight GeSHi** allows for syntax highlighted computer code (HTML, JavaScript, and PHP). See Figure 9 and Appendix A for examples.
- **Cite/Cite** allows internal citing and a reference list at the foot of the page. Some manipulation allowed a hybrid numerical/APA style, plus zotero (a Firefox extension) compatibility.
- **Widgets** allows for not only additional multimedia elements to be included, but many Web 2.0 systems to be embedded, such as, Flickr, Google gadgets (used by the iGoogle interface), Google maps and Twitter.
- **Glossary**. This extension allows the creation of a popup “tooltip” to assist students with explanations (or for international students translations) of domain specific words, when the mouse is rolled over the word. (An example is shown in Figure 10.)

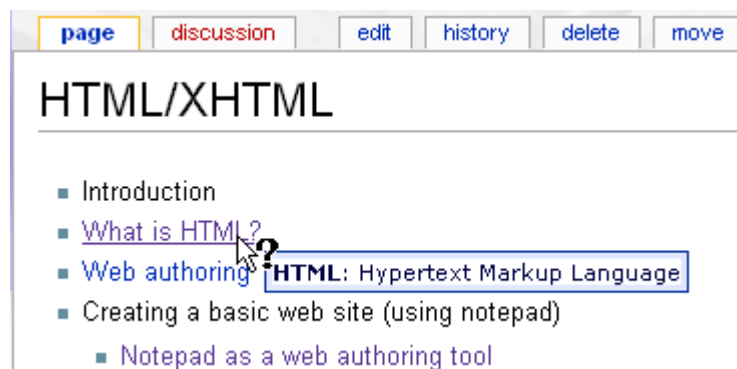


Figure 9: virtualMVwiki - Adding a glossary feature

Delivery

The previous section described how wiki content can be added and identified templates and extensions to enhance Media Wiki for teaching and learning. This section investigates how the wiki prototype was used to deliver, disseminate and interact with the teacher, learner and Web surfer, and is illustrated in Figure 11.

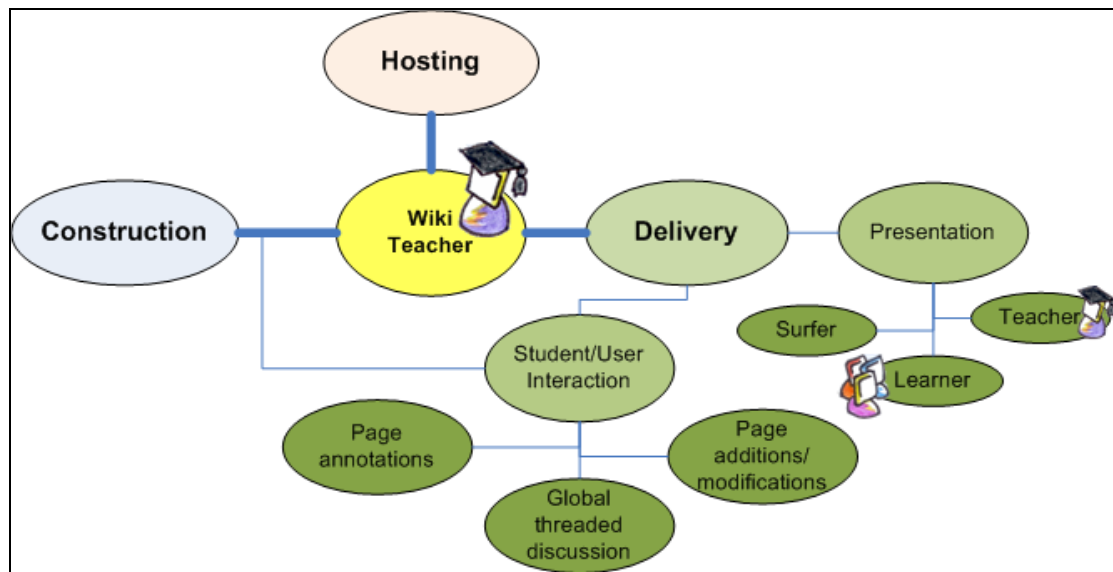


Figure 10: wiki Teacher (Delivery /interaction)

The virtualMVwiki contains a variety of teaching and learning resources, suitable for a variety of different learner modes.

In a face-to-face teaching mode, the lecture is a common technique that a teacher uses to deliver content. How can a wiki be used in this mode?

The first issue is using a wiki to display content in a lecture. This requires the wiki text to be enlarged when shown on a data projector. Fortunately, most web browsers have the facility to enlarge the text and images by using the zoom feature. When displaying in lecture format, a very useful tool is Mark Russinovich's Zoom-it (Russinovich, 2009). Used in conjunction with the wiki, it allows drawing onto the screen using a standard PC.

Developing content suitable for students to follow in a tutorial or computer laboratory setting was similar to developing these resources in other formats. In the virtualMVwiki courses were developed to teach HTML, JavaScript, MySQL and Flash. For Flash, JavaScript and HTML, examples of the result of the code were made available by linking to an external web page.

Where videos were desirable to teach more difficult concepts (some were created for teaching Flash CS4), these were included on a web page linked to the wiki, however, with the addition of the widget extension videos can be uploaded to YouTube and embedded.

User group discussion

One common issue that arose in previous prototypes was the capability to add global comments to content while remaining in context. This can be achieved by using the wiki discussion feature, called wiki talk pages. These are regular wiki pages whose only distinction is that they are associated with a content page. However, there is an extension that significantly enhances their usefulness and usability by adding threading, user signatures, a response mechanism (new, reply, edit) and conversation tracking (Extension: Discussion Threading, 2009). This feature has not yet been added to the virtualMVwiki but is planned for in the future.

Annotations

The ability for students and Web surfers to contribute to the content is a cornerstone of the virtualMe framework. In the custom prototype developed for the virtualMe framework, this was managed via annotations.

As each wiki page is fully editable and can be changed by users, this provides an advanced ability to contribute to the content.

Adding annotations as a threaded discussion which was an important concept in the virtualMe can be achieved in Media Wiki using the Discussion extension (2009). When first investigated in October 2009, a sample of where this extension was used contained spam entries. It appears (December 2009) that there is now the ability to restrict additions by users so this will be investigated as future work.

With regards to spam, the basic wiki page technology appears to be robust, but as a precaution a user id and password was introduced for users who wished to add or modify content in the wiki. So far this has worked well.

Student knowledge construction

An interesting development that evolved from actual use by students of the virtualMVwiki was the capability of students to create a personal wiki off the main wiki. Once a user identifier is created in Media Wiki a persistent link (on every wiki page) to a personal wiki page is created. Using this feature, students were able to create their own wiki pages and so have an online place to store their own personal

observations. The teacher (and any other user of the wiki) can access the user pages. Figure 12 shows a page entered by one of the virtualMVwiki users.

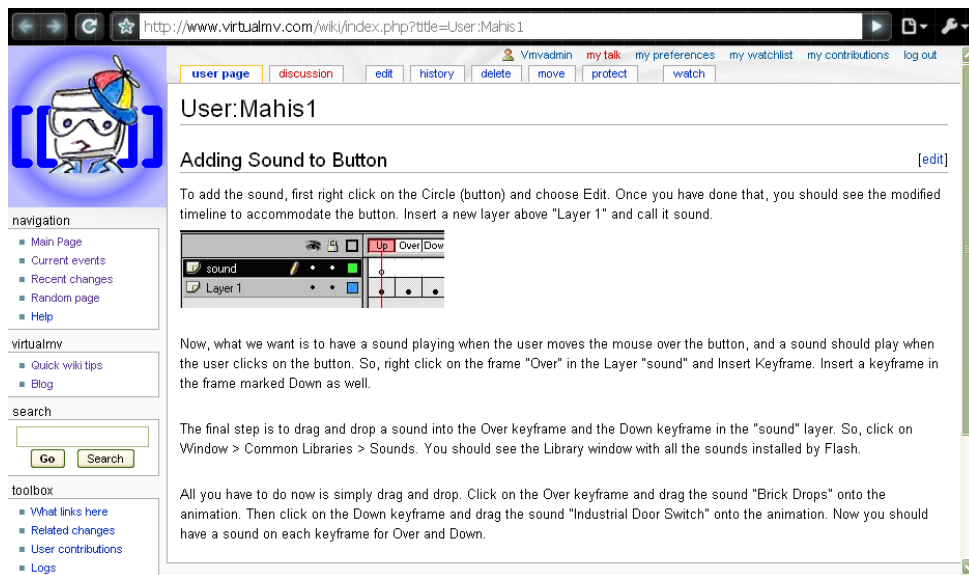


Figure 11: virtualMVwiki. User page

Wiki Teacher architecture

The previous discussion describes the wiki Teacher architecture in three areas: hosting, construction and delivery.

Hosting was categorised as open, corporate, or private. From a research perspective the private hosting option was best as it allows the most freedom to explore ideas.

Construction includes building structures and the actual content creation. Tools and extensions found to be useful for a teaching and learning environment were discussed, and included the ability to be able to connect to Web 2.0 tools such as photo sharing web sites, such as Flickr, and video sharing sites such as YouTube.

Delivery includes how the wiki is used by the teacher, students and other Web surfers. From a teacher perspective the ability to use the content in a lecture or to construct it in such a way as to be usable in tutorials was described. From a student perspective, the ability to view the content independently is a function of placing the wiki on the Internet and allowing it to be publically accessible. There is the capability for students to interact with the content through the ability to maintain a personal wiki notebook, to add comments to a global discussion list, and to use threaded discussion on each page.

Diagrammatically this is represented in Figure 13.

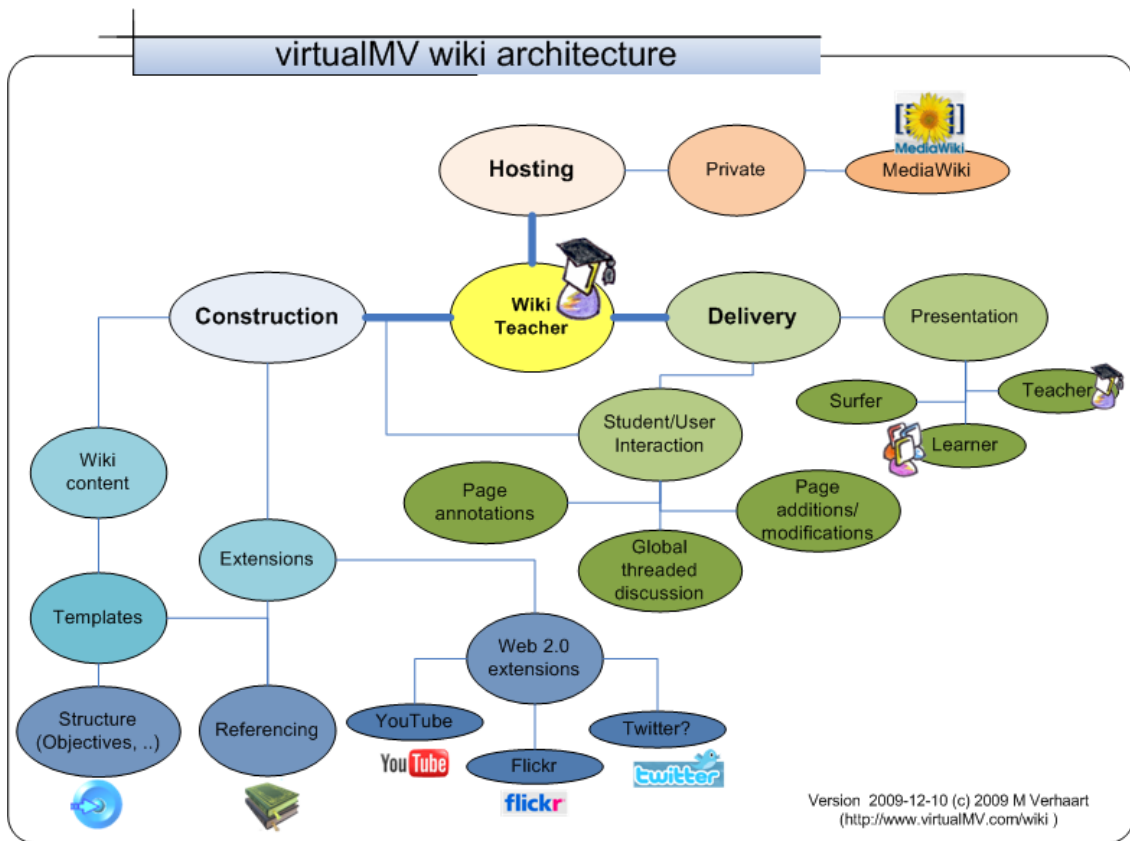


Figure 12: Wiki teacher architecture

Limitations and further development

The work presented in this paper discusses the development of an artifact that will be used in the fourth phase of an action research project. The limitations of this study at present include statistical analysis as to the effectiveness and perceived usefulness of implementing teaching and learning content using the wiki structure. It is planned that formal student feedback will be sought in the future.

At this point the development wiki is still evolving knowledge of what the wiki is capable of expands. The case study concentrated on building an environment suitable for teaching and learning and focused on delivering content and instructional material. Analysing teaching and learning techniques from other educational wikis, such as, WikiEducator, Wikiversity and Wikibooks is also planned, and ideas incorporated into the research wiki.

Wiki extensions are continually being created and enhanced. Some of the extensions identified as candidates for future inclusion include:

- Adding widgets, and exploring their extensive range, including social media extensions
- Adding a global threaded discussion
- Adding threaded discussions to each page

Conclusion

This paper describes the development of a wiki artifact centered on an educator for a teaching and learning environment, and observations about the hosting, construction and delivery were made.

The wiki with extensions was implemented based on the concepts identified in virtualMe framework, and has proved to be capable of many of the features identified as desirable for a teacher centered teaching and learning system.

The research is a continuous work-in-progress – which parallels a wiki philosophy. As the wiki evolves, an understanding of what the wiki is capable will continue to grow, for both the researcher and students. It is hoped that this research will involve others interested in adopting or learning about the technology.

Links

- virtualMVwiki: <http://www.virtualmv.com/wiki/>
- wikispaces: <http://virtualmv.wikispaces.com/>
- WikiEducator: <http://www.wikieducator.org>
- Wikiversity: <http://en.wikiversity.org/>

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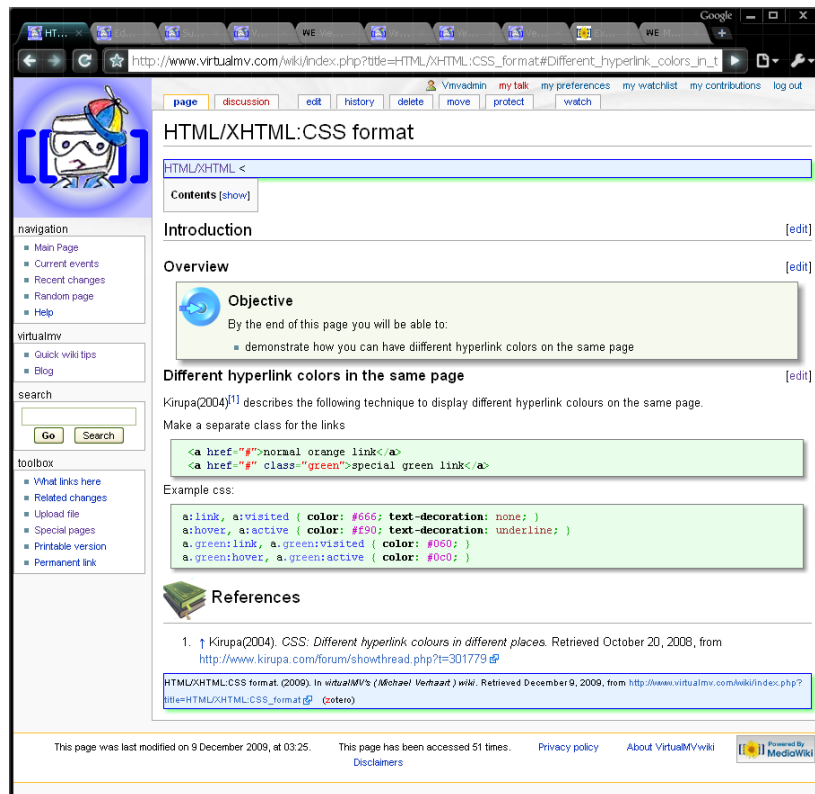
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Appendix A:



was created using the following wiki code.

```
{{ vmv:Header |[[HTML/XHTML]] }}
```

```
==Introduction==
```

```
===Overview===
```

```
{{ vmv:Box|Objective|3|
```

By the end of this page you will be able to:

*demonstrate how you can have different hyperlink colors on the same page

```
}}
```

```
===Different hyperlink colors in the same page ===
```

Kirupa(2004)^{<ref>}Kirupa(2004). "CSS: Different hyperlink colours in different places". Retrieved October 20, 2008, from

<http://www.kirupa.com/forum/showthread.php?t=301779>^{</ref>} describes the following technique to display different hyperlink colours on the same page.

Make a separate class for the links

```
{{ vmv:Source|<source lang="html4strict">
```

```
<a href="#">normal orange link</a>  
<a href="#" class="green">special green link</a>  
</source>}}
```

Example css:

```
{{ vmv:Source|<source lang="css">  
a:link, a:visited { color: #666; text-decoration: none; }  
a:hover, a:active { color: #f90; text-decoration: underline; }  
a.green:link, a.green:visited { color: #060; }  
a.green:hover, a.green:active { color: #0c0; }  
</source>}}
```

```
{{ vmv:FooterAPA}}
```