Learning and Documentation using Wikis : Use Cases from State-of-the-art Engineering Courses

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Introduction

- Wiki has been used as an effective tool for collaboration and sharing information
  - Wikipedia is perhaps the best example for the power of wiki
  - Several other open-source and proprietary wiki software available
  - Many organizations have deployed wikis for various purposes
- (Duffy and Bruns, 2006) detail the possible advantages and applications of wikis in teaching and learning
- We used the NUS wiki
  - Based on the Confluence enterprise wiki
- Teaching state-of-the-art engineering courses poses new and unique challenges which may not be relevant in other disciplines

Duffy, P.D. and Bruns, A., 2006. The use of blogs, wikis and RSS in education: A conversation of possibilities. *Online Learning and Teaching Conference 2006*, Sep. 2006, Brisbane.

Context

- Embedded systems – computer systems which are embedded as part of larger systems
- Technology and tools (hardware and software) in this field undergo fast changes
- Hands-on knowledge is crucial – most embedded systems courses incorporate major laboratory and project components (Hsu and Liu, 2005)
- The rapidly-changing nature of the tools and technology make it challenging to ensure that the students are exposed to the state-of-the-art
- Using a wiki in this context renders several advantages

Hsu, R.C. and Liu, W.C., 2005, June. Project based learning as a pedagogical tool for embedded system education. In *Information Technology: Research and Education, 2005. ITRE 2005. 3rd International Conference on* (pp. 362-366). IEEE.

1. Easier updating of information

- Lab manuals require constant updates to keep pace with the changes in tools
- Bleeding edge nature of the tools -> many students run into problems which the instructor might not have encountered / has a ready solution for
- Not always possible for the instructor to come up with project specifications to cover every scenario
- Wiki makes it possible to disseminate information through a medium which is easily editable and updatable

1. Easier updating of information ...

- For the most part of the past 5 years, wiki was used to create lab manuals for the courses
  - EE2024 Programming for Computer Interfaces (https://wiki.nus.edu.sg/display/ee2024)
  - EE3032 Innovation and Enterprise II (https://wiki.nus.edu.sg/display/ee3032)
  - CG3207 Computer Architecture (https://wiki.nus.edu.sg/display/cg3207)
  - EE4218 Embedded Hardware System Design (https://wiki.nus.edu.sg/display/ee4218)

- All the related files such as sample codes were also provided through the wiki in a form that was easy to access and navigate

2. Encouraging sharing and collaboration

- Wiki allows students to share their solutions to the various issues encountered
  - Certain versions of software might need some configurations before students can get the provided template codes to work
  - To enable students to post issues and work-arounds, edit permissions were granted to students
- Students could also correct any errors they come across in the manuals
  - No need to wait for the teaching staff to do it, edits are instantly visible to others
  - Students can choose to subscribe to edits to any page by anyone
- The wiki page for each lab also has the provision to create threaded discussions
  - Allows for related information and discussions to be on a single page
- Also gives students a sense of ownership of their own learning

3. Easier linking of learning materials to external resources

- Embedded systems courses rely heavily on data-sheets and links to other state of the art publicly available material
  - The use of a wiki makes this easier
- In certain courses such as CG3207, a separate page was maintained for the instructor and students to post links to articles detailing new innovations in the field
- For the EE2024 course, all lecture notes were also disseminated through the wiki
  - All the external information sources linked to the main text appropriately

4. Project documentation

- The capstone project, EE3032, has a strong emphasis on collaborative learning
  - Students work in a group; search for and share information within their groups to conceive and implement a complete product

- Wiki used as platform for project documentation and information sharing in a group
  - Power of wikis in collaborative engineering projects illustrated in (Minocha & Thomas, 2007)

Minocha, S. and Thomas, P.G., 2007. Collaborative learning in a wiki environment: Experiences from a software engineering course. *New Review of Hypermedia and Multimedia*, *13*(2), pp.187-209.

4. Project documentation ...

- Students were given a set of template pages, and they were expected to document and collaborate with their teammates through those pages
  - Permissions such that only team members and instructor has access to the documentation
  - Encourages collaborative learning through active sharing of information within a team
- Allows the instructor to track the progress and contributions of each student (through the version history of each page) and team
  - Helps to give them timely feedback, highlighted by (Trentin, 2009)
- The same wiki was used by the instructor as the medium for information dissemination for the whole class, using pages accessible and editable by all students

Trentin, G., 2009. Using a wiki to evaluate individual contribution to a collaborative learning project. *Journal of computer assisted learning*, *25*(1), pp.43-55.

5. Student generated learning materials

- Wikis can be an effective tool for student-generated content (Wheeler and Yeomans, 2008)

- In the graduate course EE5903 Real-time Systems, wiki was used a tool for creating student-generated learning materials (https://wiki.nus.edu.sg/display/EE5903RTS)

- EE5903 is a graduate course - very important to expose students to the state-of-the-art in real-time scheduling strategies for computers

Wheeler, S., Yeomans, P. and Wheeier, D., 2008. The good, the bad and the wiki: Evaluating student-generated content for collaborative learning. *British journal of educational technology*, *39*(6), pp.987-995.

5. Student generated learning materials ...

- Students were randomly assigned to work on 1 of the 8 scenarios encountered in scheduling (such as heterogeneous multi-processor scheduling, power aware scheduling etc.)

- Individual pages were created for students where they wrote articles on the advances in the respective topic
  - Made available for the entire class after a submission deadline
  - These articles were used in the presentations and discussions in the class so that the entire class benefited from the student-generated learning material

6. Administrative matters

- Some administrative matters, such as signing up for lab evaluations, were done through the wiki itself
- Students could sign up for an evaluation slot by editing the wiki directly
  - Relieves the teaching staff of having to schedule and inform students about their evaluation slots
- It also allows for announcements on updates to be made in a well-structured and formatted manner

Results

- The use of wiki was well received by students
- In almost all the semesters there were constructive edits to the wiki, as well as active discussions
- In CG3207 course, more than 350 comments were posted over the past 5 years
- For EE4218, about 75 comments and discussions materialized in the last semester
- Students in EE2024 were very appreciative of the comprehensiveness of the lecture notes provided through the wiki, based on the qualitative comments in the student feedback

Challenges

- Some students ‘experiment’ with the wiki platform through non-constructive edits
  - Constant monitoring from the teaching staff can ensure such edits can be promptly removed
- The permission settings that need to be set for a group-based activity for a large class could be challenging too
  - These permissions have to be manually set for many wiki pages
- There are limitations on the nature of content that can be posted on a wiki
  - It is difficult to incorporate interactive contents and animations

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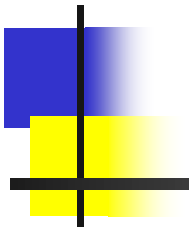

Thank You!

Questions?