Metaknowledge, weblogs and learning mechatronics

Authors:

Gunnar Andersson, Oestfold University College, Sarpsborg, Norway, gunnar.andersson@hiof.no
Bjoern Gitle Hauge, Oestfold University College, Sarpsborg, Norway, bjorn.g.hauge@hiof.no
Sissel Larsen, Oestfold University College, Sarpsborg, Norway, sissel.larsen@hiof.no

Abstract *— We can see a rather dramatic change in engineering education. These changes include how it is delivered, its objectives, and who the students are. Key issues are team cente red, project based learning activities, flexible delivery methods and portfolio assessment. New curriculums evolving are dominated by integrative and holistic approaches to engineering education with early exposure to engineering practice and design. The l earning activities are structured around projects and cases with complex and authentic tasks, objectives, questions and problems. The courses conducted are often designed to attract a wide range of learners, allowing for flexible individual solutions. This implies new educational approaches and tools.*

One important educational approach to engineering education curriculum is the awareness of metaknowledge and how it may increase the quality of learning. Metaknowledge is, simply stated knowledge about knowl edge; the understanding of how to control our personal mental processes.

A tool for implementing the above approach may be a weblog. Weblogs are increasingly popular and seen in a wide range of scenarios; from an individual diary to complex websites open to all (like Slashdot.org). Generally, weblogs are devoted to a special topic (or person/group) that uses a dated log format that is updated frequently with new entries and comments. It can be thought of as developing commentaries on a particular topic. T he popularity may be because the viewer knows that something changes every day and that there is a personal point -of-view in an informal style. There is also (often) an opportunity to collaborate or respond with the authors and other participants.

A resea rch study has reviewed and analyzed a case using weblogs for reflections and discussion on own learning activities. Key objectives in the study are the development and evaluation of educational tools to support reflections and understanding of our personal mental processes.

The review and analysis is based on the course Mechatronics. This is a 25 credits (European Credit Transfer System) multi - disciplinary course based on project based learning and cases. The course is part of the new bachelor program in technological innovation and entrepreneurship run at Oestfold University College (the first of its kind in Norway). The case used in this review is the Robotics -Case. It runs over three phases each of 2 -3 weeks; Introduction, Building/programming and Presen ting.

As part of the ongoing evaluation of the new bachelor course and cases are monitored closely. This is done using surveys, survey feedback discussions and the actual weblogs. This paper review and analyze the course with focus on metaknowledge and th e use of weblog.

Index Terms *— Mechatronics, metaknowledge, project based learning, weblog.*

INTRODUCTION

We can see a rather dramatic change in engineering education. These changes include how it is delivered, its objectives, and who the students are. Key issues are team centered, project based learning activities, flexible delivery methods and portfolio assessment. New curriculums evolving are dominated by integrative and holistic approaches to engineering education with early exposure to engineering practice and design. The learning activities are structured around projects and cases with complex and authentic tasks, objectives, questions and problems. The courses conducted are often designed to attract a wide range of learners, allowing for flexible individual solutions. This implies new educational approaches and tools.

One important educational approach to engineering education curriculum is the awareness of metaknowledge and how it may increase the quality of learning. Metaknowledge is, simply stated knowledge about knowledge; the understanding of how to control our personal mental processes [1].

A tool for implementing the above approach may be a weblog. Weblogs are increasingly popular and seen in a wide range of scenarios; from an individual diary to complex websites open to all (like Slashdot.org). Generally, weblogs are devoted to a special topic (or person/group) that uses a dated log format that is updated frequently with new entries and comments. It can be thought of as developing commentaries on a particular topic. The popularity may be because the viewer knows that something changes every day and that there is a personal point-of-view in an informal style. There is also (often) an opportunity to collaborate or respond with the authors and other participants [2].

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CONTEXT

The review and analysis is based on the course Mechatronics. This is a 25 credits (European Credit Transfer System) multi-disciplinary course based on project based learning and cases. The course is part of the new bachelor program in technological innovation and entrepreneurship run at Oestfold University College (the first of its kind in Norway).

The case used in this review is the Robotics case. It runs over three phases each of 2-3 weeks. In the first phase the student are introduced to the core technology and objectives. This includes programming workshops, design seminars and prototype construction. Phase two is dedicated to the actual building and programming of the robot based on the prototype and ideas derived in phase 1. The students were encouraged to explore the technology and be innovative in both design, software and hardware. Phase three is focused on documentation, reports and presentation of the case. Each student write an individual paper in English based on a conference template and each group present the robot to a international jury with members from finance, business and universities. Both the paper and the presentation are part of the final assessment.

The Blackboard learning management system was used for announcements, course documents, discussion boards, assignments and surveys in this course.

Weblogs were used in several cases but this paper focus on phase 2 in the Robotics case. Writing reflection logs were compulsory in this phase and the surveys biased for our study on using weblogs to support reflections and understanding of our personal mental processes.

TOOLS

Pivot is a tool to create weblogs and other dynamic websites, like weblogs or online journals. Pivot is released under the GPL so it is completely free to use. It is written in PHP, and does not require additional libraries or databases to function [3].

FIGURE 1
A PIVOT BASED EDUCATIONAL WEBLOG.

From the Pivot homepage the following features are listed:

- Sophisticated Categories/Weblogs system, so you can maintain several weblogs and publish your entries how you like;
- Template based. Fully adaptable to your wishes;
- Built in simple search tool.
- Keeps simple statistics of how your visitors came to your site;
- Easy to upload and include pictures with your log-entries;
- Allows for making thumbnails of uploaded images;
- Commentsystem that remembers your visitors (if they wish);
- Automagically creates RSS- and Atom-feeds;
- IP-blocking,to prevent certain people from leaving comments;
- Automagic Archiving by week or month, and/or by category;
- Optionally supports full wysywig editing of your posts (IE5.5+ on windows and Mozilla 1.3+ / FB 0.6+ on all Platforms)
- Supports Textile, both in entries and in comments;
- No external databases are required, just plain PHP. This is to ensure Pivot runs on as much servers as possible.
- Makes valid xhtml, when possible.

Pivot was chosen primary because it is easy to install, support multiple weblogs and is released under the GPL license [4]. Our installation is based on a very simple and inexpensive workstation running Linux.

METHODS

As part of the ongoing evaluation of the new bachelor program every courses and cases are monitored closely. In this case this is done using surveys, survey feedback discussions and the actual weblogs. This paper review and analyze the course with focus on metaknowledge and the use of weblog.

We used Blackboard to create the online survey.

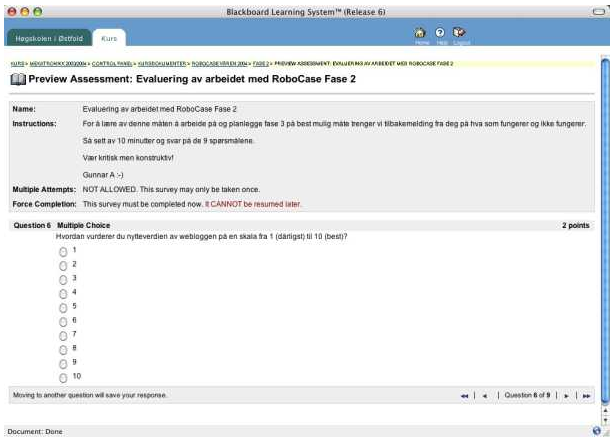

FIGURE 2
MULTIPLE CHOICE QUESTION FROM THE ONLINE SURVEY.

Immediate after the survey deadline and an initial analyze of the responses we posted a survey summary on the course pages. Comments and corrections on the summary were encouraged (but not compulsory) and guided to a dedicated discussion board. The server statistics were collected using the statistics and administration services provided in the weblog software.

From the server statistics we get an overview on the usage of the weblogs in the different teams. From the survey responses we get the students evaluations and experiences using the weblogs. And finally from the survey summary discussions we may reveal any misconceptions and errors in the initial analysis on using weblogs for reflections and discussion on own learning activities.

RESULTS

The server statistics on entries and comments in the different weblogs are summarized in Table 1.

Weblog	Entries	Comments	Exclusive entries	Exclusive Comments	Entries v. comments ratio
Common	63	43	21	22	0,95
Alfa1	32	32	11	10	1,1
Gamma3	24	22	3	0	-
Gold4	31	26	10	4	2,5
Juno5	29	26	8	4	2,0
Sword6	31	25	10	3	3,3

TABLE 1
WEBLOG ENITRIES AND COMMENTS.

The exclusive entries made by the teams themselves are especially useful to characterize the different teams activity as shown in Figure 3.

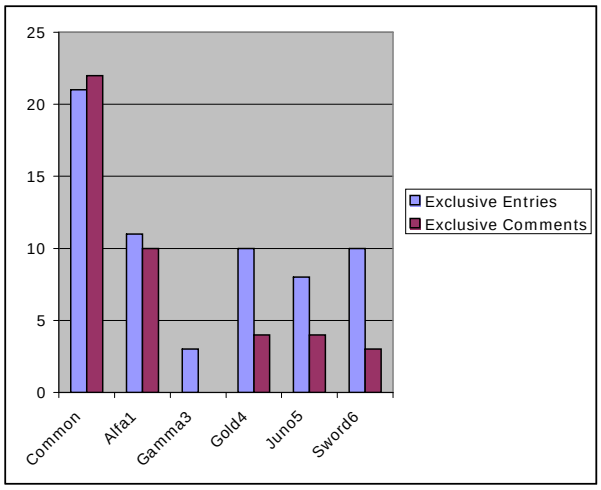

FIGURE 3
WEBLOG ENTRIES AND COMMENTS.

The survey responses statistics on using weblogs for reflections and discussion on own learning activities are shown in Table 2.

Survey	Due Date	Attempts	Total Questions	Essay Questions	Multiple choice Questions
Robotics Phase 2 Evaluation	April 30	23	9	5	4

TABLE 2
SURVEY STATISTICS.

Student responses on different essay questions (translated from Norwegian by the authours) from the survey summary:

"That we were alloved to work without intervention from the teachers, but they were avalaible f or guidance when we needed them. We learned a lot."

"I am surprised we achieved so much that we did."

"Our creativity was allowed to thrive."

"We could set our own time plan and organize the work in our own way."

"Not to much resourcefulness in the te am at times. Little interest in the other team members tasks and how they were solved."

"The weblog worked and made it easier to manage work logs. It makes it possible to see what the other groups do and think and use this to solve own problems."

"I thin k it is positive with feedback from the other teams. Strengthen the collaboration."

Student responses on different multiple choice questions from the survey summary are presented in Table 3.

#	Question	Distribution	Average	Comments
6	What is your evaluation of the utilitarian value of using weblogs on a scale from 1 (poor) to 10 (best)	1 to 9	5,5	
7	What is your evaluation of own contributions on a scale from 1 (poor) to 10 (best)	4 to 9	7,3	A small decrease from phase 1 (7,7)
8	What is your evaluation of the information before and during phase 2 on a scale from 1 (poor) to 10 (best)	3 to 9	6,8	A small decrease from phase 1 (5,5)
9	What is your evaluation of the implementation and guidance from the teachers on a scale from 1 (poor) to 10 (best)	4 to 10	7,9	A small increase from phase 1 (7,0)

TABLE 3
SURVEY SUMMARY.

There were very few comments and corrections on the summary when presented to the students in the dedicated discussion board or in the classroom.

DISCUSSION

The above results raise several questions.

- Do the number of entries reflect the quality of the teams weblog?
- Do the entries versus comments ratio reflect the quality of the teams weblog?
- Have the students understood the difference on a pure descriptive log and a log to support reflection and understanding of mental processes.
- How should we interpret the distribution from 1 to 9 on the evaluation of the utilitarian value of using weblogs?
- What success criteria can be found among the different teams weblogs?
- Is it possible to support reflections and understanding of our personal mental processes in a team environment? (Should the weblogs be individual?)

The weblogs analyzed cover three weeks of fulltime work. The ideal (?) could be one entry for each day to sum up the work done. Another possibility could be one entry for each task done. Anyway a number below 9 entries (three each week) for a team may be regarded as to little to reflect in depth on complex issues like metaknowledge. Two of five groups are below this limit.

The entries versus comments ratio reflect how the other teams or outsiders react on the entries. This make it a poor measure for the quality of the teams weblog although it is a key parameter for how interesting the entries are regarded outside the team.

From the essay questions it look like some of the students have regarded the weblogs in a pure descriptive perspective. If not conclusive the survey implies misconceptions on the objectives of the use of weblogs.

As in the discussion on the misconceptions the distribution from 1 to 9 and average of 5,5 on the evaluation question indicates doubts among the students. Do they evaluate different aspects?

The last question to discuss on the analysis is more fundamental. Is it possible to reflect on personal mental processes in a team environment? Our initial answer was yes and still we think this answer may be valid. Reading different reflections may start the process of this difficult and demanding task. Using individual weblogs raises many new and maybe bigger challenges, for instance the amount of reading necessary to keep updated on the other students work.

CONCLUSION

We think and increased understanding of metaknowledge may increase the quality of learning. We also think using weblogs is one possible way of doing this, but our initial experiences implies changes in the way we may use it. We have to address the problem of possible misconceptions and be more expressed in definitions, objectives and goals. This may be done using diagnostic tests and introductory seminars on the concept of metaknowledge.

We should also consider objectives indicating the number of entries and comments anticipated in the weblogs.

REFERENCES

[1] URL: *http://www3.sympatico.ca/lgrightmire/META.HTM*

[2] URL: *http://whatis.techtarget.com/definit ion/0,,sid9_gci213547,00.html*

[3] URL: *http://www.pivotlog.net/*

[4] URL: *http://www.opensource.org/docs/definition.php*