

USING WIKIS TO FOSTER COLLABORATIVE WRITING: EXPLORING INFLUENCING FACTORS TO SUCCESSFUL IMPLEMENTATION

Said Hadjerrouit

University of Agder

Serviceboks 422, 4604 Kristiansand, Norway

ABSTRACT

Wiki technology provides new opportunities to foster collaborative learning in various educational settings. To empirically examine the impact of wikis on learning, this article explores students' collaborative writing activities performed on MediaWiki. The activities were analyzed using a taxonomy with ten categories (clarify content, add content, delete content, add link, delete link, fix link, grammar, spelling, style/typography, and formatting). The work also analyses students' comments posted on the discussion page of the wiki. The results show important differences in the types of contributions across the categories investigated. The results also reveal that the level of collaboration and discussion was relatively low compared with other activities performed on the wiki. Finally, the article suggests a number of factors influencing wiki-based collaborative writing in teacher education.

KEYWORDS

Collaboration, collaborative learning, collaborative writing, MediaWiki, wiki.

1. INTRODUCTION

With the emergence of wiki technology, opportunities for fostering group interaction and participation are greatly enhanced. Combined with the collaborative learning theory and the socio-constructivist view of the learning process, wikis are increasingly becoming potentially powerful tools to foster collaboration among participants (Caple & Bogle, 2011; Grant, 2009; Li & Zhu, 2011; Tetard, Packalen & Patokorpi, 2009; Thomas, King, & Minocha, 2009). Wikis offer possibilities for teachers and learners to collaborate on joint assignments and collective writing tasks. They enable active participation of contributors by editing and revising each other's writings, and hence contributing to the sharing of knowledge and collective development of wikis. However, although teachers and students are encouraged to exploit the possibilities offered by wikis in their practices, they may not be confident or experienced in supporting collaborative writing, or adapt the technology to the characteristics of the learners and target audience. This paper reports on a study that focuses on wiki technology as a tool for collaborative writing in teacher education. The overall aim is to assess the activities carried out on the wikis by means of the history function that tracks all students' contributions. Particular attention was devoted to students editing one another's contributions. The activities are analyzed quantitatively using a taxonomy proposed by Pfeil, Zaphiris, and Ang (2006). The work also analyses students' comments posted on the discussion page of the wiki. Finally, influencing factors are discussed to exploit the opportunities offered by wiki technology to foster collaborative writing in teacher education.

2. BACKGROUND

2.1 Wiki Technology

This work used one of the most popular wiki platforms – MediaWiki - to perform collaborative writing activities (Kasemvilas, & Olfman, 2009). MediaWiki uses a simplified HTML language and provides an extensive functionality for user authentication (Su & Beaumont, 2010). Another important functionality of MediaWiki is the history function that keeps track of students' edits by name, date, and colour coding (Lund & Smørðal, 2006). In addition, MediaWiki provides a discussion page for reflecting on the wiki content.

2.2 Collaborative Writing

Collaboration is an activity that enables participants to accomplish a task collectively (Ta-Elhasid & Meishar-Tal, 2007; Witney & Smallbone, 2011). Wikis offer a new way to work collaboratively by creating collective content, and as such, they facilitate collaborative writing and group discussion. Collaborative writing is a coordinated activity that enables participants to edit and revise each other's contribution to the wiki task (Chao & Lo, 2009; Meishar-Tal & Gorsky, 2010; Trentin, 2009; Witney & Smallbone, 2011), as opposed to simply splitting up the task, work independently of each other, and then assemble individual contributions to a final wiki. Collaboration is grounded in the social-constructivist learning theory (Vygotsky, 1978), and assumes that participants can achieve more in terms of learning benefits than individuals.

2.3 A Taxonomy to Analyze Students' Actions Performed on Wikis

Taxonomies have been proposed in the research literature to classify and analyze collaborative writing activities performed on wikis (Meishar-Tal & Gorsky, 2010; Pfeil, Zaphiris, & Ang, 2006). The taxonomy used in this paper draws on the one developed by (Pfeil, Zaphiris, & Ang, 2006). This included originally 13 categories, of which the following 10 were identified as important for this work (Table 1).

Table 1. Taxonomy and categorization of activities (Pfeil, Zaphiris, & Ang, 2006, pp. 101).

Category	Explanation
Add Information	Addition of topic-related information (the information must not consist only of links).
Add Link	Addition of links to an existing set of listed links or linking of a word within an existing sentence to a page (links to other Wikipedia pages or to external Internet pages).
Clarify Information	Rewording of existing information without adding new information. Rewording done in order to clarify the content (e.g., substitution of certain words for a better understanding, change of the word order or deletion/addition of words in order to clarify).
Delete Information	Deletion of topic-related information (the information must not consist only of links).
Delete Link	Deletion of links from the set of listed links or removal of the linking function from a word within an existing sentence (links to other Wikipedia pages or to external Internet pages).
Fix Link	Modification of an existing link (can be an alteration of the linked URL or the name of the link).
Format	Contributions that affect the appearance or structure of the whole page (e.g., addition of space lines, sorting/moving of paragraphs or links and addition of subtitles in order to structure the content).
Grammar	Alterations of the grammar (e.g., change of punctuation).
Spelling	Correction of spelling mistakes (e.g., reversed letters or capital letter).
Style/Typography	Contributions that affect the presentation/appearance of the text (e.g., bold/italic/underlined text).

2.4 Related Work

Most research work on wiki reports on students' perceptions of collaborative learning and writing by means of qualitative methods. A number of researchers (Arnold et al., 2009; Britcliffe, & Walker, 2007; Cole 2009; Ebner et al., 2008; Minocha & Thomas, 2007; Karasavvidis, 2010; Lund & Smørdal, 2006) reported that students do not collaborate when they use wiki and rarely edit each other's contributions. Several hypotheses were raised to explain the low level of collaboration: limited student contribution, reluctance and resistance to use wiki, dominant learning paradigm, problem of ownership, lack of appropriate pedagogy, etc. In addition, according to Pifarre and Fisher (2011), there is relatively little research on successful implementations of wikis supporting collaborative writing. In quantitative terms, a small but growing number of studies have recently drawn on the data log generated by the history function of wikis. Hadjerrouit (2011) reported that most students do not collaborate when they use wiki to edit collective documents. Instead, they focused mostly on adding content to existing pages and technical aspects. Similarly, Hadjerrouit (2012) highlighted the problems and difficulties of using wikis to edit each other's contributions. Leung and Chu (2009) also reported that students worked individually most of the time, and edited each other's contributions if necessary. Likewise, Judd, Kennedy, & Cropper (2010) provided evidence against a general tendency to collaborative writing. In some contrast, Meishar-Tal and Gorsky (2010) indicated that adding text was carried by a large majority of students, but the percentage of editorial changes was higher than adding sentences, because the students were required to edit each other's work.

3. METHODOLOGY

3.1 Objective

This work aims at exploring the extent to which students collaborated to perform wiki projects associated with collaborative writing in teacher education. The work focuses particularly on students editing each other's contributions to the wikis and comments posted on the discussion page.

3.2 Participants

An eight-week wiki project was introduced in a Web 2.0 technology course. The participants were 16 students divided into 6 groups of 2 to 4. None of the students were experienced wiki-based collaborative writing. Some possessed good technical skills, and some had background in pedagogy. The wiki topics were chosen by the students themselves. The specificities and technical features of wikis were introduced to the students during the first week of the projects. Lectures on collaborative writing were given in the following two weeks. The students were required to submit their wikis for continuous supervision.

3.3 Learning and Assessment Goals

To perform collaborative writing using MediaWiki, the teacher provided a set of three learning goals. First, the wikis should follow general usability criteria such as technical layout, formatting, and style. Second, the wikis must contain information of good quality, without linguistic, grammar, and spelling errors. The content should draw on recent curricular development, and include study material that is well structured with heading and subheading, images, tables, lists, and references. Third, the wikis should be self-explaining, and offer information that is relevant to the target audience. Some of these tasks could be done individually, for example adding or deleting content. However, developing an overall wiki requires collaborative work such as arguing, discussing, and reflecting on the content through editing each other's contributions, adapting the language to the needs of the target audience, designing an overall structure of the wiki, and making cross-linking. Given these requirements, the students were encouraged to edit each other's contributions, and take actively part in discussion. Finally, in line with the wiki philosophy based on collaborations, the students were not assessed individually, but as a group working collaboratively. Nevertheless, the history function can be used to look at the students' individual contributions to the wiki.

3.4 Data Collection and Analysis Methods

The work used both quantitative and qualitative methods. Firstly, the total number of actions per group and category, including their frequencies were collected and analyzed, such as whether the action was an addition, deletion or modification of content; addition, deletion, or fixation of a link; formatting, spelling, style, or grammar etc. Secondly, the comments raised in the discussion page were categorized by increased level of criticality, and analyzed both quantitatively in terms of number of comments, and qualitatively in terms of quality of the comments provided.

4. RESULTS

This section describes the results achieved in terms of actions carried out on the wiki across the categories investigated, and students' comments posted on the discussion page. Contribution to collaborative writing and discussion is also assessed.

4.1 Contribution to Collaborative Writing

Table 2 shows the frequency of actions that fell under each of the 10 categories investigated. The total number of actions was 2856, which means an average of 178.5 actions per student ($n = 16$). Note that a single edit may involve several actions, for example a student could add content and delete a link. In this case, both actions in the categories *add content* and *delete link* were recorded. The table reveals that the most important category performed on the wiki in terms of average frequency relative to the total number of actions was formatting, followed by addition of content and links, clarification of content and fixing of links, deletion of content, style/typography, deletion of links, spelling, and finally grammar. In terms of clarifying content, and thus editing each other's contribution, two subcategories can be distinguished: a student clarifying his/her own content, which is not the focus of this work, and clarifying each other's content, which is the main concern of this study. The statistics does not indicate the frequency of each subcategory. However, even if all actions associated with clarifying content fell under the second subcategory, which is the best possible scenario, the average frequency of 12.04 % cannot be considered as high compared with the percentages achieved for formatting, addition of content and links. This is the case of four groups (1, 2, 5, and 6), where the average frequency for clarifying content is lower than 12.04 %, and group 4 with a slightly higher frequency (14.93 %). The only exception is group 3 that achieved a percentage of 23.79 %, which in itself cannot be regarded as very high. Considering these frequencies as the best possible results that can be achieved, it can be implied that only a few actions fell under the category *clarify content* by editing each other's contributions.

Table 2. Types of actions in each category in terms of frequencies and total number of actions in ascending order.

Category	Group 1	Group 2	Group 3	Group 4	Group 5	Group 6	Total no. of actions per category	Frequency of actions in %
Formatting	155	113	80	163	109	48	668	23.39 %
Add content	65	51	81	259	89	44	589	20.62 %
Add link	79	36	136	119	82	53	505	17.68 %
Clarify content	24	21	114	138	44	3	344	12.04 %
Fix link	69	8	20	68	39	17	221	7.73 %
Delete content	24	19	18	86	35	25	207	7.25 %
Style/Typography	33	9	6	19	38	29	134	4.69 %
Delete link	23	0	5	29	14	6	77	2.70 %
Spelling	13	7	8	29	6	5	68	2.39 %
Grammar	3	3	11	14	9	3	43	1.51 %
Total no. of actions per group	448	260	479	924	465	233	2856	100 %
No. of students per group	2	3	4	2	3	2	$n = 16$	

4.2 Contribution to Discussion

A detailed analysis of the comments posted on the discussion page showed that the students made comments on a range of issues. Following (Su & Beaumont, 2010), the content of the comments were analyzed and categorized by increased level of criticality (Table 3):

- Comments on technical issues of the wiki
- Comments on the wiki content
- Comments on collaborative writing

Table 3. Comments posted on the wikis derived from a content analysis.

Level of criticality	Categories	No. of comments per category	Frequency in %
Low	Comments on technical layout, structure, formatting, images, tables, lists, paragraphs, headings, subpages.	106	55.21 %
Middle	Comments on content, proof reading, corrections, references, linking, wiki length.	74	38.54 %
High	Comments on reflections related to usefulness of information, critical review of literature, adaption of language to target audience, editing each other' content	12	6.25 %
Total no. of comments		192	100 %

Most comments were posted the last two-three weeks before the project deadline. Otherwise it was difficult to follow the discussion threads of the respective wikis, because the date of contribution or/and name of contributor were missing. As the table shows, most comments were low-level criticality comments (55.21%). These related mostly to technical layout, such as insertion and placing of tables and figures, formatting of headings and subheadings, etc. Middle-level criticality comments related mostly to addition or deletion of content or links, corrections, wiki length, etc. Finally, high-level criticality comments were associated with critical issues of the wiki content, such as usefulness of information sources and study material used to design the wiki. Only one student emphasized the need to work collaboratively. None of the students discussed the issue of how to adapt the language to the characteristics of the target audience.

There were several comments with low-level criticality, of which the following are representative:

Now we have nice images and I think there are enough. We can probably insert a picture or two to the section on (...).

Fixed a positioning of images, but I am still not particularly happy (...). Need some more lists to meet the requirement. Suggestions would be appreciated.

The following were typical comments associated with middle criticality:

We have to at least make sure that none of the links are "empty". We now have about 3000 words (...). Thus, 1000 words are still missing. Any suggestions on what we can write more detailed?

I guess today we will deliver the wiki, so we have to get it done. Who takes care of creating tables? I thought I was writing the page about (...), and proofread the entire wiki. We also need to arrange the reference list.

There were few high-level criticality comments. The following illustrates the type of students' comment:

The next will probably be that we meet and work collaboratively with the wiki, do you agree?

Considering that the category with a high-level of criticality is the one that requires most collaboration in terms of reflection and critical discussions, it can be asserted that the level of collaboration was rather low. This is in accord with the results achieved for the categories of actions carried out on the wikis. In addition, the number of comments (192) is very low compared with the number of actions (2856), which means an average score of only one comment per 14.87 actions.

5. DISCUSSION

5.1 Summary of Results

As the results clearly show (Table 2) the most frequent action was formatting, followed by adding content and links. Clarifying each other's content was an action that the students did not carry out much. As a result, collaboration among participants was rather low compared with the frequencies of other actions. This is confirmed by the comments posted on the discussion page (Table 3).

5.2 Factors affecting Collaborative Writing

Although the students were encouraged to edit each other's work, and reflect on their ideas and concerns, the results indicate that they preferred to focus more on formatting, technical layout, addition of content, or making links to pages than collaboration. In spite of the fact that some issues were discussed face-to-face or by means of traditional communication channels, there is little evidence that the students identified gaps in their knowledge by reflecting on the content of the wikis by means of literature review and adapting the content to the characteristics of the target audience. In addition, most discussions happened the last two-three weeks before the project deadline. Likewise, the history function also shows that all group worked much as the deadline approached, approximately two weeks before the delivery of the wiki projects. This is in accord with previous research indicating the students' tendency to postpone much of their work until just before the deadline (Judd, Kennedy, & Cropper, 2010; Leung & Chu, 2009; Meishar-Tal & Gorsky, 2010). This behavior somehow undermined the students' opportunities to fully collaborate, edit each other's contributions, and discuss with their peers. A possible explanation is that the students were more concerned about passing the course, while doing as little work as possible than learning collaboratively. The fact that they mentioned several times the length of the wiki, the linking of words, uploading of images, insertion of tables, and technical layout, is an indication that the students were more concerned about passing the course than critically evaluating their knowledge. However, this is not the only explanation for low collaboration.

Adapting the content to the characteristics of the users was an important requirement, but this issue was not raised in the discussion page. This is confirmed by the final wiki products, which failed to thoroughly address this issue. Indeed, the analysis of the wikis shows that the students did not identify gaps in their knowledge in order to make the wikis more relevant and attractive to the users. Rather, the students focused more on selecting content from Wikipedia and other Web sites than reflecting on their knowledge. Adapting the content to the characteristics of the target audience is a demanding task that requires knowledge about the reliability and usefulness of information sources, including central facts and concepts of the topic, and how to connect them to foster meaningful understanding. It is obvious that this issue requires drafting, rephrasing, and reworking the language recursively until it fits the needs of the target audience. In addition, an acceptable level of language proficiency needs to be taken into account (Li & Zhu, 2011). In turn, drafting and reworking the wiki content cannot be done properly without editing each other's contributions. Another explication raised by (Grant, 2009) is that students do not perceive their wikis as an authentic activity that requires an authentic audience. They think that their wikis will not continue after the end of the project. As a result, combined with the importance of grades, the most important audience for them is their teacher.

Grant (2009), in line with the results of previous research work (Elgort et al., 2008; Forte & Bruckman, 2007; Lund & Smørðal, 2006), also suggests that students appear to use practices of individualised written work they were accustomed, rather than collaborating to realize shared knowledge, particularly in the absence of collaboration models to draw on. The wiki history function seems to confirm the view that students tended to approach the writing task more individually than collaboratively by splitting up the wiki task into subtasks, not only in the very beginning of the project, which is reasonable and understandable, but also throughout the entire project period. This behaviour may be explained by the fact that collaborative writing is more challenging in terms of cognitive efforts, active participation, group interactions, and time management than just splitting up the wiki task into subtasks, working individually without collaborating, and finally putting all the subtasks together to create a final wiki (Hadjerrouit, 2011).

Another possible explanation may be the assessment form being used (Harsell, 2010; Tetard, Packalen, & Patokorpi, 2009). Since the students were not assessed individually, but as a group working collaboratively to achieve a common goal, students tended to focus more on the final wiki product than the collaborative

process. As a result, the students did not consider editing each other's contributions as useful or desirable, and they preferred more individual work than collaboration. Nevertheless, wikis offer a possibility to assess individual contributions by means of the history function, which records all students' activities, particularly when they are required to demonstrate regular contributions and discussion (Grant, 2009, Harsell, 2010). However, being aware of the usefulness of the history function to assess individual contributions may not automatically facilitate collaboration, if students are not able to develop effective collaborative and discussion strategies.

Finally, usability obstacles of wiki technologies may disrupt the students' learning experience (Minocha & Thomas, 2007). Likewise, the absence of a WYSIWYG editor may prevent students from fully using wiki for project collaboration (Chao, 2007). As a consequence, although students are positive when they use wikis, they are reluctant to fully collaborate, in accordance with several previous research studies. However, for Selwyn (Cited in Grant (2009)) collaboration is less a technological problem than a cultural and pedagogical issue. Focusing on removing technological barriers to realizing wiki potentialities is a "reductionist thinking equivalent to technological determinism" (Grant, 2009, p. 113). As a result, it appears that while wikis might support group work, collaborative writing is not reducible to the technology. Rather the role of the teacher, the nature of the task, time management, motivation, assessment, pedagogy, and technology integration are crucial elements in encouraging students to work more collaboratively (Caple & Bogle, 2011; Lund & Smørðal, 2006, Tay & Allen, 2011).

6. CONCLUSIONS

Although this work has its limitations, because of the small sample size ($n = 16$) and short duration of the wiki projects (8 weeks), it can serve as a basis for further explorations in wiki-based collaborative writing. Given these considerations, some conclusions can be drawn. Firstly, the results are in line with research that reports on students' reluctance to edit each other's contributions to the wikis. Secondly, the history function of the wiki provides an excellent research tool to analyze students' contributions using an appropriate taxonomy of activity categories (Judd, Kennedy, & Cropper, 2010; Meishar-Tal & Gorsky, 2010; Pifarre & Fisher, 2011). Finally, factors influencing collaborative writing are identified. These need to be considered by teacher educators to successfully exploit the potentialities of wikis to foster collaborative writing. In future work, a longitudinal study will be undertaken to explore students' collaborative writing activities over a period of three years to confirm the results of this work. Future research will also be undertaken with a larger population of students to strengthen the validity and reliability of the results.

REFERENCES

- Arnold, N., Docate, L. and Kost, C., 2009. Collaborative Writing in Wikis. In: Lomicka, L. and Lord, G. (Eds.). *The Next Generation: Social Networking and Online Collaboration in Foreign Language Learning. CALICO Monograph*, Vol. 8, pp. 115–114.
- Britcliffe, W. and Walker, R., 2007. Making Wikis Work: How Do We Create the Conditions for Effective Collaborative Learning? In: *ALT-C 2007*. Nottingham, UK, 4–6 September, pp. 91–92.
- Caple H. and Bogle, M., 2011. Making Group Assessment Transparent: What Wikis Can Contribute to Collaborative Projects. *Assessment & Evaluation in Higher Education*, iFirst Article, pp. 1-13.
- Chao, J., 2007. Student Project Collaboration Using Wikis. *Proceedings of the 20th Conference on Software Engineering Education and Training (CSEE&T)*. Dublin, Ireland, pp. 255-261. Washington, DC: IEEE Press.
- Chao, Y-C.J. and Lo, H-C., 2009. Students' Perceptions of Wiki-Based Collaborative Writing for Learners of English as a Foreign Language. *Interactive Learning Environments*, iFirst Article, pp. 1–17.
- Cole, M., 2009. Using Wiki Technology to Support Student Engagement: Lessons from the Trenches. *Computer & Education*, Vol. 52, pp. 141-146.
- Ebner, M., Kikckmeier-Rust, M. and Holzinger, A., 2008. Utilizing Wiki-Systems in Higher Education Classes: A Chance for Universal Access? *Universal Access in the Information Society*, Vol. 7, pp. 199–207.
- Elgort, I., Smith, A.G. and Toland, J., 2008. Is Wiki an Effective Platform for Group Course Work? *Australian Journal of Educational Technology*, Vol. 24, No. 2, pp. 195–210.

- Forte, A. and Bruckman, A., 2006. Constructing Task: Wiki as a Toolkit for (Collaborative?) Learning. *Proceedings of the 2007 International Symposium on Wikis*. Montreal, Quebec, Canada, 2007, ACM, pp. 31–42.
- Grant, L., 2009. 'I don't Care Do Our Own Page!' A Case Study of Using Wikis for Collaborative Work in a UK Secondary School. *Learning, Media, and Technology*, Vol. 34, No. 2, pp. 105-117.
- Hadjerrouit, S., 2012. Using Wikis for Collaborative Learning: Critical Evaluation and Recommendations. *Proceedings of IADIS International Conference on e-Society 2012*. Berlin, Germany, 10-13 March 2012, pp. 91-98.
- Hadjerrouit, S., 2011. Collaborative Writing with Wikis: Evaluating Students' Contributions. *Proceedings of the IADIS International Conference on Cognition and Exploratory Learning in the Digital Age (CELDA 2011)*. Rio de Janeiro, 6-8 November 2011, Brazil, pp. 173-180.
- Harsell, D. M., 2010. Wikis in the Classroom: Faculty and Student Perspective. *Journal of Political Science Education*, Vol. 6, No. 3, pp. 310-314.
- Judd, T., Kennedy, G. and Cropper, S., 2010. Using Wikis for Collaborative Learning: Assessing Collaboration through Contribution. *Australasian Journal of Educational Technology*, Vol. 26, No. 3, pp. 341-354.
- Karasavvidis, I., 2010. Wiki Uses in Higher Education: Exploring Barriers to Successful Implementation. *Interactive Learning Environments*, Vol. 18, No. 3, pp. 219-231.
- Kasemvilas, S. and Olfman, L., 2009. Design Alternatives for a MediaWiki to Support Collaborative Writing. *Journal of Information, Information Technology, and Organizations*, Vol. 4, pp. 87–104.
- Li, M. and Zhu, W., 2011. Patterns of Computer-Mediated Interaction in Small Writing Groups Using Wikis. *Computer Assisted Language Learning*, iFirst Article, pp. 1-22.
- Leung, K. and Chu, S. K.W., 2009. Using Wikis for Collaborative Learning: A Case Study of an Undergraduate Students' Group Project in Hong Kong. Available online: http://www.ickm2009.org/snews/upload/ickm_2009
- Lund, A. and Smørdal, O. 2006. Is there a Space for the Teacher in a Wiki? *Proceedings of WikiSym'06*, August 21–23, 2006, Odense, Denmark, pp. 27–45.
- Meishar-Tal, H. and Gorsky, P., 2010. Wikis: What Students Do and Do not Do When Writing Collaboratively. *The Journal of Open and Distance Learning*, Vol. 25, No. 11, pp. 25-35.
- 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*, Vol. 13, No. 2, pp. 187-209.
- Pifarré, M. and Fisher, R., 2011. Breaking up the Writing Process: How Wikis Can Support Understanding the Composition and Revision Strategies of Young Writers. *Language and Education*, Vol. 25, No. 5, pp. 451-466.
- Pfeil, U., Zaphiris, P. and Ang, C.S., 2006. Cultural Differences in Collaborative Authoring of Wikipedia. *Journal of Computer-Mediated Communication*, Vol. 12, No. 1, pp. 88–113.
- Selwyn, N., 2008. Developing the Technological Imagination: Theorising the Social Shaping and Consequences of New Technologies. In: Livingstone, S. (2008). *Theorising the Benefits of New Technology for Youth: Controversies of Learning and Development*. London/Oxford: London School of Economics/University of Oxford.
- Su, F. and Beaumont, C., 2010. Evaluating the Use of a Wiki for Collaborative Learning. *Innovations in Education and Teaching International*, Vol. 47, pp. 417-431.
- Tay, E. and Allen, M., 2011. Designing Social Media into University Learning: Technology of Collaboration or Collaboration of Technology. *Educational Media International*, Vol. 48, No. 3, pp. 151-163.
- Tal-Elhasid, E. and Meishar-Tal, H., 2006. Models for Activities, Collaboration and Assessment in Wiki in Academic Courses. Available online: http://www.biu.ac.il/bar-e-learn/eden2007/tal_tal.doc
- Tetard, F., Patokorpi, E. and Packalen, K., 2009. Using Wikis to Support Constructivist Learning: A Case Study in University Education Settings. *Proceedings of the 42nd Hawaii International Conference on System Sciences*, pp. 1–10.
- Thomas, P., King, D. and Minocha, S., 2009. The Effective Use of a Simple Wiki to Support Collaborative Learning Activities. *Computer Science Education*, Vol. 19, No. 4, pp. 293-313.
- Trentin, G., 2008. Using a Wiki to Evaluate Individual Contribution to a Collaborative Learning Project. *Journal of Computers Assisted Learning*, Vol. 25, pp. 43-55.
- Vygotsky, L.S., 1978. *Mind and Society: The Development of Higher Mental Processes*. Cambridge, MA, Harvard University Press.
- Witney, D. and Smallbone, T., 2011. Wiki Work: Can Using Wikis Enhance Student Collaboration for Group Assignment Task? *Innovations in Education and Teaching International*, Vol. 48, No. 1, pp. 101-110.