A Qualitative Study of Collaborative Learning in a Wikibook project: Implications for Design and Implementation

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Abstract

Wikis, when used as an open editing tool, can have profound and subtle effects on students’ collaborative learning processes. Do students feel comfortable editing each others’ wiki articles? How are collaborative learning outcomes impacted when students communicate using wikis? This study addressed these issues using qualitative methods, including multiple semi-structured interviews and student reflective journals for analysis. The findings challenge idealistic hypotheses that wiki work, without careful design and implementation, is naturally beneficial. It was also found that collaborative writing and learning were the exception rather than the norm among participants. It is recommended that instructors provide highly supportive learning experiences to teach students how to use wikis and how to work collaboratively when implementing wikis to maximize the benefits of this emerging tool.

Introduction

Wikis have been lauded in the literature as being an ideal tool for collaborative learning because learners are able to write, edit, version, and discuss next to the content. According to Holmes, et al. (2001) theory of communal constructivism, wikis can be used to move learners toward a state of communal constructivism, where students and teachers are not simply engaged in developing their own information but actively involved in creating knowledge that will benefit others, hence, constructing knowledge for the community, not just the self.

Given the promise of wikis for open editing and collaborative learning, the question remains: do students take full advantage of the collaborative features inherent in wikis, which are not available in e-mail and discussion boards? Many authors have discussed the functionality of wikis (Désilets, Paquet, & Vinson, 2005; Fuchs-Kittowski & Köhler, 2005; Schaffert, et al. 2006); however, little explicit attention has been paid to the human interactions surrounding students’ use of the collaborative features of wikis to maximize learning outcomes. How do students interact, communicate, and collaborate to achieve learning goals in wikis?

This study addressed the need for empirical evidence regarding student interactions when working collaboratively in a wiki by qualitatively exploring the evolving phases of using wikis to complete class assignments. The purpose of this study was to investigate 1) how students communicated in wikis, 2) students experiences in writing and editing collaboratively in an open writing environment, and 3) if students learned collaboratively.

Review of the Literature

Computer-Mediated Collaborative Learning

Brandon and Hollingshead (1999, p. 54) defined collaborative learning as “an activity that is undertaken by equal partners who work jointly on the same problem rather than on different components of the problem.” Moallem (2003, p. 84) stated that “While learning is ultimately an individual enterprise, the support of a group with a common learning objective can produce a synergistic facilitation of learning by
each member of that group.” Similarly, Holmes, et al. (2001, p. 1) considered that collaborative learning
was “an approach to learning in which students not only construct their own knowledge as a result of
interaction with their environment but are also actively engaged in the process of constructing knowledge
for their learning community.” A meta-analysis (Johnson, Johnson, & Smith, 1991) of the comparative
effects of collaborative learning and individual learning concluded that college students improved their
higher order thinking skills such as reasoning, idea generation and solutions, more in a collaborative
environment than working solo.

With the increased use of the Internet in educational settings, computer-mediated collaborative
learning has attracted much attention. Computer-mediated collaborative learning takes advantages of
Internet resources and online communication tools (e.g., discussion board, e-mail, conferencing systems,
videoconferencing, and chat rooms) to facilitate communication and collaboration. In such environments,
students can access sufficient and just-in-time resources, reorganize their thinking, present new forms of
knowledge, and be exposed to multiple views from groups (Uribe, Klein, & Sullivan, 2003).

Empirical studies that have investigated the effectiveness of computer-mediated collaborative learning
in classrooms have proliferated in the literature. A meta-analysis (Lou, Abramín, & d’Apollonia, 2001)
study examined 122 studies and found that small groups learning with technology outperformed individuals
learning with technology. In addition, researchers examined whether certain instructional methods worked
effectively in a computer-mediated environment. Johnson and Chung (1999), Mergendoller et al. (2000),
and Uribe, Klein, and Sullivan (2003) found that computer-mediated environments were not only suitable
for project-based learning but also contributed to higher order learning. Similarly, Jonassen, Previs, Christy,
and Stavrulaki (1999) and Murphy and Collins (1997) investigated whether using case studies in a
collaborative environment helped learning transfer from a face-to-face environment to computer-mediated
environment. Their results support the hypothesis that case studies work well in a computer-mediated
environment and enhance higher order learning.

The social dimensions of learning at a distance have also been investigated and were found to be vital
to learning, and yet often the missing element in distance education courses (Berge, 1999; Moore &
Kearsley, 1995; Spitzer, 2001). These authors argued that if online interaction is not an integrated and
expected component of online learning, students probably will not use the available communication tools.

In general, research has provided evidence that a computer-mediated environment supports
collaborative learning and enhances learning outcomes. Along these lines, educators place greater
expectations on the potential role of wikis as a recent computer-mediated communication tool to enhance
collaborative learning in education than the research can support.

**Pedagogical Claims of Wikis**

Wikis have been credited with increasing democracy within groups by focusing on the community
rather than the individual, thus, increasing students’ skills in collaborative work (Holmes, et al., 2001).
Collaboration is considered beneficial because learners must consider multiple perspectives, can rely on
each other to reduce uncertainty during complicated activities, and increases participation in the learning
activity. By using wikis, students’ learning is extended over time, across collective environments and
people, and through open-natured projects that create public goods (Ciffolilli, 2003). Wikis have the
potential to maximize writing, reflecting, reviewing, and witnessing cumulative results (Fountain, 2005;
Hammond, 2005). Fuchs-Kittowski and Köhler (2005, p. 2) reported that wikis support “cooperative
community knowledge generation” by allowing users to create and maintain a “community knowledge
base, offering a quick, simple way to produce and review information that can be gathered and linked to
other wiki pages.”

While researchers and educators laud the use of wikis for supporting collaborative and inquiry-based
learning (Engstrom & Jewett, 2005), improving critical thinking skills, and “empowerment of the
individual in terms of life-long learning” (Freeman, Holmes & Tangney, 2001, p. 1271), little empirical
research has been conducted to test the pedagogical promise of wikis (Edwards, 2002; Freeman, Holmes &
Tangney, 2001; Hammond, 2002). The majority of the literature surrounding the use of wikis in
educational settings is based on “speculative and aspirational stances rather than strong theoretical or

Applications of Wiki in Classrooms

Engstrom and Jewett (2005) studied 400 students with 11 teachers who used wikis for an inquiry-based
project in a professional development teacher-preparation program. They found that students posted and
edited insufficiently in their small research groups, which primarily reflected surface-level learning in the
inquiry process and that the teachers did not model or facilitate an exchange of ideas, questions, or provide
feedback to students required to build wiki pages. The study suggested that project developers model the
wiki practice that prompts interaction, critical thinking, and thinking from multiple perspectives. Wang et
al. (2005) investigated students’ editing behavior and their performance in wiki. They explored the effects
of students’ frequency of editing usage in wikis on their final exam performance and found that students
with low usage on the wiki performed better than those with high wiki usage on the final exam.

Other studies investigated factors such as online environment and anonymous writing that affected
effective collaboration. Bold (2006) incorporated wiki in a Master’s online courses to support
collaboration. Although the study did not survey students on wiki use specifically, it investigated whether
the use of wiki facilitated online interaction. The study indicated that wiki put students in charge of jointly
posting, editing, reporting, maintaining work without burdening individual students as project coordination.
In this manner, students reported that the use of wiki increased their sense of connection in the online
setting. Chong & Yamamoto (2006) investigated a group of 20 people who had not met prior to the study,
yet felt comfortable in exchanging ideas in a wikis writing project. Their study suggested that anonymous
writing gave students’ a private space, therefore, collaboration between strangers could facilitate
independent thinking, clear understanding of the team members, thus contributed to high quality outputs.

Hewitt and Peters (2006) asked their 15 students to construct wiki pages on an array of topics in a
graduate-level distance education course. They found that the students considered building a knowledge
base in a wiki project was not only an authentic task for themselves but also a value-added activity to future
classes. Coutinho and Bottentuit (2007) asked 16 students in a Master’s program to build an enormous
collaborative repository that could help future students with their dissertation. Their findings were
inclusive. On the one hand, students enjoyed working with they group. On the other hand, they did not
think team work has a better quality or helped them learn more than if they worked by themselves.
Similarly, Plowman (2007) provided his students with a wiki environment where they built a social justice
forum. Through the very interactive forum, the participants went through the circle of construction –
deconstruction – reconstruction several times so that their knowledge building experience was not linear. In
contrast, Blank, et al. (2004) reported students’ territorial needs prevented true collaborative work in a wiki
environment.

These studies lay the groundwork for this study, which addressed the gap in the literature regarding
how students communicated, whether communication affected their wiki writing, and whether the potential
of wikis – effective collaborative learning – had been achieved.

Methodology

Context of the Study

The study was situated in a graduate level course about adult education, offered at a major land-grant
university in the mid-west. The instructor built the shell for a wikibook using Mediawiki® software
(www.mediawiki.org) and posted it online, purposefully public and accessible.

Students (n=5) were required to write four articles using wiki as the writing and presentation tool.
Students were to work individually on two chapters, collaboratively on two chapters, and were asked to edit
another student’s article for the fifth assignment. In addition, students were given a detailed rubric for
completing the assignments along with face-to-face instruction about the project. Students could create a
chapter under the instructor-defined headings or create a new article. Moreover, the teams were assigned by
the instructor to increase heterogeneity in regard to culture, age, and discipline. The instructor met with
student teams weekly to access progress and cohesiveness of the team.

Instrumentation

An original semi-structured interview protocol was created and reviewed by three researchers.
Interview questions were developed based on Holmes et al. (2001) theory of communal constructivism.

Data Collection

Data were collected from four sources: the contents of the wiki, student interviews, students’ weekly
reflective journals, and meeting notes taken by the researchers in the classroom. Specifically, a total of
eight interviews were conducted face-to-face, three of which were team interviews after two collaborative
wiki articles were completed. The rest of the interviews were conducted one-on-one after students
submitted their individually created wiki articles and finished the edits of one wiki article created by others.
In addition, meeting notes taken by the instructor and the researchers as well as students’ reflective
journaling of their learning experiences were also part of the data set and were analyzed qualitatively.

Validity, Reliability and Objectivity

To ensure the reliability and accuracy of the findings, the researchers followed Lincoln and Guba’s
(1985) framework of trustworthiness. Internal validity was achieved by insuring congruence between the
findings and reality. A synthesis of each interview was prepared and sent to all the participants for content
verification (member checking the data). In addition, multiple interviews were conducted and served to
verify previous statements (triangulation). External validity was achieved by transferability of research
findings to other situations. Thick (detailed) description of structures and processes were revealed by the
data and articulated for adaptation (audit trials).

Reliability, or replication of research findings is not a goal of qualitative studies, but detailed field
notes and memos were maintained throughout the process and serve as an audit trial to verify findings. In
addition, students’ reflective journals were collected and analyzed for triangulation purposes. Objectivity
was achieved by creating a research team (course instructor and external interviewer and researcher) for
peer examinations purposes. Data management and transcribing process were carefully maintained.
Interviews were transcribed verbatim, and write-ups of process notes and interview summaries were
documented and verified by the research team.

Results

Phase 1: Exploration (A Crisis of Authority)

Communication. The participants indicated that using an open editing tool such as wiki was difficult at
the beginning of the project because it challenged their notions of group work. The primary difficulty
involved ineffective communication within the group such as not knowing what to communicate to each
other, frequency of communication, or how to use the wiki discussion board to communicate with.
Participants 1 noted, (Excerpt 1) “the first chapter was chaotic. We had the technology problems because
things wouldn’t get posted in time, and because we didn’t know how to post it. We had to view the
discussion board and there was a lack of communication because we weren’t all on the same page.”
Participant 2 said (Excerpt 2) “at first it was hard to get it right. I didn’t know how to write [in the wiki].”

A lack of communication resulted in students doing separate work for a supposedly collaborative
project. Participant 1 said (Excerpt 3) “for the first group project, our group didn’t communicate as much as
we should have. When we got together, we just showed everybody our work.” Participant 6 said (Excerpt
4) “I can just do the chapter on Word, but to put it in the wiki format. It took a while for me to know [how
to use the wiki].” Thus, students created work individually, then put their writing together at the end of the project rather than the idealized co-writing that leads to improved critical thinking.

*Writing. When asked about the impact of writing in the wiki in terms of increasing learning outcomes participant 1 said (Excerpt 5), “when developing this chapter, I’m not sure I learned a lot. It was mostly compiling all the information we had learned over the semester into a practical and usable format.” When asked if they felt comfortable about changing and editing other students’ work, all the participants were unanimous. They all said “not really” after the first project was completed. Participant 3 said (Excerpt 6) “I don’t know if I would like to change another person’s work. I could do some editing, but I would want to go over things with them first. I figure that I should go to the individual person quietly first [before editing].” When asked further what made them uncomfortable, participant 1 stated, (Excerpt 7) “because it’s their work, because it’s their tasks, and you’ve been taught to work on your own work. And it’s hard to kick that habit.”

The participants’ comments indicate that they were hesitant in editing others’ articles when the project began. The discomfort resulted from a feeling of a lack of ownership in the article and they needed time to explore feelings prior to editing, indicating a crisis of authority in co-creating a joint article. Students saw the assignment as pieces of a pie to be delegated and reassembled after the fact, rather than a whole pie in which they would all take credit for.

*Collaboration* Compared with first generation web tools such as e-mail and discussion boards, wikis are considered superior second generation web-based social tools because of the increased capacity for collaborative work. Collaboration; however, did not occur in the first phase of the project where students were asked to co-write an article in wiki. Rather, students divided the assignment into smaller parts, completed their part, and cut and paste the article together after it was written individually. The wiki was used as a presentation tool rather than as a writing tool and the results were awkward at best. Participant 1 said (Excerpt 8), “at first, I didn’t really want to use wiki. It really intimidated me, and so I did everything outside of it and just cut and paste [my finished article into wiki]. Participant 6 notes that (Excerpt 9) “you can feel the rough transition between each part [because it was created as separate pieces and merged at the end]. There’s not a good flow in the chapter.”

None of the students had used a wiki prior to this assignment. During the early phase of the assignment the participants had difficulty communicating with each other in a timely manner. The participants also felt high anxiety and uncertainty about authorship issues and feared editing their classmate’s work, even when they knew it was unacceptable. The students felt territorial about their work and respected the boundaries of other’s work when presenting their content in the wiki. The wiki was not used as a collaborative writing tool. These findings do not support the literature that wiki encourages team writing and editing.

*Phase 2: Adaptation (A Crisis of Relationship)*

*Communication* After the first wiki article was submitted and the work was found to be of poor quality, the instructor provided more guided instruction on how to co-write in wiki, including using the discussion board for communication. New teams were established and a new article was required. Participants began to communicate with their team members more effectively. The discussion board feature in wiki was adopted by the teams as well as face-to-face meetings. Participant 1 stated that appropriate communication with the discussion board in wiki increased her comfort level with her peers. She said (Excerpt 10) “I think that not being familiar with what to do was really what came at the beginning, not being comfortable. Once we used the discussion board on wiki to communicate, we all got on the same page. I think basically my comfort level [with using wiki] made a big difference.” Participant 6 described how communication took place in her group and how it affected the relationship among team members (Excerpt 11). “We had to be sure that we had at least two meetings for the team. First of all, we had to work well with each other. It’s their timing and my timing. It’s like any group project, how to fit and how to work well with the team to get a good product.”
The first article gave students experience in working in teams and working in wiki. The second article allowed students to practice communication skills, both face-to-face and using the wiki discussion board. It is argued that such communication helped enhance the relationships among the team members. The improved communication positively affected students’ writing quality.

**Writing** Students moved from experiencing high anxiety and uncertainty in the first article to improved communication and relationships in the second article. Participant 2 explained, (Excerpt 12) “at first it was hard to get it. As I’ve gotten better at it, I like it more.”

When asked about territorial boundaries when using the wiki as a collaborative writing tool, participant 1 said (Excerpt 13) “if I changed a whole bunch [of text on the article], I posted something about it on discussion board. If they didn’t like it, they could change it. It didn’t matter really.” Participant 1 continued to explain (Excerpt 14), “I think you are more inclined to edit everybody’s work on the wikis. It’s just there on the screen so I think the project would be a little bit better quality when it was in the wiki [because of open editing].” Participant 6 described the pleasant connection when seeing wiki projects when searching Google. She said (Excerpt 15), “now, when I go to any search on Google and find wikis, I feel that is something I know. So it is nice for me. It is always nice to know more.” A better writing experience with wiki emerged during the second article assignment due to increased skill in using wiki and more explicit expectations regarding the quality of the articles.

**Collaboration.** Participants continued to test and adjusted their relationship with their peers when working on the second article. In this manner, they became more familiar with using wiki and the collaborative writing process. They reported an improved experience with communication, writing, and collaboration. Participant 4 said (Excerpt 16), “the first time, I had a hard time. After that I got some information from my team members, I learned and I started to like [using wiki].” Participant 1 said (Excerpt 17) “not understanding the wiki, we wanted to get everything situated before we posted it. I guess it's just the mentality that when you post it on there and that's the final product, so you get it done. As we've learned more about wikis, we're able to do everything in wikis.” These comments indicate that when communication channels open, writing is less stressful as collaboration was improved by knowing how to use wiki more effectively.

**Phase 3: Collaboration (A Resolution of Crisis)**

**Communication.** During the course of the semester students were asked to write four wiki articles, two solo and two in teams. The researchers documented that the participants’ communication moved from minimal, either via e-mail or discussion board on wiki to maximum communication via the wiki discussion board and face-to-face meetings. Once students learned how to use the wiki, how to edit and co-write, and how to communicate with each other more effectively they enjoyed using the wiki to complete the course assignments. Participant 4 said (Excerpt 18), “we don’t spend all the time talking, but totally collaborative writing. We can exchange our writing through e-mail or via wiki. We have talked a lot on the discussion board about what we are going to do, what our views are, and what categories we want to write our stuff in. I think that’s collaborative.”

Participants 6 and 5 compared communicating via the discussion board in wikis with e-mail and Blackboard® discussion board. Participant 6 said (Excerpt 19), “we used the discussion board in wiki, it was like we are online and we can do it faster than email.” Participant 5 said (Excerpt 20), “comparing with wiki, Blackboard®, the course management system, just has the discussion function. It’s just like talking in class. You can’t really go back and change your answers. With wikis, however, you can keep adding to it.”

As identified by the participants, communicating with the discussion board on wiki became not only an addition to face-to-face meetings, but also an integral part to the group assignments.

**Writing** As a result of smoother communications, participants resolved the crisis of authorship and relationship, which was observed in the initial phases. Two participants summarized their writing experience from the first project to the last. Participant 6 said (Excerpt 21), “after doing 5 chapters in Wiki, I'm confident to add and write [in wikis].” Participant 3 said (Excerpt 22), “With the first article, it really
intimidated me so I did everything outside of it and just cut and paste. The second article I got more in the wiki and started typing in the actual wiki. I did a lot more in the third article. So it was just a matter of getting comfortable using the system, a big thing that I think affects whether you like it or not. I’ve enjoyed it as I’ve learned more.”

At the end of the course participants were asked if they felt comfortable editing others’ work. Participant 1 said (Excerpt 23), “editing has become interesting to do. Editing someone else’s work was not hard in the wiki. I didn’t feel it was another’s work; it was just a web page that I felt I could add something to.” The participants indicated that they felt confident about writing and editing in wiki. To this end, wiki helped them gain a deeper understanding of the article topic.

Collaboration Given the promise of wikis for open editing and collaborative learning, the researchers continued to investigate whether the students took full advantage of the wiki to learn personally and collaboratively. Participant 3 said (Excerpt 24), “I think that it’s really better than in class because it actually forces you to choose a research topic. I think I learned a lot better because you are actually forced to go out there and search for materials and then by letting your classmates know via wikis.” Participant 6 compared the unique collaborating experience in wiki with other tools such as encyclopedias. She said (Excerpt 25), “the idea of cooperation in wiki allows everybody else to read it online, and they are welcome to edit it. No other encyclopedias have this feature.”

Two participants pointed out that group collaboration helped generate ideas and enhance creativity. In addition, it was mentioned that different viewpoints and backgrounds were beneficial for the learning. Participant 1 said (Excerpt 26), “in the group you’re going to have more ideas because you have more people, different viewpoints, and different backgrounds. I think I tend to be less creative working on a project individually. I don't spend as much time generating ideas. I just go with what I know.” Participant 5 said (Excerpt 27) “I thought it was great to see people from different backgrounds. It added new ideas.”

The results suggest that using wiki as a collaborative tool became more productive and constructive for the participants over time as they learned how to use wiki and the elements of a high quality article. The findings enrich discussions in the literature that wikis can be used to move learners toward a state of communal constructivism, where participants are not simply engaged in developing their own information but actively involved in creating knowledge that will benefit others (Holmes, et al., 2001). If the initial phases of using wiki as a collaborative tool are underrepresented in the literature, the last phase began to unearth the promise of writing in an open environment constructively.

Discussions

This study reported that when writing and editing wiki articles collaboratively, students experienced a crisis of authority and feared editing their peer’s work, even when the same grade was assigned to every member of the team, regardless of individual effort. This situation was especially evident during the initial phase of creating and editing a wiki article.

At first, the participants were not comfortable communicating and writing in wiki. In particular, they felt uncomfortable editing their peers’ articles in that they believed their peers had devoted a tremendous amount of time and effort on a particular topic while they did not. They experienced a crisis of authority. They indicated that until they did their own reading and became very familiar with the material, they should not edit other’s work to ensure individual accountability of their editing. As indicated by the students, this crisis of authority in the first phase directly resulted from not knowing the functionality of the wiki tools and a lack of effective communication among team members. Not surprisingly, little collaboration occurred in phase 1; adjustment was dominant.

In the second phase, as the participants overcame the functionality of wiki, communication increased. Free editing behavior increased but it was not common. In fact, the participants were not comfortable editing their peers’ articles before they knew their team members’ working styles, reaction to interdependence, and attitudes on territorial limits. They experienced a crisis of relationship. In this phase, communication was improved, collaborative writing in wikis was visible, and collaborative learning emerged.
In the third phase, once trust and rapport were established within the student teams, the frequency of communication and co-writing increased. Positive interdependence occurred rapidly. Students experienced a resolution of crisis. Furthermore, the participants indicated that they usually would consult with the original author of the wiki chapters to ensure that the changes were pertinent and value-added, add a crisis of negotiation. At this phase, they positively viewed writing in wikis as pair-share, peer-teaching, and peer-collaboration, which aligns with the promise that wikis hold for enhancing collaborative learning.

In summary, students’ communication and writing changed over the life of the course. The idealistic hypotheses that wiki work is naturally beneficial and contributes to collaborative learning did not occur. Instead, students worked through the crisis of authority and relationship, to resolution through negotiation. Such changes were influenced by their estimation of territorial boundaries and interpersonal interactions while working in small teams. The following session reflects on the design and implementation practices of using wikis in this course.

Implications for Design and Implementation

Wikis are a new computer-mediated communication tool that holds much promise for collaborative writing projects in the educational setting. Even though students may have been exposed to other tools such as email, blogs, course management systems, and e-portfolios, we found that they experienced a steep learning curve and did work effectively on the first wiki article assignment. The learning curve included technical operation of the software as well as knowing how to truly write collaboratively (Brandon & Hollingshead, 1999). Our students were anxious and uncertain about editing others’ writing initially, and required a paradigm shift to overcome a crisis of authority.

Consistent with the literature on using wikis (McKay & Headley, 2007; Qian, 2007), we suggest that the instructors design a practice article at the beginning of the course to teach students how to use the software and to encourage re-writing others’ text. Many wikis contain a sandbox, but further coaching may be necessary to resolve the crisis of authority among groups who have been long taught to not interfere with other’s work. A practice article will not only allow students to become familiar with wiki functionality, but will model the practice of interacting with peers on the wiki. Instructors are also encouraged to model collaborative writing to prompt students’ critical thinking and decision-making skills (Engstrom & Jewett, 2005).

Repeated wiki assignments were also necessary to obtain the benefits of collaborative writing in wiki. This course required five articles, 4 original (2 solo, 2 in teams), and 1 edited. The benefits of using wiki as a collaborative writing tool were not realized until the third or fourth article assignment. It is recommended that instructors use several wiki assignments to reinforce the skills of collaborative writing infused with feedback on quality expectations of the articles.

As more educators explore and adopt the use of Wikis, we hope that this study lays the groundwork for further study on team editing behavior to advance the artifact evaluation of human interactions within a wiki environment, other than its technical interaction. As Perkins, a pioneering thinker about computers as learning tools, concluded, the importance of innovative technologies is not “what you can do that you could not before,” rather, the important question to ask is “what difference will computers really make” to a person’s higher-order thinking skills such as decision making, reflection, reasoning, problem solving, and peer collaboration (Perkins, 1986, p. 11).
References


