

Systematic Literature Review regarding Communication Support in Project-Based Learning of Software Development

Yutsuki Miyashita
Graduate School of Education
Tokyo Gakugei University
Tokyo, JAPAN

Takafumi Tanaka
Graduate School of Engineering
Tokyo University of Agriculture and
Technology
Tokyo, JAPAN

Atsuo Hazeyama
Department of Information Science
Tokyo Gakugei University
Tokyo, JAPAN
hazeyama@u-gakugei.ac.jp

Abstract—Project Based Learning targeted at software development (SD-PBL) has been paid attention to as a practical education method. A number of studies regarding communication support in SD-PBL have been conducted. However, systematic review in the field does not exist as far as we know. Therefore, this paper conducts systematic literature review regarding communication support in SD-PBL and shows current trends. We find this research field has been actively conducted since 2011, in addition, more studies used existing tools rather than developed original tools, in particular, Learning Management Systems were used. On the other hand, no used software engineering tools like contemporary popular GitHub and Slack combination.

Keywords—Software development PBL, communication support, systematic literature review

I. INTRODUCTION

Project Based Learning targeted at software development (hereafter we describe it as SD-PBL) has been paid attention to as a practical education method in the field of information technology [1]. It is said that learners can learn not only the software process but also communication and/or problem solving skills by participating in PBL [1]. It is indispensable for communications in PBL to deal with understanding of anxiety about project and building relationships to encourage and/or support colleagues as well as information exchanges about project [2]. Thus far, a number of studies regarding communication support in SD-PBL have been conducted. However, systematic review in the field does not exist as far as we know. Therefore, this paper conducts “Systematic Literature Review (Hereafter we describe it as SLR)” regarding communication support in SD-PBL, shows current trends, and discusses future directions.

The remainder of this paper is organized as follows. Section II describes a research method. Section III shows the results for research questions we set. Section IV concludes this paper.

II. RESEARCH METHOD

This study adopts SLR as a research method. SLR is a method to clarify criteria of literature selection for research questions (RQs) and to conduct literature survey in an

exhaustive and reproducible manner [3]. This paper follows a guideline to conduct SLR [4].

A. Research questions

We set the following research questions for communication support in SD-PBL. We clarify how active this field is and what kind of tools support communication in SD-PBL.

RQ1 How actively are papers regarding communication support of SD-PBL published?

We focus on the number of papers published in each year to answer this question.

RQ2 What kind of tools are used for supporting communication in SD-PBL?

As technologies evolve, communication support tools change. We set sub-questions to this question as follows:

- a) Are original tools developed or are existing tools used?
- b) When existing tools are used, what tools are used?

B. Selection of the database

We use SCOPUS which is a large-scale database for literature retrieval [5].

C. Execution of retrieval

We collected papers based on the following retrieval equation: ("software engineering" OR "software development") AND ("Computer-Supported Collaborative Learning" OR "project based learning") AND communication.

As the result, we got 42 papers.

D. Determination of the inclusion/exclusion criteria

We set the following inclusion/exclusion criteria:

Inclusion criteria

- Studies focused on communication in SD-PBL
- Refereed papers written in English and published in international journals or international conferences

Exclusion criteria

- Studies that do not focus on communication in SD-PBL
- Survey papers
- Papers that were not refereed and were not appeared in international journals or international conferences
- Papers that were not written in English

We finally obtained twenty papers by applying these criteria to 42 papers and conducted literature review to these twenty papers.

E. Analysis procedure

We analyze twenty papers by the following procedure:

- 1) The papers are downloaded and shared among the authors
- 2) The first author prepares a sheet to record the analysis results of each paper for the research questions
- 3) The papers to be analyzed are assigned to the authors. They read the assigned papers and record the results for each RQ
- 4) The first author merges three sheets and we answer the research questions.

III. RESULTS AND DISCUSSIONS

This section describes results for RQs and discussions.

RQ1: Fig. 1 shows the number of papers published each year. From this figure, we find two papers on the communication support in SD-PBL were published before 2011, on the other hand, eighteen papers were published after 2011 on this topic. This research field has been actively conducted since 2011.

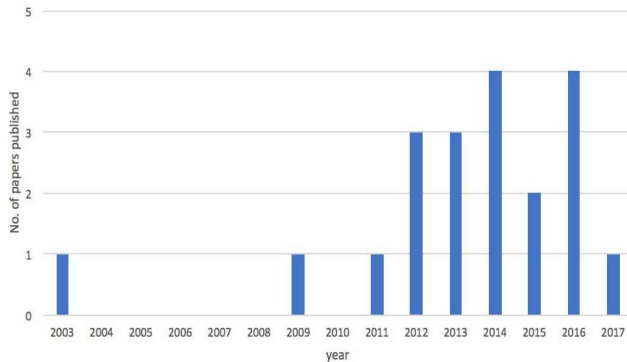


Fig. 1. Transition of papers published for the theme of this paper.

RQ2: Thirteen papers referred to some communication support tool out of twenty papers. Seven papers did not refer to communication support tools.

a) Two papers reported development of original communication support tool. For example, Giraldo et al. applied “Human Computer Interaction” approaches that include “Information Architecture” and “Interaction Design” to construct an effective CSCL environment that promotes exchanges among learners in the practice of distributed software engineering CSCL [6]. Eleven papers reported to use existing tools.

b) Fig. 2 shows a result of classification of communication support tools in SD-PBL. Learning Management Systems (LMS) were used most (seven papers). LMS provides asynchronous communication functions such as forum, e-mail, file sharing, wiki, discussions, and so on as well as synchronous communication functions such as chat and/or meeting. Open source software such as “OLAT,” “Sakai,”

“Moodle,” “OSBLE” is used. On the other hand, one paper reported to use a tool used in software engineering, that is, “Redmine.” No reported to use contemporary popular tools “Github” and “Slack” combination. This result shows tools developed in the education technology like LMS tend to be used more than software engineering tools in SD-PBL. One paper reported to use Social Networking Service (SNS), it used “Facebook.” No reported to use other SNS.

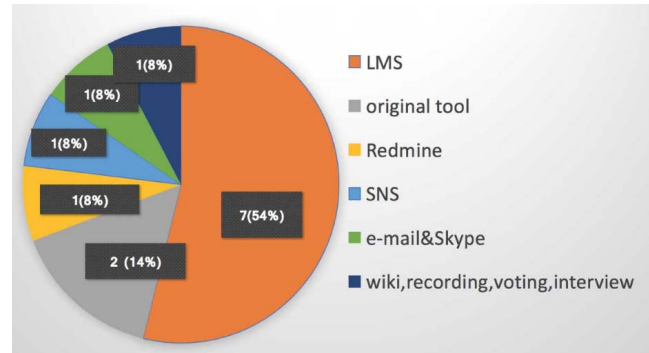


Fig. 2. Result of classification of communication support tools.

IV. CONCLUSION

This paper has shown the result of SLR regarding communication support in SD-PBL. We found this research field has been actively conducted since 2011. We also found more studies used existing tools than developed original tools, especially LMS were used. On the other hand, few used software engineering tools. Effective communication support using contemporary popular software engineering environments should be explored.

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