USING DISTRIBUTED SOFTWARE DEVELOPMENT IN THE IMPROVEMENT OF COMMUNICATION AND COLLABORATION SKILLS IN SE COURSES: AN OBSERVATIONAL STUDY

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Motivation

• The software industry needs practitioners technically qualified and that have skills such as: communication and collaboration skills.

• Training these skills during Software Engineering courses can represent a cost reduction in training programs in industrial environment.
Research Question

How can we stimulate the development of communication and collaboration skills during Software Engineering courses?
Alternatives to develop communication and collaboration skills

- Using practical projects from real environments:
  - Skills are developed through practical projects [Dawson 2000];

- One growing industrial scenario is Distributed Software Development - DSD
Distributed Software Development - DSD

- A **development strategy** in which the software development teams are **geographically dispersed** [Richardson et al. 2007].
Why choose DSD to improve skills?

• The use of DSD stimulates the adoption of new practices of communication and collaboration [Begel and Naggapan 2008].

• Almeida et al. [2012] reported a teaching experience using DSD and, according to their perception, the students enrolled in the project improved the communication and collaboration skills.

• Moreover, in a previous work, with students from the South of Brazil, the subjects reported a significant improvement in their skills including communication and collaboration [Prikladnicki 2011].
DSD in the classroom can help achieve two goals:

1. To stimulate the development of communication and collaboration skills
2. To provide “a real development scenario” experience
Study Context: Manaus - Amazonas, Brazil
A DSD scenario demands partners *geographically dispersed*

- It requires a great effort of coordination

In Brazil we have two different issues:

- Language Barrier: students usually do not speak English
- We have different academic semesters

A cost-effective alternative to include DSD is to simulate it!
Pilot Study

- 12 graduate and undergraduate students from Federal University of Amazonas (UFAM);
  - Students were separated into two sites and supervised by a monitor
- Only 11 students provided all required data;
- Activities:
  - Requirements Elicitation
  - Requirements Priorization
  - Mockups Elaboration
Pilot Study

Diagram showing the setup of a pilot study with supervisor/client relationships and teams divided into POs and analysts. The diagram includes connections between teams in the classroom and computing lab, with a distance of 95 m.
When the distance between two teams is **larger than 30m** the communication is affected in the same way as if the distance was of many kilometers [Herbsleb & Mockus 2003]
1. Verbal description of the software
2. Creation of user stories and send them (by email) to the Analysts team
Pilot Study

3. Priorization of the user stories and draw one mockup
The teams had to interact by chat and email – discussing the prioritization and the mockup.
Pilot Study’s Findings

- How do you perceive the level of influence of the activity on your collaboration skills?
Pilot Study’s Findings

• How do you perceive the level of influence of the activity on your communication skills?
Pilot Study

- Limitations:
  - Despite the distance larger than 30m, the students already knew each other;
  - The questions may have induced the students answers.
Different Approach

• We decided to evaluate a new Scenario:
  • Students interact with avatars
    • The avatars are operated by one researcher
Changes in the Questionnaire

• We **stopped asking explicitly how does DSD affect communication and collaboration**
  • Because we identified that this could induce the subject

• We changed the scope of the questionnaire in order to ask **which were the improved skills**

• We added questions about **satisfaction and motivation**

• We added more **open questions**
Observational study

- 17 students from other university in Amazonas;
  - Only 14 students provided all required data;

- Students were divided into five teams;

- Each team interacted with an avatar (representing a virtual team)
  - We simulated the geographical distribution
Observational study

- The students received a document with the requirements of a system. They had to specify the use cases and prepare the use cases diagrams.

- The document provided to them had intentional problems aiming to stimulate the interaction with the virtual team.
Observational Study - Configuration

*The researcher that operated the avatars*
Example of Interaction

What information is needed in the second requirement?

Title, keywords, topic of interest, abstract, and file. In addition to other associated authors

Communication mediated by computer

TEAM 1

AVATAR 1
Students receive the Requirements Specification Document

Students interact with the Virtual Teams

Students prepare the use cases specification

Students answer the post-experiment questionnaire
Qualitative Analysis

- Based on students perception
- Exploratory research
- Using Grounded Theory procedures
4) Regarding to learning, what activity's aspects do you consider as positive ones?

R - In my opinion, the activity brought, the simulation of a real application, which made me personally adopt prototyping for better understanding the software.
Quotations related to Collaboration

“The leadership of a real project allowed me to work my abstraction and collaboration skills.”
– Member 1 from Team 3

“The activity stimulated inter-personal relationships, information flow, abstraction of the scenario, collaboration...”
– Member 4 from Team 4
Quotations related to Technical Knowledge

“The activity helped me understand how does the software development works from the beginning”
– Member 1 from Team 1

“In my opinion, the activity brought the simulation of a real application, which made me personally adopt prototyping for better understanding the software”
– Member 2 from Team 2

“The activity allowed me to see, in a practical way, how does the modeling occurs in a real development process”
– Member 3 from Team 2
Improved Skills

Technical Knowledge: 92.86%
Self-discipline: 35.71%
Communication: 85.71%
Ability to Abstract: 57.14%
Responsibility: 57.14%
Collaboration Skills: 85.71%
Knowledge on DSD: 71.43%
Final Remarks

• In this research’s context, the use of DSD was useful in the improvement of communication and collaboration skills.

• The collected data are based on the subjects’ perception and this can be a limitation to the conclusions.

• The main limitation of this study is the sample size, 14 students, which do not allow generalization of the results.

• We hope that the results can stimulate the adoption of DSD projects in regular courses of SE
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