

# 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?**



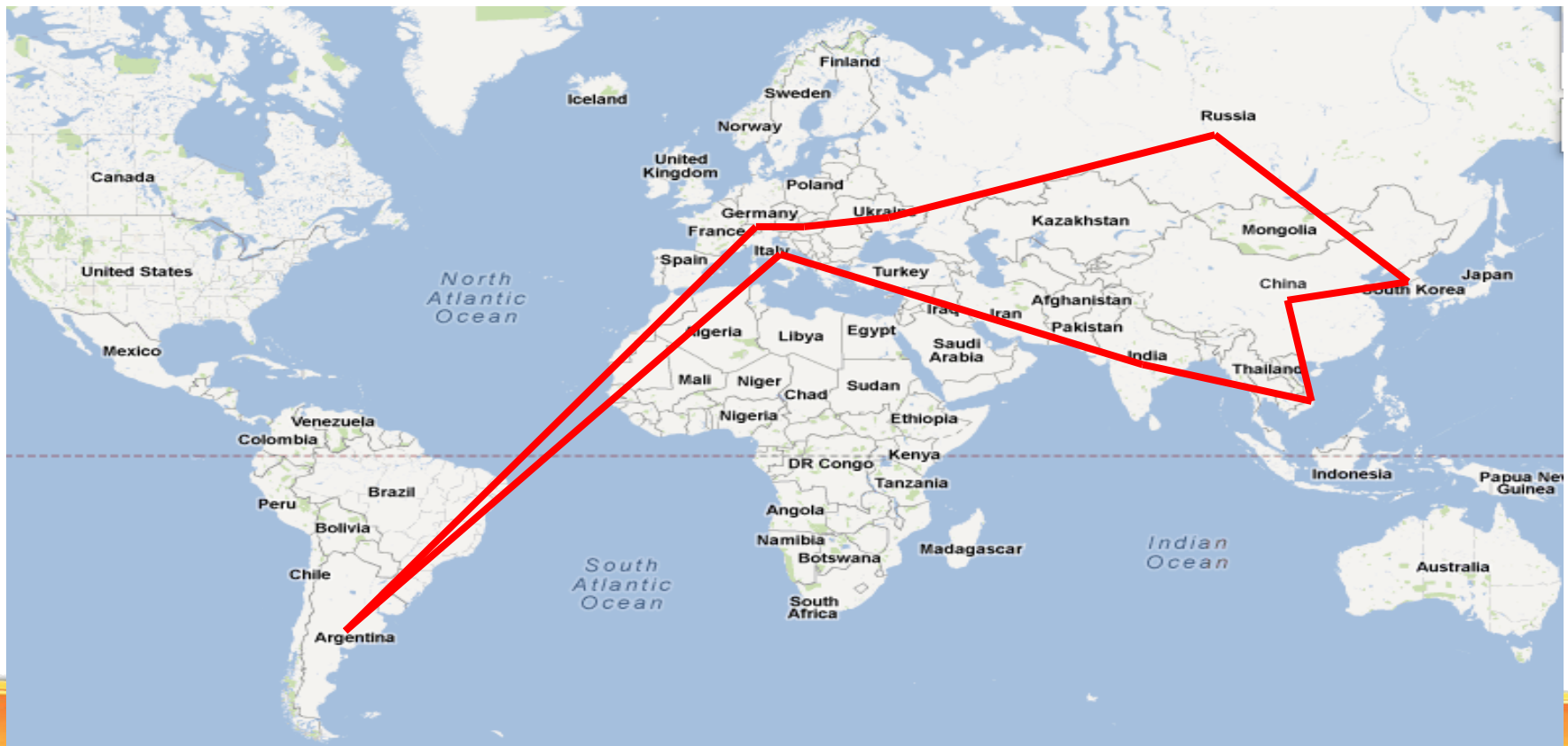
# Alternatives to develop communication and collaboration skills

- 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?

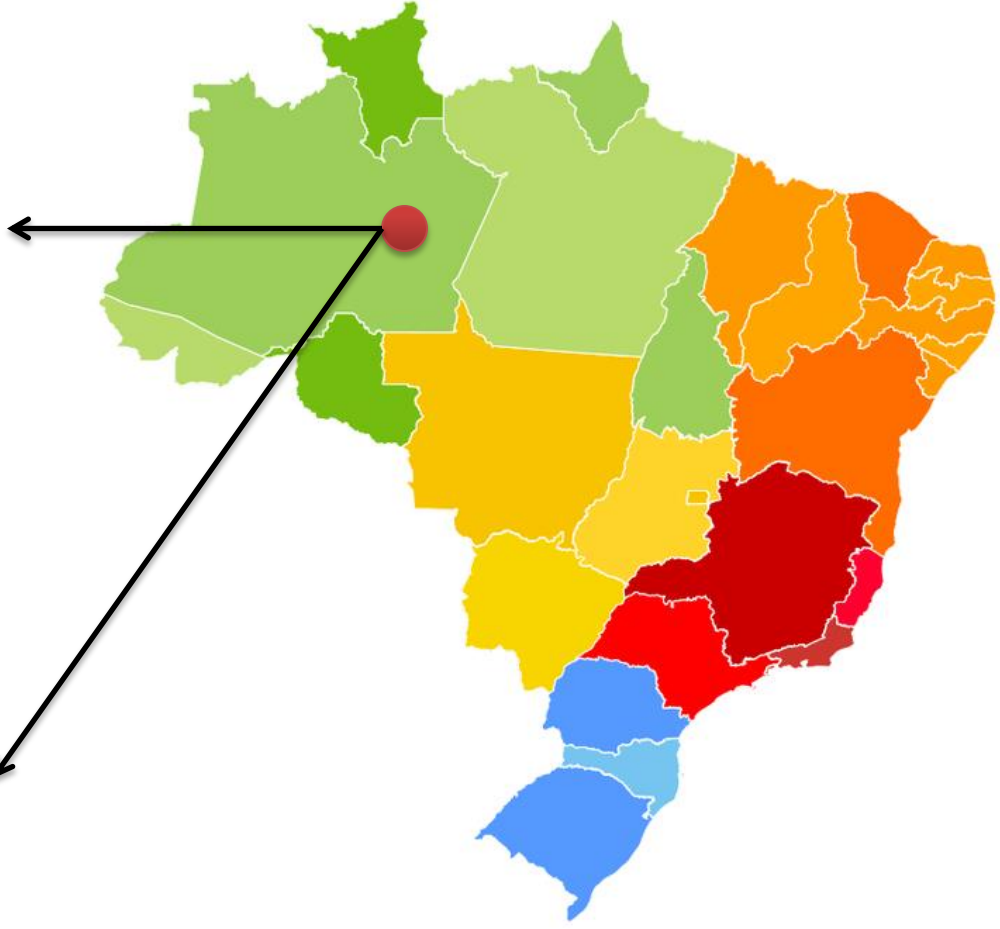
- The use of DSD stimulates the adoption of **new practices of communication and collaboration** [Begel and Naggapan 2008].
- Almeida et al. [2012] reported **a teaching experience using DSD** and, according to their perception, **the students** enrolled in the project **improved the communication and 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





# DSD in the classroom – Main Obstacles

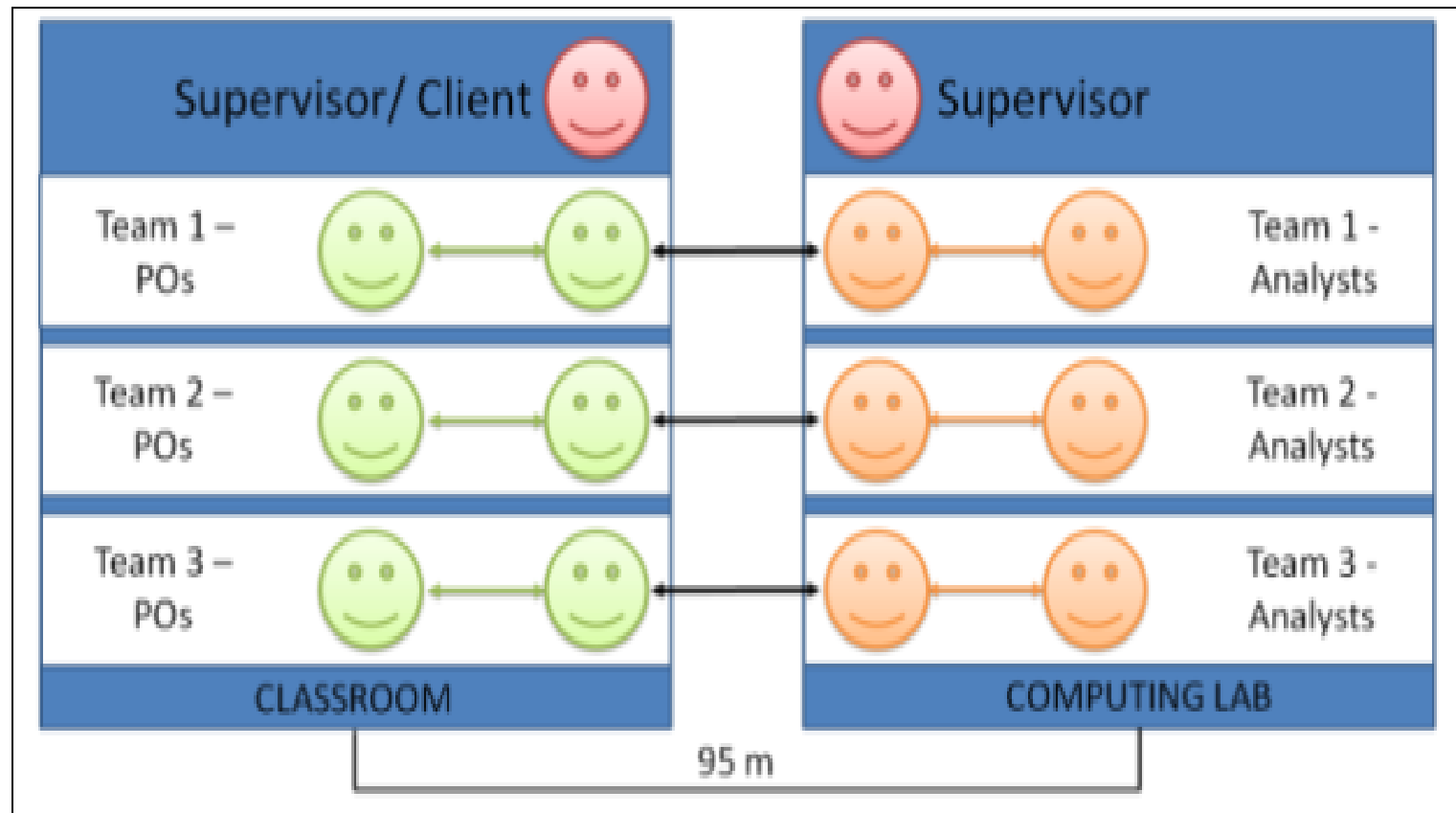
- A DSD scenario demands partners **geographically dispersed**
  - It requires a great effort of coordination
- In **Brazil** we have two different issues:
  - Language Barrier: students usually do not speak English
  - We have different academic semesters

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

# Pilot Study

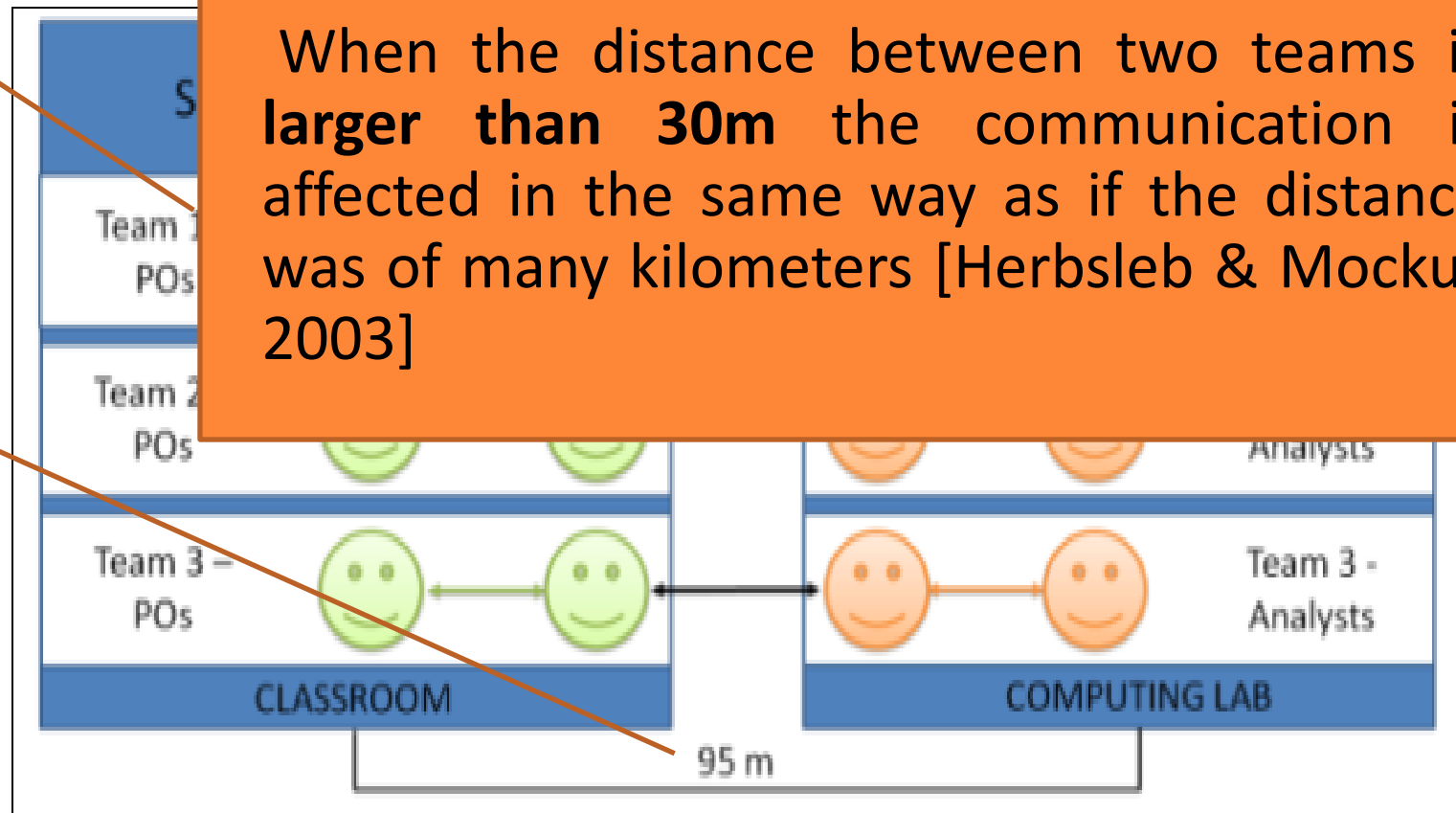
- 12 graduate and undergraduate students from **Federal University of Amazonas** (UFAM);
  - Students were separated **into two sites** and supervised by a monitor
- Only **11 students** provided all required data;
- Activities:
  - **Requirements Elicitation**
  - **Requirements Priorization**
  - **Mockups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

# Pilot Study

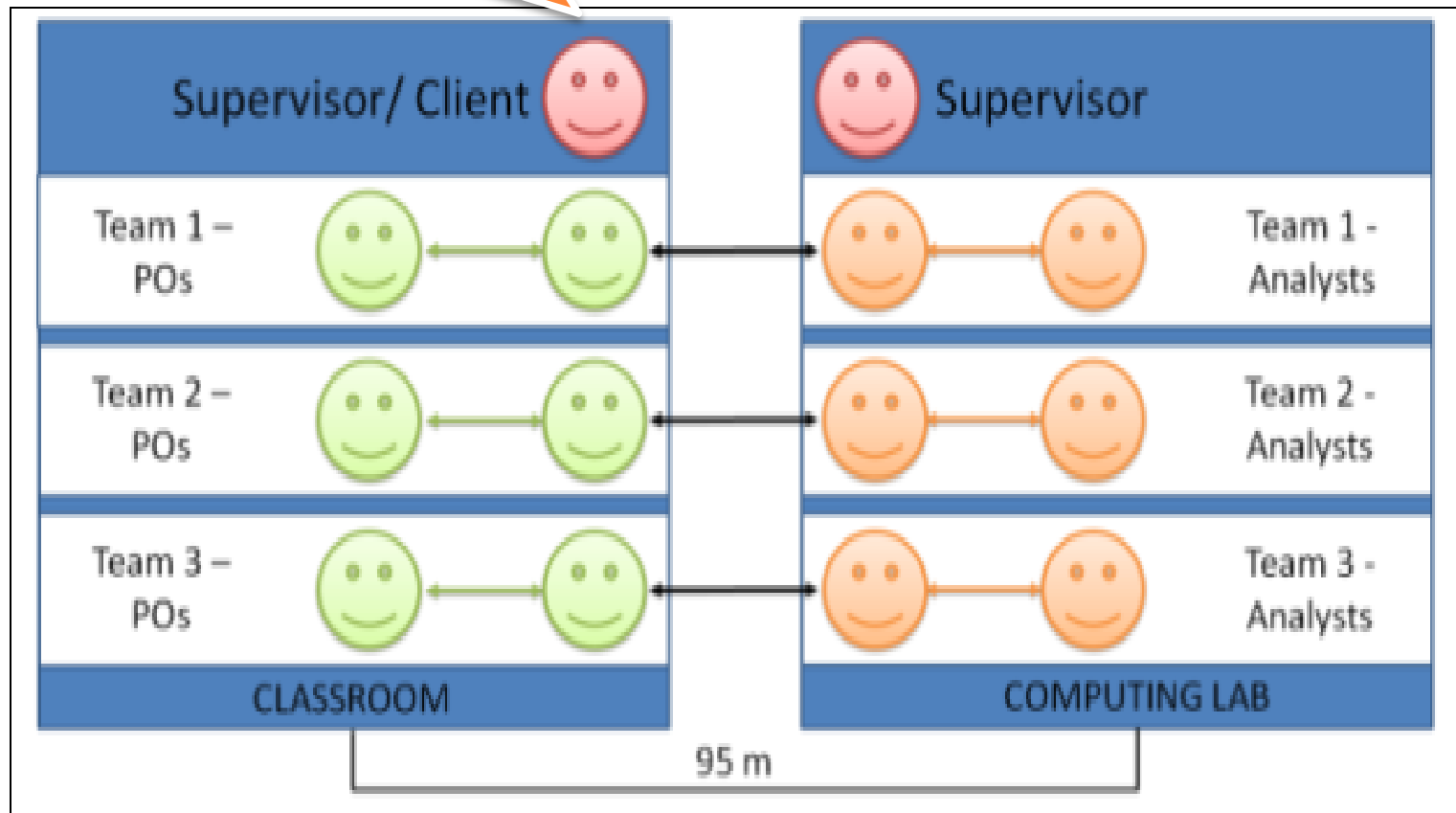


# Pilot Study

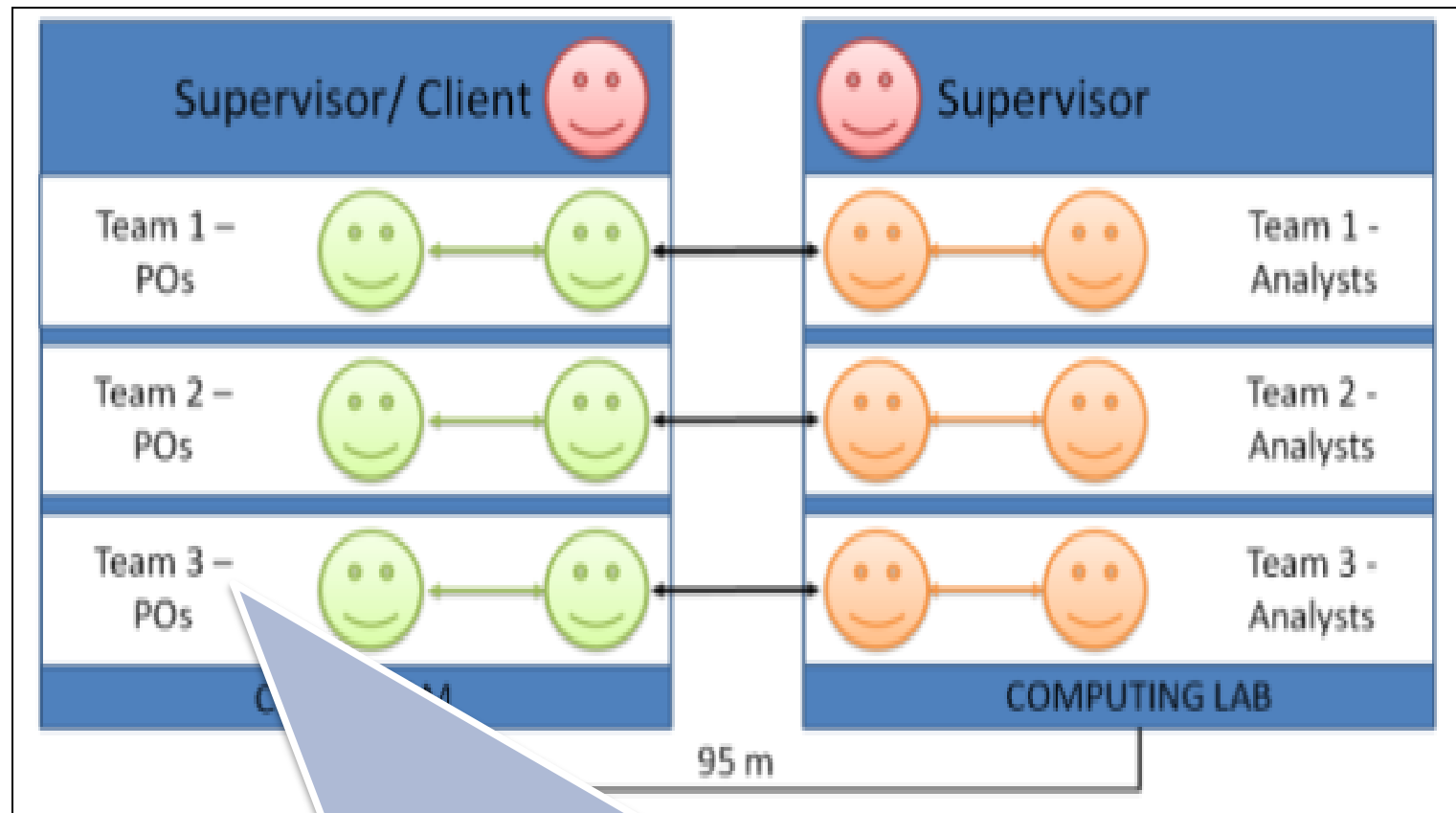
When the distance between two teams is **larger than 30m** the communication is affected in the same way as if the distance was of many kilometers [Herbsleb & Mockus 2003]



# 1. Verbal description of the software

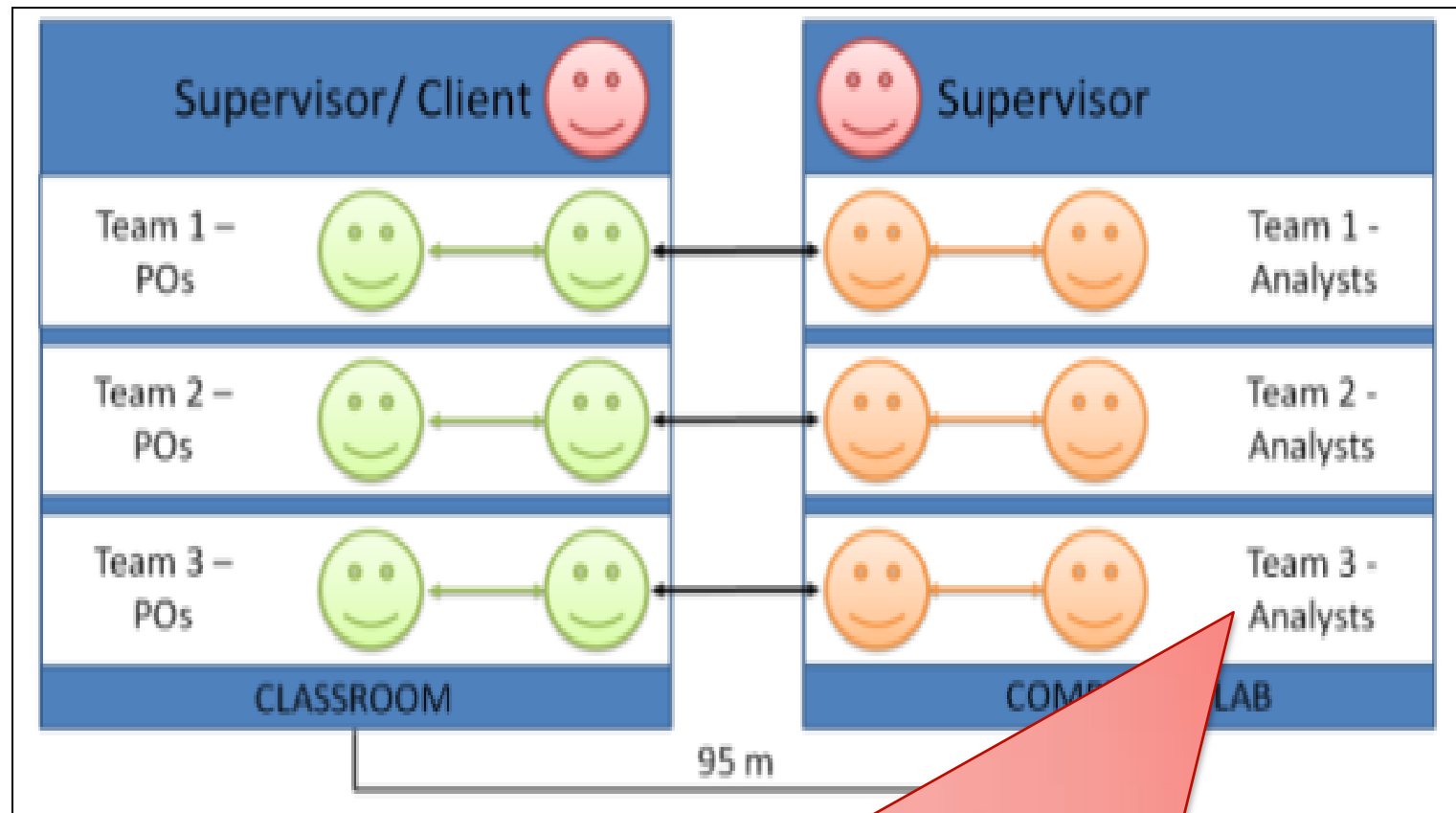


# Pilot Study



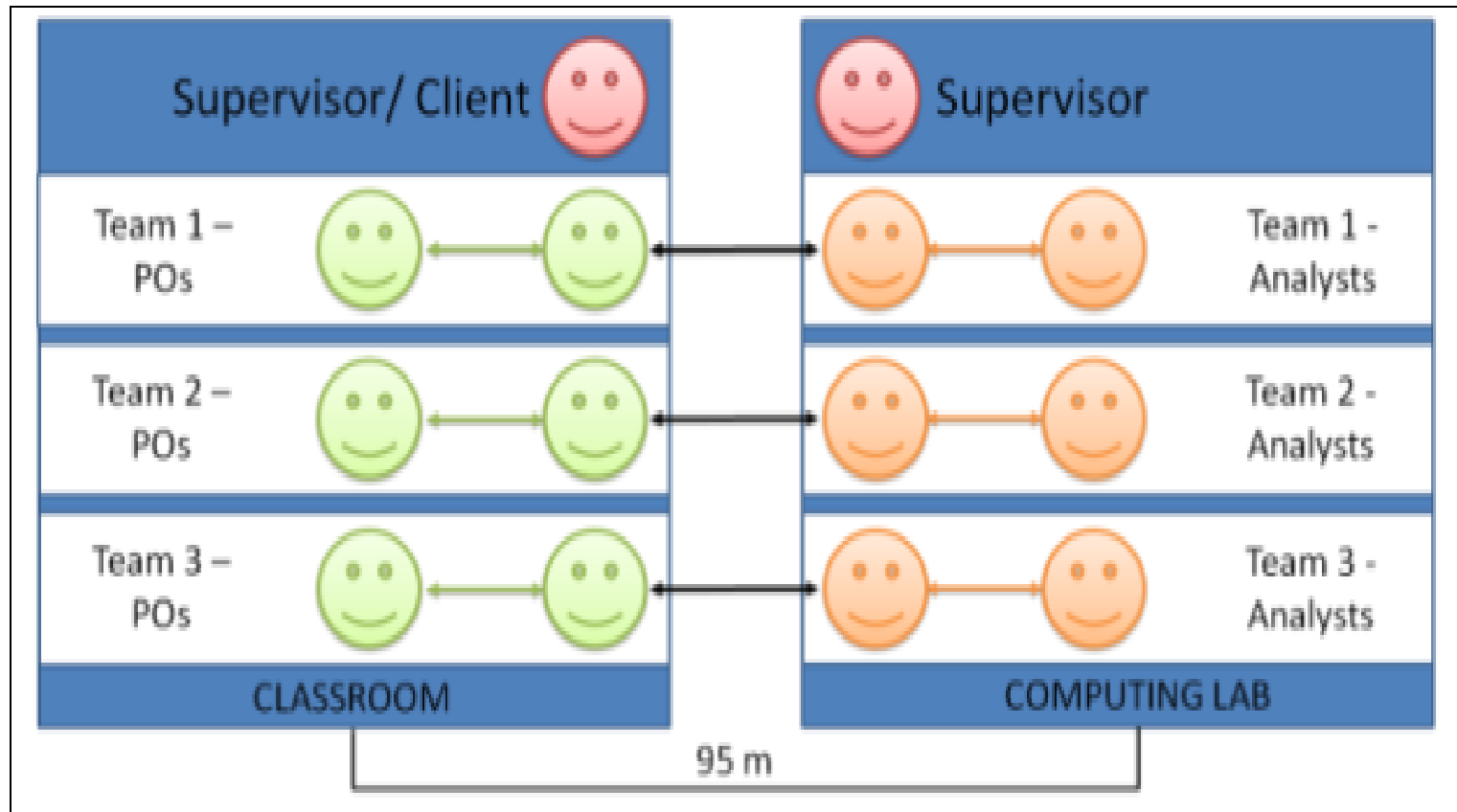
**2. Creation of user stories and send them (by email) to the Analysts team**

# Pilot Study



**3. Priorization of the user stories and draw one mockup**

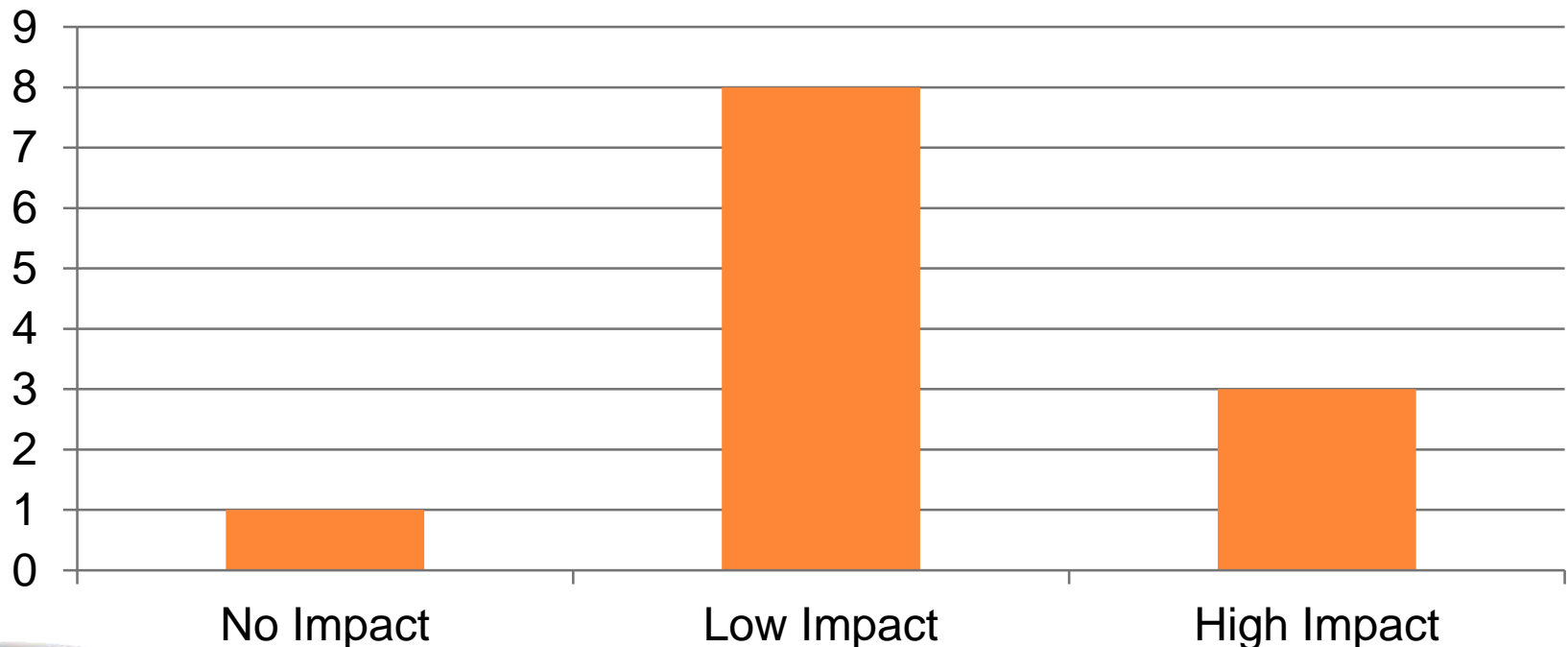
The teams had to interact by chat and email – discussing the prioritization and the mockup





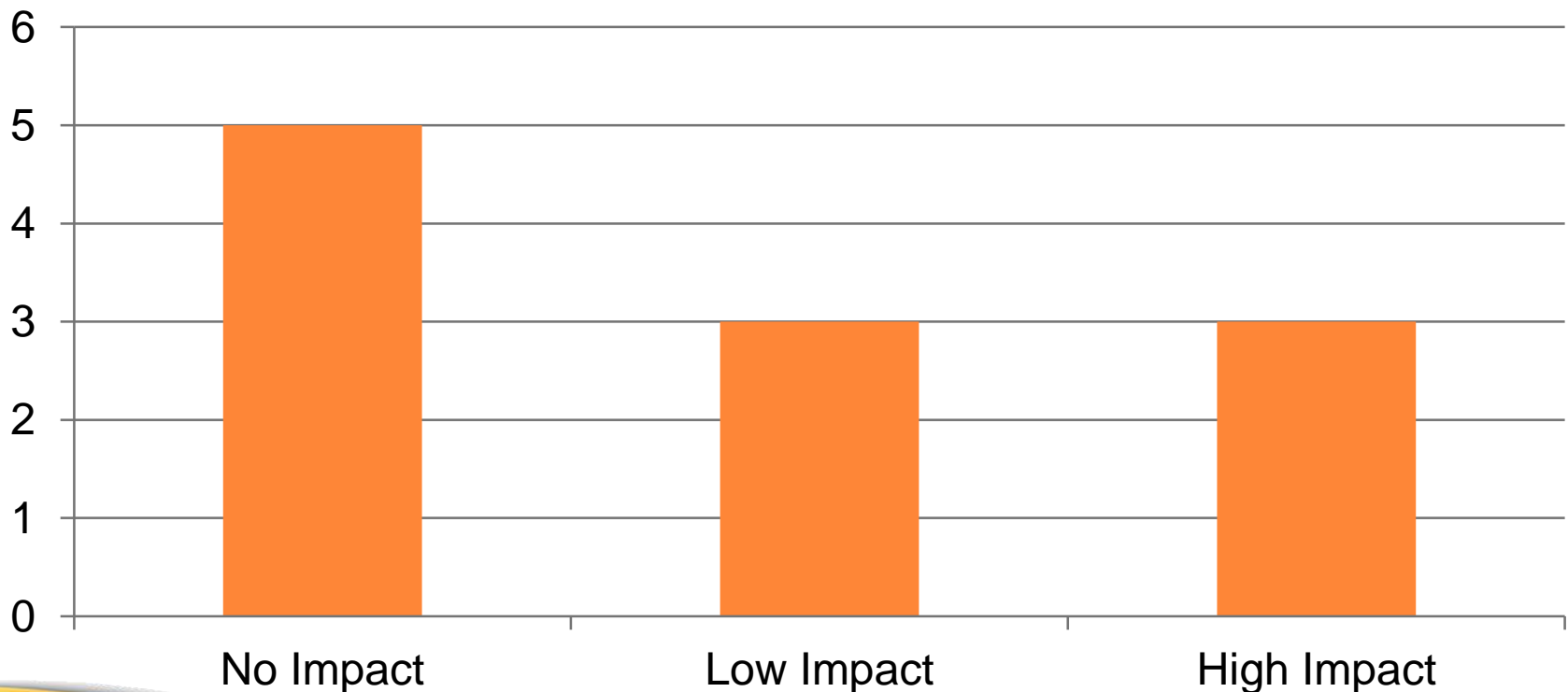
# Pilot Study's Findings

- How do you perceive the level of influence of the activity on your **collaboration skills**?



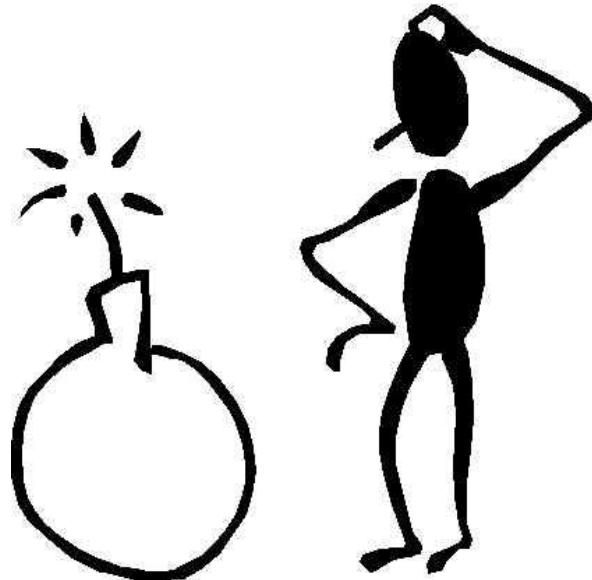
# Pilot Study's Findings

- 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

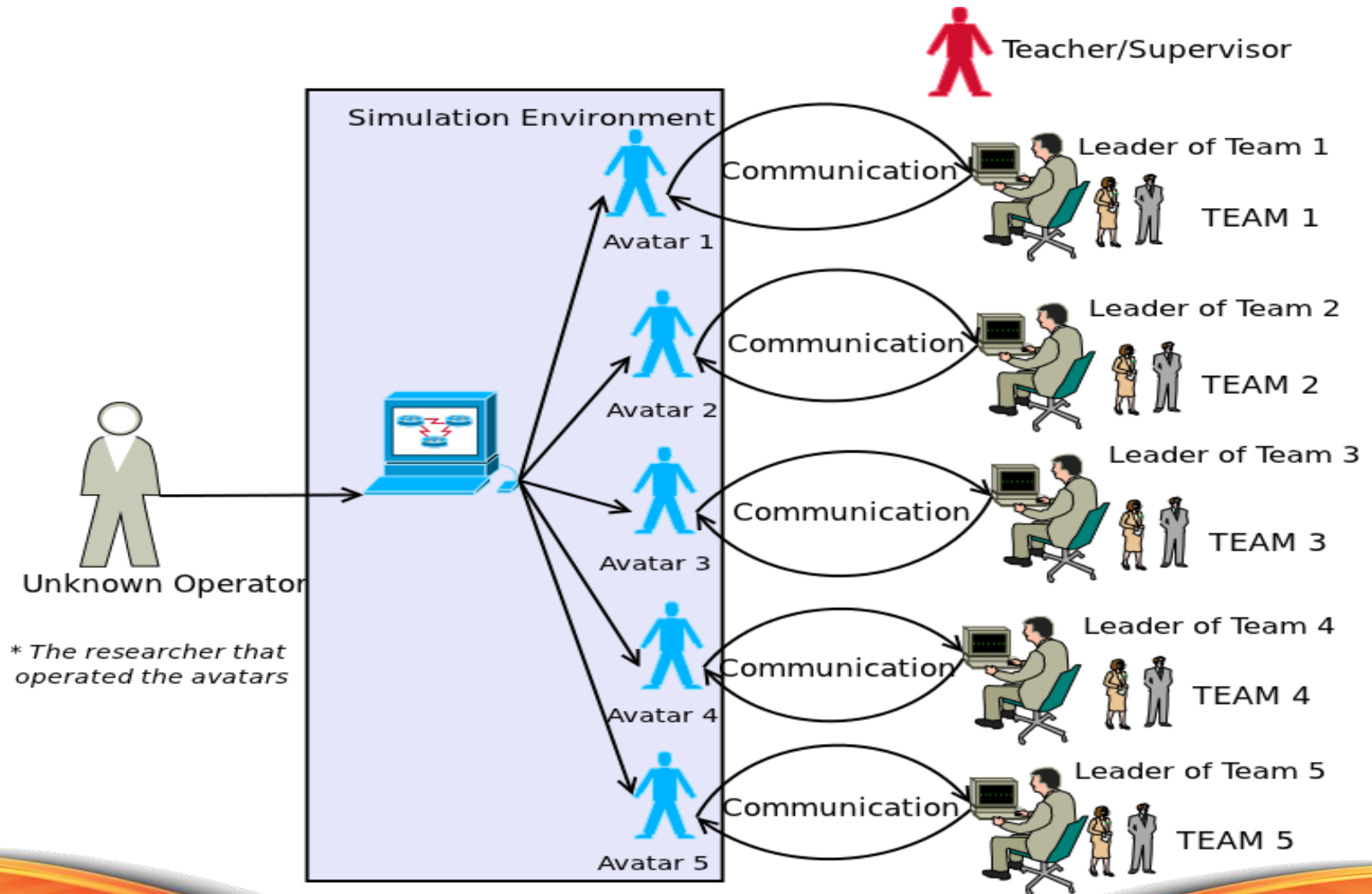
- The students received a document with the requirements of a system. They had to specify the use cases and prepare the use cases diagrams



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

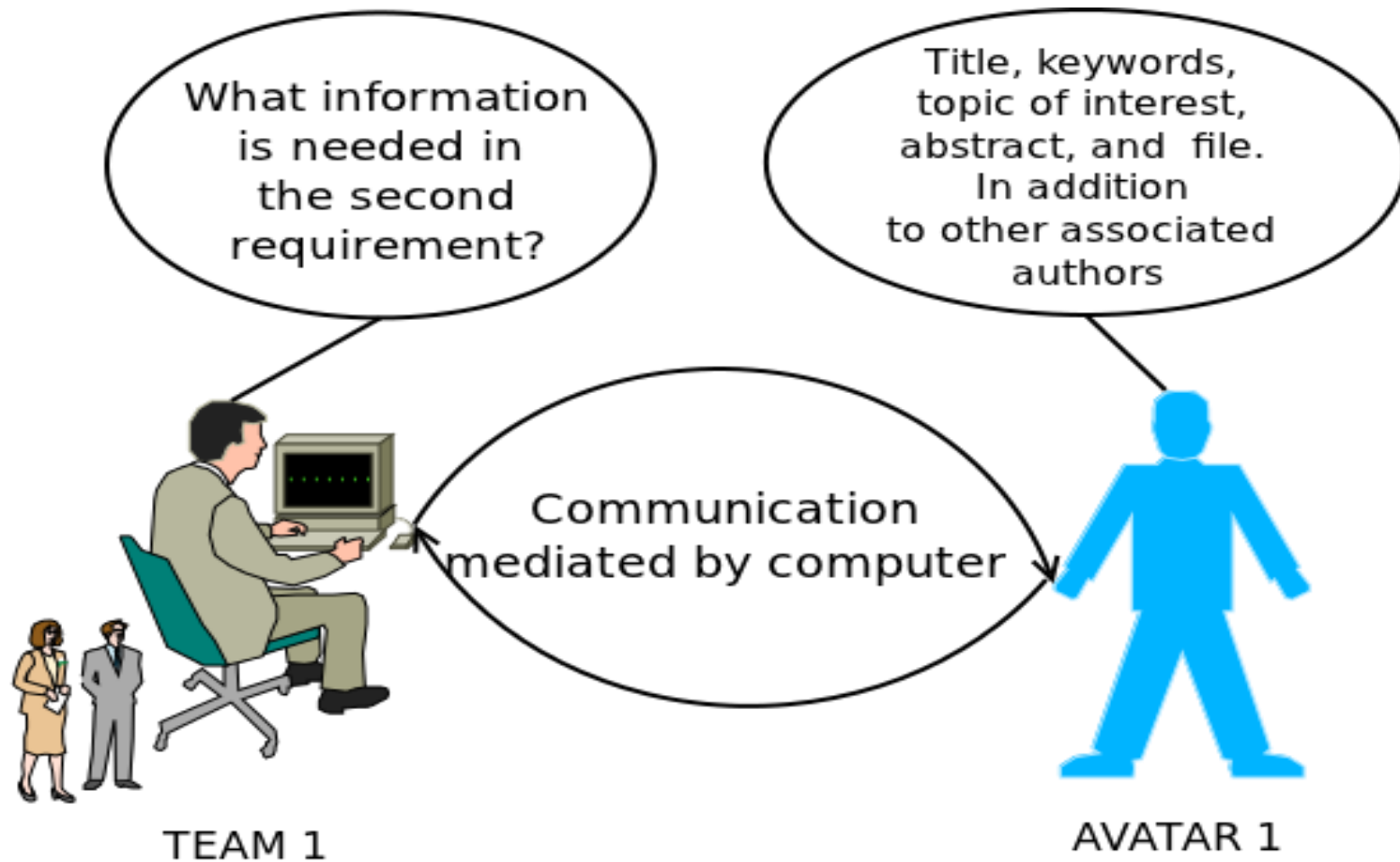


# Observational Study - Configuration





# Example of Interaction



# Observational Study Activities



**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

# GT Procedures - Open Coding

The screenshot shows a software interface with a top toolbar containing tabs for 'Q\_Team2\_Member2.r', 'Quotes', 'Codes', and 'Memos'. The 'Quotes' tab is active, showing a question and answer. The 'Codes' tab is also visible, showing a list of codes. An 'Open Coding' dialog box is open, prompting the user to enter codes separated by a pipe symbol. The dialog box contains the text 'simulation of real application|use of prototypes' and buttons for 'OK', 'Cancel', and 'Help'.

Q\_Team2\_Member2.r ▾ Quotes [icon] 11:1 (X) ▾ Codes [icon] (X) Hat ▾ Memos [icon] ▾

4) Regarding to learning, what activity's aspects do you consider as positive ones?

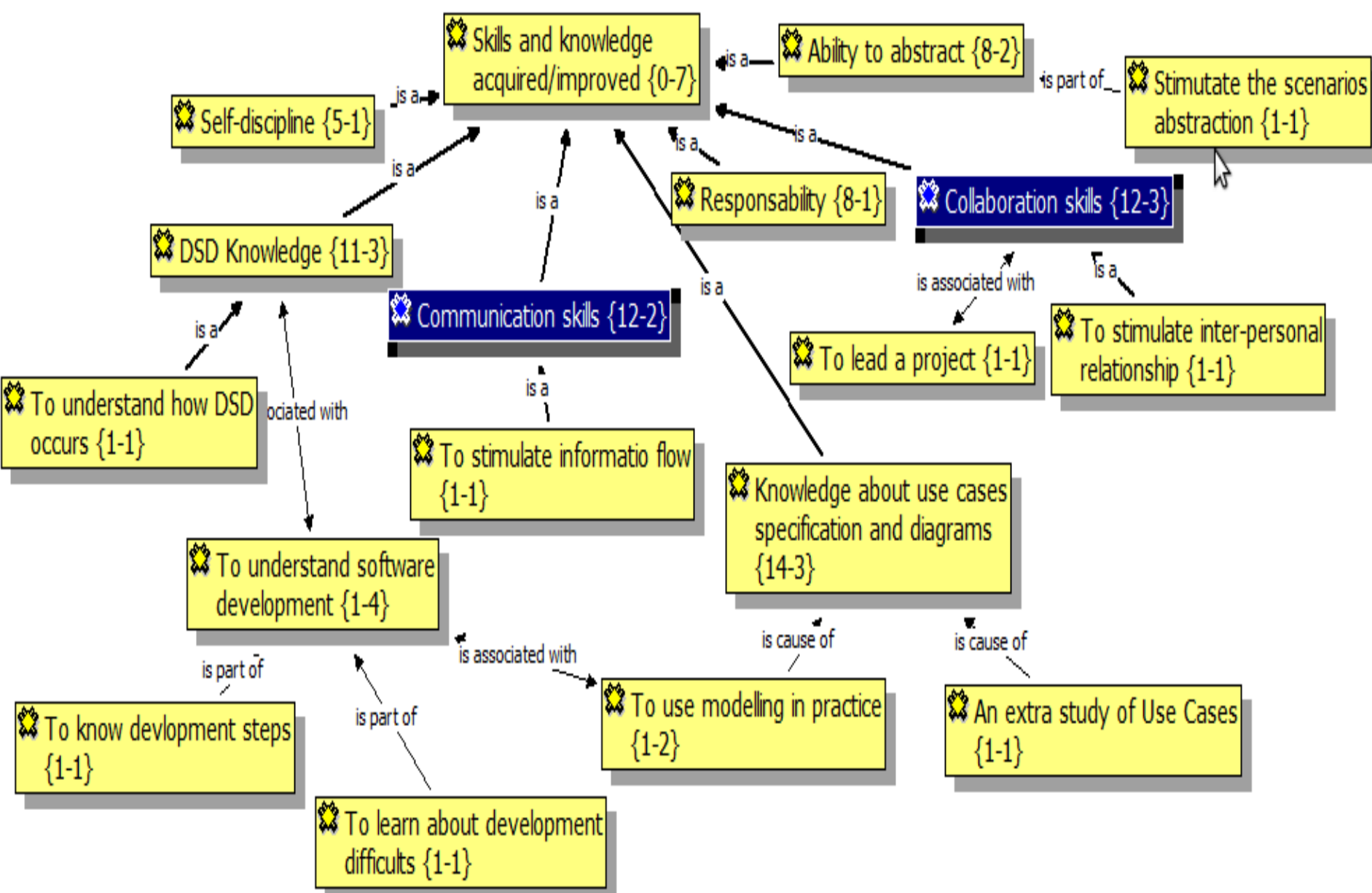
R - In my opinion, the activity brought, the simulation of a real application, which made me personally adopt prototyping for better understanding the software.

Open Coding [X]

Enter codes separated by |

simulation of real application|use of prototypes

OK Cancel Help





## 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”*

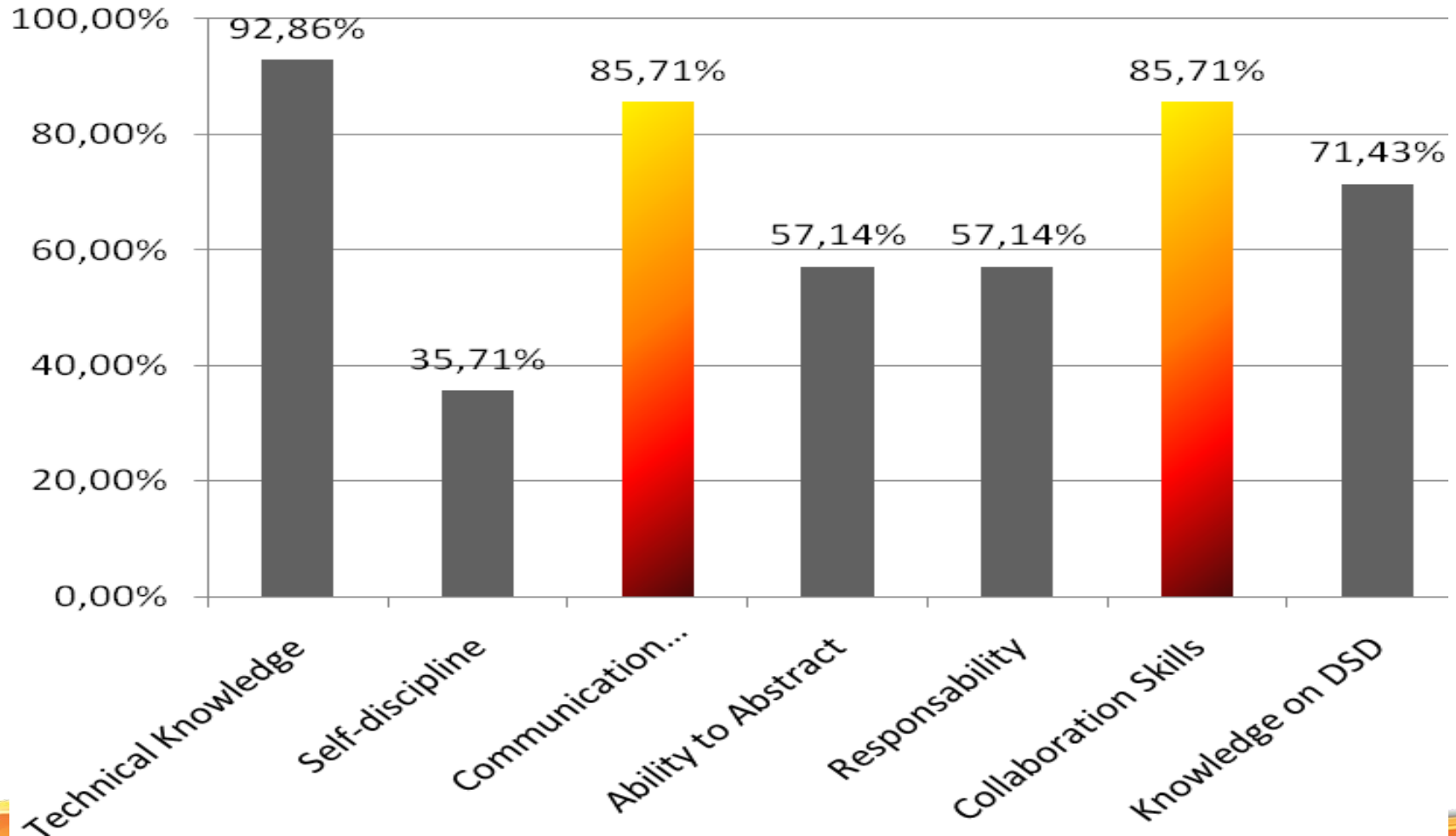
– Member 2 from Team 2

*“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







# 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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