

## Evaluation of PBL in Communication Networks I

Within the framework of the qualification program "Research-based Learning at TUHH",

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### 1. Objectives

- The objective of this analysis is to identify the features that make the course the master degree course "Communication Networks I – Analysis and Structure of Communication Networks" a successful PBL class.
- Later, it is compared with the students self-assessments and expectations.
- The main objectives are to determine the key factors for a successful PBL-based course and to monitor the influence of group dynamics originating in varying degrees of student activity and background.

### 2. Didactic Concept

In 2015, the course "Communication Networks I – Analysis and Structure of Communication Networks" was redesigned to incorporate Problem Based Learning (PBL) in addition to the existing Lecture. Thus far, the new approach has been received very positively by the students. An open question is what exactly contributes to the successful learning experience achieved in this class. Also, while almost all students seem to like the new approach, it has been observed that the participation levels vary greatly between different students. This has been tried to mitigate using moderation by tutors and pre-defined team roles, but the effect of quiet and active students on the learning outcome has not been analyzed methodically, yet. This project – a part of the TUHH research-based-learning qualification program – has been taken as an opportunity to close this gap.

### 3. Initial Situation

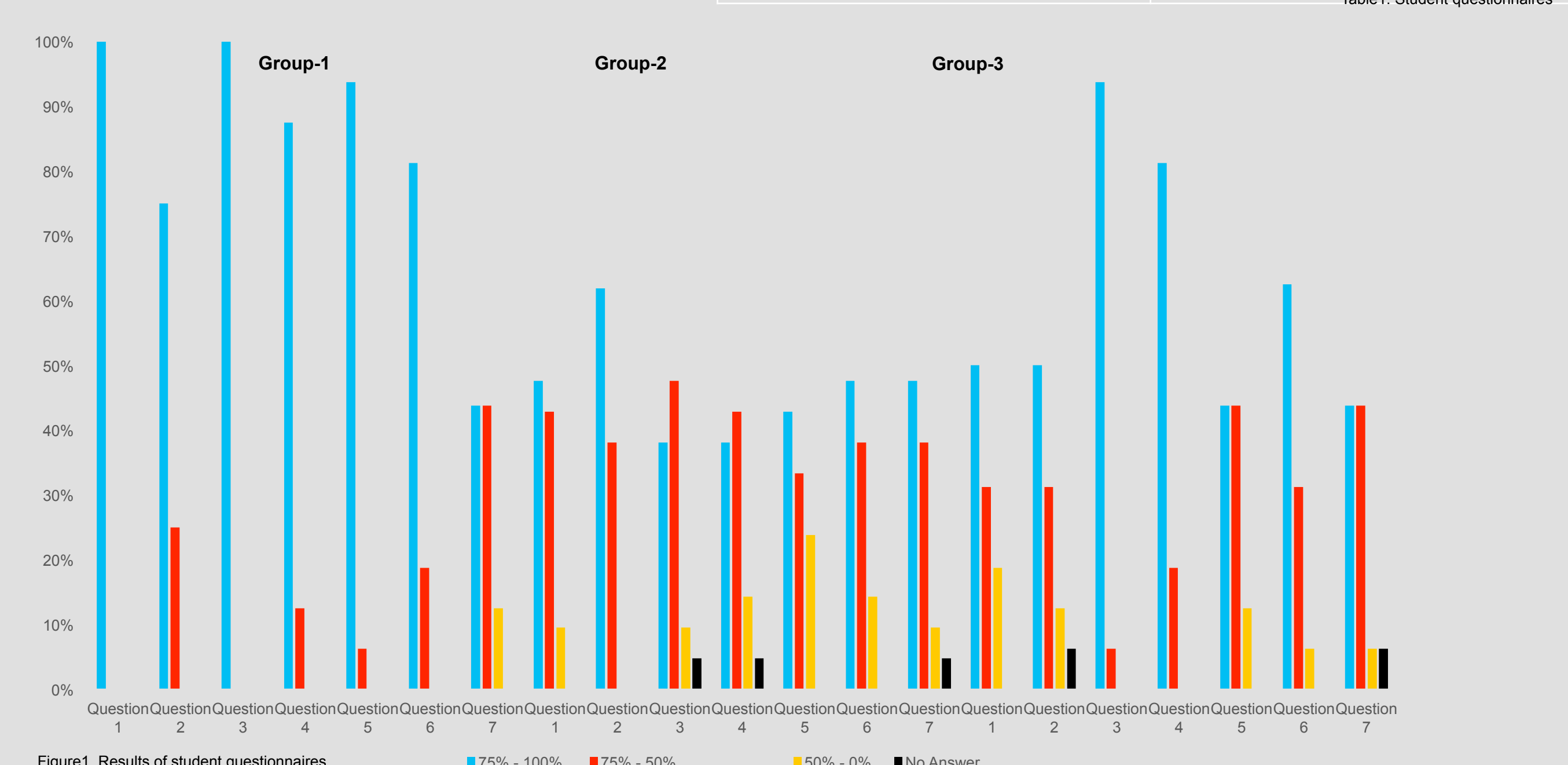
- Communication Networks I module:**
  - Elective 6 ECTS module on master level
  - 2-hour lecture + 3 hours of Problem-Based Learning (PBL)
  - The final exam: poster submission, a peer presentation and an individual oral exam.
- PBL in Communication Networks I:**
  - In small groups, students work on a total of 5 topics over the course of 8 weeks.
  - The work on each topic is partitioned into 7 steps, and the students are assigned fixed roles during their group work.
  - 7 steps are as follows:
    - 5 take place during the first session, step 6 is research at home, and step 7 is a presentation in the next session.
- Open question:**
  - If all students profit from the PBL approach and if so, what exactly is the reason for the success of PBL in Communication Networks I.

### 4. Evaluation Design

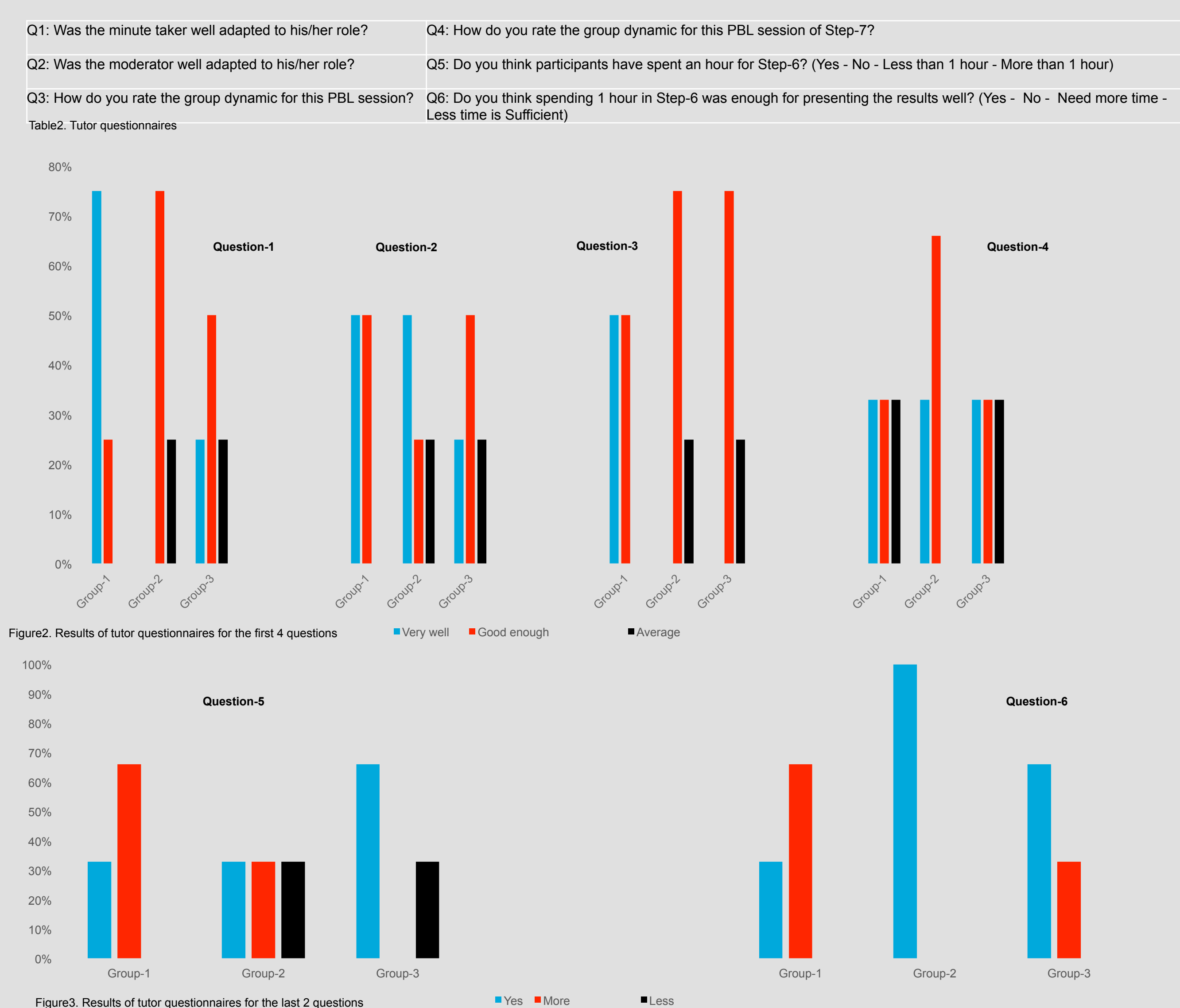
- Evaluation**
  - For evaluation, both observations and evaluation through questionnaires is conducted.
  - In tutor's phase: Initial data on these questions are collected through questionnaires given to the tutors each week. Based on the initial observations by tutors, the contribution of students are measured and recorded.
  - In student's phase: Questionnaires are given to the students each week until the final exam. They are also asked about the group dynamics and their participations.
  - Considering the evaluation approach in [1], for the assessment of PBL group work in Communication Networks I those methods will be adapted.
- Implementing Improvements**
  - The information collected during the tutor's phase will be used to support students if needed similarly to the approach in [2].
  - The feedback from the observation and questionnaire can be used to improve the definition of the roles distributed to the students and the group dynamic during the PBL sessions.

### 5. Results

#### 5.1 Results from student questionnaires



#### 5.2 Results from tutor questionnaires



### 6. Conclusion

- Group-1 consists of only international master students, while Group-2 and 3 includes mostly German students.
- As results show in Fig.1, international students seem to be more open to a discussion comparing to German students. They show more activity in discussing the things, so that having more group dynamic involved.
- Q2,Q3 and Q4 in Fig.1 also show that they are more satisfied with their contribution and role of the minute taker and moderator, while Group-2 and 3 seem to be less satisfied with the role distribution and individual participation.
- However, results from Q5 and Q6 in Fig.3 show that students in Group-2 and Group-3 were more prepared to present their results with one hour preparation.
- Q4 in Fig.2 shows that even though students in Group-1 were more satisfied with the group dynamic during PBL sessions, the tutor seems to be not having the same satisfaction with their presentations. This might be judged also with Q6 that they were not prepared very well.

### 7. References

- C. Vasconcelos, (2010) Teaching Environmental Education through PBL: Evaluation of a Teaching Intervention Program, Research in Science Education, DOI 10.1007/s11165-010-9192-3
- S.C. Willis, A. Jones, C. Bundy, K. Burdett, C.R. Whitehouse & P.A. O'Neill (2002) Small-group work and assessment in a PBL curriculum: a qualitative and quantitative evaluation of student perceptions of the process of working in small groups and its assessment, Medical Teacher, 24:5, 495-501, DOI: 10.1080/0142159021000012531