Proposal to Second Nordic Workshop on Phenomenography in Computing Education Research

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General research questions of my Ph.D. research project

My research questions regard processes in computer science student projects and their relation to the learning outcome. More precisely, my general research questions address the following: how participants in groups of advanced students experience personal influence, the decision-making, the responsibility, and the goal setting processes while working on industry-like projects; how is the distribution of these processes in the groups related to the students' competence in computer science; how is the distribution of processes in the groups connected to the learning outcome; and, what are the pedagogical implications of the above stated questions?

Some of the above stated research questions have been investigated, using a phenomenographic framework, in two earlier studies:

A *"I Think It's Better if Those Who Know the Area Decide About It" - A Pilot Study Concerning Power in CS Student Project Groups [1].*
This is a study of students participating in a full semester computer science project course for information technology students. The focus is on how personal influence is distributed within a group of students. A phenomenographic research approach was used to reveal some of the aspects of personal influence within computer science projects.

B *Computer Science Students' Experiences of Decision Making in Project Groups. [2].*
This study aims to understand the ways in which students experience the process of decision-making in computer science student projects. It also investigates the ways in which student groups work to make decisions. The empirical setting for the study is a semester long project with 22 final year computer science students. It is a qualitative study where data are gathered through interviews that are analyzed using phenomenography.

In addition to these two cases based on a phenomenographic approach, an evaluation of the trustworthiness of results from e.g. phenomenography was performed from a methodological point of view [3]. The evaluation was the seven principles for interpretative field research developed by Klein & Myers [4].

Proposed framework - Lesson learned from the previous studies

The two described studies present empirical results in the area of decision making and personal influence. Although not a direct result, four central areas of general interest for designing and running student projects have been identified while performing the studies. Those areas are hence not empirically based in the phenomenographic studies, but still an indirect result of them. Starting with empirical evidences like interview excerpts and phenomenographic results, the proposed model is drawn. The proposed model itself does not provide evidences for its validity, but acts as a reasonable starting point for discussion and analysis of features of importance when designing computer science student projects.

These four features included in the proposed model are: 1) the mechanism for work allocation; 2) students connection to external stakeholders; 3) focus on result or process; and 4) level of freedom in the project task. Carbone [5] has in her Ph.D. thesis argued for a framework to analyse and design introductory programming courses tasks. The model I propose is

not directly connected to Carbone's model for tasks, but the approach is similar. Therefore, the overall idea of Carbone's model is borrowed as inspiration for the proposed model. The four features are presented as a proposed framework for analysis of computer science student projects below (figure from [3], p 47).

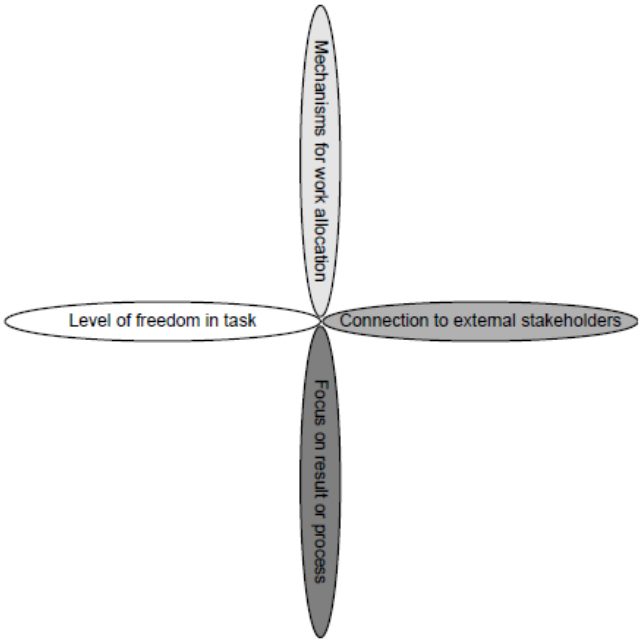

Figure 6.2 – A proposed framework for analysis and design of computer science student projects. Each field contain a feature recognized as important in such projects. Inspired by earlier work of Carbone (2007).

Particular issue to discuss

In order to establish the proposed framework and its four features, I would like to learn more on the internal connections between the features as well as their connections to the learning outcome. One idea is that a quantitative approach could be useful since it could measure the relationships between features and the relationship to the learning outcome.

Given the stated research questions and results from the previous research, I would therefore like to discuss the following:

1. Is the proposed framework motivated and useful for further research?
2. What useful questions about the perceptions of relationships between these aspects can be discerned using a phenomenographic study?
3. What study designs would help to illuminate experiences of relationships between, or confirm the existence of, the aspects that are proposed to be crucial to team project work in learning situations?
4. Would a quantitative approach be useful? If so, is the findings identified with phenomenography a good standpoint for a quantitative approach?

Why the proposed issues to discuss are interesting to the audience

I think that a combination of studies where phenomenography is the main source for both quantitative and other qualitative methods is an important field of application for phenomeno-

graphic results. By discussing if it is possible and how to perform such studies, we as a community can learn more about how to use phenomenography in computing education research.

One example of studies where qualitative data has been guiding a quantitative analysis is Kolikant [6]. In an analysis of students' perception of correctness Kolikant uses qualitative data about students' perceptions, norms and practices regarding testing and verification to make a quantitative study of their definition of correctness. The main result in the study is that students' definition of correctness differs from those of professionals. Kolikant's methodological approach combining qualitative and quantitative methods is an interesting example of a mixed method approach**.**

References

[1] Wiggberg, M. (2007). *"I Think It_s Better if Those Who Knows the Area Decides About It" - A Pilot Study Concerning Power in Student Project Groups in CS.* In A. Berglund & M. Wiggberg (Eds.), Proceedings of the 6th Baltic Sea Conference on Computing Education Research, Koli Calling (p. 132-135). Uppsala University, Uppsala, Sweden.

[2] Wiggberg, M. (2008). *Computer Science Students' Experiences of Decision Making in Project Groups.* In R. Lister & Simon (Eds.), Seventh Baltic Sea Conference on Computing Education Research (Koli Calling 2007). Koli National Park, Finland: Australian Computer Society, Inc.

[3] Wiggberg, M. (2008). *Unwinding Processes in Computer Science Student Projects*. - Uppsala University, p. 59-69.

[4] Klein, H. K., & Myers, M. D. (1999, March). *A set of principles for conducting and evaluating interpretive field studies in information systems.* MIS Quarterly, 23 (1).

[5] Carbone, A, "Principles for designing programming tasks: How task characteristics influences student learning of programming", Ph.D. thesis, Monash University, Melbourne, Australia, 2007

[6] Kolikant, Y. B.-D. (2005). *Students' alternative standards for correctness.* In Icer '05: Proceedings of the 2005 international workshop on computing education research (pp. 37{43). New York, NY, USA: ACM Press.