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Co-operative learning at Telemark State University - the students' verdict

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ABSTRACT: The Engineering College of Høgskolen i Telemark has practiced cooperative learning since 1982. As seen from the college, this way of administering the students' work appears powerful. After briefly having described the "Telemark Model", the paper concludes by reporting positive academic feedback from the U.S.A. in addition to present the students' opinion about this way of conducting cooperative learning.

It has been found that students at large find project work in groups timeconsuming but rewarding. Their positive attitude towards cooperative learning becomes more clearly pronounced as they advance from freshmen to seniors and Graduates. The latters, who are seing the whole process retrospectively, are reported to find the process of a 3-year's cooperative learning program useful to their daily work.

INTRODUCTION

Engineering education has been under pressure, at least in the Western world for the last 25 years. The pressure has come from industry, from public utility companies, from politicians, and not at least, from within the universities and colleges themselves. The root for this pressure was likely to be the structural changes observed in the "industrial world" as new countries and regions started to take over important fields of production. This continuing process may partly have lead to the present situation, where engineers by hundreds of thousands [1] have been laid off.

At the present Engineering College of Høgskolen i Telemark, or Telemark State University, these challenges have been taken seriously since 1976, when the first experiments with cooperative learning took place. Since 1982 a system of cooperative learning has been applied to *all classes*. In Norway, this way of organizing the student's work, was soon to be known as the "Telemark Model". Cooperative learning is often referred to also as "Project Oriented Studies" or "Problem-Based Learning", PBL.

This paper will briefly describe the Telemark Model as seen from the college with respect to educational activities and administration. Finally, the paper reports student and even graduate reactions to this model and compares these to some ideal goals which can be set for cooperative learning programs.

THE TELEMARK MODEL

The Telemark model is a slightly modified version of the pedagogic approach used at the University of Ålborg, Denmark.

Engineering education at Høgskolen i Telemark lasts for 3 years, each year is divided into 2 semesters. The semesters are numbered from 1 to 6, where the 6th semester is the semester of graduation.

The Telemark Model is characterized by *the group, the project, the adviser, the documentation,* and *the evaluation.*

1. *The Group.* Consists normally of 4-7 students but special arrangements may be made on demand. The group is expected to constitute themselves, define standards for group behavior, exert self justice etc.

   The group is officially organized for the project oriented part of the studies. But many group members are cooperating also in courses taught in traditional ways

2. *The Project.* There are different types of projects:

   a) First Semester's Project should have a broad scope, dealing with general problems of interest to society at large - typically with an environmental emphasis. Ideally, this project is supposed to introduce the student to a scientifical way of thinking, working and writing. The topics may be chosen by the group from a list set up by the teacher

xt semesters: Technical projects, often in
ation with industry or public utility com-
The problem is usually assigned by the

emester's project (main project, 60 % of
ester or more): A technical project given
teacher or others

rojects: The group members are required
project report orally to an audience.

. Each group is assigned one adviser and
These are normally members of the ordi-
however, some external project partners
d their interest in closer cooperation

has been worked out to assist advisers
during the process

ntation. The group's activities and pro-
be documented by a "project file" contai-
tc., a "process description" where the
uating their progress, and the formal re-

There is a pass/fail system. Only the final
ded, with individual grades for each
er

COURSE CONTENT

odel is, depending on the engineering de-
, allocating 25-30 % of the total organi-
ject work. The rest of the weekly sche-
tioned above, filled with "traditional ac-

content of the project work can only
d and controlled by the teacher, he will
role than usual to provide the "useful"
students. Instead: Cooperative partners
ge will have (and use) the opportunity to
lege directly through student work. Ex-
ving that teachers are indeed learning
nts' reports and often include such ma-
n classroom work.

ect of the Telemark model is the oppor-
ization - limited by the narrow frames
ear's program. Some graduates are re-
en hired just because of the topic they
heir main project in the final semester.
d later, this is not "the general rule".

EDUCATIONAL METHODS

It has been referred to as "traditional ac-
ented studies above all mean a change

The change is **fundamental** since the objectives of project oriented studies are something more than just a curriculum replacement: While a "traditional" program normally emphasises certain selected fields of specific knowledge, project oriented studies are trying to realise objectives like [2]

1. teach the fundamentals
2. help the students how to learn, and
3. give the students some training in solving problems

Done successfully, project oriented studies should have the ideal objective of helping the students learn to know themselves, making them fit for working in a constantly changing world.

CHANGE OF THE TEACHER RÔLE

The ideal rôle of the teacher serving as an adviser, may be formulated like this [3]:

> *The real challenge in college teaching is not covering the material for the students, it's uncovering the material with the students*

Consequently, the adviser needs neither be the expert of the topic chosen by the group nor in command of the group process. He should instead be the insightful indirect **leader** letting things happen.

This change may be described as fundamental. Maybe the "change of the teacher" will be the key element in restructuring engineering education for tomorrow's needs?

CURRICULUM CHANGE

The partial shift of responsibility from the teacher to student groups will lead to the growth of "new" curricula containing several elements necessary to cope with the realities in the world of today.

The "new" curriculum may include *tangible* as well as *intangible* features [4]:

1) Among the *tangible* aspects are training in practical leadership, applied to handling and following up formal meetings, the preparation and implementation of oral presentations, basic technical writing including style, grammar, spelling etc. And - of course - training in finding and applying appropriate technical solutions even in fields which are not being taught at the college

2) Some *intangible* parts of the "new" curriculum include experience with a variety of group psychology processes (also handling immigrants with often different cultural backgrounds), development of personal attributes as creativity, social adjustment, responsibility, flexibility, initiative, courage and perserverance

ADMINISTRATIVE CHANGES

As mentioned earlier, only 25 - 30 % of the total scheduled time is allocated for the cooperative learning program. But even this apparently modest change of program means some fundamental changes to the daily routines of the college.

1) The advisers should be pulled together to agree on certain basic principles underlying the idea of cooperative learning and how to put these into work

2) Students must be arranged in groups as well as classes

3) The college must have plenty of small rooms or at least large tables to be used by the groups. In addition to ordinary classrooms, larger plenary rooms for large composite groups are necessary

4) The advisers (teachers) should ideally have offices large enough to handle sudden meetings with student groups

5) A "satisfactory" number of PC's, printers, binding machines, telephone lines (with an "appropriate" budget) etc. are required for student use

6) A large amount of jobs/problems must be found within and outside the college to be used as project themes by the groups

ACADEMIC RESULTS

So far, no research has been carried out to document the professional results of graduates from the Engineering College of Høgskolen i Telemark.

However, South Dakota School of Mines and Technology (SDSM&T), Rapid City, receiving 70-80 Telemark graduates for MSc-studies since 1990, is reporting excellent results. The grade report sent the author from the Electrical Engineering Department after the Fall Semester of 1994 may be used as an example:

The 8 entering transfer students from Telemark achieved an average grade point ratio of 3.01 of the maximum of 4.00. Later, after having adjusted to the American system, the grades normally raise substantially.

This top performance is reported to have been discussed by the SDSM&T faculty, and credit has to a great extent been given to the Telemark Model's development of the *tangible and intangible curriculum elements* mentioned above.

STUDENTS' VERDICT

No extensive research so far has taken place to evaluate the students' attitude towards the Telemark Model. The numbers and figures used here are therefore taken from a student report [5] based on a survey during the Fall Semester 1990, supervised by the author.

Respondents

The results are based on the collection of questionnaire forms from

- 62 entering freshmen
- 36 sophomores
- 48 seniors, and
- 17 graduates

The questions which were asked the graduates deviated a little from those addressed to the students, who were all asked identical questions.

These figures tell that nearly 50 % of the total number of students have responded. Provided clearly formulated questions, the student response should give important signals back to the college. 17 graduates does not seem very much but their response could give the college some feedback *indications*, at least.

Results

1. Attitude towards the Telemark Model

The respondents were asked how they felt about cooperative learning at their *present* stage of development:

Figures in %

Category	Positive	Don't know	Negative
Freshman	44	44	12
Sophomore	100	0	0
Senior	98	0	2
Graduate	100	0	0

The results appear consistent, except for the freshmen. This may be due to this group's lack of experience with the cooperative program: The survey took place less than 2 months after their entrance to the college.

2. Should the Telemark Model be changed?

Figures in %

Category	No	Yes	Comments from the "yes" group
Freshmen	54	46	More liberty, better supervision
Sophomore	53	47	More time, better supervision
Senior	40	60	More time, better supervision
Graduate	0	100	More time, better supervision

It can be seen, that the respondents get more aware as they proceed through the system, as they are generally becoming more critical.

Even if they as a group tend to be satisfied with the *Model*, they are critical to their supervisers all the way through. More specificly, many claim that their supervisor do not cooperate well with other supervisers(!)

They do all agree that the school seems to allocate too short time for for the project work.

3. How do you define "more time"?

The respondents were asked how much time they thought they put into project work each week:

Figures in hours per week

Category	Scheduled	Actually	Comments
Sophomore	2	10	The actual load
Senior	2[1]	12	differs betw. depts.

[1] The questionnaire was completed during the Fall semester of the Senior year. The real challenge, the Main Project of 6 weekly hours takes place in the 6th and final semester.

The entering freshmen were not asked this question because they had just entered the college, see comments to question 1, "Attitude.." above. Collecting the graduates view on what they might have *thought* they remembered from some years ago, was considered of little value and omitted.

The table apparently shows students being pressed to work 5 to 6 times more than scheduled time. However, at the engineering college it is assumed that the weekly assigned student work should amount to 50-60 hours. As the classroom and laboratory work is sheduled to only 20 hours, it is expected that each student should put at least 5-6 weekly hours into every 2 hours' project.

Maybe they are putting the extra work into their projects because they are feeling comfortable with the learning process?

4. Do you think the Telemark Model is a better preparation for future employment than an ordinary engineering program?

Figures in %

Category	Yes	No	Comments from the "yes" groups
Freshman	95	5	Self confidence, experience in
Sophomore	100	0	handling informations and meet-
Senior	83	17	ings
Graduate	-	-	(Inappropriate)

Even if question 2 uncovered some sceptical comments on the supervisers, the students seem to have faith in the Telemark way of handling cooperative learning program with respect to their post-graduation performance.

The respondents answering "no" tend to agree that:

1) Project work is too timeconsuming
2) The amount of project work is unevenly imposed by the different engineering departments: The burden is considered most heavy by the chemical and electronics students. The electrical power students represent the other edge
3) Project work displaces what the students consider to be the "real curriculum" beyond acceptable limits

5. Have you ever applied what you learned by cooperative learning in your daily work?

This question was asked the graduates, who responded:

Figures in %

Yes	No
71	29

Taken into account that 35 % of this group of (only) 17 were hired into positions *outside* their major field of interst, the result is interesting as it also can be detected an indication of *adaptability* to unexpected conditions.

The graduates listed these "new curriculum" items as most important to their jobs:

- writing reports
- cooperation
- writing (in general)
- research, since research work is often organized as projects
- presentations

6. Did you get your first job because of your experience with project work in groups?

This question was asked the graduates, who responded:

Figures in %

Yes	No	Don't know
10	45	45

One may ask: If cooperative learning is - which has been demonstrated here - such excellent way of educating young people, why don't the college do a better job in *selling* its graduates to the labor marked?

CONCLUSION

It has been shown that students at large tend to have faith in and are positive to the Telemark Model of cooperative learning. Even though they find the project work timeconsuming they apparently find themselves personally developing, too. On the other side, there is a fear of the time spent on project work is paid by the sacrifice of the "hard knowledge" taught in ordinary courses.

In short:

1) Student view on the benefits of cooperative learning tends to coincide with the "tangible and intangible curriculum elements" listed earlier in this paper

2) The response from the SDSM&T seems to contradict their fear of the negative consequences of sacrificing some traditional curricula to the advantage of cooperative work in groups, and, not without irony,

3) the Engineering College of Høgskolen i Telemark should improve their own cooperative routines before the students - eventually - become satisfied

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