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

T. Clausen
The Engineering College of Høgskolen i Telemark, Porsgrunn
Norway
Lead Paper

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 seeing 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 scientific way of thinking, working and writing. The topics may be chosen by the group from a list set up by the teacher
At semesters: Technical projects, often in

The problem is usually assigned by the

semester's project (main project, 60% of

teacher or others

projects: The group members are required

report orally to an audience.

Each group is assigned one adviser and

However, some external project partners

has been worked out to assist advisers

written. The group's activities and pro-

be documented by a "project file" containing,

a "process description" where the

mitating their progress, and the formal re-

There is a pass/fail system. Only the final

COURSE CONTENT

model is, depending on the engineering de-

allocating 25-30% of the total organi-

n project work. The rest of the weekly sche-

ed, 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

g will have (and use) the opportunity to

g directly through student work. Ex-

ing that teachers are indeed learning

nts' reports and often include such ma-

classroom work.

pect of the Telemark model is the oppor-

nized - limited by the narrow frames

ear's program. Some graduates are re-

ried just because of the topic they

main project in the final semester.

later, this is not "the general rule".

EDUCATIONAL METHODS

it has been referred to as "traditional ac-

mented studies above all mean a change

The change is fundamental since the objectives of pro-

ject oriented studies are something more than just a curri-

ulum replacement: While a "traditional" program nor-

mally emphasises certain selected fields of specific know-

edge, project oriented studies are trying to realise objec-

tives 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

change 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 mate-

rial 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 indi-

rect leader letting things happen.

This change may be described as fundamental. Maybe

the "change of the teacher" will be the key element in re-

structuring 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 prac-

tical leadership, applied to handling and following

up formal meetings, the preparation and im-

plementation of oral presentations, basic techni-

cal 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 psy-

chology processes (also handling immigrants

with often different cultural backgrounds), de-

velopment of personal attributes as creativity, so-

cial adjustment, responsibility, flexibility, initi-

ative, courage and perseverance
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:

<table>
<thead>
<tr>
<th>Category</th>
<th>Positive</th>
<th>Don’t know</th>
<th>Negative</th>
</tr>
</thead>
<tbody>
<tr>
<td>Freshman</td>
<td>44</td>
<td>44</td>
<td>12</td>
</tr>
<tr>
<td>Sophomore</td>
<td>100</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Senior</td>
<td>98</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Graduate</td>
<td>100</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

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?

<table>
<thead>
<tr>
<th>Category</th>
<th>No</th>
<th>Yes</th>
<th>Comments from the &quot;yes&quot; group</th>
</tr>
</thead>
<tbody>
<tr>
<td>Freshmen</td>
<td>54</td>
<td>46</td>
<td>More liberty, better supervision</td>
</tr>
<tr>
<td>Sophomore</td>
<td>53</td>
<td>47</td>
<td>More time, better supervision</td>
</tr>
<tr>
<td>Senior</td>
<td>40</td>
<td>60</td>
<td>More time, better supervision</td>
</tr>
<tr>
<td>Graduate</td>
<td>0</td>
<td>100</td>
<td>More time, better supervision</td>
</tr>
</tbody>
</table>

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 supervisors all the way through. More specifically, many claim that their supervisors do not cooperate well with other supervisors(?)

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

<table>
<thead>
<tr>
<th>Category</th>
<th>Scheduled</th>
<th>Actually</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sophomore</td>
<td>2</td>
<td>10</td>
<td>The actual load differs between departments.</td>
</tr>
<tr>
<td>Senior</td>
<td>2</td>
<td>12</td>
<td></td>
</tr>
</tbody>
</table>

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 scheduled 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 %

<table>
<thead>
<tr>
<th>Category</th>
<th>Yes</th>
<th>No</th>
<th>Don't know</th>
</tr>
</thead>
<tbody>
<tr>
<td>Freshman</td>
<td>95</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Sophomore</td>
<td>100</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Senior</td>
<td>83</td>
<td>17</td>
<td></td>
</tr>
</tbody>
</table>

Even if question 2 uncovered some sceptical comments on the supervisors, 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 time-consuming
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 %

<table>
<thead>
<tr>
<th>Yes</th>
<th>No</th>
<th>Don't know</th>
</tr>
</thead>
<tbody>
<tr>
<td>71</td>
<td>29</td>
<td></td>
</tr>
</tbody>
</table>

Taken into account that 35 % of this group of (only) 17 were hired into positions outside their major field of interest, 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 %

<table>
<thead>
<tr>
<th>Yes</th>
<th>No</th>
<th>Don't know</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>45</td>
<td>45</td>
</tr>
</tbody>
</table>

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 market?

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 time-consuming 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
REFERENCES


2. Hagler, M., NEEDHA Chair's Message, Newsletter of the IEEE Education Society and ASEE Electrical Engineering Division, Spring 1994

3. Smith, K.A. supported by Johnson, D. and Johnson R., Notes on Cooperation in the College Classroom, Fall 1994


5. A Telemark student group report, Prosjekretter undervisning, Porsgrunn, Norway (1990)