

An Attempt to Get More Creativity to the Training Program of Engineers

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Abstract - In 1970-1980 the Training Center of Engineer Organizations offered coaching in creativity development (CD) for the employees of Finnish industrial companies. The relatively expensive training program was offered also to all willing teachers concerned with the education of engineers by the National Board of the professional training.

As an extension of the training, the project group developed a series of seminars named More Creativity to the Classroom, 3L in Finnish. These were organized annually in different towns. It was understood, that only a teacher can bring new ways of working in the classroom. A part of the methods of finding a creative solution to a problem was included in the curriculums of all new students.

In this paper, the completed project is described. The project of CD was undoubtedly the biggest training program concerning the only thing in the area of training of teachers addressed with engineer education. It took a lot of time and money but many teachers were excited to be a part of it at that time.

Was something changed? Is there something remaining nowadays after those years and after that enthusiasm? For this paper, some of the teachers who were involved in the CD training were interviewed. The research was carried out in the Turku University of Applied Sciences which had a role in developing the schooling.

Index Terms - Creativity development, engineering education

TRAINING PROGRAM OF CREATIVITY DEVELOPMENT

In 1970-1980 the Training Center of Engineer Organizations offered coaching in creativity development (CD) for the employees of Finnish industrial companies. It meant a course of distance learning in groups with a view to develop creativity. The schooling was composed of fifteen booklets which were sent to all participants (at first 24 booklets). Every booklet was followed by a workshop but first every participant had to complete their individual exercises as homework. Groups made up of 4-8 individuals participated in the training schedule in their corresponding companies. A mentor with extensive knowledge of these affairs visited in two of the meetings. All the groups were started off with a common tutorial. Duration of the course was 6-18 months and the curriculum took at least 80 hours. Additional literature was also provided [1].

A working method described above was originally generated in a large Finnish company, Kone Oy, about thirty years ago. More than a hundred companies accepted this chance to educate their personnel, making the total amount of participants mount to about 4500 people in over 600 groups.

The aim of the training was to instruct the courage and drive to see different problems and approaches and the discipline to examine a whole process smoothly. In the program different methods and solutions were introduced that could be used especially to solve the synthesis problems. Focus of the training was particularly in problems related to the participant's own employment.

THE CONTENT OF CD COURSE

During the continuation of the training program, the problem-solving method was examined as a process: problem, facts, ideas, solution, assent, and implementation. To generate a considerable number of ideas, various methods were exercised like distinct brainstorming sessions, usage of various lists of questions or pictures, the varied ways of thinking, the exploitation of stimuli etc. First, a problem was analyzed, for instance through a hierarchy or a target. Then, alternatives for a solution were compared.

Some extensive problem-solving methods were gone through, too. These combined creative problem-solving with a systematic process. These methods included individual and group work, brainstorming sessions, selection, and commitment. In addition basic rules about creativity and creative thinking were deliberated.

TEACHERS IN EDUCATION OF ENGINEERS ALONG

The preceding CD-training was not offered by the government officials, so it was quite expensive. None the less, the Finnish National Board of the professional training offered an opportunity to participate in this schooling for teachers. In total, 72 groups started including 546 teachers during the course of ten years in 1978-1987. There were six groups with 64 teachers in Technical Institute of Turku, the present Turku University of Applied Sciences. This quantity meant a great deal of a total number, about 80 %.

A mentor who paid two visits in the group meetings was usually organized by the training center. Also an expert from the group's company could act as a mentor. Some of the

teachers, who were especially taken up with the concept of the developing the creativity, schooled themselves to be mentors. They visited, besides the groups of the teachers of the engineering section, also in some of the groups of the corporations. This was tailor-made for a creation of a mutual exchange of thoughts and interactions.

Teachers who acted as mentors attended within almost ten years in around twenty in-service training. They were active in planning refresher courses and participated in extensive seminars. This caucus planned and arranged the training of creativity for the teachers after the CD courses.

TRAINING OF TEACHERS AFTER CD COURSE

The National Board appointed a group of authorities mentioned above, to plan a series of extensions to the CD course. The goal was that the concept of creativity would not be forgotten. Teachers of the engineering area, who had carried out the CD course, were invited to partake in this further training. The training had three phases. There was a two day period at the beginning of a semester, after which participants tried to apply their plans in practice. The group was again united for two days after the term. This set was executed three times in all during five years.

Alongside with these CD extensions, the planning group composed four regional seminars with a theme of how to get More Creativity to Classroom, MCC (LLL or 3L in Finnish). The series was started with a common three-day-seminar for the leaders of the local seminars. The plans and the implementations were elaborated with the means of the problem-solving methods, too.

After this process, all teachers that had been a part of the development of the creativity were invited together few times. In the first instance a national MCC seminar was arranged. Then there were three MCC seminars organized in turn at various regions of the country. All eager teachers from the whole state were now welcome.

AIMS

Over a decade, the concept of CD was sustained by many interested teachers. As a theme, was to encourage the participants to commit themselves in taking their own small steps to the direction of more creative thinking and activity. A simple discovery was that there is no-one but a teacher in a classroom who can do something differently!

- **Teachers:** The purpose was to improve the spirit, to gain talent for problem-solving and to introduce new methods. The pedagogical training of teachers had an important role. The meaning was that each of the teachers should be able to find the proper tools to grow up creativity in a classroom. Everybody was motivated to collect up their own tool box.
- **Students:** For the educational usage was yielded a booklet about the basics of creative thinking [2]. The guidelines for creative problem-solving methods became mandatory to pass. All kinds of study modules wanted to involve creative material, for instance exercises which should not be so logical but more open. Good possibilities were thought to be found in the laboratory

works and in the projects executed with the industrial life.

- **Updating training:** The creative problem-solving methods became a part of the curriculum for a decade. E.g. such courses as product development, coaching of managers, or teamwork can be mentioned. Many teachers from the education of the engineers worked as instructors of these methods also for students in universities, companies or other institutes.
- **Supplementary attainments:** Some teachers also bravely obtained new dimensions in learning such as suggestopedia, neuro-linguistic programming, relaxation methods, mind-mapping, microteaching and video self-confrontation. One subject also in focus was a problem-solving methodology, TRIZ, and based on it, a Russian problem-solving method, ARIZ. The method is computer backed (Inventive Machine). In mid 1990s, a group of teachers was in on evolving the old CD course to a new top team course, which included only eight booklets. Many of the teachers gained a strong knowledge of the group work, e.g. OPERA process [3].
- **Context:** The function of the reformation of educational system was to spread out at least to the local small-sized and medium-sized industries. Means for this were considered to be especially the diploma works of the students and the service activity of the laboratories. The main aim was to find a new way of thinking. It is not worthwhile to do things the same way as the others!

WHAT IS REMAINING NOW?

For this study were interviewed all the teachers, who completed the CD course and still act as teachers at Turku University of Applied Sciences (TUAS). Personal interviews were carried out during spring 2007. Fifteen years had passed since all the above described training. Among these interviewed people were two teachers who had performed their CD course in another polytechnic earlier, two teachers who had done the training in their industrial enterprises, and one teacher who switched polytechnics during his training. In total, seventeen teachers were interviewed.

- **Advanced training:** Only 18 % of the participants joined in on the training after the distance learning in groups. So further schooling was only shared by the nuclear group of teachers', although the experience itself was considered favorable.
- **Experience:** 82 % of the interviewees considered the training as a fairly or very positive experience. Nobody viewed it as negative!
- **Work (mostly teaching):** 71 % of the participants described the training of being quite or very useful for their employment. Only one person conceived it as unnecessary.
- **Newness:** Most people (53 %) regarded the essentials of the creative problem-solving methods as very or fairly new things. 29 % of participants considered these ideas being quite familiar. Usually, it has been essential in the schooling of the engineering to learn a fluent method of solving logical problems. Normally, students also want

to have one clear answer on every problem: there should be only one “right” answer. It is very usual that a learner would revise the right answer which can’t to be wrong. Many of the problems in real life are not like that. They are problems where creative problem-solving methods need to be applied.

- **Activity:** The training had 59 % of the participants to observe creative things very or fairly more than earlier. 24 % from people noticed no change at all.
- **Applicability:** The majority, that is 59 %, thought that the instructions of the creative thinking are suitable for their work which is mainly some kind of teaching. Only one person envisioned no usage for creative methods at all. 41 % of the teachers applied creative methods also in other sections, such as organizing meetings, quality system work, consultation, enterprises, developments of business ideas, R&D and so on.
- **Effects:** That 59 % of the interviewees said that they wish to use creative methods in their work. Mostly various think tank sessions but also larger problem-solving processes [3]. The Majority of the population, or 77 %, said that their attitude converted to positive because of the training. 47 %, for one, recognized that they now have a better knowledge of the significance of creativity.
- **Atmosphere:** The majority, 82 %, thought that the atmosphere of the organization was fairly or very encouraging for creative activity during the training many years ago and that there were no negative feelings at all. The present-day atmosphere of the organization on the contrary was experienced to be very or fairly discouraging by 59 % of the interviewees. On the other hand, 35 % thought the atmosphere to be very encouraging, when earlier the reading was 47 %.

DISCUSSION

In the new global world of radical change, it is decisive how successful one can be in innovations. All five species of innovations must be pooled: technology, business, design, service, and culture [4]. An example of the enterprises which has amalgamated the different types of innovations is the Finnish Kone Oy mentioned earlier.

The strategies of TUAS emphasize the innovativeness in the activity and the use of new educational methods at present. The written orientation is consequently parallel with the expectations of the interviewees. However, following circumstances were mentioned relating the present state: the core process, teaching, is forgotten, the atmosphere is oppressive, the enjoyment of the work is gone, the school teaching is now hard, the continuous change inflicts stress, and the leaders solely compel to do something. Formerly the core process was leading, the activity was planar, and the administration was encouraging. The intensions of the leaders are apparently good, but the practice has not been successful.

Learning is best, when taking place in an enriching community which requires trust. In that case, creativity can be developed. The essential things for a creative action are said to be the following circumstances: the backup of the

leaders (82 %), more time (82 %), more money (65 %), and good co-workers (88 %). A positive motivation and atmosphere, innovative leaders, and an inspirational environment were also wished for.

A constructive theory emphasizes an exploratory and problem-based learning. Lack of time was experienced to restrict creative activity in the classroom largely. Financial resources have been at every turn retrenched. The basic skills of engineering program are wished to be taught through conventional methods and there is simply no time after this. The experience of the inadequate time is also probably the essential reason for the stress.

Creativity requires an atmosphere of trust and fundamental safety. If the trust collapses, the culture of the angst preoccupies and nobody flirts. No ideas, no creative risks, and no new innovations are born.

According to a collaborative theory of learning, students must interact with each other. The enriching community can not be born as remote work. Large groups of pupils have been experienced as restrictive.

A culture of fairness creates an atmosphere of trust. In this culture of transparency, there is no secret information. Only by means of trust also a teacher can execute his own creative forces and be in an enriching community with each other. A license to practice promotes the best creativity.

ACKNOWLEDGMENT

Thanks go to the interviewees who have put in time and contributed to compile the concepts about the creativity development.

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