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A NEW APPROACH REGARDING THE ENGINEERING INTERNSHIP

Gabriel. D. Dima[1], Werner Braun[2]
[1]Transylvania University, Brasov, ROMANIA, dumitru.dima@unitbv.ro
[2]NUARB Aerospace, Brasov, ROMANIA, w.braun@nuarb.ro

Abstract: *This paper's propose is to bring a new approach to the students' internship, by combining in a creative way modern and old concepts looking forward to improve the future engineers skills and adaptivity. Based on personal pedagogical experience, the authors proposed a new approach, already successfully tested, combining oriental educational methods with modern concepts specific to multinational companies. Within the paper, topics like how to teach effective skills, increasing student's eligibility on the job market and fast adaptation skills to the specific of a new company are presented.*
Keywords : *internship, industrial training, project based teaching*

1. INTRODUCTION

In most cases, for a successful creer path, both theoretical and practical knowledge are required [3]. For this reason, many students choose to apply for an internship in an industrial company.
According to reference [4], by internship applications, the students can improve their skills, woking in a professional environment and finding good solutions in real work cases. After [5], an industrial training is considered the best environment to develop the students skills and thinking.
According to reference [2], the modern teaching method is a constructivist one that is based on practical project work. This new teaching strategy can offer the possibility for the students to fill the gaps and understand the information presented at the theoretical courses. Related to the work of [1], the activating methods are the teaching procedures that are based on the student's own work. They can activate the students' skills by regular tasks that are rewarded at the final evaluation.
Working with the students during the internship activities, different problems may occur; they are briefly explained in the first chapter of this paper. The paper presents also a case study of this new internship concept, which was held between 2010 and 2014, involving three groups of students in an aerospace development company.

2. THE CURRENT INTERNSHIP DRAWBACKS

Internship is an occasion for students to get closer to industrial practice – seeing how the theoretical knowledge learned in university is applied in real life.Traditional internship implies an employee of the company to take care of students. This system has some drawbacks as follows:

- the employee in charge with students program:
  - has no allocated time for preparing internship;
  - has no pedagogic training;
  - he/she is not all the time motivated (due to company attitude versus students);
- there are not planned/ allocated resources to involve students in real development/ manufacturing activities.

Therefore, many times, students are required to read norms and work methodologies most of their internship period. This leads to disoriented and unmotivated students, in the end, their skills being far from what an engineering office needs [6].

In eastern countries, due to problems of the industrial environment which did not gain its robustness yet, only a few companies are interested in offering worthful internship programs. Another problem is that the companies are interested only of the top students, while the Universities has to solve this stage for all the students, doesn't matter of their level.
In multinational companies also, internships are focused on developing skills by following the program in a specific workshop or office. At the end, the students will have strong skills, for a well-defined task, missing the overview, and what should be his/her role in the development process. To understand the functionality of the product, the development and manufacturing stages, the student needs a dedicated training to get the overview, to participate in professional meetings, and get answers to his questions.

3. ORIENTAL VS. OCCIDENTAL PEDAGOGY

The authors of this paper were directly involved in oriental pedagogical methods for more than 15 years, acting as a martial art instructor. Oriental pedagogy is strongly related to the oriental culture and life philosophy. The main fatures are listed below:

- the absence of a curricula; the teacher (the master) knows the final level to be reached by his students, having the freedom to:
- choose the topic for every meeting;
- choose the subjects to be highlighted or removed;
- deciding about a timeframe of the whole program;
- the teacher may work individually with students according to their potential and affinities (students are treated like a group only at the beginning);
- the teacher insists on finding the vocation of students and their individual development; the students having no affinity for that domain are advised to leave;
- ethical and moral aspects are fundamental; forming a socially integrated and civilized man is more important than forming a high skilled technician;
- the teacher insists much on the students learning attention; many times, the teacher acts like a movie director, creating an appropriate environment to transfer knowledge;
- technical curricula is doubled by a philosophy, art and a balanced life - the target is not only a skilled student, but a mature human;
- the teacher represents an example for his students in all aspects – as a specialist and human being; students show him a special kind of respect. The forerunners are known and respected;
- there is no democracy; teacher is the master of his method and students. This does not limit the feedback, but the intentionally bad attitude of students.The parental attitude of the teacher is at the heart of the system, complementary with the respect of the students;
- The teacher helps the student to get beyond his limits. The moments when the student is extremely solicited are real tests for him. Exams are such reasons, too.The student is accustomed to work with limitations. In the moment they disappear, he can perform with very good results.

The differences between the classic occidental and the oriental system are obvious. Even if the new asian economic success stories are very attractive, the authors consider the European system is more suitable to the present time. It can be improved with good ideas, especially to solve the problems like working with students, bad attitude towards teachers, curricula rigidity.

4. A NEW CONCEPT OF INTERNSHIP

Between Transylvania University of Brasov and Nuarb Aerospace LTD there has been experienced a concept with the following main features/ requirements:

- the student's ability to deal with an objective up to its closure;
- the student's ability to learn to document himself and to ask for the right person when he/ she needs help;
- the student's ability to be flexible to new team/ working conditions;
- the student's ability to learn how to deal with limited resources;
- a generic curricula followed by the students according to their potential;
- subjects may be developed according to the students interest;
- for certain periods, the leader put presure on students;
- students are informed that the one that does not respect the program or with disciplinary problems will be rejected.

5. THE INTERNSHIP DEVELOPMENT

This program was first time introduced in 2010 for four students from aerospace manufacturing, then upgraded every year up to 2014. From 2012 students form automotive, mechanical engineering and manufacturing engineering were accepted too. The the intership started with an recruiting stage the students passing an interview and an initial exam (technical drawing, physics and mechanical engineering), only a percent of about 15% being accepted.
The company involved in this partnership is Nuarb Aerospace ltd, specialized in aerostructure engineering and tooling. The objectives of the internship were as follows:

- developing mechanical design skills;
- developing specific CAD skills (Catia V5 software);
- team working and project management;
- understanding the difference between 3D modeling and design.

The students form the third year of study had the challenge of having a team work on the objective of generating the 3D model of a historical gyrocopter starting from old incomplete blue prints, within a time frame of four months. After the part and assembly design trainings they were only supervised on their activity working more than 80% independently. The team was structured like in real life, students having the roles of designers, checkers, project engineer and project manager. They got involved with big interest in their tasks, in the end their work being presented in the Scientific Session of the Aerospace Department of Transylvania University. After the 3D modeling and solving of the technical issues, the students made a design application by improving the pilot seat attachment and adding an aerodynamic fairing to the instrument panel.

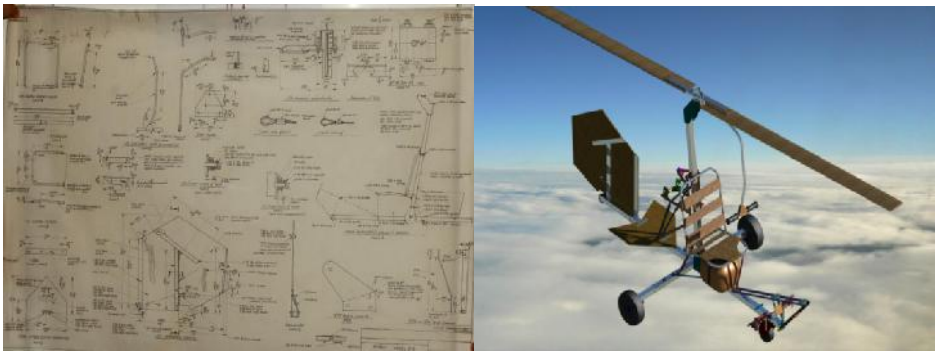

Figure 1: Sample of the original blue prints and the rendered 3D model

Another group of students was involved in the conceptual design of interactive objects of the future Herman Oberth Aerospace Museum. The objectives of the program were:

- identification of the principles/ sensations that can be experienced by visitors (propeller thrust, aerodynamic flow, aircraft flight controls, etc);
- understanding the design criteria (visitors safety, simplicity, low cost);
- conceptual design of objects proposed by students and detail design of one concept.

Students faced a creativity challenge, being involved in brainstorming meetings to propose different interactive solutions. The development of a gyroscope for pilots training was selected from many other ideas, likewise a mock-up for flight controls, a demonstrator showing the flow around an airfoil and a pivoting bicycle trusted by a propeller. The gyroscope was chosen for further detail design.
Students in last year developed their license projects in collaboration within Nuarb Aerospace ltd, the activity reaching a more specific an complex level. After following dedicated aerostructure and simulation trainings, they continued their projects within small teams, the objectives being:

- documenting the specific domain of the project theme;
- developing 3 to 4 design concepts, analysing them and selection of one concept for detail design;
- simulation (kinematic and stress);
- manufacturing drawings.

The different themes were related to light airplane (engine support, landing gear, instrument panel) and to a flight simulator structure and flight controls).

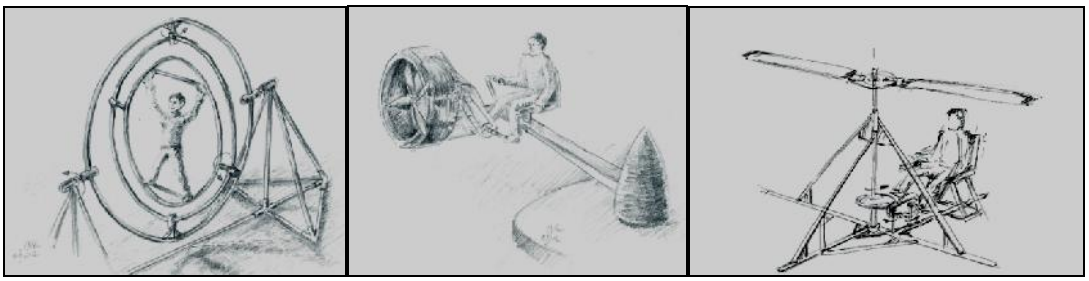

Figure 2: Design concepts for interactive objects of an aerospace museum

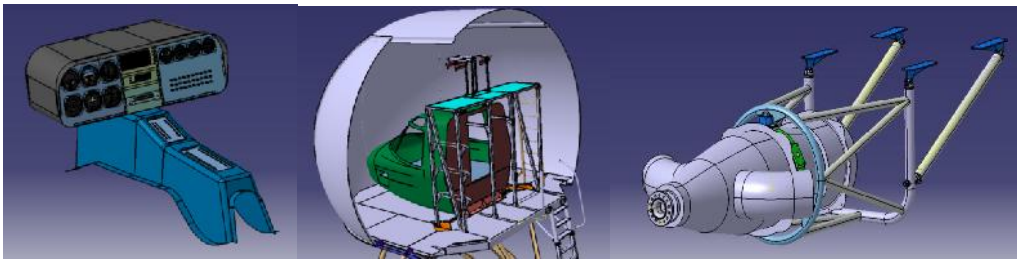

Figure 3: Samples of license projects

6. CONCLUSIONS

Combining classical pedagogy principles with oriental concepts leads to a good attitude of the students, being highly motivated to get involved in their task (even if the program was only 2 hours per week, they spent 4 to 12 hours per week). The relationship with students was both friendly and professional, students that were interested continuing their collaboration with the company within new internship programs and trainings.
Students got involved with high interest in programs complementary with subjects studied in the university curricula. They had a positive attitude up to the end of the internship, passing exams with good results and finishing the projects as scheduled. The flexible curricula let the students develop naturally, their objectives being successfully accomplished, even partially exceeded. Organizing a self managed team led also to the usage of a small resource from the company.
The best students were hired by Nuarb Aerospace ltd and continued the activity within real aerospace projects, with very good results.

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