

## SUSTAINABILITY IN FASHION INDUSTRY: THE CASE OF PROBLEM BASED LEARNING (PBL)

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### **Annotation**

*The aim of this work is to present the outcomes of NordApparel project the results of which can serve as the example of studies internationalisation by the application of problem based learning and how it can enable students to find, to formulate and to present the solutions of fashion industries sustainability problems. Presented results and case study will also enhance international educators and students to identify and to present socially responsible solutions of sustainability problems in other branches of industry.*

**Key words:** *fashion industry, apparel, sustainability, problem based learning, NordApparel network.*

### **1. Introduction**

Human economic activity since the Industrial Revolution had a troubling environmental impact on our planet. From this standpoint fashion and textiles is one of the most polluting industries in the world. Every stage of garments value chain threatens nature and its resources, e.g. it takes more than 20,000 litres of water to produce 1 kg of cotton (one T-shirt or a pair of jeans). Up to 8,000 different chemicals are used to turn raw materials into clothes, including a range of dyeing and finishing processes. Moreover, not all clothing is sold, it falls apart or goes out of style and is discarded in giant landfills. All this leads to the circumstances which forces to integrate sustainability into all stages of fashion industry [1].

Thus educators must speak to students about human influence on our environment. Nowadays students must leave institutions of higher education with a new set of learning outcomes related to the world they will face, i.e. knowledge about the consequences of traditional economic behaviour, attitudinal motivation to change consumer patterns and practical skills for initiating social structures and sustainable lives [2]. Internationalisation in higher education is important in both the local and the global contexts. Universities have a social responsibility to prepare graduates to live and work as responsible national and global citizens. Where ever they are, their lives and their work will be influenced by the global environment. International and intercultural skills and knowledge, an awareness of and commitment to connecting positively with cultural others, and the ability to think locally, nationally and globally will be important in this world [3].

As Scott G. Blair have noted [2], this means creating educational programmes for students that include key learning outcome - a commitment to alter traditional habits of human production and consumption. With respect to upholding basic human rights - the right to live food, housing, medical care, education, safe work conditions and living wages - the global economic order also has some work to do, particularly in terms of equitably allocating basic goods. John Hudzik have underlined that our local actions have direct global consequence. Thus each of us is implicated in the lives of others. The complex nature of globalisation ties us all to a common destiny. This why institutions of higher learning have a social responsibility to empower students to imagine and create new behavioural patterns that are both sustainable and equitable [4].

There are different instruments of study internationalisation including mobility and networking that can be used for new learning outcomes formation. One of them is Nordplus - Nordic Council of Ministers' most important programme in the area of lifelong learning. The overall aim of Nordplus program is be one of the most important political instruments for furthering by covering such topics: 1) cultural and linguistic community based on a shared set of values; 2) knowledge, competence, lifelong learning, and educational and research community; 3) the economy and competitiveness of the Nordic region and Adjacent Areas [5]. The aim of this article is to present the outcomes of NordApparel project the results of which can serve as the example of studies internationalisation by the application of problem based learning and how it can enable students to find, to formulate and to present the solutions of fashion industries sustainability problems. Presented results and case study will also enhance international educators and students to identify and to present socially responsible solutions of sustainability problems in other branches of industry.

## **2. The NordApparel intensive course**

The NordApparel network for cooperation of apparel engineering higher education institutions consists of six higher education institutions from for countries: TTK University of Applied Sciences (Estonia); Helsinki Metropolia University of Applied Sciences (Finland); Jyväskylän University of Applied Sciences (Finland); Kaunas University of Technology (Lithuania); Vilniaus kolegija/University of Applied Sciences (Lithuania) and University of Borås, Swedish School of Textiles (Sweden). All participating institutions are top educators in the field of apparel engineering with good cooperation within the industry and educational sector in the region, on European level and beyond. The need for this network draws from the global, European and regional challenges in the field of apparel engineering. The overall goal of the NordApparel network is to pave way to the sustainability of Scandinavian-Baltic apparel engineering and to intensify cooperation between apparel engineering higher education institutions in the region to further improve the quality of apparel engineering education.

Intensive courses for students from all partner institutions are an essential part of the network cooperation, focusing on the recent developments in apparel engineering and at the same time enabling to practice and improve teamwork among participating institutions. The aim of the presented course is to examine the topics of sustainable development and environmental protection, use of chemical in production, etc. in more detail than the curricula of the participating institutions can cover. The participation of teachers and students from different countries enabled to investigate the theme in more detail, as well as to focus on similarities and differences of regulations and attitudes towards corporate responsibility of each country in the Baltic region. The intensive course gives 3 ECTS points and is recognised as part of the students' degree in each institution according to the requirements of Nordplus program. It lasts one week, i.e. five working days.

Vilniaus kolegija/University of Applied Sciences was selected for the course location in order to benefit from their outstanding contacts with the apparel industry. Vilnius was responsible for hosting the course. Most imported – it was responsible for arranging visits to at least two different apparel production companies in Lithuania for each international team of students and lecturers. Jyväskylän University of Applied Sciences was in charge of the course for its outstanding knowledge, skills and experience in the field of corporate responsibility, environmental protection and appropriate study methods. Borås Swedish School of Textiles contributed with their strength in sustainability aspects, Helsinki Metropolia University of Applied Sciences - with global awareness. All participating Baltic universities added value to the project by their strength in industrial-practical bases and related professional knowledge for practical assignments of the course. The final arrangements for the course were completed by the representatives from all participating institutions during the short preparation meeting one semester before the intensive course.

The intensive course started with homework prepared by students at each home institution under the supervision of their teachers, i.e. with the studies of national and EU

regulations and legislations for the apparel engineering. During the intensive course students had to work in several multicultural teams, each consisting of a student from each partner school. The course was conducted in close cooperation with enterprises because international student teams had to solve real problems indicated by various industry partners of Lithuanian higher education institutions. An external experts from the labour market were also involved in initiating the course by indicating the real-life problems of the industry, arranging company visits and evaluating the results of the student works. Problem based learning (PBL) strategy and method was used to activate students to take responsibility for their own learning. While students were occupied with group assignments teachers were concentrating on the development of their skills and knowledge on the main theme, teaching methods and familiarising with the developments and professional facilities of the host institution - Vilniaus kolegija/University of Applied Sciences. At the end of the course student teams presented their findings which were evaluated by the teachers and the external experts.

### **3. The application of problem based learning (PBL) method**

Problem based learning is a strategy and method for learning. At the same time it is the approach to improve the culture of education and learning and is based on experimental and contextual learning. PBL activates students to take responsibility for their own learning. The skills learned through the problem based approach are related to: problem solving; active information search; knowledge and feedback sharing; communication; teamwork and continuous self-assessment [6].

Problem based learning challenges students to learn through engagement in real problems. It develops problem-solving strategies as well as knowledge base and skills of the discipline. Learning in this case takes place within the context of authentic tasks, issues and problems, aligned with real world concerns. The degree of learning succession attained by different learning and teaching methods is as follows: lectures 5 %, reading 10 %, audio-visual presentation 20 %, demonstrations 30 %, group conversation 50 %, learning by doing 75 % and learning from team members 80 %. The whole process goes by working in small groups from 6 to 12 members. Duration of a tutorial is maximum two hours. Processing of a problem takes two tutorials. The work in tutorials is divided in six steps: agreement in roles; agreement on issues observed and feedback; agreement on timetable of the tutorial; working according to the cycle model; assessment and feedback; conclusions, discussions.

During the first step of this intensive course the roles of discussion leader, recorder, observer and tutor were agreed. Roles were changed in every tutorial. This provided the students the opportunity to be in different roles, sometimes even in a role not so familiar to oneself. The purpose of the roles was to support the growth of self-awareness and development of communication skills along with learning. During the tutorial the team had to agree on what the observer observed and which matters should give feedback on. Agreement on timetable – two hours of a tutorial – were divided as follows: agreement on roles and timetable – approximately 5 min; working according to the steps in the cycle model about 1,5 h; observers assessment and feedback from 5 to 10 min; conclusions and discussions from 10 to 15 min. During the assessment and feedback the observer gave feedback according to the team agreement. The given feedback was not commented and was based on the agreed matters of observation. Meantime during the conclusion and discussion the members evaluated their working and the common process of the team. The objects of assessment were: learning process, problem solving, group process and it took from 10 to 15 min at the end of the tutorial.

At the beginning of the intensive course the steps of the cycle model in the first and the second tutorials were introduced for the students. First tutorial was: problem scenario; brainstorming; analysis and classification; problem areas and learning objectives, self-study. Second tutorial - reconceptualization and clarification. Brainstorming was generation of problem solving ideas (Fig.1). Former, subject related knowledge of the members was brought up. Alternatives, ideas, thoughts and experiences were presented freely in short sentences or in few words. There was no justification, analysis or criticism at this point, because analysis and classification means gathering of ideas in a way that they have a common theme or denominator. The critical study of the connections between matters is essential at this step. The objective of the problem was discussed analytically, critical viewpoints with arguments and counter-arguing were presented. Observe was making no heading at this phase. Heading of the idea groups was performed at the stage of problem area together with the definition of the most important and current themes for learning objectives. The need for learning and interest areas of team members were studied and common learning task for the team was formulated which had to be in a form of an open question or two. At the same time one or few problem areas related to the learning objectives were selected.



Fig. 1 The process of international student group brainstorming

Reconceptualization stage of the second tutorial was the start point of the dialogue between the team members. The objective of this phase was to bring forward new, adopted knowledge related to the learning task and learn from the information constructed by others. The work could start e.g. with a round where everyone has shortly told the most essential, learning task related to the idea he or she has found out. During the clarification student team were going back to the original starting point by comparing the present situation, caused by the new information, with the start point information. Thus they were making an effort to analyse the starting point from the basis of new understanding. The team had to assess what has been learned and what should still be learned. The common synthesis was visualized: e.g. by picture or by the map of concepts attached to the memo. From the basic of such synthesis everybody had to compile a final report.

After each tutorial the recorder together with the observer had to compile a memo, which was returned to the members as agreed. The outfits of the memo could be decided by the writers. Also after each tutorial team members had to compile a report: cover page, content, actual text biblioFig.y and references. Self-assessment had to be written by every team member in order to present and to discuss learning and working in a tutorial experience.

The intensive course has taken five days. During the first day course introduction together with the study methods were presented. External expert has given a lecture and introduced real-life problems from apparel industry. After that international teams of students were formed. On the second day student team work started: idea generation and sharing, information gathering in library and internet, familiarization with host institutions - Vilniaus kolegija/University of Applied Science study curricula, facilities, laboratories, etc. On the third day company visits were arranged with the aim to see with real-life problems on the spot. After that students had to work in teams by discussing, cooperating ideas and preparing for the following workday. On the fourth day student teams had to finalize their presentations in order to present them for the evaluation on the fifth day of the intensive course. The results of the course were discussed and evaluated by both students and teachers.

#### 4. NordApparel network outcomes and presentations

Case study No. 1. The case to be studied by students was formulated in such a way: Lithuanian apparel company has fabric supplier which is in France, but they deliver fabrics in carton boxes which often get damaged. So, **what is the Best Way to Transport Fabrics in Apparel Companies?** The main challenges, which were noticed by students were - how to transport fabrics without damaging them and can packing materials be recycled? New solutions, found by students were related with plastic boxes, fabric rolls wrapped in plastic; fabric rolls in bigger carton boxes and vacuum bags. They have noticed that special attention must be drawn to written agreements with suppliers by integrating more clear advices how to handle boxes and when and where to use pallets (Fig. 2). So the summary prepared by the students was: 1) to pack the fabric rolls in the plastic bags and put them in the bigger carton boxes; 2) to re-use the carton boxes and recycle plastic and 3) to make the accurate agreement with the supplier.



Fig. 2. The discussions of student group No. 1

Case study No. 2. The second group of students have got the question - ***What Physical and Psychological Factors Create a Good Working Environment?*** For this they had to visit two Lithuanian companies. In the first company they have noticed these positive sides: good working hours, flexible schedules for mothers, technical development of manufacturing equipment. Meantime there were much more negative sides: messy environment, missing cutting gloves, strong noise, stressful atmosphere, missing escape routes, no safety clothes, no safety areas, non-ergonomic environment.

The same group have noticed such positive sides at the second company - spacious, light, clean air, clear escape lines, green environment, and focus on the needs of employees, available first aid, and good working hours. Besides there were only few negative sides: noise from outside and no safety equipment (Fig. 3). During this intensive course students have analysed documents related to psychological improvements at work place: regulations of trade unions, preconditions for stable employment, health care, possibilities of flexible work hours and 40 hours per week, bonuses to salary, and stress less environment.



Fig. 3. The example of workplace at the apparel company

By summarising their findings students have stated that physical factors effecting working environment are: 1) safety (chemicals, equipment development, and first aid), 2) work comfort, 3) clean environment, 4) organised workplace and 5) resting areas. Psychological factors effecting working environment are: 1) employees' rights, 2) motivating salary, 3) stability and 4) stress less environment.

Case study No. 3. The problem of the third group was ***The Methods of Textile Waste Utilisation***. Cutting of fabrics in layers is one of major operations in apparel companies. In automated cutting lines the layers have to be vacuumed in order to keep the layers tightly together. This requires plastic film on top of the lay. The waste that is left over after the cutting includes fabric, paper and plastic. Students have visited two companies and have studied literature sources from which they have learned how to sort waste and how textile (natural, synthetic, cellulose fibres) and other materials can be recycled or reused (Fig. 4). Solutions of the problem generated by students were: textile waste prevention, e.g. by using certain CAD/CAM software allowing to minimise waste; expertise in waste burning to make energy; melting, mechanical or chemical recycling; the adoption of EU- Waste hierarchy regulations; the implementation of the idea of Trash to Trend project.



Fig. 4. The evaluation of industrial trash in sewing company

The idea behind the Trash to Trend platform is to share design globally and to find and to use leftover textile materials locally [7]. The Trash to Trend model consists of three elements: 1) waste mapping and database by providing designers an overview of where local textile waste is being produced, its type, and quantity; 2) design techniques by offering designers techniques for upcycling textile waste into fashion design; 3) web-based platform – an interactive framework integrating different elements and making direct communication possible between waste generators, designers, and clients. Waste mapping provides an overview of available textile waste by material, producer, and region using an internet-based map found at <http://www.reuse.ee>. The idea is that the database will grow as it becomes public and more manufacturers participate in the Trash to Trend platform.

Student conclusions after visiting two different companies were that in the first one there is a lot of waste and it looks messy, but they have eco containers. The second company has left good impression, because they didn't find any messy places. Besides students have found that one eco company is constantly taking waste from them. So final conclusions of student group were that cutting waste from textile factories is a worldwide ecological issue: caused by the ignorance of companies or the lack of time and money; there is not just one solution to this problem, but many different ways; individual countries are not able to solve this problem by themselves and everyone must work together to get positive results

Case study No. 4. Fourth group of students had to analyse ***Environmental Impact and Sustainability of Jeans Wear Production***. Students have noticed that most industries and companies which are working with denim are not environmental friendly. As the examples they mentioned XITANG city in China where is very high emission of CO<sub>2</sub>. The materials which are mainly used in denim industry for the production of jeans wear are natural: cotton (organic or genetically modified - BT), jute, ramie, nettle, hemp, bamboo or chemical: PET and other plastics. Quality requirement for denim fabrics are controlled through such material properties as: durability, breathability, dye ability, and shrinkage. Meantime, produces most often care about the profit which is determined by the prices of materials, fabric and garment finishing, production and brand or designer. Student team has made the conclusions that quality, materials and price can improve the sustainability of the jeans wear but the industry itself cannot change without new innovations of the manufacturing process, new chemicals, or new energy sources.

#### 4. Conclusions

As the result of NordApparel intensive course the students have improved their knowledge on the issues of corporate responsibility and environmental protection in the field of apparel engineering in the different countries of the region and have experienced a joint effort with team members from different countries and cultural background. Moreover, students as the future employees of this sector have become better prepared for the global demands for the workforce. In such a way the presented intensive course can be the example of new learning objectives that take up the challenge of how to navigate an ethical path between the needs of environment and the consumer demands. The outcomes of NordApparel project illustrate new educational experience – curricular and community-based - that result in the innovative knowledge, skills and behavioural attitudes students need for sustainable lives.

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