education for FASHION-TECH

design and technology for future fashion creatives

Chiara Colombi, Livia Tenuta (eds)

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Digital has disrupted many industries. New values, new vision, new business models… and new actors! E4FT provides today's fashion leaders a unique opportunity to be in the driving seat for the next decades. The outcome of this European initiative express the challenge well beyond technologies: we tend to forget that innovation is not only about technology, but also about adoption. It includes social, cultural, emotional dimensions. Although these dimensions are obvious for the creation of a new product, they are usually forgotten when we start to speak about innovation. This essay express the strong connections between research, education, industry. Disruptive innovation requires new thinking, new tools, new skills, new profiles. It must be sustainable to provide return on investment. It means to create solutions, but also to educate and understand the impact, to make it last. E4FT is ambitious and pragmatic, inspiring and reliable. It's the new corner stone of an exciting and productive relation between the worlds of research and industry.

Nicolas Henchoz
Founder and Director of EPFL+ECAL LAB

This roadmap is a great resource for those involved in fashion education and more broadly for companies, policymakers and individual designers in the clothing and textile industry. It clearly highlights the environmental, social and societal urgencies and how they are intertwined and expressed within fashion. It reflects on the opportunities that technology has to offer, while also holding a critical stance towards the role and effects of the merge of fashion and technology. It provides new ways of looking at the human body and emotional needs within a rapidly changing environment that challenges design students to reevaluate the fashion system as well as individual relationships with clothing. By giving both theoretical grounding and practical guidance, it can accelerate the convergence of disciplines that is necessary in order to bring new perspectives into the fashion system and promote conscious innovation. The proposed shift in education generates a new awareness and perspective for action for a new generation of students.

Pauline van Dongen
Wearable Technology Designer,
Founder & Creative Director of Pauline van Dongen

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LEARNERS AND TRAINERS: FASHION-TECH PEDAGOGY AND SKILLSET

Chiara Colombi, Ann Vellesalu

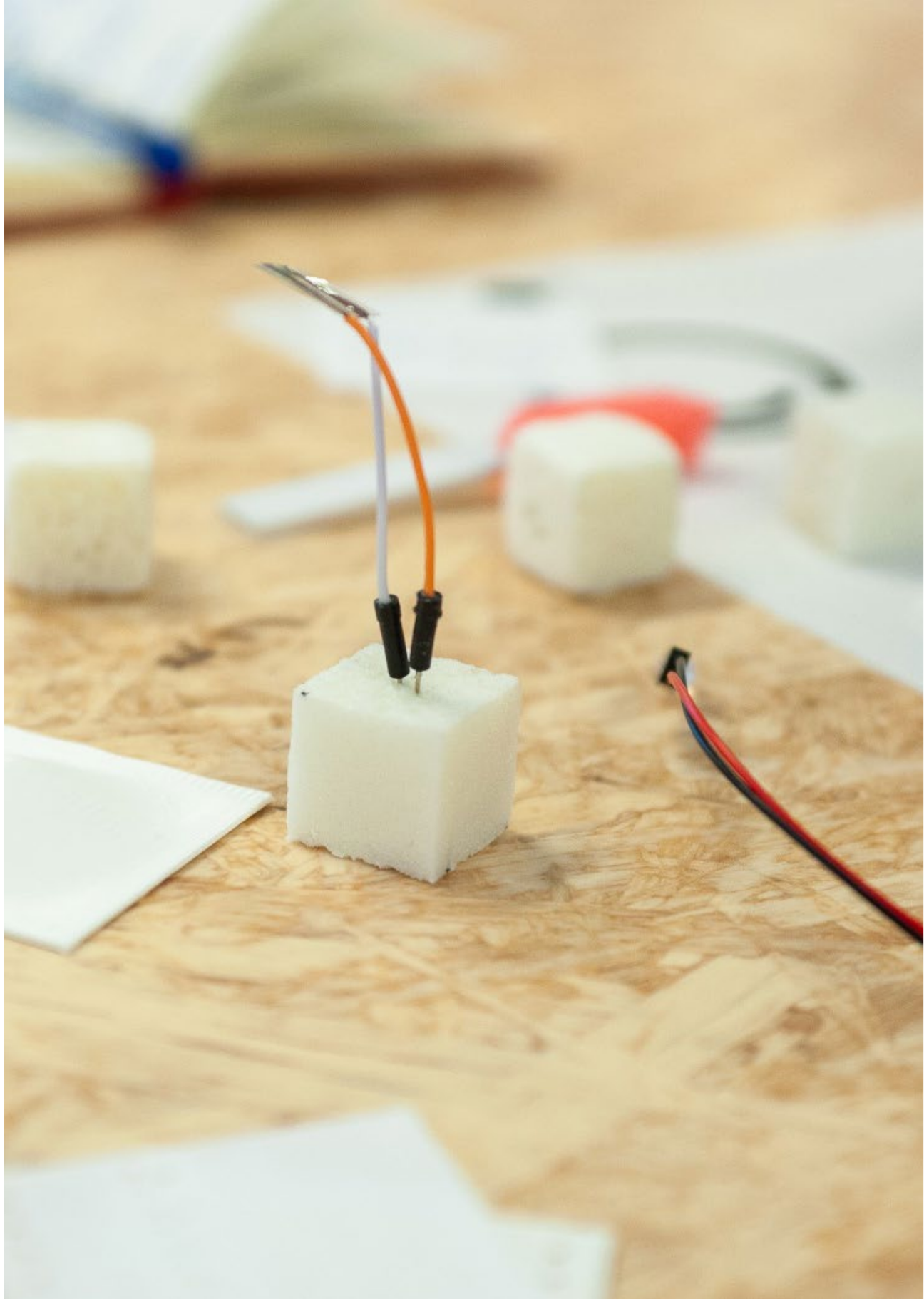
02. LEARNERS AND TRAINERS: FASHION-TECH PEDAGOGY AND SKILLSET

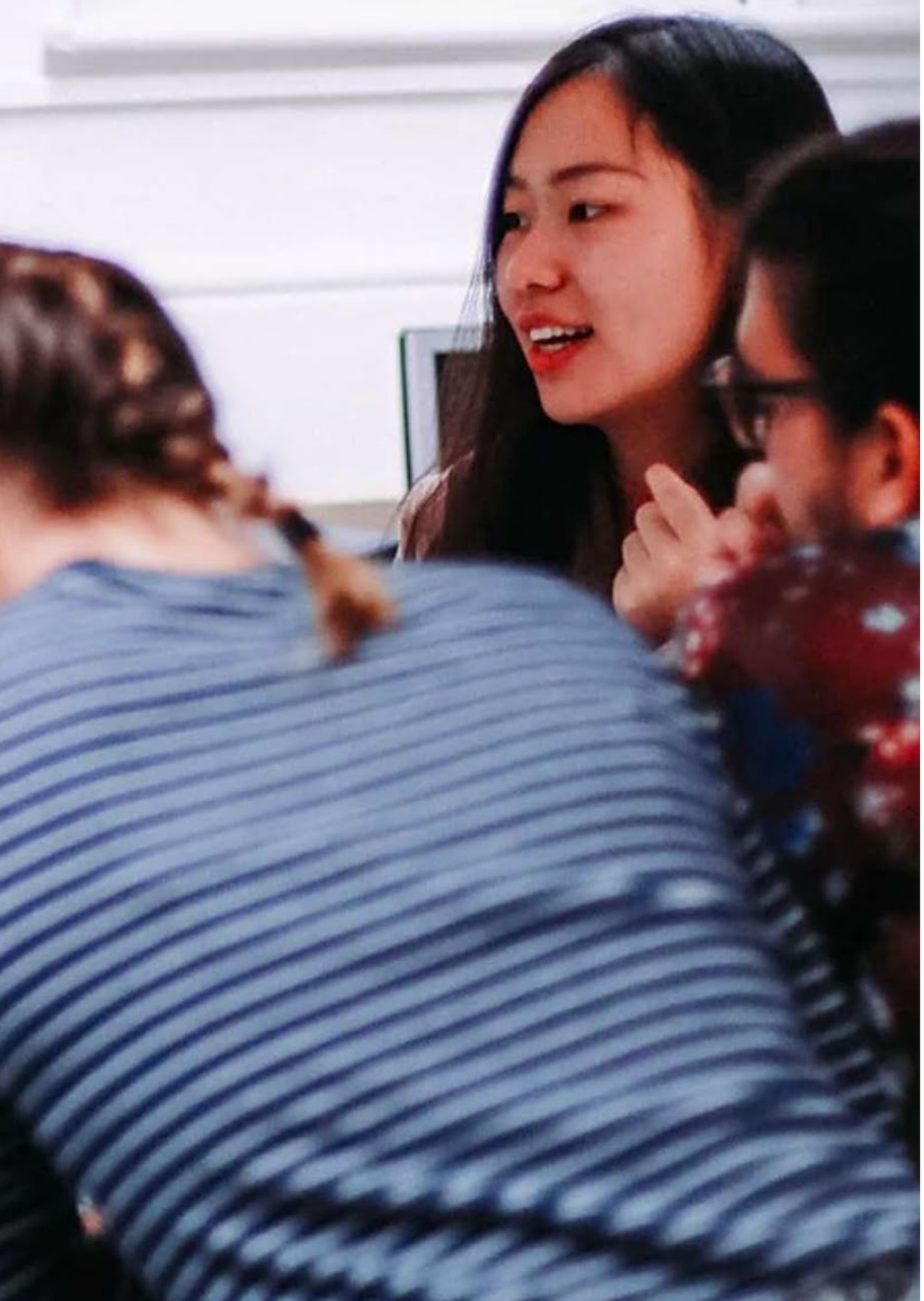
C. Colombi, A. Vellesalu

Five pilot workshops were organized during the 3-years E4FT project with the aim to test and evaluate different approaches to Fashion-Tech. Each workshop was designed to reach specific objectives of the Project.

The Fashion-Tech Hackathon was organized as an opportunity to map current levels of knowledge and skills of learners active and/or interested in fashion-tech. The Train the Trainers short workshop allowed the testing and refinement of the teaching methods identified, adjusted and compiled into a Teacher's Toolkit for fashion-tech, by the teachers of the project members. The following three intensive programs brought together both teachers and learners from the partner universities to test and refine the proposed fashion-tech approaches at the intersection of smart textiles, digital manufacturing and wearables, in real-life situations. Politecnico di Milano (POLIMI) held a 5-day workshop on digital manufacturing, University of the Arts London (UAL) on wearables, and the Swedish School of Textiles – University of Borås (HB) on smart textiles. The workshops were not only the key activities to interact and gain feedback/learn from the learners participating in the project but also aimed to ensure that the courses developed are relevant and transferable to different fields of fashion-tech, different institutions and different regions, ensuring the project results are truly adjustable and sustainable. As all activities had a transnational approach (involving trainers and learners from each of the partner universities), they contributed to the mobility of these participants providing the added benefit of shared learning experiences, greater opportunities for knowledge sharing between institutions and its teachers & learners, as well as for further collaborative opportunities beyond the project. During the pilot workshops, the monitoring process aimed to assess the overall quality and success of

each delivered training program. Central to this process it was the use of evaluation forms and questionnaires that the participants completed before and/or after each workshop. The methods were designed to provide accurate feedback and assessment relating to the depth and quality of the material delivered, the relevance of the subject matter, and the teaching practices employed throughout the intensive teaching and learning period. In addition, a peer observation process was adopted within the for the participating teachers. Peer observations offer critical insights into an instructor's performance and complement the student ratings and feedback forms. Combining both perspectives contributed toward a more comprehensive and accurate representation of the overall teaching quality. Lastly, informal group discussions were held at the end of each workshop to openly discuss and collate any additional areas or matters that they wish to raise or express, which may not be best achieved using feedback forms or questionnaires. An in-depth analysis of each learning, teaching and training experience follows.





FASHION-TECH HACKATHON

Observing the current state of skills and knowledge in Fashion-Tech at UAL

DATE

July - September 2018

PROJECT LEADER

UAL

GOAL

This Fashion-Tech hackathon aims to:

- Map the current state of skills and knowledge in Wearables.
- Document approaches/obstacles to cross-disciplinary collaboration.
- Identify requirements for supporting bespoke curriculum developments within this space.

PROJECT BRIEF

Fashion and technology are increasingly merging, specifically in three areas: wearables, smart textiles and digital manufacturing. Edu4Fashion-Tech team researched around these three areas and found out five emerging directions for Fashion-Tech:

1. Protection and body enhancement through artificial second skin: wearables and smart textiles with embedded sensors are able to monitor physiological, neurological and body kinematic parameters that are critical for healthcare.
2. Culture driven wearable: art, technology and interaction: generating thoughts and knowledge around human behaviours, interaction with the body, other people and the environment.
3. Hyper-body: connecting senses and materials: involving three of the five senses (eyesight, hearing, touch) enhancing or “substituting” them.

4. Fashion takes care: sustainability across design, production and retails covering the entire supply chain and it is intended as efficiency, recyclability, transparency, mission orientation and ethical upgrades.
5. Real/Virtual mixed environments: analogical/digital places created and customized with mixed reality as a result of the addition of virtual and augmented reality; new dimensions for self-assembly and programmable materials; artificial intelligence for all the supply chain.
Starting from the MACRO trend assigned, develop:
- DEBRIEFING
- RESEARCH TROUGH CROSSFERTILIZATION (research in different fields as architecture, art, science, industrial design, nature..);
- BLUE SKY RESEARCH (curiosity-driven science);
- ANALYSIS OF NEEDS (obvious, declared, hidden);
- CONTEXT RESEARCH (on the market)
- DATA ANALYSIS AND INTERPRETATION (metatrend)
- SCENARIO BUILDING (mood board and scenario of use for wearables or smart textiles or digital manufacturing).
- VISION DESIGN (orientation of ideas following the suggestions of professionals from science, art and technology field, story-board)
- CONCEPT

LOCATION

Digital Learning Lab, School of Design and Technology - London College of Fashion, London.

ACTORS INVOLVED

- 22 students from MA programs of partner universities
- 1 moderator: Douglas Atkinson, Research fellow at the LCF - Digital Anthropology Lab
- 6 facilitators: (2 LCF, 2 HB, 2 POLIMI)
- 4 keynote speakers: Birgit Freundorfer (Adidas), Fredrik Timour (Neue Labs), Massimo Bianchini (Politecnico di Milano) and Matthew Drinkwater (Fashion Innovation Agency UAL)

METHODOLOGY

The following has been presented at INTED2019 – 13th International Technology, Education and Development Conference in March 2019. A hackathon in its origin entails collaborative practices to solve problems in short time periods [John Duhring], [David Altounian and Sarah Sharif], [E. Kolog, E. Sutinen and E. Nygren], while benefitting from continuous feedback and guidance from mentors and industry experts [S. Chandrasekaran, G. Juckeland, M. Lin, M. Otten, D. Pleiter, J. Stone, and F. Foertter] to accelerate innovation [J. Silver, D. Binder, N. Zubcevik, and R. Zafonte], [A.H. Suominen, J. Jussila, T. Lundell, M. Mikkola, and H. Aramo-Immonen]. With a central idea revolving around a ´rapid iteration of ideas`, participants allocated to a fast paced and high-energy environment [J. Wang, K. Pamnani, R. Capasso, and D. Chang] are enabled group-based learnings in inter-, cross- and multi-disciplinary settings [J. Silver, D. Binder, N. Zubcevik, and R. Zafonte], [A.H. Suominen, J. Jussila, T. Lundell, M. Mikkola, and H. Aramo-Immonen], [J. Wang, K. Pamnani, R. Capasso, and D. Chang]. With a solution-oriented structure, hackathons can be appealing as educational

outlets [A.H. Suominen, J. Jussila, T. Lundell, M. Mikkola, and H. Aramo-Immonen], [J. Wang, K. Pamnani, R. Capasso, and D. Chang], by using them as tools to give students an opportunity to develop problem-solving skills to prepare them for the market [David Altounian and Sarah Sharif], as schools today are not focused on developing the ability to solve 21st century problems [Brandon Zoras]. Furthermore, by urging students to brainstorm, plan and develop projects and prototypes, and pitch concepts [John Duhring], the hackathon model defines a structure and a process around conceptual development [Elizabeth Spaulding and Greg Caimi]. With similarities to project-based and problem-based learning [P.A. Horton, S. Jordan, S. Weiner, and M. Lande], a hackathon model shares the following key elements with the approaches to teaching and learning. Firstly, a challenging problem or question should be raised, along with directing the participants to investigate potential solutions through in-depth research prior to starting the project [P.A. Horton, S. Jordan, S. Weiner, and
M. Lande]. Secondly, by allowing participants to have control over their chosen practice or strategy [NSW Department of Education], a sense of ownership is created, which further motivates them to find solutions [P.A. Horton, S. Jordan, S. Weiner, and M. Lande] by gaining a professional experience [John Duhring]. By enabling the participants to present their projects, their performance levels and authenticity of the projects are increased, as they are enabled to demonstrate their knowledge and skills to the community [P.A. Horton, S. Jordan, S. Weiner, and M. Lande]. Moreover, critique and revision on the projects should be enabled by the individuals themselves, teachers, peers and experts [P.A. Horton, S. Jordan, S. Weiner, and M. Lande], by also acting as a support system in the form of mentors and industry professionals for improvements in the development process [9]. By establishing connections between academia and the industry, and other organisations, the students are exposed to community issues [David Altounian and Sarah Sharif] that provides them with an authentic context, participants are motivated to solve problems directly faced by other people or themselves personally [P.A. Horton, S. Jordan, S. Weiner, and M. Lande]. Furthermore, the industry gains from identifying new professionals [David Altounian and Sarah Sharif] due to participants demonstrating their potential value [P.A. Horton, S. Jordan, S. Weiner, and M. Lande]. Furthermore, with a high focus on teamwork [13], participants are encouraged to develop collaborative and communication skills, besides competencies related to design and technology [A.H. Suominen, J. Jussila, T. Lundell, M. Mikkola, and H. Aramo-Immonen], [T. Aungst]. By forming teams of individuals that are not familiar with each other, their interest in new technology and motivation can be enhanced [P.A. Horton, S. Jordan, S. Weiner, and M. Lande], while a balanced set of skills and experiences is relevant [Brandon Zoras]. Additionally, a variety of cultural and linguistic backgrounds can be relevant to motivate the students' collaborative thinking [E. Kolog, E. Sutinen and E. Nygren]. As hackathons are planned on tight timelines to accelerate and encourage creativity and innovation [J. Silver, D. Binder, N. Zubcevik, and R. Zafonte], [A.H. Suominen, J. Jussila, T. Lundell, M. Mikkola, and H. Aramo-Immonen], time is the main aspect that has been found challenging in organising such events [P.A.

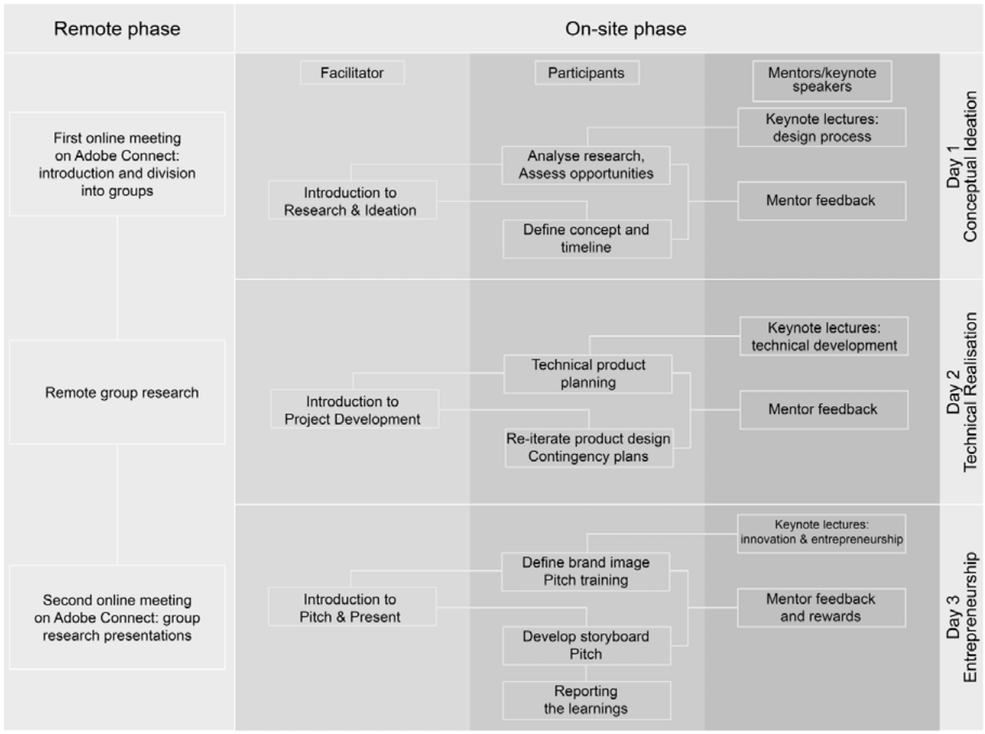
Horton, S. Jordan, S. Weiner, and M. Lande]. While it can limit the participants' ability to perfect their solutions, it aims to instead achieve functionality and innovation [P.A. Horton, S. Jordan, S. Weiner, and M. Lande]. As the concept of using the hackathon model has been tested and accepted in business settings [E. Kolog, E. Sutinen and E. Nygren], [14], and in education for example within health [J. Silver, D. Binder, N. Zubcevik, and R. Zafonte], [J. Wang, K. Pamnani, R. Capasso, and D. Chang], [T. Aungst] and computer science [E. Kolog, E. Sutinen and E. Nygren], [P.A. Horton, S. Jordan, S. Weiner, and M. Lande], and with its similarities to problem-based learning and a solution-oriented structure, utilising the model as a framework for teaching and learning is of interest within this study, aligned with the previously defined aims.

RESEARCH METHODOLOGY

The hackathon event was planned in two phases: a remote phase initiated 3 months before the event, and an on-site phase (see Fig. 1). The phases consisted of the four steps of the Fashion-Tech design methodology: research, conceptual ideation, technical realisation and entrepreneurship.

WORKSHOP STAGES

During the remote phase, the first online meeting was held 3 months before the hackathon event utilising the online platform Adobe Connect. The first meeting aimed to introduce the participants to their group members and to give them their first task of research. The participants were expected to research their given themes to understand the field and to be able to find



Structure of the Hackathon Event, Source: Education for Fashion-Tech

problems and gaps on the market, and assess the opportunities. Furthermore, all participants were required to answer an online survey, which will be explained below. After the research period, the second online meeting was held, where the participants were asked to present their research, focusing on design, technology and market. The on-site phase took place over three days at the London College of Fashion's Digital Learning Lab. Besides the participants, staff from the E4FT project and keynote speakers from the industry took part in the event, to make expert knowledge available to the participants. The role of the facilitator was to introduce the participants to the different parts of the hackathon and keep them on track with time, while E4FT staff and keynote speakers as mentors were providing support throughout the whole event. The on-site phase focused on the conceptual ideation, technical realisation, and entrepreneurship steps, with a solution-oriented aim of finding an opportunity in the market. To motivate the participants, a first and second-place prize was announced to the two best teams, settled by a peer vote at the end of the last day.

THE OUTPUT

In order to map the competencies related to the Fashion-Tech design methodology, the participants were asked to fill in two online surveys – one at the beginning of the remote phase and one after the hackathon event. The competences were divided into generic and subject-specific competences, defined by the Tuning Document, also produced by the project. Thus, the survey

results provided insights into the perception of the levels of knowledge and skills related to the Fashion-Tech methodology. The two surveys were defined to understand the changes in the perception of the participants, providing information on the value of utilising the hackathon model as a framework for teaching and learning in Fashion-Tech design. Furthermore, the second survey along with group reflections provided information related to student experience and satisfaction. Both surveys thus presented a list of 29 competencies to be evaluated on a 6-point Likert scale, with the second survey also focusing on aspects related to the programme, level of skills within the groups, expectations for the event, and any strengths or weaknesses. The Likert scale was defined based on the perceived level of competence from 'No level of knowledge and/or skills' to 'Excellent level of knowledge and/or skills'. The data was analysed based on a mean average for the perceived level of competences, and through a thematic analysis to pinpoint and examine patterns within the data related to student experience and satisfaction. A total of 23 international students from the partner universities took part of the hackathon event, with 6 students from University of Borås, 11 from the University of the Arts London, and 6 from Politecnico di Milano. For the online surveys, a 95,7% response rate was achieved for the first survey and a 78,3% response rate for the second survey. The response rates were assessed to be acceptable, as while not presenting a full set of data, the results were informative and the response quality was evaluated to be high. The results are divided into competence mapping, where the perceived levels of knowledge and skills are presented in four groups of generic and subject-

specific competences, along with presenting student experience and satisfaction with such educational setting. In total for all four groups of competences, the perceived levels increased on an average by 12,6% for the whole group of 23 students. The data from group reflections and the second survey was thematically analysed, and four main themes emerged as most relevant: content, structure, mentors and keynote speakers, and groups. In terms of content, most participants found the programme to be coherent with the topic of Fashion-Tech tackled intensely, where they learned about the development processes and how to apply them in their studies.

On the other hand, the participants found that a practical phase was missing, with an opportunity to carry out technological experiments or prototyping. Furthermore, they found that the given themes could have been narrower to facilitate defining a specific concept for an application. Regarding the structure, the participants found the event to be challenging and intense in terms of time, which was seen both positively and negatively. On one hand, the structure was positively challenging to achieve more than they thought they would be capable of. On the other hand, some participants found the time to be limiting, relating to adding additional time for research while designing and practical aspects, or even to the remote phase of the event, where the participants suggested allow additional time for presenting their research results in person. The participants also suggested involving computers in the development process, allowing them to use their time more efficiently, while also enabling more research being carried out during the event. The mentors and keynote speakers were found to be relevant, offering diverse lectures, ideas and input throughout the process. The keynote lectures were found important for giving an overview of the state of art in the Fashion-Tech field, while also offering inputs for rethinking their own concepts and designs. Similar to the feedback relating to content and structure, the participants found the technology side of the process to be lacking, especially related to specifically Smart textiles and Wearables. Furthermore, some participants mentioned the necessity of the mentors reminding the groups to stick to their given themes for more narrow applications and more diverse outcomes. As the groups were combined from design and management students, it was of interest how their different backgrounds and experience would enable them to maximise their combined knowledge and skills, and reaching common solutions. Firstly, the participants began by learning about the importance of working in a team, which also reflects in an increase of their perceived level of the competence `teamwork´. Most students found that their group members had complementary knowledge and skills due to their different backgrounds. On the other hand, some participants found the level of competences unbalanced within their groups and stated the necessity of adding a student from the marketing and engineering disciplines into the group.

TRAIN THE TRAINERS

Engaging Teachers in the Fashion-Tech Approach at HB

DATE

26th-28th February 2019

PROJECT LEADER

HB

GOAL

The transnational workshop was utilised to engage the academic team members from the partner universities delivering the intensive study programmers C3-C5 for higher education learners. The main aim of the workshop was to test and refine the methods and approaches to teaching and learning of Fashion- Tech, as developed by the project and compiled into the Teacher's Toolkit.

PROJECT BRIEF

The project brief of the Train the Trainers workshop was to develop an MA-level Fashion-Tech course (learning unit), responding to 7,5-15 ECTS, that would meet the modular structure of a proposed MA curriculum in the Tuning Document. The foundation for developing the course was based on the Tuning Document, and the Teacher´s Toolkit, defining open and innovative methods to teaching and learning Fashion-Tech in higher education. Each group was assigned an overarching topic, referring to the three areas of the proposed MA programme: (1) design and ideation, (2) technology and engineering, (3) human, social, psychological and economic contexts. The participants were also briefed about the philosophy of the project and previous intellectual outputs and activities to give an overview of the objectives of the

project, and its deliverables.

LOCATION

DoTank – Textile Fashion Centre, in Borås Sweden

ACTORS INVOLVED

15 teaching staff members from the partner universities: Douglas Simon Atkinson, Maria Dada, Mouhannad Al-Sayegh, Nathan Philpott, Ella Sharp-Mitchell, Susanna Testa, Livia Tenuta, Chiara di Lodovico, Laura Cipriani, Silvia Deborah Ferraris, Nils-Krister Persson, Erin Lewis, Tuser Biswas, Niina Hernandez, Vijay Kumar.

Their experience ranged from different disciplines related to Fashion-Tech, complemented with a variety of experience with teaching in higher education institutions. For example, the participants had backgrounds in textile engineering, interaction design, material technology, digital embroidery, jewellery design, fashion entrepreneurship and innovation, among others.

The participants were divided into groups based on their focus topic and length experience, to complement those of other group members, and the three focus areas of the to be developed courses.

The workshop was planned and held by the project members from the University of Borås, The Swedish School of Textiles.

METHODOLOGY

By giving the participants the project brief of developing a Fashion-Tech course, the Teacher´s Toolkit was tested and evaluated through practice. The participants were guided through a step-by-step process of developing a course. The steps involved were the following:

1. Define course goals
2. Define/decide competences based on the Tuning Document
3. Determine course content
4. Choose teaching and learning methods based on the Teacher´s Toolkit
5. Plan assignments and assessment
6. Select reading materials and other resources
7. Develop course schedule

The steps for course development were intertwined with group discussion and feedback based on the progress, and each individual tool in the toolkit.

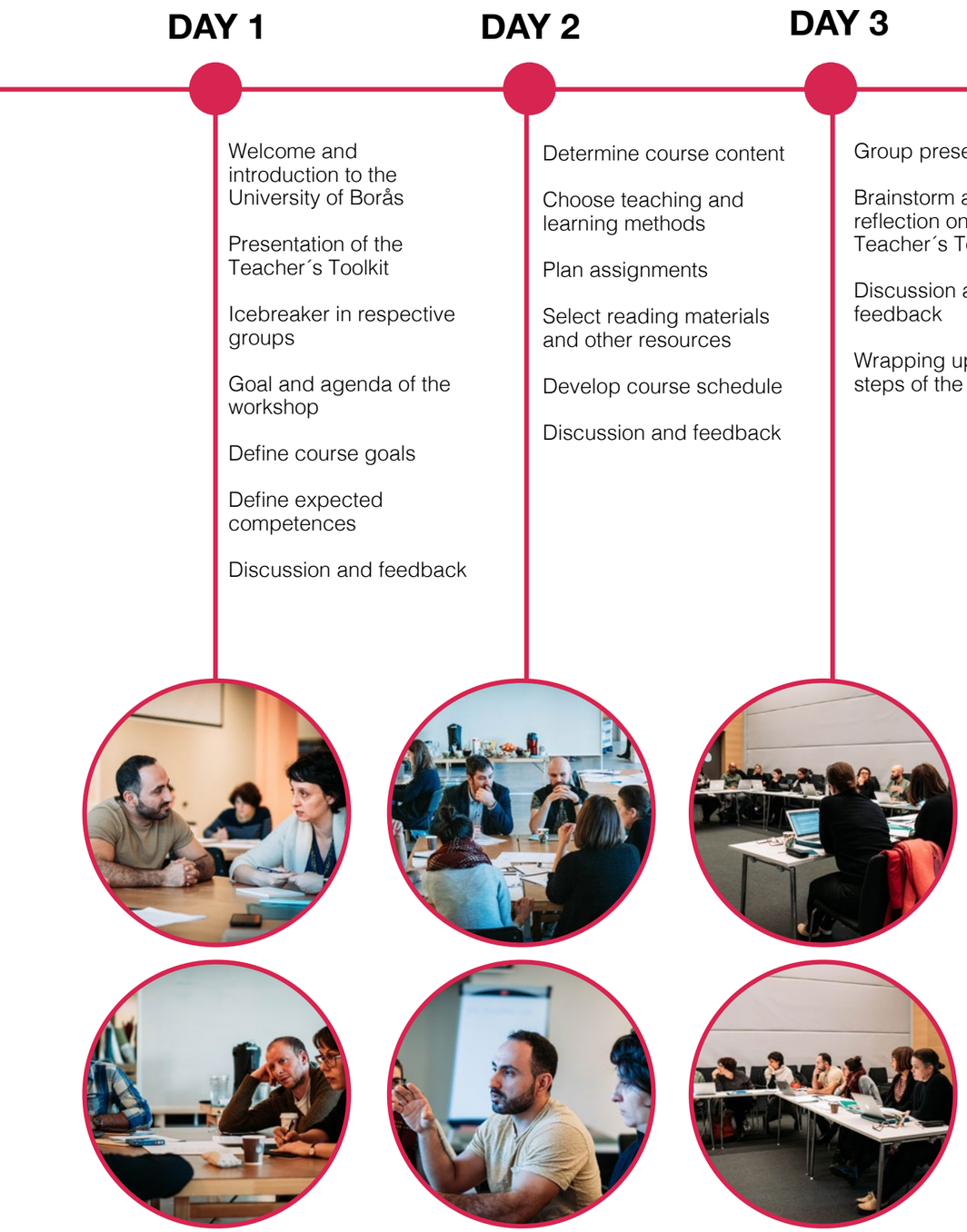
RESEARCH METHODOLOGY

Data from the workshop was captured through participant observation, individual and group discussions and feedback throughout the workshop, which were complemented by interviews with a few participants regarding their aspirations as a teacher of Fashion-Tech, and how they can implement the toolkit in their work.

WORKSHOP STAGES

Day 1

* Welcome and introduction to the University of Borås
* Presentation of the Teacher´s Toolkit



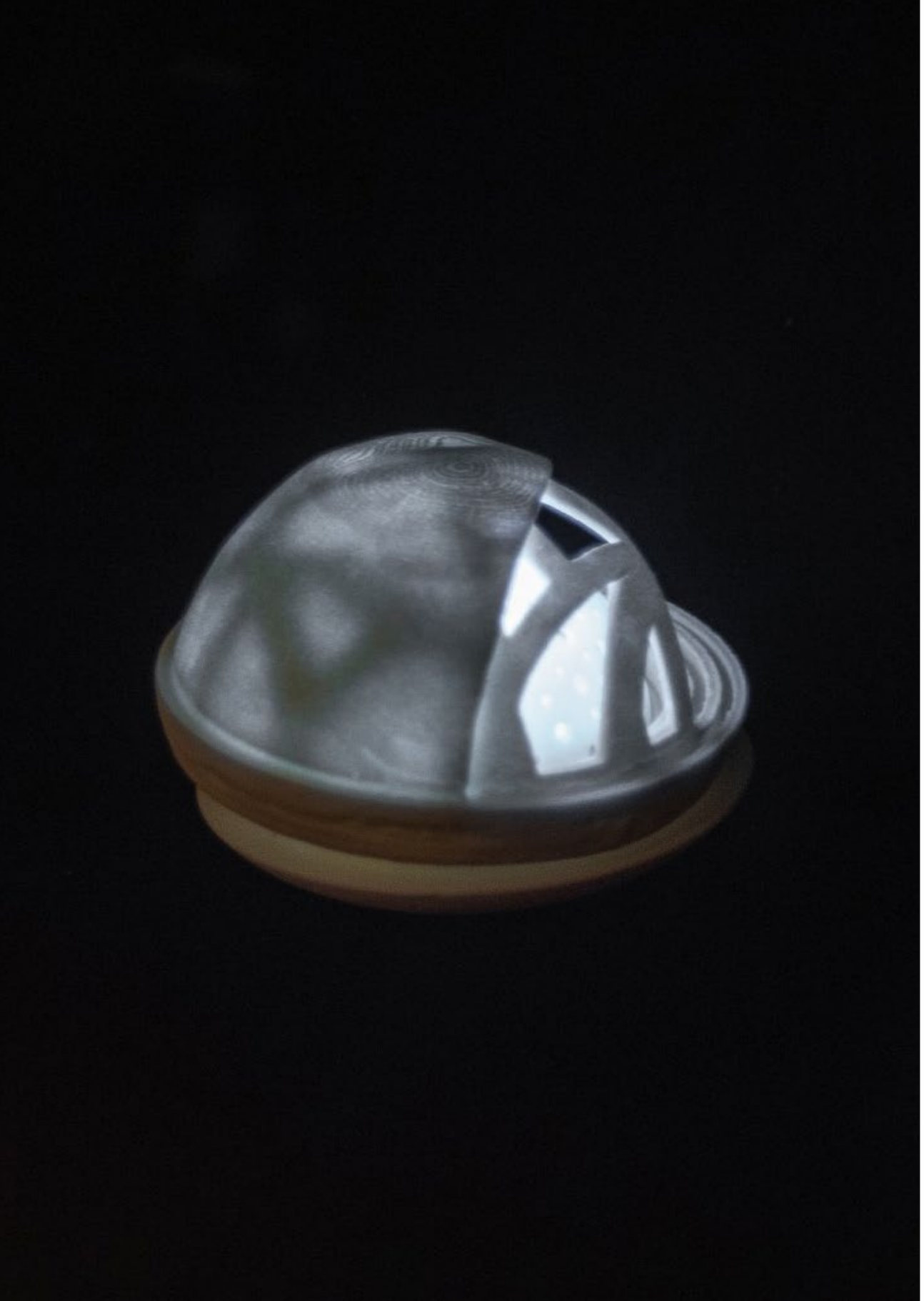
* Icebreaker in respective groups
* Goal and agenda of the workshop
* Define course goals
* Define expected competences
* Discussion and feedback

Day 2
* Determine course content
* Choose teaching and learning methods
* Plan assignments
* Select reading materials and other resources
* Develop course schedule
* Discussion and feedback

Day 3
* Group presentations
* Brainstorm and reflection on Teacher´s Toolkit
* Discussion and feedback
* Wrapping up and next steps of the project

THE OUTPUT

The resulting experience and feedback of working with the Teacher´s Toolkit was analysed and resulted in a refined version of the toolkit, available both online and pdf for print.



IAMLIGHT
Experiencing Additive Manufacturing at POLIMI

DATE

24th - 28th June 2019

PROJECT LEADER

Politecnico di Milano

GOAL

This intensive programme for higher education learners aims to:

- Test the designed curriculum's pedagogy and teachers' toolkit in real settings;
- Engage learners in an intensive transnational, multicultural and interdisciplinary collaboration, to test not only their technical abilities but also their interpersonal skills;
- Facilitate learners' ability to divergently personalise their learning within the fashion-tech fields thanks to the use of blended tools and on-field activities;
- Prototype and evaluate the quality of possible outputs as Fashion-Tech artefacts too, then, approve methodology and promote it beyond the partnership and into the European communities of HEIS, companies and shareholders;
- Highlight the further learning, teaching, and training opportunities based on the emerging needs of trainers and learners on the field.

PROJECT BRIEF

Design a jewellery piece for Maison 203 company using 3D Printing technique. A design concept that starts from the perception of surfaces depending on the presence or absence of light.

DAY 1

Brief launch

Basic elements of perception; Exercise, from theory to practice;

Peer review and comments + definition and identification of the elements useful for the design concept

Company presentation

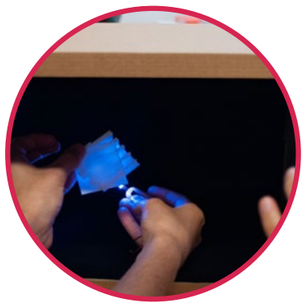
DAY 2

Lecture: Light as design tool

Peer review and identification of guidelines for the design concept

Lecture: Theory on 3D printing, case studies and exercises

Brainstorming + inspirations for research



DAY 3

Lecture: Augmenting/ connecting the human body through digital technologies

Lecture: Jewellery Design Today

Research + Concept definition

Shape definition and development for 3D printing

DAY 4

Collection development in 3D

Finalization of the presentation + prototype check

DAY 5

Presentation check (Inspiration, concept, sketches, technical drawings and 3D modelling)

Final presentation to Maison 203

LOCATION

Polifactory, the official makerspace and FabLab of Politecnico di Milano.

ACTORS INVOLVED

- 1 company: Orlando Fernandez Florez, Maison 203
- 5 Politecnico di Milano staff members from fashion and tech field, 2 (1 fashion 1 tech) with the role of trainers: Chiara Colombi, Patrizia Bolzan, Chiara Di Ludovico, Livia Tenuta, Susanna Testa
- 3 keynotes speakers with the role of expert trainers offering specialised contents to supporting trainers and learners' activities: Daria Casciani, Sara Colombo, Silvia Deborah Ferraris.
- learners from LCF, 6 from Polimi and 4 from HB selected through a call for students, for a total of 15 students, grouped in 5 teams of 3 students, one student forms each partner, to maximise the benefits of an international collaborative experience.

METHODOLOGY

The project envisaged a learning-by-doing part which was compounded by theoretical lessons imparted by experts in Digital manufacturing and 3D Printing, Fashion and Jewellery Design, Fashion-Tech and Communication Design. These supported the whole design process and guided the students through all of its stages.

RESEARCH METHODOLOGY

Qualitative analysis from observation + quantitative results through interviews and questionnaire.

WORKSHOP STAGES

Day 1

* Brief launch
* Basic elements of perception; Exercise, from theory to practice; Peer review and comments + definition and identification of the elements useful for the design concept // Silvia Ferraris
* Maison 203 presentation // Oirlando Fernandez Flores

Day 2

* Light as design tool + Exercise // Daria Casciani - Testing the surface through samples (distance, angle, the relation between light and material) and taking pictures
* Peer review and identification of guidelines for the design concept
* Theory on 3D printing, case studies and exercises // Patrizia Bolzan - Starting from the limits identified during the morning interacting with samples, students will work on 3D models to integrate light
* Brainstorming + inspirations for research

Day 3

* Augmenting/connecting the human body through digital technologies // Sara Colombo
* Jewellery Design Today // Livia Tenuta

* Research + Concept definition // Chiara Di Lodovico, Livia Tenuta, Susanna Testa
* Shape definition and development for 3D printing // Patrizia Bolzan

Day 4

* Collection development in 3D // Patrizia Bolzan, Chiara Di Lodovico, Livia Tenuta, Susanna Testa
* Finalization of the presentation + prototype check // Patrizia Bolzan, Chiara Di Lodovico, Livia Tenuta, Susanna Testa

Day 5

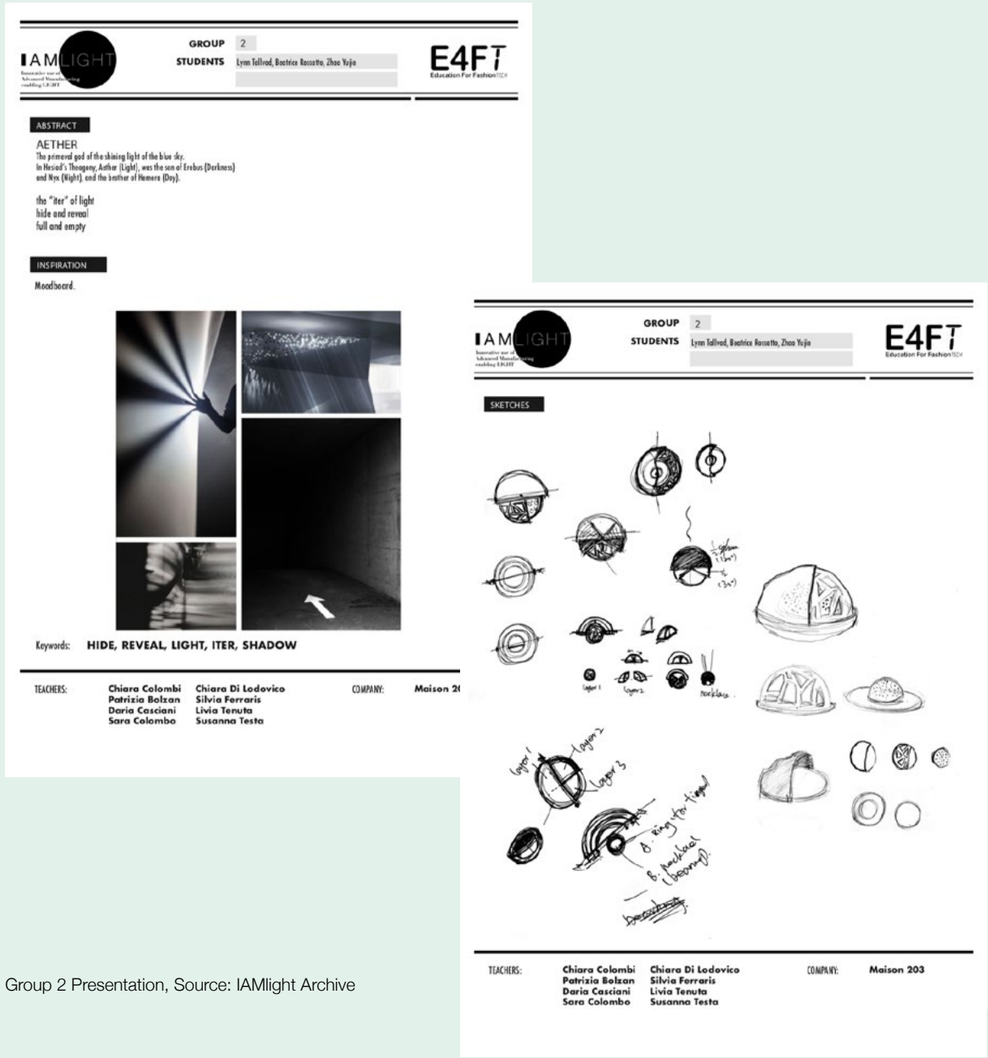
* Presentation check (Inspiration, concept, sketches, technical drawings and 3D modelling) // Livia Tenuta, Susanna Testa, Chiara Di Lodovico, Patrizia Bolzan
* Final presentation to Maison 203 // Orlando Fernandez Flores + workshop team

THE OUTPUT

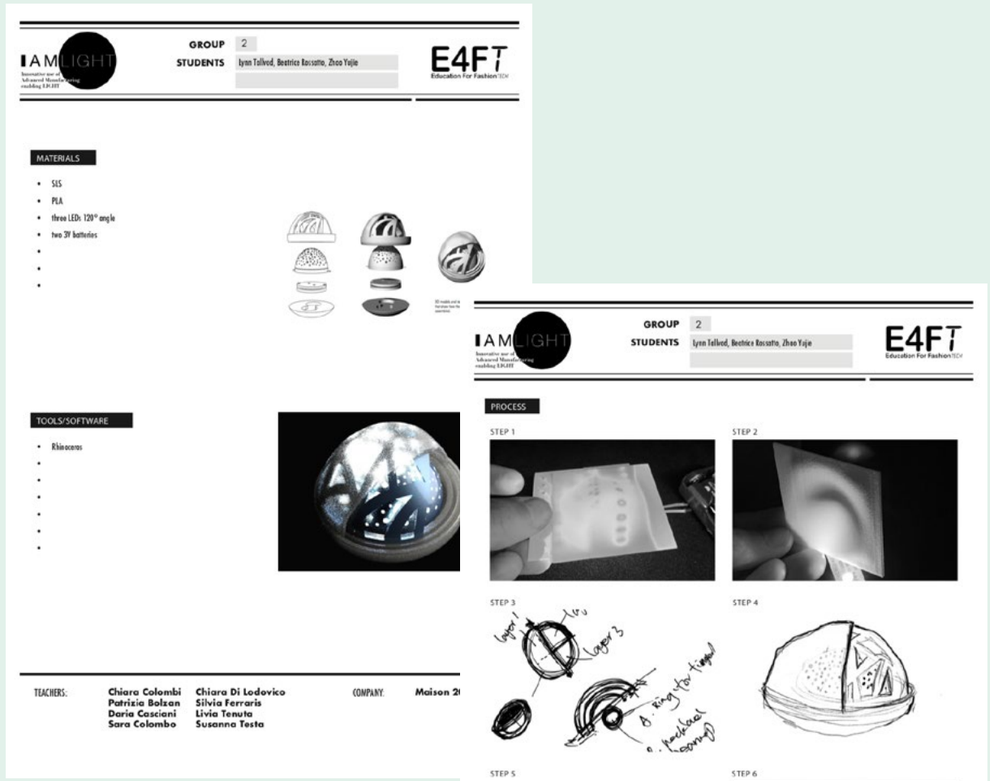
The intensive study programme produced 5 new Fashion-Tech product concepts, delivered with a physical prototype, addressing specific market opportunities in term of product-service, interaction with the users, supply chain management. The groups were asked to produce a presentation including research, concept, sketches, technical specifications and pictures of the prototype/mock-up.

THE OUTCOME

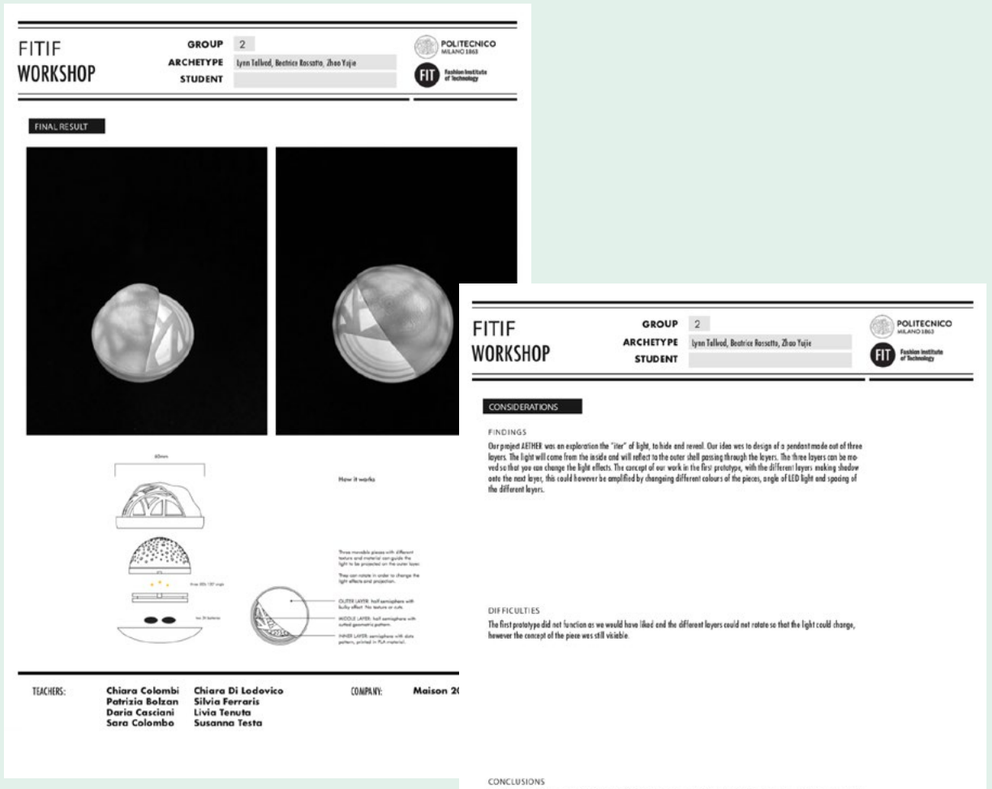
The products designed and prototyped by the various groups envisaged very diverse scenarios for the use of 3D printing and embedding light.



Group 2 Presentation, Source: IAMlight Archive



Group 2 Presentation, Source: IAMlight Archive



Group 2 Presentation, Source: IAMlight Archive

IAM LIGHT QUESTIONNAIRE.*

Was the programme coherent with the main topic of Fashion-Tech?
90% of the participants found the programme coherent.

And what would you change?
The implementation suggestions mainly concern the technical knowledge and range from the implementation of the technical knowledge of 3D software to the desire to have further experimentation with experts in the field of electronics such as circuit integration as well as programming with a microcontroller.

Which are the limits and the opportunities of IAMlight workshop?
Limits

- Time (to improve 3D modelling skills; learn technicalities about light; experimenting with machines)
- Use of Rhinoceros as a crucial skill
- Interdisciplinarity in teams (For example it would have to be preferred: a fashion/jewellery designer working together with a product designer/ architect or even a (mechanical) engineering or electronic student etc.)

Opportunities

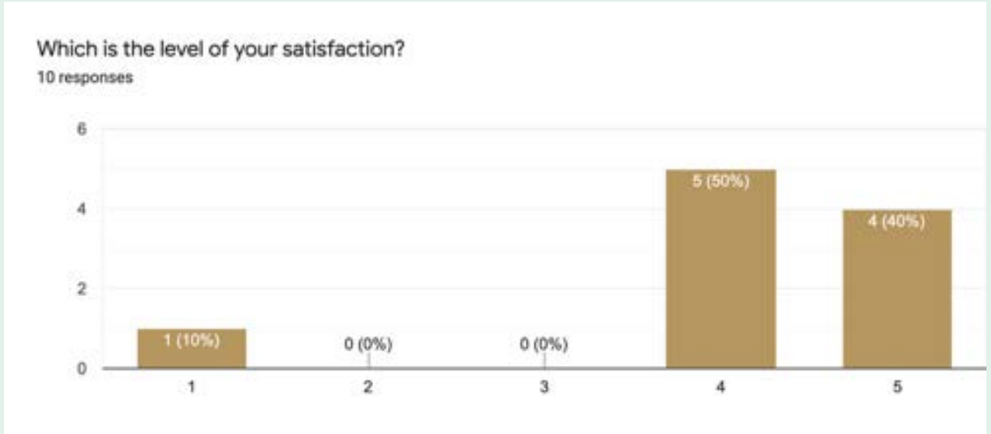
- Theory and practice merge
- Multidisciplinary experience
- Cooperate with a company
- Learning from experts
- Knowledge inputs
- Good simulation of design reality
- Work in a heterogeneous team in terms of knowledge, skills and cultural background

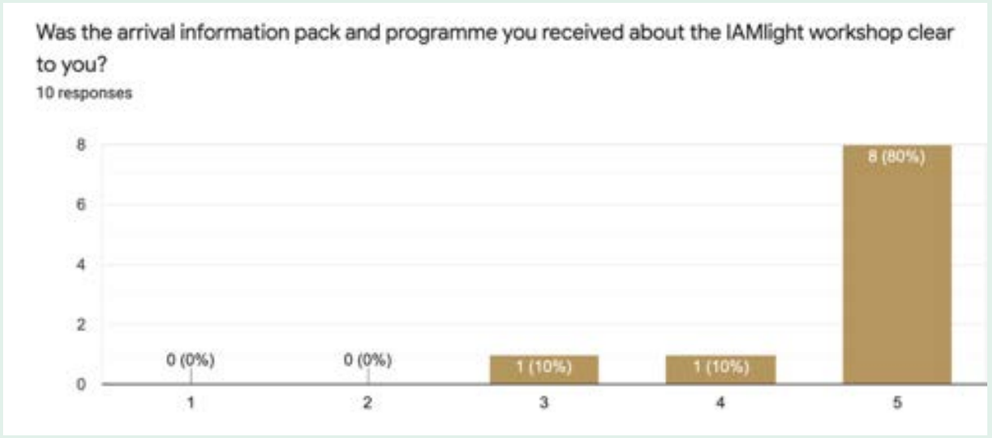
The level of satisfaction for the entire programme, the structure and the organization was very high.

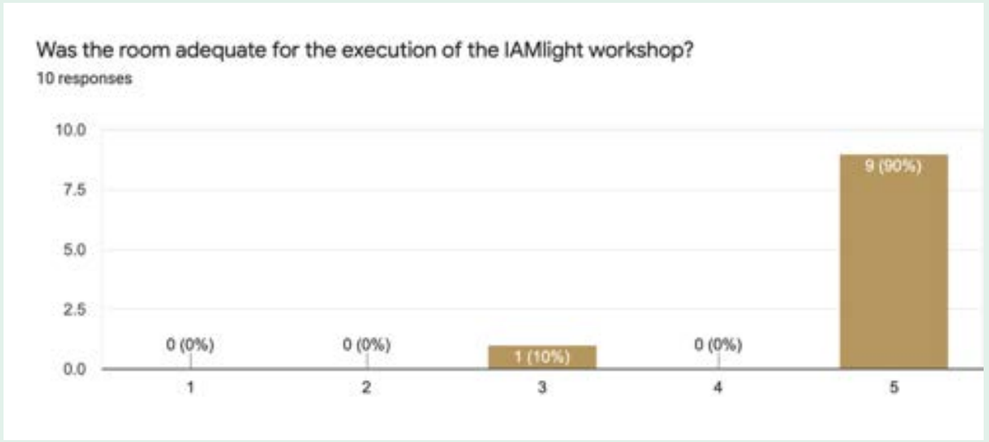
Which is the most important lesson learnt that you took from the programmeme and you will capitalize on your academic education and/or in your professional future?
Understanding the role what a designer could contribute to the field of Fashion-Tech; Need of changing the education curriculum; Importance of communication in group work; Design the piece to satisfy customer's demand; Fields of application of 3D printing.

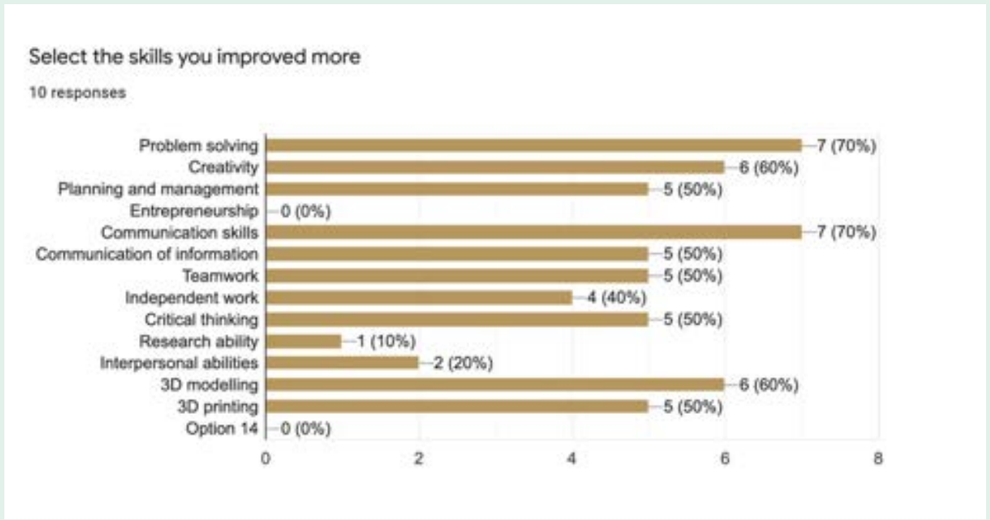
Which are the skills you improved the most?
Problem Solving; Communication Skills; 3D Modeling.

**10 out of 15 participants responded the questionnaire*

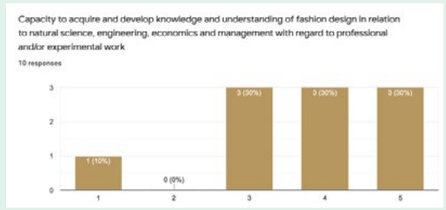


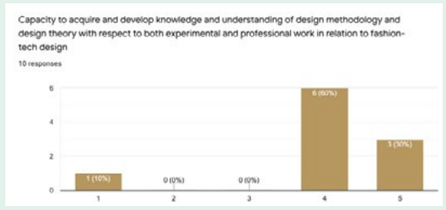


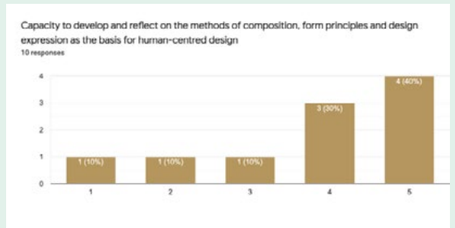


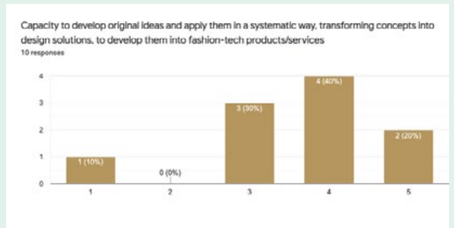


DESIGN AND MULTIMEDIA COMMUNICATION.*

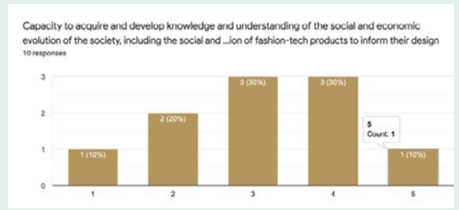


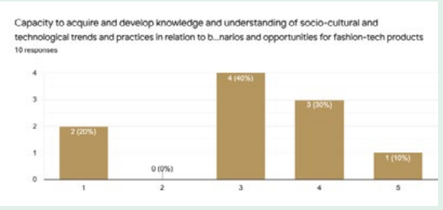


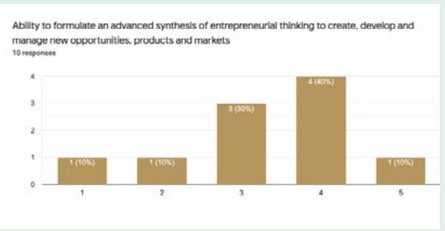


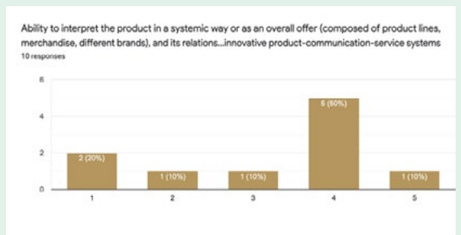


HUMAN, SOCIAL, PSYCHOLOGICAL AND ECONOMIC CONTEXTS.*





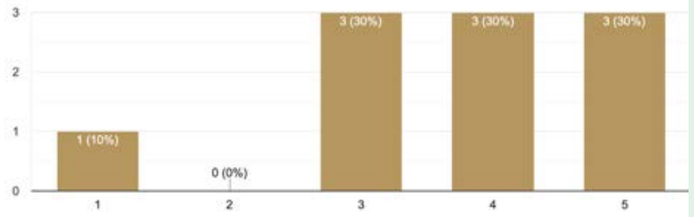




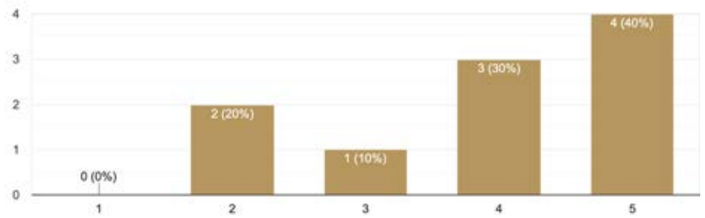
* 1 NO EXPERIENCE ACQUIRED // 5 EXCELLENT EXPERIENCE ACQUIRED

TECHNOLOGY AND ENGINEERING.*

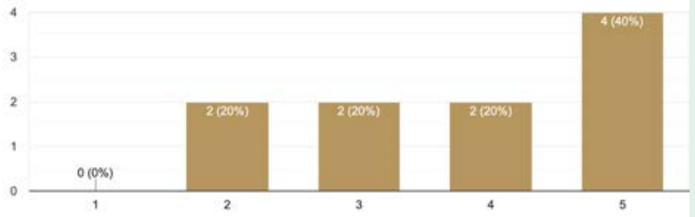
Capacity to function as a catalyst that enables designers to plan, manage and lead design led interdisciplinary research and development proces...r material, products for manufacturing processes
10 responses



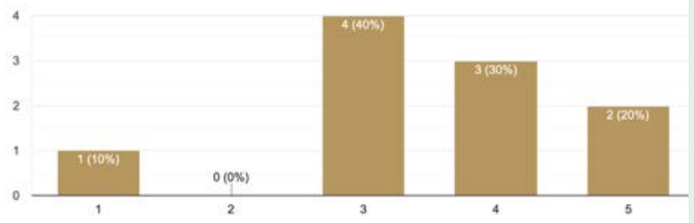
Capacity to acquire and develop knowledge and understanding of materials, processes and applications
10 responses



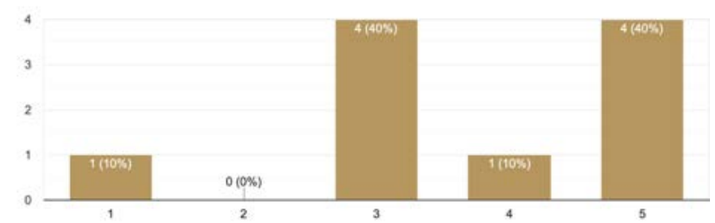
Capacity to acquire and develop knowledge and understanding of wearable technologies, digital manufacturing and their processes
10 responses



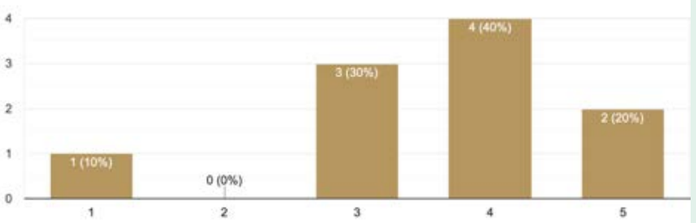
Capacity to acquire and develop knowledge and understanding of collaborative design and innovation methods to deliver more effective ways...ations, disruptive products and products/services
10 responses



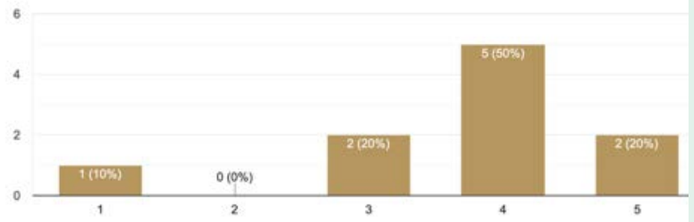
Ability to research and transfer innovation with particular reference to materials, meanings and processes in various fields
10 responses



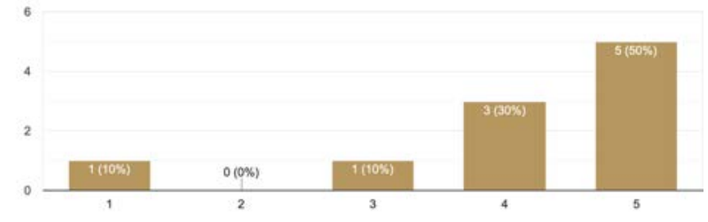
Ability to develop and integrate capabilities in the engineering area and the design area to obtain innovative products and applications
10 responses



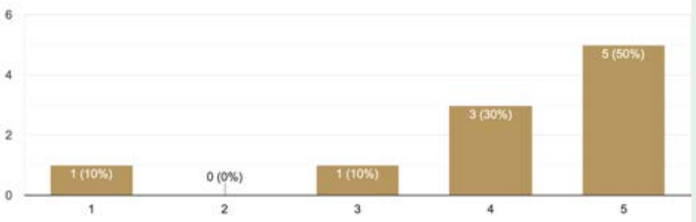
Capacity to evaluate diverse and disruptive forms of innovation that contribute value to a fashion enterprise and shape the future of the fashion/jewellery industry
10 responses



Capacity to creatively and critically envision future possibilities of emerging technologies and propose both new and well explored concepts for o...solutions in socio-cultural and economic context
10 responses



Capacity to transfer knowledge from disciplinary fields to new sectors and applications, favouring the creative solutions of problems
10 responses



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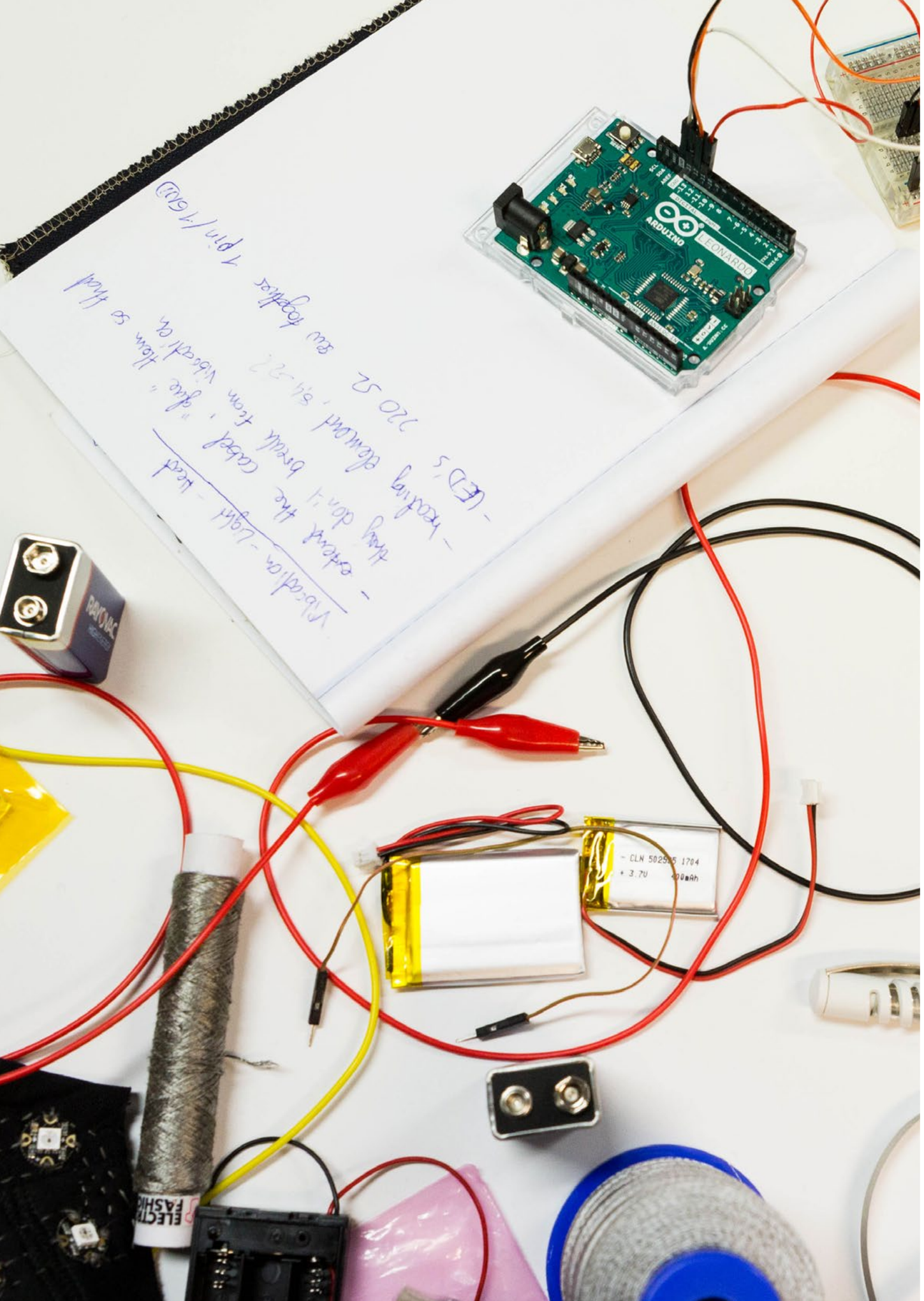


DESIGNING WEARABLES

Intensive programme for learners at LCF

D. Atkinson

DATE

18th - 22nd November 2019

PROJECT LEADER

LCF

GOAL

Introduce participants to real-world challenges experienced by Fashion-Tech businesses, introduce interaction design prototyping methods and physical computing technologies, leading to the creation of:

- a proposal for a Wearable tech product
- an interactive swatch, or sample of a part garment/shoe/accessory
- a detailed design for the interaction with the product

PROJECT BRIEF

Choose at least two INDUSTRY CHALLENGES to combine in your Fashion-Tech project.

PAULINE VAN DONGEN

TOUCH TECHNOLOGY FOR SOCIAL CONNECTION:

1. Explore touch through your own body and in collaboration with your fellow students. Develop your embodied awareness: study how your body touches things (objects, interior and architectural elements) and how your body touches or is “in touch with” other people.

2. Try to describe the type of physical interaction that you encounter or imagine: what are the related “touching” gestures (stroking/tapping etc.) what other qualities play a role (pressure,

direction, rhythm) and finally: try to explore the role of materials in relation to touch (tactility, texture, temperature).
3. Having gained this first-person embodied experience and having exchanged thoughts and ideas with others, now ask questions that will drive your concept development:
- What kind of touching can we invite people (wearers of the garment, but maybe also those who the wearer encounters) to engage in?
- How can the input from a touch-sensitive material/textile be of value for the wearer?
- What situations and what contexts can you imagine in which the act of touching or the experience of being touched play an important role?
- How can the input from a touch-sensitive material/textile be transformed into a useful and intuitively legible output?

KIREN PASSI
BONDING, LAMINATING AND LAYERING TO ADD TECH TO TEXTILES
How can you use a layered bonding process incorporating soft electronics to create practical modern armour? Collectively or individually brainstorm what type of clothing protection would be useful in the following scenarios:
a. Dancing
b. Yoga
c. Long-distance travel
d. Other- what scenarios can you imagine you would need modern protective clothing for?

1. Discover where on the body you would need protection. Can your sensors help discover pressure points? Be inspired by where your body touches the ground/ other objects and takes body-weight, or pressure. For example: experiment with the placement of fabric sensors on the body. Where do they restrict movement? Where will they capture the most useful information? How can you distribute an electronic system across the body, and how can you use it to enhance your design, rather than hiding the technology?
2. Consider the size, shape of the area that would need protection for your chosen activity. Create a series of quick sketches to inspire the type of silhouette/shape the layering should have. Create a silhouette template for your layering technique.
3. Concept questions to think about:
How deep should the protection be?
How many layers of material should be included?
What composition should the layering take?
Explore how many layers are helpful by referring back to the pressure sensors. Bond the layers into a composition that is of a luxury aesthetic.

FREDRIK TIMOUR / NEUE
CREATIVE, CONNECTED BUSINESS MODELS & BRAND EXPERIENCE
Using the Neue App and NFC tags, how can you develop creative fashion business models or brand experiences which connect the physical world to digital content?
1. If you can turn anything into an Internet of Things (IOT) device with NFC tags, what items would you link to digital content?

What would this content add to your experience?
2. How could digital content connected to a physical object be motivational? For example to encourage people to behave more sustainably, to connect to one another, or to be loyal to your fashion brand?

LOCATION

Digital Learning Lab, London College of Fashion, 182 Mare Street, Hackney, London, E8 3RE.

ACTORS INVOLVED

- 15 students from London College of Fashion, MA Fashion Futures and MA Fashion Design and Technology Womenswear, Politecnico di Milano, MA Design for the Fashion System and University of Borås, MA Fashion Design and MSc Textile Engineering. The participants worked in five groups composed of one member from each partner institution to ensure a diverse range of skills and backgrounds.
- 1 workshop facilitator: Douglas Atkinson, London College of Fashion Research
- 1 tutor: Michèle Danjoux, London College of Fashion Research.
- 4 mentors:
  * Maria Dada – Student mentoring, Arduino coding and physical computing support, London College of Fashion Research.
  * Mouhannad Al-Sayegh – Student mentoring, Arduino coding and physical computing support, London College of Fashion Digital Learning Lab.
  * Fredrik Timour – Professional: Student mentoring & setting industry challenge on behalf of Neue AB & The Swedish Fashion Council.
  * Kiren Passi – Professional: Student mentoring & setting industry challenge on behalf of Kiren Passi Ltd.
- 2 lecturers:
  * Pauline Van Dongen – Professional: setting industry challenge on behalf of Pauline Van Dongen Studio
  * Dr Camille Baker – Visiting Academic, Reader in Interface and Interaction, University for the Creative Arts: student feedback and introduction to other European projects supporting Fashion-Tech.

METHODOLOGY

The workshop was delivered to interdisciplinary groups of students from the three partner institutions, encouraging collaboration between different nationalities, backgrounds and skillsets. The workshop was structured around three industry challenges delivered over consecutive mornings, with afternoon sessions providing technical introductions to constructing e-textile sensors, the Arduino physical computing platform and linking content to a product using NFC. The industry challenges framed a problem-based learning approach which invited students to critically assess the challenges and identify common, cross cutting themes which would allow them to address two or more challenges with their design proposal.
The fourth day of the workshop focused on design ideation and development, introducing UI and UX design methods and card based design tools. Then refining the design concept and final-

ising an interactive swatch or sample to represent the technological solution adopted by the design.
The final day allowed time to finish the concept and develop a presentation to communicate it for critique and feedback from peers and mentors. Delivery involved intensive one to one work with each group by the Facilitator and Mentors, along with group demonstrations during the technical inductions.

RESEARCH METHODOLOGY

Participant observation was undertaken by the Workshop Facilitator, this is reflected in the Critical Issues discussed. A student facing questionnaire was conducted to better understand participant experience. Interviews were also conducted with student participants.
workshop video: https://www.youtube.com

WORKSHOP STAGES

Day 1 // SOFT ELECTRONICS
* Welcome - Introduction to the Digital Learning Lab
* Recap of Industry briefs & brainstorm of initial student ideas
* Workshop Induction - Health and Safety briefing for the LCF Open Access Fashion Studio
* Presentation - Kiren Passi - https://www.kirenpassi.com
* Demo - Maria Dada & Douglas Atkinson: touch sensing materials
* Textile sensor making activity - Douglas Atkinson / Maria Dada

Day 2 // NFC TECHNOLOGY & CONNECTED CONTENT
* Connect textile sensors from Day 1 to Arduino and trigger an interaction - Maria Dada / Douglas Atkinson
* Presentation - Fredrik Timour – Neue & The Swedish Fashion Council
* Connect an RFID tag to digital content using the Neue Playground App - Fredrik Timour

Day 3
* Connect an RFID tag to design digital content using the Neue Playground App - Fredrik Timour
* Video Presentations - Pauline Van Dongen - http://www.paulinevandongen.nl & Discussion with Douglas Atkinson. Develop design responses - Douglas Atkinson / Maria Dada / Fredrik Timour
* Design Ideation Activities - Douglas Atkinson/ Maria Dada / Fredrik Timour

Day 4
* Design iteration & Prototyping
* Present initial design ideas and prototypes for feedback - Douglas Atkinson / Mouhannad Al-Sayegh / Fredrik Timour / Camille Baker
* Presentation – Camille Baker - STARTS Ecosystem for science, technology and arts collaborations https://www.starts.eu
* Adapt and develop designs based on feedback

Day 5
* Project Pitching
* Identify key IP and develop project pitch presentations

DAY 1

Introduction to the Digital Learning Lab

Recap of Industry briefs & brainstorm of initial student ideas

Workshop Induction
- Health and Safety briefing for the LCF Open Access Fashion Studio

Presentation
- Kiren Passi
- Demo - Maria Dada & Douglas Atkinson: touch sensing materials
- Textile sensor making activity - Douglas Atkinson / Maria Dada

DAY 2

Connect textile sensors from Day 1 to Arduino and trigger an interaction - Maria Dada / Douglas Atkinson

Presentation - Fredrik Timour – Neue & The Swedish Fashion Council

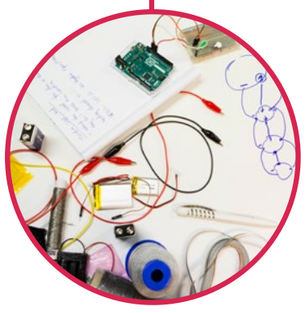
Connect an RFID tag to digital content using the Neue Playground App - Fredrik Timour

DAY 3

Connect an RFID tag to digital content using the Neue Playground App - Fredrik Timour

Video Presentations - Pauline Van Dongen & Discussion with Douglas Atkinson. Develop design responses - Douglas Atkinson / Maria Dada / Fredrik Timour

Design Ideation Activities - Douglas Atkinson/ Maria Dada / Fredrik Timour



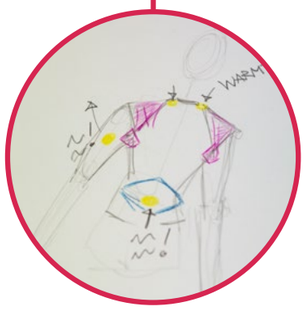
DAY 4

Design Iteration & Prototyping

Present initial design ideas and prototypes for feedback - Douglas Atkinson / Mouhannad Al-Sayegh / Fredrik Timour / Camille Baker

Presentation – Camille Baker - STARTS Ecosystem for science, technology and arts collaborations

Adapt and develop designs based on feedback



DAY 5

Project Pitching

Iteration & Prototyping
Design Iteration & Prototyping

Identify key IP and develop project pitch presentations

Project pitch presentations and feedback – Douglas Atkinson / Mouhannad Al-Sayegh / Jose Teunissen

* Project pitch presentations and feedback – Douglas Atkinson / Mouhannad Al-Sayegh / Jose Teunissen

THE OUTPUT

Interactive Sample 1 – Amplitutor: A posture and motion-sensing garment for music tuition. Using heat and vibration the music student can be prompted to change their form and receive remote, or one to many feedback from a tutor.
Interactive Sample 2 – Crystal Ball: Exclusive event invitations delivered via customised, themed clothing. Using NFC the garment becomes your ticket and allows you to access connected content.
Interactive Sample 3 – Untitled: An elegant connected garment to send emotional messages to a loved one when they are far away, using light, heat and vibration.
Interactive Sample 4 – Fōkus: An active knitted fabric to encourage presence and mindfulness through a focus on the sensations of it stroking the body.
Interactive Sample 5 – Let's Run, Let's Have Fun: touch sensing running top for gamified social exercise, encouraging wearers to play tag with one another and have fun while exercising.
All outputs captured in the Workshop Video on https://www.youtube.com/watch?time_continue=2&v=g2RsQIDBgNE&feature=emb_logo

GENERAL EVALUATION OF THE EXPERIENCE

The following quantitative survey data was provided by eleven respondents who participated in the workshop.

- 5 of 11 rated their experience of the workshop as excellent, with the remainder rating it as very good.
- 4 of 11 rated the content of the workshop as extremely helpful in relation to their current studies. A further 4 rated it as very helpful, with 3 rating it only somewhat helpful.
- 5 of 11 rated the relevance of the invited speakers as extremely relevant, 3 as very relevant and 3 as somewhat relevant.
- 8 of 11 participants felt that they had enough introduction to the workshop technologies to design with them
- On average participants felt that the level of technical instruction was just right. Of those who did not think it was just right, two rated it as too complex and two rated it as too simple.
- The staff were unanimously rated as extremely helpful and friendly, with several participants mentioning staff enthusiasm and helpful instruction in their qualitative feedback.
- All participants felt that they were facilitated to work successfully as a group, with several also mentioning in their qualitative feedback that group work with new people was a highlight of the experience.
- 6 of 11 rated the workshop as extremely well organised, with the remaining 5 rating it as very well organized.

FINDINGS

Qualitative feedbacks

When describing the workshop, participants focused on the support for creativity, benefits of collaborative working and gaining new perspectives on Fashion-Tech.
When reflecting on the new skills and knowledge they had ac-

quired, participants focused on the technical competencies they had gained in Arduino, NFC tags and coding. However, several commented on new perspectives on design development and new design approaches focused on the user:
“How to combine different themes and ideas into one product.”
“A different take on the design process, thinking about the users was a high priority.”
“I like the perspective of adding value to a product using technology, therefore enhancing the consumer-user relationship.” This indicates that the design ideation activities and the user-centred design perspective were both valuable and somewhat novel in the workshop context.

In answer to the question *What did you like most / what did you find most useful about the workshop?* Participant responses were diverse, but four themes recur:

- staff enthusiasm, helpfulness and facilitation of creativity
  “What I liked most during this workshop was how competent the staff were. They could guide us, without killing ideas and frustrating us. They were respectful and willing to share knowledge. There were times that they were more motivated and excited about our project than us :)”
- opportunities for hands on experience with technologies
  “The most helpful thing about the workshop was working with the instruments and applications in person that help us to really feel the idea.”
  “The best parts of the workshop were the hands-on tutorials, where we learned to physically build the technology and learned basic coding. I also enjoyed the speakers that came in, and introduced us to examples of how Wearable technology is used in art and design. It really helped me understand how this technology can be used and how varied the design solutions can be, based on very similar technologies.”
- inspirational speakers
  “I liked the lecture given by Camille. It was very inspiring to know what people are doing in this sustainable area and how they are connected.”
  “I liked to get inspiration from the different speakers and to hear about research in the field.”
- international group collaboration
  “It was really nice and interesting to meet and work with people from all over the world.”
  “I really appreciated that the workshop is organised in collaboration with different universities.”

In relation to the question ‘*What was missing, or what would you have changed about the workshop? What did you like least?’* responses generally focused on the timeframe of the workshop and the confusing, or overwhelming nature of the multiple industry challenges. Three participants indicated they would prefer more time to develop and prototype ideas, or orient themselves to the project. While conversely, one participant indicated they would like less group work and more hands-on introductions to tech, or inspirational speakers to help develop their own practice in future. Three participants noted the multiple industry challenges and a lack of clarity in the communication around how they should respond to them, were they to be viewed as separate, could ideas from one be developed for another etc.

“The first few days there was a lot of brainstorming. We had a lot of ideas, maybe too much, that might have made it too complicated afterwards.” One participant suggests that more examples of existing fashion- tech garments, or sample Arduino circuits and NFC tags would have helped them to visualize how they could be applied.“I would have liked to see what technology can do, how it can look and more examples of how it could be applied to garments. I think that we struggle to link technology to a garment because we didn’t know exactly what it could do and how it would work; there was a missing link between the teaching part and the application part.” This is a useful comment which can be addressed in future iterations of the workshop through the provision of samples and references. These responses generally support the format of the workshop, with the exception of the multiple industry challenges and the timescale. The majority of participants felt that they would not require any additional information from the workshop. One participant would have liked a clearer overview of the Workshop aims and organisation at the beginning of the process. Another indicated they would like to have known more about smart garments beforehand. Thus, some contextual information could be provided, or form an independent learning task prior to the workshop. Two participants suggested that the workshop could have included more of a focus on sustainability in relation to Fashion-Tech products. This is a highly nuanced area and difficult to cover in a short timeframe, however, it is obviously a significant concern for participants and should at least be discussed in future iterations of the workshop.

One participant from an engineering background commented that they found the level of instruction in Arduino too basic, but that they felt it was appropriate for their peers. They also indicated that they would prefer more of a focus on design methods as they did not have any experience in this area. It will be important to scope the areas and levels of competence of participants prior to future iterations of the workshop (perhaps through a preliminary survey), to ensure different needs are met. This was echoed in a comment that the Health and Safety induction to sewing equipment was simplistic for participants from a fashion background. Broadly the final comments are to be expected when working in multi-disciplinary groups. That they were not seen as detrimental to the overall experience indicates that participants understood the rationale for their inclusion.

Amplitutor group presentation and sample garment
Source: E4FT Archive

Fōkus group presentation and sample textile
Source: E4FT Archive

Let's Run, Let's Have Fun group presentation and sample garment
Source: E4FT Archive

Crystal Ball group presentation and sample garment
Source: E4FT Archive

Connected garment to send emotional messages to a loved one, group presentation and sample garment
Source: E4FT Archive


Source: E4FT Archive

SMART TEXTILES
Intensive programme for learners at HB

A. Vellesalu

DATE

24-28th February 2020

PROJECT LEADER

HB.

GOAL

The goal of the last intensive workshop was to test the training resources developed by the project. An additional goal was to pilot the community platform in an educational experience to test its functions.

PROJECT BRIEF

The project brief was to develop a textile material based on a selection of the presented techniques (knitting, weaving, thermochromic printing, conductivity) by exploring the context of application around the body through an understanding of how to use Smart textiles to design a Wearable, by considering the whole system, including the power source.

LOCATION

Textile Museum and textile labs (sewing, knitting, weaving, printing, electronics) of the University of Borås, Swedish School of Textiles, located in the Textile Fashion Centre, in Borås, Sweden.

ACTORS INVOLVED

- 10 students in total, 5 from the Swedish School of Textiles and 5 from London College of Fashion, University of the Arts London. The background of the students offered a variety of

areas and levels of experience, ranging from fashion design, to textile engineering and sustainable design.

- Teaching staff involved in the workshop included:

*Delia Dumitrescu is a professor in the department of design. In her work she focuses on architecture, interaction design, and textile design - and everything in between - with the aim of developing new materials. She has extensive experience in machine knitting and is managing the Smart textiles Design Lab, which, among other duties, involves dissemination of their research, both within the industry as well as academia, and thereby stimulating research collaboration.

*Marjan Kooroshnia is a senior lecturer in the department of design. Her PhD work focused on exploring the design properties and potentials of leuco dye-based thermochromic inks when printed on textiles to expand the range of colour-changing effects offered by thermochromic inks on textiles, as well as to facilitate communication regarding, understanding of, and design with thermochromic inks. Currently she teachers and supervises both BA and MA students in subjects related to colour, dyeing, printing and finishing of textiles.

*Erin Lewis is a doctoral student in the department of design. Her PhD research explores magnetic and electromagnetic textile expressions through a process of material exploration and textile design experimentation. Prior to her studies in Sweden, Erin was an instructor at OCAD University in her beloved hometown of Toronto, Canada, where she taught Wearable electronics and Wearable computing within the Faculty of Design, and was a Senior Researcher within

OCAD University's Wearable technology design lab, the Social Body Lab (2010-2015). From 2011-2015 she was the Coordinator of the Toronto Wearables Meetup. In 2015 Erin held the position of Education Manager at InterAccess, Canada's preeminent new media art gallery.

*Vidmina Stasiulyte is a doctoral student in the department of design. She started her career as a conceptual fashion designer and created various projects in this media: costume performances, individual costume collections, and textile installation (BA in Apparel Design and BA in Fashion Design). Later Vidmina expanded her practices in different media such as interactive sculpture, sound, and installation art (MA in Visual Arts). She is also experienced in teaching and evaluating fashion design programmes. Since 2015 she has been doing practice-based research in fashion design, within the ArcInTexETN programme, by investigating the non-visual aesthetics of fashion.

*Peter Ljungstrand is a studio director and senior researcher at RISE (Research Institutes of Sweden), in the department of interaction technologies. He has experience in building working prototypes of interactive Wearables by using electronics, sensors, software and smart fabrics.

*Fredrik Timour is the founder of Neue, a platform for digital fashion development including both hardware, software and cloud services, for fashion brands and end-user applications. Currently, he works for the Swedish Fashion Council as Head of Innovation, where he is setting up a new innovation centre for sustainable fashion. With a broad, deep and holistic perspective to digital fashion, he has been running

courses in Fashion-Tech at Fashion Institute of Technology - NYC, London College of Fashion - London, IFA - Paris, Beckmans - Stockholm.

* Lisa Lang is a European entrepreneur, technologist and international speaker. Her brands ElektroCouture and ThePowerHouse are leading agencies for FashionTech, Wearable technologies, Smart textiles manufacturing and making things glow. She is recognized as one of the top 50 women in tech (EU), top 100 most influential people in Wearable tech worldwide, one of 25 leaders in fashion and technology worldwide, and has been listed as one of the 50 most important women for innovation & start-ups in the EU.

- Further staff from the University of Borås, Swedish School of Textiles involved lab technicians supporting the students with their projects.

METHODOLOGY

The workshop aimed to allow the students enough time to experiment with the presented techniques and their ideas. While the structure was provided through planned lessons for each main area of the workshop, along with involving keynote speakers and an industry presentation, the students were asked to explore the context of application around the body through an understanding of how to use Smart textiles to design a Wearable, by considering the whole system, including the power source.

RESEARCH METHODOLOGY

Data relating to participant experience with the workshop was collected through interviews and online surveys pre- and post-workshop. The interviews focused on teachers' experience with teaching Smart textiles and their perspective on the opportunities and limitations with the workshop, and students' perspective on the opportunities and limitations with the workshop, and their takeaways from the experience. The surveys focused on mapping the students´ skills related to the main areas of the workshop and development of generic competences as defined in the Tuning Document.

WORKSHOP STAGES

Day 1

* Introduction to the workshop
* Introduction to the labs and the Textile Fashion Centre
* Introduction to printing with thermochromic inks
* Introduction to conductivity in textile materials
* Reflecting on the day's activities on the e4ft.eu

Actors involved: Marjan Kooroshnia, Erin Lewis, Delia Dumitrescu, Ann Vellesalu, lab technicians

Day 2

* Gathering at the museum
* Company presentation – Inuheat
* Introduction to experimental knitting
* Introduction to experimental weaving
* Feedback
* Reflecting on the day's activities on e4ft.eu

Actors involved: Marjan Kooroshnia, Delia Dumitrescu, Vidmi-

DAY 1

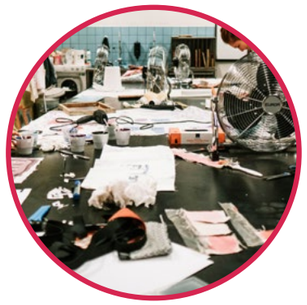
Introduction to the workshop

Introduction to the labs and the Textile Fashion Centre

Introduction to printing with thermochromic inks

Introduction to conductivity in textile materials

Reflecting on the day's activities on e4ft.eu



DAY 2

Company presentation – Inuheat

Introduction to experimental knitting

Introduction to experimental weaving

Feedback

Reflecting on the day's activities on e4ft.eu

DAY 3

Gathering at the museum

Presentation – Peter Ljungstrand (RISE)

Experimentation in the labs

Feedback on day´s progress

Reflecting on the day's activities on e4ft.eu

DAY 4

Presentation – Fredrik Timour (Swedish Fashion Council)

Making prototypes

Feedback

Finalising prototypes

Reflecting on the day's activities on e4ft.eu

DAY 5

Presentation – Lisa Lang (ThePowerHouse)

Develop project pitch presentations

Project pitch presentations and feedback

na Stasiulyte, Rickard Rosendahl (CEO – Inuheat), Ann Åström (Textile Engineer – Inuheat), Ann Vellesalu, lab technicians

Day 3
* Gathering at the museum
* Presentation – Peter Ljungstrand (RISE)
* Experimentation in the labs
* Feedback on day´s progress
* Reflecting on the day's activities on e4ft.eu

Actors involved: Marjan Kooroshnia, Erin Lewis, Delia Dumitrescu, Peter Ljungstrand, Ann Vellesalu, lab technicians

Day 4
* Presentation – Fredrik Timour (Swedish Fashion Council)
* Making prototypes
* Feedback
* Finalising prototypes
* Reflecting on the day's activities on e4ft.eu

Actors involved: Marjan Kooroshnia, Erin Lewis, Delia Dumitrescu, Fredrik Timour, lab technicians

Day 5
* Presentation – Lisa Lang (ThePowerHouse)
* Develop project pitch presentations
* Project pitch presentations and feedback

Actors involved: Erin Lewis, Delia Dumitrescu, Fredrik Timour, Lisa Lang, Ann Vellesalu, Jonas Larsson

THE OUTPUT

The intensive study programme produced 5 new Smart textiles, delivered with a physical prototype.

GENERAL EVAUATION OF THE EXPERIENCE

In summary, both staff and students were satisfied with the experience of participating in the workshop. While the schedule was intense and limited timewise, thus not leaving enough time for deeper investigation into the presented techniques, working in multi-disciplinary groups in an open space and a variety of labs allowed for innovation and concept development, facilitated by the fact that the resulting work was not assessed.

FINDINGS

Combining the experience of the staff and keynote speakers, and the variety of backgrounds of the students, the students were free to explore the application of conductivity and printing with thermochromic inks when designing Wearables. Through the pre- and post-workshop surveys, the students evaluated their knowledge and skills on knitting, weaving, sewing, printing and conductivity. Based on their evaluations, the perceived levels of knowledge and skills were evaluated higher for weaving, printing and conductivity after the workshop. Furthermore, several generic competencies were perceived to be higher post-workshop, especially those related to problem-solving, critical thinking and information literacy, all related to the experimental nature of the workshop.

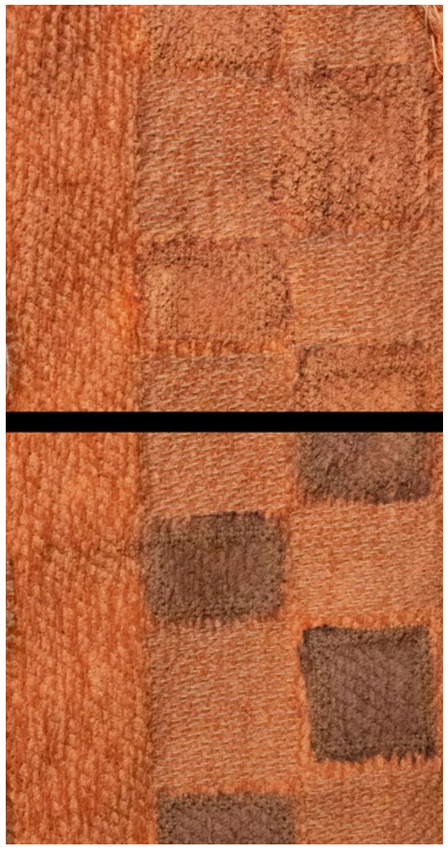
CRITICAL ISSUES

First, with the students from Polimi not being able to attend the

CONCEPT 1

Prototype of Ellinor (HB) and Carla (LCF)
Source: E4FT Archive

CONCEPT 2



Prototype of Xue (HB) and Joshua (LCF)
Source: E4FT Archive

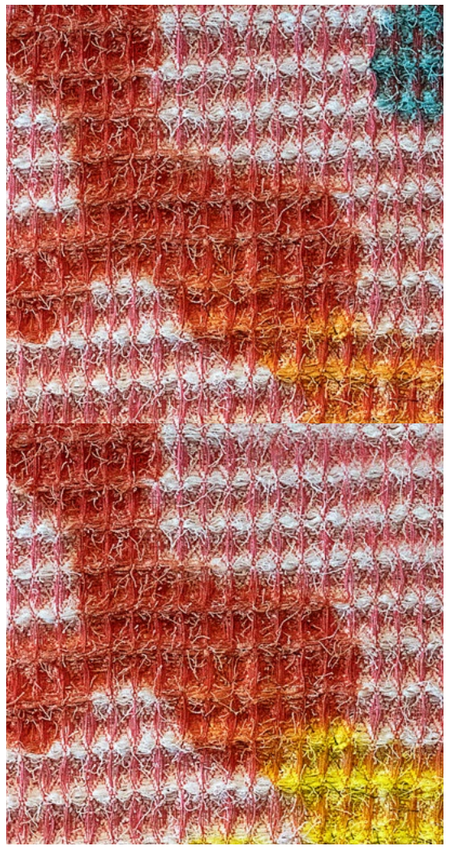
CONCEPT 3

Prototype of Bilel (HB) and Marie (LCF)
Source: E4FT Archive

CONCEPT 4

Prototype of Nicolas (HB) and Jiamin (LCF)
Source: E4FT Archive

CONCEPT 5



Prototype of Matilda (HB) and Diane (LCF)
Source: E4FT Archive

workshop, the groups were lacking of design skills, as the students were placed in groups based on their previous experience and education. This added some confusion in the beginning stages of ideation, where the students were more aware of the technical side of their idea but were struggling with the aesthetics.

Secondly, the experience of the involved staff and keynote speakers favoured a more experimental approach to teaching and learning Fashion-Tech design, while involving an industry representative meant including a very detailed problem presentation to be solved by the students. Based on the students´ feedback, the industry brief was too restrictive when learning about new areas of integrating fashion and technology.

A CRITICAL ANALYSIS: LEARNINGS FROM HANDS-ON EXPERIENCES

From the very beginning, all activities were designed to complement each other. Additionally, the results of the workshops fed into the development and finalisation of the Teacher´s Toolkit and Learning Units.

Train the Trainers short joint workshop allowed the testing and refinement of the Teacher's Toolkit by allowing the sampling teaching methods and approaches developed. Learnings from the workshop were fed back into the project to refine the toolkit. The structure and themes for the Learning Units were inspired by, and partly utilized during the intensive programs, that brought together learners and teachers. So each activity was affected by the previous one. Additionally, some common findings were identified, and it is interesting to highlight them as they start to trace the outline of what Fashion-Tech is and needs today.

Basic Knowledge both in Design and Technology.
What has emerged is how necessary it is to have a basic technical and technological knowledge for designers to understand, manage and design Fashion-Tech and at the same time for students with a technical specialization to have a basic knowledge of methods in design. Consequently, this requires more time in learning, no longer dedicated only to digital technologies or design-oriented subjects, but both.

Power of Interdisciplinarity in Teams.
Fashion-Tech involves different disciplines and it is unthinkable that a single individual is able to have knowledge in each specific subject. This is why collaborative working is essential because a multidisciplinary experience enriches all members of the team by creating an exchange of knowledge between them, facilitate learning and management of different topics that require different specializations.

Learning by Doing.
Learning by doing has its beating heart in concrete experience. It is based on the assumption that only through action, through doing, is a deeper understanding and true learning possible. Students do not learn through traditional frontal lessons, which transmit a defined amount of knowledge, but "learn by doing". The advantages of learning by doing related to Fashion-Tech are many, but can be summarised in four points:
- It increases the participants' engagement because they learn through engaging and dynamic experiences that reduce the distance with cryptic themes to approach such as the integration of technologies;
- It helps to bridge the training gap deriving from an exclusively theoretical approach: the learning processes are effective, fast and continuous.
- Helps to contextualize the notions, principles and tools learned in real situations
- It allows to test the skills being trained right away and do a test of what works - note that technology must be functional to be used.

Contact with Reality.
In all organized activities the involvement of companies and professionals in the sector were perceived as an added value. Learning from experts, immersing oneself in reality with real challenges and problems such as cost management, industrial production or sales, the very tight deadlines stimulated participants in the production of results and made it easier to identify design constraints.

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