

EDU4TEX²⁰

EDUCATIONAL PATHWAY

EDUCATIONAL RESOURCES &
FRAMEWORK

THE EUROPEAN
TEXTILE AND
CLOTHING
INDUSTRY IS A
DIVERSE
AND INNOVATIVE
SECTOR, DRIVEN
BY CREATIVITY



O2 | Educational Pathway

Educational Resources and Framework

| | |
|-------------------------|--|
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Partners:

| | | |
|---|--|---|
|  | <p>Huddersfield & District Textile Training Company Limited</p> | <p>http://textilehouse.co.uk/</p> |
|  | <p>Centro Tecnológico das Indústrias Têxtil e do Vestuário - Portugal</p> | <p>http://www.citeve.pt/</p> |
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|  | <p>Asociacion de Investigacion de la Industria Textil</p> | <p>www.aitex.es</p> |
|  | <p>Centro Tessile Cotoniero e Abbigliamento</p> | <p>www.centrocot.it</p> |
|  | <p>Agrupamento de Escolas D. Sancho I</p> | <p>http://www.aesancho.pt/</p> |
|  | <p>Instituto de Educación Secundaria "Cotes Baixes"</p> | <p>www.mestreacasa.gva.es/web/iescotesbaixes</p> |
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1. About the Project

EDU4TEX 2.0 project is bringing together schools and businesses to develop a new approach to promoting the textile sector to teachers, careers advisers and young people. The project will enhance the curriculum by developing new learning content to illustrate the variety of activities and attractive careers in textile companies, providing new opportunities and developing new partnerships between industry and education.

Early project activity includes research into students' aspirations and career preferences and the future skills needs of companies across the sector. Practical classroom sessions will be developed, supported by resources and teaching packs that link closely to the school curriculum. These will illustrate and demonstrate the wide range of science and technology based activities and occupations that exist across the sector. New relationships with companies will be created to facilitate reciprocal visits and company placements.

EDU4TEX 2.0 is delivered by a selection of European schools and industry organisations working together to develop and test new approaches to providing sector information to students using a wide range of media. Practical activities will be developed in partnership with textile companies. Teaching and learning packs will be created to ensure the information complements both the school curriculum and educational framework. These materials will be tested by schools in the four participating regions supported by a series of visits to companies and schools.

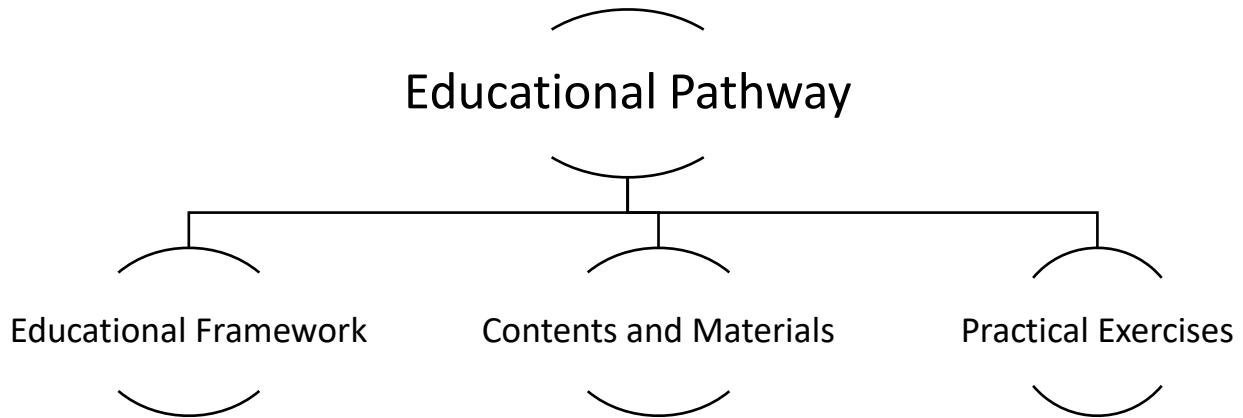
Our overall ambition is to improve the level of students' and teachers' knowledge of opportunities within the sector by providing new learning materials and organising practical activities both within and outside the classroom. This will serve to change perceptions about the modern textile industry, opening up new career options and providing new opportunities for young people.

2. Aim

The Educational Pathway is part of the IO2- Educational Pathway (Educational Resources and Framework); its objective is to develop relevant content and experiences that can constitute practical exercises aiming at encouraging students to choose an industrial career, specifically in the textile & clothing area.

The contents will be set in a practical approach, challenging youngsters to develop products or process related to textile with a few and easy to find materials that can encourage and motivate the students into careers in the textile & clothing sector.

The Educational Pathway includes:



The aim of the Educational Framework is to provide information that supports a particular approach to a specific objective in the definition of the contents and material of practical exercises.

An educational framework, as we know, is an organized plan or set of standards or learning outcomes that defines the content to be learned in terms of clear, definable standards of what the student should know and be able to do, and will be a central part of the work for the development of the contexts, materials and practical exercises.

This document will settle clear standards which should be achieved by the students during and at the end of the development of the practical exercises.

Some practical exercises produced will be available for students to take home and test them and others will be available to be developed in the schools, labs and during the textile days (e.g.) to technological centres.

3. Educational Framework Overview

3.1 Education system / Vocational training in Portugal

In Portugal education is compulsory from ages 6 to 18, with comprehensive schooling (the same curriculum for all students) until the age of 15. Upper secondary education, compulsory since 2009, lasts three years and includes academic and vocational courses. It is organised into four strands: sciences and humanities, technological, specialised artistic and vocational education.

Vocational Education and Training (VET) (regulated by Decreto-Lei n.º n.º 139/2012 de 5 de julho¹) can facilitate entry into the labour market and is available for those who have completed at least nine years of schooling or equivalent training.

VET programmes, which include vocational, technological and also artistic courses, play an important role in Portugal in policies to prevent dropout.

The Vocational Training provides apprenticeship courses and initial vocational training (both theoretical and practical) to prepare young people to find employment or continue their education. The curriculum is divided into three main areas: the **sociocultural area** (Portuguese, English, Information Technology, Integration Area – a mix of History, Philosophy and Geography - and Sports), the **scientific area (made up of two or three subjects such as Maths, Economy, Physics and Chemistry, Psychology), and the technological area** (made up of three or four subjects directly connected to the course) and also the **training hours in a work context-apprenticeship**.

The diploma (*Decreto-Lei n.º 139/2012 de 5 de julho*) refers that “*both the pedagogical and organizational are autonomy of the schools as well as the professionalism and freedom of teachers in the implementation of methodologies based on their experiences, individual and collaborative practices*” and also refers that “*it is intended that education for citizenship as a cross-sectional area can be approached in all curricular areas*”.

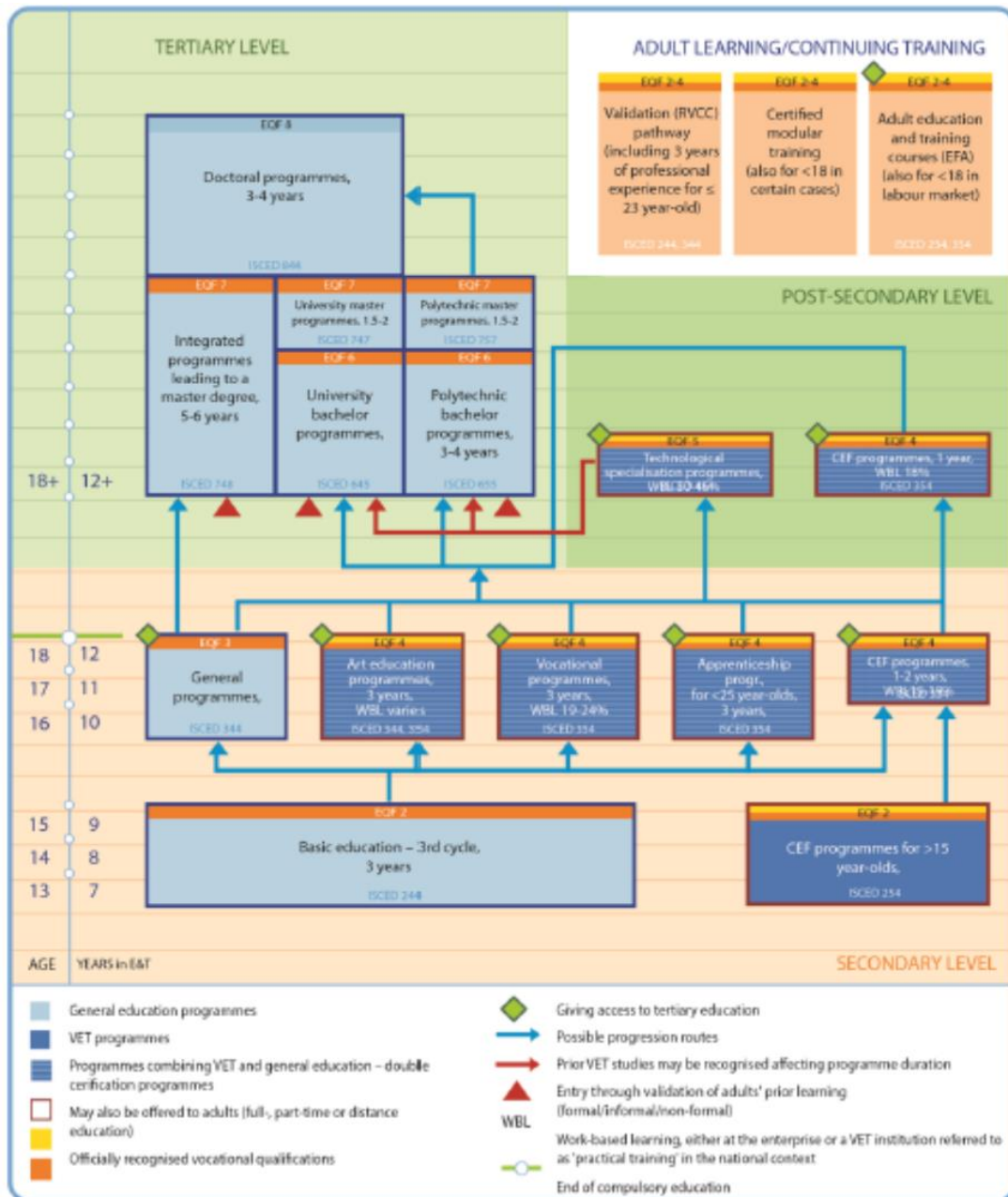
In this sense, we believe that the contents, materials and the practical exercises produced can be adapted and used by the teachers in their subjects with the aim of promoting the understanding of the Textile and Clothing Industry.

Diagramme of the Portuguese education and training system²:

¹ https://www.dgae.mec.pt/?wpfb_dl=5533

² https://cumulus.cedefop.europa.eu/files/vetelib/2016/2016_CR_PT.pdf

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3.2 Education system / Vocational training in Italy

In Italy the education and training system is divided in 4 stages³:

1. **Preschool**, for children from 3 to 6 years old, it's non-compulsory and lasting 3 years;
2. **First cycle of education**, divided in primary school, lasting 5 years, and first degree secondary school, with a duration of 3 years;

³ <http://www.statoregioni.it/DettaglioDoc.asp?IDDoc=38876&IdProv=11452&tipodoc=2&CONF=csr>

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3. **Second cycle of education**, composed by the five-year upper secondary education system and vocational education and training, with three and four-year pathways;
4. **Higher education**, consisting of the university offer, higher education in art and music (AFAM), and the offer made by the Higher Technical Institutes (ITS).

Education is compulsory and free for 10 years, and includes the first cycle of education and the first two years of the second cycle. The legislation support for the fulfilment of the right-duty of education and training for at least 12 years or, in any case, until the attainment of a professional qualification by the 18th year of age. Once they have completed their compulsory education cycle, young people must continue their education and training in the second cycle of the education and training system.

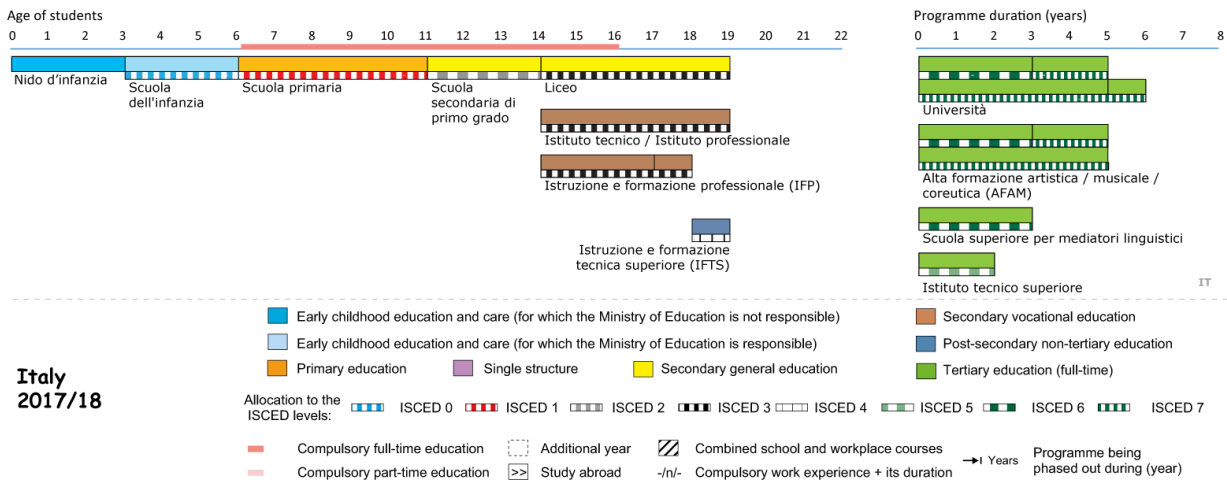
The training framework is as follows:

- Specializations in higher technical education and training (IFTS)
- Initial vocational training post-qualification, post-diploma and post-graduate training
- Apprenticeship
- Adult education and training
- Life-long learning
- Private training

The National government has exclusive competence to define the general rules on education. The responsibility for the education system lies with the Ministry of Education, University and Research (*Ministero dell'Istruzione, dell'Università e della Ricerca* - MIUR), which operates on a central level, while on a local level operate the Regional (USR) and Provincial (UST) School Offices. Furthermore the Ministry of Labor and the Social Policy (*Ministero del Lavoro e delle Politiche Sociali*) establishes and guarantees the essential levels of performance related to the vocational training system.

The Regions have exclusive competence on vocational training, including vocational education and training (VET) courses, in compliance with the essential levels defined by the National government; they also exercise this competence by transferring functions and delegating tasks to the Provinces. The Regions operate in the field of vocational training by defining the planning plans of the training offer involving the social partners, in the context of consultation and/or consultation forums.

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The Second cycle of education includes pathways of different duration, which are divided into two chains: secondary education, that is in charge of the Ministry of Education, and vocational education and training that is in charge of the Regions.

The Second cycle of education consists of three types of offer, all of which last five years.

| High school (I two-years period + II two year period + 5 th year) | Addresses/Sections/Option |
|---|---|
| Artistic | The II two year period is articulated in the following addresses: <ol style="list-style-type: none"> 1. Visual arts 2. Architecture and environment 3. Design 4. Audiovisual and multimedia 5. Artwork 6. Scenography |
| Classical | |
| Linguistic | |
| Performing arts | Musical section Dancing section |
| Scientific | Additional option: Applied Sciences |
| Human sciences | Additional option: Socio-economic |

| Technical Institutes (I two-years period + II two year period + 5 th year) | Addresses |
|--|--|
| Economic sector | <ol style="list-style-type: none"> 1. Administration, finance and marketing 2. Tourism |
| Technological sector | <ol style="list-style-type: none"> 1. Mechanics, mechatronics and energy 2. Transport and logistics 3. Electronics and electrical engineering 4. Information technology and telecommunications |

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| | |
|--|--|
| | <ol style="list-style-type: none"> 5. Graphics and communication 6. Chemistry, materials and biotechnology 7. Fashion system 8. Agriculture, food processing and agro-industry 9. Construction, environment and territory |
|--|--|

| Professional institute (I two-years period + II two year period + 5th year) | Addresses |
|---|---|
| Service sector | <ol style="list-style-type: none"> 1. Services for agriculture and rural development 2. Social and health services 3. Services for food and wine and hotel hospitality 4. Commercial services |
| Industry and craft sector | <ol style="list-style-type: none"> 1. Handicraft and industrial production 2. Maintenance and technical assistance |

The higher technical institutes (ITS) are established on the basis of Regional plans, they are configured as participatory foundations. The ITS courses are open to young people and adults with a diploma of upper secondary education, have a duration of 4 semesters for a total of 1800/2000 hours and releases diplomas of Higher Technician. These diplomas, released by the Ministry of Education, are divided into professional figures related to technological areas.

| Technological areas | Areas |
|---|--|
| Energy efficiency | <ol style="list-style-type: none"> 1.1 Energy supply and generation 1.2 Highly efficient and energy-saving processes and plants |
| Sustainable mobility | <ol style="list-style-type: none"> 2.1 Mobility of persons and goods 2.2 Production and maintenance of means of transport and/or related infrastructure 2.3 Info-mobility management and logistic infrastructures |
| New technologies of life | <ol style="list-style-type: none"> 3.1 Industrial and environmental biotechnology 3.2 Production of equipment, diagnostic and biomedical devices |
| New technologies for the Made in Italy | <ol style="list-style-type: none"> 4.1 Agro-food system 4.2 Home System 4.3 Mechanical System 4.4 Fashion System 4.5 Business services |
| Innovative technologies for cultural heritage and activities - Tourism | <ol style="list-style-type: none"> 5.1 Function and enhancement of cultural heritage |

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| | |
|---|--|
| | 5.2 Conservation, requalification and safety of buildings and places of cultural interest |
| Information and communication technologies | 6.1 Methods and technologies for the development of software systems 6.2 Organization and use of information and knowledge 6.3 Architectures and infrastructures for communication systems |

The specializations in higher technical education and training (IFTS) pathways are programmed by the Regions and they are specialized pathways. The IFTS courses are open to young people and adults with a diploma of upper secondary education, have a duration of 2 semesters for a total of 800/1000 hours and are aimed at obtaining a certificate of higher technical specialization issued by the Regions. The sectors of reference are: Agriculture, Industry and crafts (manufacturing, ICT, construction), Tourism, Transport, Public Services and private services of social interest, Insurance and financial services.

The higher university education is organized in in three cycles:

- The first consist in three-year degree programs. At the end of this cycle the qualification issued is Bachelor degree;
- The second cycle provides two-year master's degree courses. At the end of this cycle the qualification issued is Master degree;
- The third is dedicated to specialization courses and PhD. At the end of this cycle the qualification issued is PhD.

The higher university education is structured with training credits, each university credit corresponds to 25 hours of student work. The amount of academic work done in one year by a full-time student is 60 credits.

The practical exercises, developed in the project, fit into the Italian training framework of reference thanks to their experience-based nature. On the one hand, the pathways of the Second cycle of education, in particular those of the Technical Institutes, are oriented to the practice of educational contents through workshops, laboratory activities, internships and school-work alternation. The proposed exercises are similar to that already practiced by the students of this cycle of education. On the other hand, the ITS and IFTS pathways are closely linked to the companies because are built up with them and based on their needs. The companies belong to the same foundations promoters of ITS and IFTS training courses and they play an active role in the internship phase by hosting students for a high number of internship hours.

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The fact that some of the practical exercises have been developed on the basis of suggestions from companies, makes these products assimilate to the collaborations that students have with companies throughout the school period, allowing them to experience the company's activities even outside the usual internship activities.

3.3 Education system / Vocational training in Spain

Education in Spain is regulated by the Ministry of Education, but regional governments and educational centers in its territory. Both administrations were guided by the principles of quality, cooperation, equity, freedom of education, equal opportunities, non-discrimination, efficiency in the allocation of public resources, transparency and accountability. Education is compulsory and free from 6 to 16 years, although families have paid for the books and materials used in class. The last high school cycle, which runs from 16 to 18, is also free. Higher education is also the payment of the number of enrollments. There are also concerted and private centers, which are usually related to the Catholic Church and payment at all stages. Below we explain the main levels of education in Spain.

PRIMARY EDUCATION is taught in primary schools and consists of six courses, from 6 to 12 years. The goal is for children to develop their social and creative skills and acquire a common basic education in culture, oral expression, reading, writing and arithmetic. The subjects are Castilian language; mathematics; knowledge of the natural, social and cultural environment; foreign languages, arts education and physical education. Before primary education there is a pre-school education that is divided into two cycles and is not mandatory. The first, from 0 to 3 years, is paid, although there are programs to help families in need. The second, from 3 to 6 years, is free and is taught in public schools. Although it is not compulsory, it is widespread and almost 100% of children attend it. The objective of both courses is to promote the physical, emotional, social and intellectual development of children.

SECONDARY EDUCATION consists of two different cycles:

- Compulsory Secondary Education (ESO). It is the last stage of compulsory education and consists of four courses, from 12 to 16 years, which are taught in high schools. The last year you can choose between two modalities, depending on whether you will later study vocational training or baccalaureate.
- Baccalaureate. It is a non-compulsory stage that goes from 16 to 18 years old and prepares young people to access university or vocational training at a higher level. It is taught in the same institutes

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as ESO. It consists of three different modalities (sciences, arts and humanities and social sciences) that are chosen according to what the student wants to study in the future.

In addition, **HIGHER EDUCATION** includes university education, higher artistic education, professional training of higher degree, professional education of plastic arts and design of higher degree and higher level sports education. University education is the most common option and it is divided in turn into:

- Grade - Four-year programs in which a specific subject is studied in depth.
- Master - One-year course to specialize in a specific subject. To access it is necessary to have passed a grade.
- Doctorate (PhD) - It is the maximum training granted by universities and consists of an investigation of about three years.

Regarding to higher education related to textile disciplines, at this moment, there are in Spain the next studies:

- Master's degree in Textile Engineering (Aitex): This 450-hour face-to-face training course is organized by AITEX Textile Technological Institute that offers financing measures, as well as discounts and scholarships so you do not miss the opportunity to study it. It is aimed at young people with university degrees or higher as: Textile Technical Engineers, Technical and Chemical Industrial Engineers, Engineers in Organization, as well as Graduates in Chemical Sciences, Biological, Business Sciences, Diploma in Business Administration, etc. They can also access experienced technicians who wish to specialize and recycle in the Textile Industry or who come from business, marketing, design or communication.
- Degree in Technology Engineering and Textile Design (EET-UPC): The Degree in Technology Engineering and Textile Design, which enables the exercise of the regulated profession of industrial technical engineer, will allow to know the fundamentals of the materials and textile processes, and work on the integral development of textile products and industrial clothing, in projects related to linear textile structures and non-woven fabrics (technical fabrics and intelligent fabrics), in the treatment and finishing operations of textiles and biopolymers, In addition to developing responsibilities in the field of logistics and business management globally. This degree will give access, among others, to university master's degrees in the field of Industrial Engineering, prior admission by the body responsible for the master⁴.

⁴ <https://www.upc.edu/es/grados/ingenieria-de-tecnologia-y-diseno-textil-terrasa-eseiaat>

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- Master of Textile and Surface Design (IED European Design Institute - Madrid): offers a specific training in the pattern design of patterns applicable in different areas: textile and product (wall paper, ceramics, home ...) and professionals to develop a design applicable to a certain surface, trained to make decisions regarding techniques and production processes according to their possibilities and goals, learning from the industrial, semi-industrial and manual processes of each of them, with their vocabulary and peculiarities specific techniques.

The Master of Textile and Surface Design prepares the student both in the creative part, helping him to express his ideas according to aesthetic criteria, and in the economy of means, to designate which are the best ways to achieve it.

The master thus recognizes the strong demand of the industry, being the only reference in Spain with these characteristics.

- Master in Management and Management of Fashion Companies (LCI Barcelona): The internationalization of fashion is generating important changes in the direction of companies. Reason for which a large group of entrepreneurs has proposed to the Essen Superior de Disseny Felicidad Duce, given his professional career, to create a program that includes training, both creative and directive, for companies in the textile and fashion sector.
- The Master in Management and Management of Fashion Companies is endorsed by the great teaching experience that our School has, and by the international level of the Faculties of Fine Arts and Economics and Business Sciences of the University of Barcelona, with which worked closely in the design of the program, guaranteeing in this way a structured, modern and current teaching plan. This Master has been designed in accordance with the reforms proposed in the Bologna process and is based on the principles of quality, diversity and competitiveness.
- Official Degree in Fashion Design (ESADA - School of Art and Design of Andalusia): it is a four-year career, equivalent to all effects to a career taught at the university.
- University Expert Fashion & Digital Fashion: The fashion industry is characterized by the rapid advance of its markets, the transitory of its products and the prolongation of this in art and culture, sociology and the psychology of consumption, converting the "Fashion product" in one of the most difficult and advanced market of consumer goods. The impact of technologies, the information society, and new business and social behaviours have changed the way fashion is designed and marketed.
- Degree in Fashion Design (Nebrija University): Official university degree that integrates subjects related to knowledge of the sector, drawing and digital design, mastery of materials, pattern making techniques and clothing, and all this with the support of matters related to technology and with a

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fundamental humanistic base that serves as inspiration and cultural reference for the creation and design of Fashion.

- University Master's Degree in Textile Engineering (UPV): In the development of the Master, three reference centres in the sector collaborate: the UPV, the Textile Technological Institute (AITEX) and the Textile Association of the Valencian Community (ATEVAL). The available infrastructures and the strong relationship with the productive environment provided by these organizations allow us to successfully address the proposed training.
- Institute of Textile Research and Industrial Cooperation of Terrassa. INTEXTER: The Institute of Textile Research and Industrial Cooperation of Terrassa (INTEXTER) is a centre of the Polytechnic University of Catalonia, which directs its activities to promote research and industrial cooperation in all aspects related to the textile and related sector.

It contemplates two complementary areas that range from the process of research and development of products and technology, to the establishment of adequate mechanisms to open up ways of technology transfer and cooperation with the industry, all this through R & D projects. Another objective of the Institute is the training of technicians and researchers through teaching in university courses.

INTEXTER is a member of INNOTEX Centre, a reference centre in R & D for the global industry, from the experience and trajectory of company-university collaboration in the fields of textiles, toxicology and the environment⁵.

- Textile Degree University of Salamanca: The objective of the Degree in Design Engineering and Textile Technology of the University of Salamanca is to train future students to acquire, among others, the skills necessary for the exercise of the profession of Industrial Technical Engineer, Textile specialty. In the title of Graduate or Graduate in Engineering in Technology and Textile Design proposed, responds to business demands, the labour market and social demands. At the same time, it aims to make it easily comparable and understandable with other equivalent studies in Europe, which will facilitate student mobility⁶.
- Master degree in management and innovation in textile industries, University of Salamanca: The University of Salamanca launches the master in Management and Innovation in Textile Industries in the academic year 2016-2017 aware that, according to experts of the textile and fashion sector consulted, there is currently a significant lack of specialized professionals in the textile industry who

⁵ <https://www.upc.edu/intexter/es>

⁶ <http://www.universia.es/estudios/usal/grado-ingenieria-diseno-tecnologia-textil/st/181157>

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also have knowledge and experience in 4.0 technologies. The necessary training in this area is both labour and academic, especially university⁷.

VOCATIONAL TRAINING offers more than 150 training courses within 26 Professional Families, with theoretical and practical content suitable for various professional fields.

Within each Professional Family are offered:

- Basic Vocational Training Cycles, which lead to the corresponding Basic Professional Degree and are compulsory and free offer courses.
- Middle Level Training cycles, which lead to the title of Technician and which are part of post-compulsory secondary education.
- Higher Vocational Training cycles, which lead to the title of Superior Technician that is part of higher education.

These teachings, in turn, are structured in professional modules (they are the subjects or subjects) of different nature: associated to competency units, transversal, of Training and Labour Orientation, Enterprise and entrepreneurial initiative, as well as Training in Work Centres (FCT).

The Ministry of Education and Vocational Training provides the following **VET** degrees (Professional Family - Textile, Clothing and Leather):

- Basic Professional Title in Arrangement and Repair of Textile and Leather Articles
- Basic Professional Degree in Upholstery and Curtains
- Fashion Footwear and Accessories Technician
- Technician in Clothing and Fashion
- Technician in Manufacturing and Ennoblement of Textile Products
- Technical Superior in Technical Design in Textile and Leather
- Superior Technician in Design and Production of Footwear and Accessories
- Senior Technician in Pattern and Fashion
- Senior Technician in Customized and Spectacular Costumes

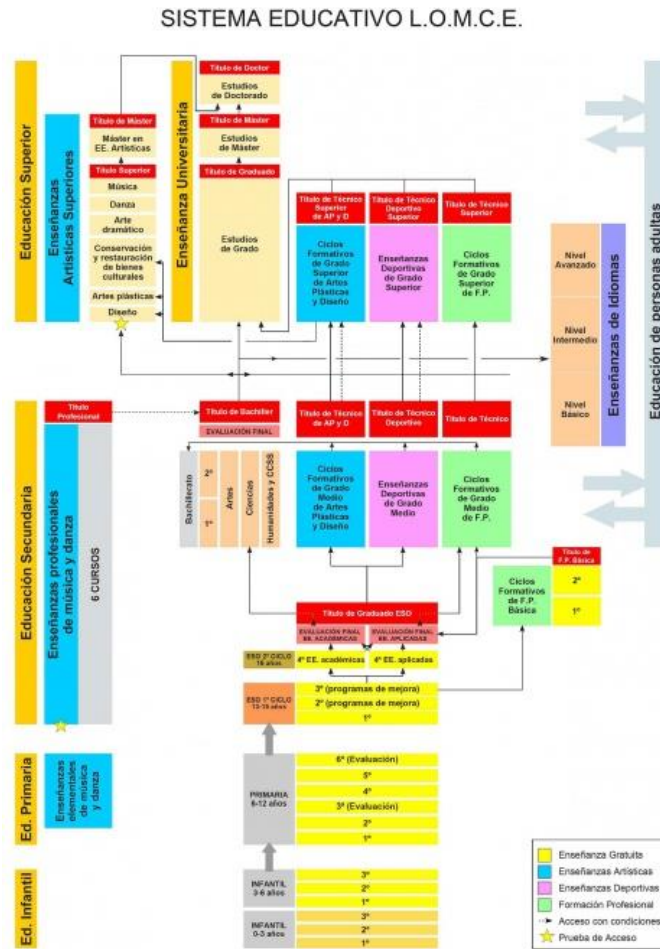
Spanish educational system⁸ flow chart:

⁷ <http://www.usal.es/master-en-gestion-e-innovacion-en-industrias-textiles-semipresencial>

⁸ <https://www.mecd.gob.es>

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Organigrama del Sistema Educativo Español



3.4 Education system / Vocational training in United Kingdom

In the UK young people are required to start school at 5 and be in some form of education or training until they are 18.

The school structure of the primary phase can differ depending on the Local educational Authority that the school is in. Primary stage (Key Stage 1 + 2) is from Year 1 through to Year 6 (5 – 10years old) some areas split this into ‘infant schools’ which are for years 1, 2 and Junior schools for years 3, 4, 5 and 6. Whilst others do not split up the primary phase and children attend the same school until the complete Year 6. All young people are required to transition to High school to complete studies in Key Stage 3 and 4. This is from the age of 11 to 16.

The structure of the national curriculum, in terms of which subjects are compulsory at each key stage, is set in the table below (structure of the national curriculum):

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| | Key stage 1 | Key stage 2 | Key stage 3 | Key stage 4 |
|----------------------------|--------------------|--------------------|--------------------|--------------------|
| Age | 5-7 | 7-11 | 11-14 | 14-16 |
| Year Group | 1-2 | 3-6 | 7-9 | 10-11 |
| Core Subjects | | | | |
| English | x | x | x | x |
| Mathematics | x | x | x | x |
| Science | | | | |
| Foundation subjects | | | | |
| Art & design | x | x | x | |
| Citizenship | | | x | x |
| Computing | x | x | x | x |
| Design & Technology | x | x | x | |
| Languages | | x | x | |
| Geography | x | x | x | |
| History | x | x | x | |
| Music | x | x | x | |
| Physical education | x | x | x | x |

All schools are also required to teach religious education at all key stages. Secondary schools must provide sex and relationship education:

| | Key stage 1 | Key stage 2 | Key stage 3 | Key stage 4 |
|---------------------------------|--------------------|--------------------|--------------------|--------------------|
| Age | 5-7 | 7-11 | 11-14 | 14-16 |
| Year Group | 1-2 | 3-6 | 7-9 | 10-11 |
| Religious education | x | x | x | x |
| Sex and relationships education | | | x | x |

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In **England, Wales and Northern Ireland** there are 9 qualification levels, as we can observe in the table below:

| England, Wales and Northern Ireland ⁹ | |
|--|--|
| Qualification levels | |
| Entry level | <p>Each entry level qualification is available at three sub-levels - 1, 2 and 3. Entry level 3 is the most difficult.</p> <ul style="list-style-type: none"> • entry level award • entry level certificate (ELC) • entry level diploma • entry level English for speakers of other languages (ESOL) • entry level essential skills • entry level functional skills • Skills for Life |
| Level 1 | <ul style="list-style-type: none"> • first certificate • GCSE - grades 3, 2, 1 or grades D, E, F, G • level 1 award • level 1 certificate • level 1 diploma • level 1 ESOL • level 1 essential skills • level 1 functional skills • level 1 national vocational qualification (NVQ) • music grades 1, 2 and 3 |
| Level 2 | <ul style="list-style-type: none"> • CSE - grade 1 • GCSE - grades 9, 8, 7, 6, 5, 4 or grades A*, A, B, C • intermediate apprenticeship • level 2 award • level 2 certificate • level 2 diploma • level 2 ESOL • level 2 essential skills • level 2 functional skills • level 2 national certificate • level 2 national diploma • level 2 NVQ • music grades 4 and 5 • O level - grade A, B or C |
| Level 3 | <ul style="list-style-type: none"> • A level • access to higher education diploma • advanced apprenticeship • applied general • AS level |

⁹ <https://www.gov.uk/what-different-qualification-levels-mean/list-of-qualification-levels>

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| | |
|---------|---|
| | <ul style="list-style-type: none"> • international Baccalaureate diploma • level 3 award • level 3 certificate • level 3 diploma • level 3 ESOL • level 3 national certificate • level 3 national diploma • level 3 NVQ • music grades 6, 7 and 8 • tech level |
| Level 4 | <ul style="list-style-type: none"> • certificate of higher education (CertHE) • higher apprenticeship • higher national certificate (HNC) • level 4 award • level 4 certificate • level 4 diploma • level 4 NVQ |
| Level 5 | <ul style="list-style-type: none"> • diploma of higher education (DipHE) • foundation degree • higher national diploma (HND) • level 5 award • level 5 certificate • level 5 diploma • level 5 NVQ |
| Level 6 | <ul style="list-style-type: none"> • degree apprenticeship • degree with honours - for example bachelor of the arts (BA) hon, bachelor of science (BSc) hon • graduate certificate • graduate diploma • level 6 award • level 6 certificate • level 6 diploma • level 6 NVQ • ordinary degree without honours |
| Level 7 | <ul style="list-style-type: none"> • integrated master's degree, for example master of engineering (MEng) • level 7 award • level 7 certificate • level 7 diploma • level 7 NVQ • master's degree, for example master of arts (MA), master of science (MSc) • postgraduate certificate • postgraduate certificate in education (PGCE) • postgraduate diploma |
| Level 8 | <ul style="list-style-type: none"> • doctorate, for example doctor of philosophy (PhD or DPhil) • level 8 award |

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|--|--|
| | <ul style="list-style-type: none"> • level 8 certificate • level 8 diploma |
|--|--|

Students study an appropriate pathway from Entry Level to completing Level 2 Qualifications by the end of Year 11. On completion of Year 11 students have an option to continue into Post 16 fulltime education and complete a combination of academic or vocational courses at Level 3. This is Year 12 & 13. If students have not achieved a Level 2 grade 4 in GCSE Maths and English or equivalent they must continue to work towards achieving this.

In addition to following this framework the National careers Strategy 2018 has made it a statutory requirement that schools and colleges meet the following standards for all students in Year 7 – 13.

| # | Benchmark |
|---|--|
| 1 | A stable careers programme |
| 2 | Learning from careers and LMI |
| 3 | Addressing the needs of each pupil |
| 4 | Linking curriculum learning to careers |
| 5 | Encounters with employers & employees |
| 6 | Experiences of workplaces |
| 7 | Encounters with further & higher education |
| 8 | Personal guidance |

Alternatively, 16 year olds have the option to start an Apprenticeship. Apprenticeships are paid jobs that incorporate on and off the job training. A successful apprentice may qualify with a nationally recognised qualification on completion of their contract. Below is a diagram illustrating the qualification levels and how these compare to qualification level. However all students must remain in some form of education or training until they are 18.

| Name | Level | Equivalent Educational Level ¹⁰ |
|--------------|-------------|--|
| Intermediate | 2 | 5 GCSE passes at grades A to C |
| Advanced | 3 | 2 A level passes |
| Higher | 4,5,5 and 7 | Foundation degree and above |

¹⁰ <https://researchbriefings.parliament.uk/ResearchBriefing/Summary/SN03052>

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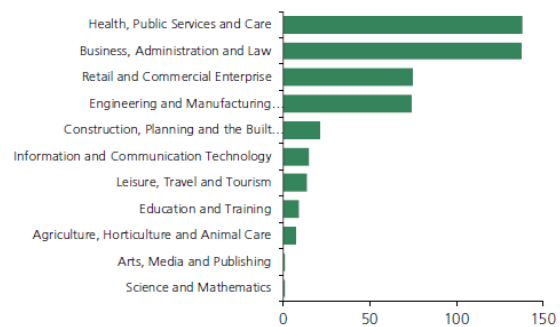
There are two different types of apprenticeships schemes, frameworks and standards. Apprenticeship frameworks are being progressively phased out and replaced by the newer apprenticeships standards, which were introduced in 2014¹¹.

Below shows the numbers of young people starting apprenticeships by age group and sector¹²:

Apprenticeship starts in England in 2016/17, thousands

| | Level Proportion | |
|----------|------------------|-----|
| Under 16 | 0 | - |
| 16 | 29 | 6% |
| 17 | 41 | 8% |
| 18 | 52 | 11% |
| 19-24 | 141 | 29% |
| 25-34 | 105 | 22% |
| 35-44 | 62 | 13% |
| 45-59 | 58 | 12% |
| 60+ | 4 | 1% |

Apprenticeship starts in England by sector subject in 2016/17, thousands



The STEM element of our practical activities supports schools to do deliver and embed within required curriculum in compulsory education. Furthermore its designs will allow other schools to pick up and deliver regardless of links with industry due to the intended digital element of the project. The statistics of numbers of apprenticeships in the Textiles sector also highlights the need for the project in the UK. Further supporting the research in the early stages of the project.

3.5 Education system / Vocational training in Austria

Austria referenced their formal qualifications to the EQF without necessarily a distinct NQF20 but adopting national criteria and methodology in order to present the interaction between the national qualifications and the EQF levels.

In Austria, this is defined in a policy paper defined by the Federal Ministry of Education, Science and Research referring the qualification levels 1-5 with the same descriptors used within the EQF and for qualification levels 6-8 two sets of descriptors have been identified with the objective of addressing both, academic and vocational qualifications.

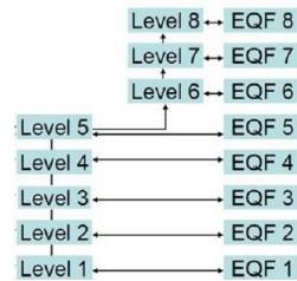
¹¹ <https://researchbriefings.parliament.uk/ResearchBriefing/Summary/SN03052>

¹² [file:///D:/JCarvalho/Downloads/SN06113%20\(3\).pdf](file:///D:/JCarvalho/Downloads/SN06113%20(3).pdf)

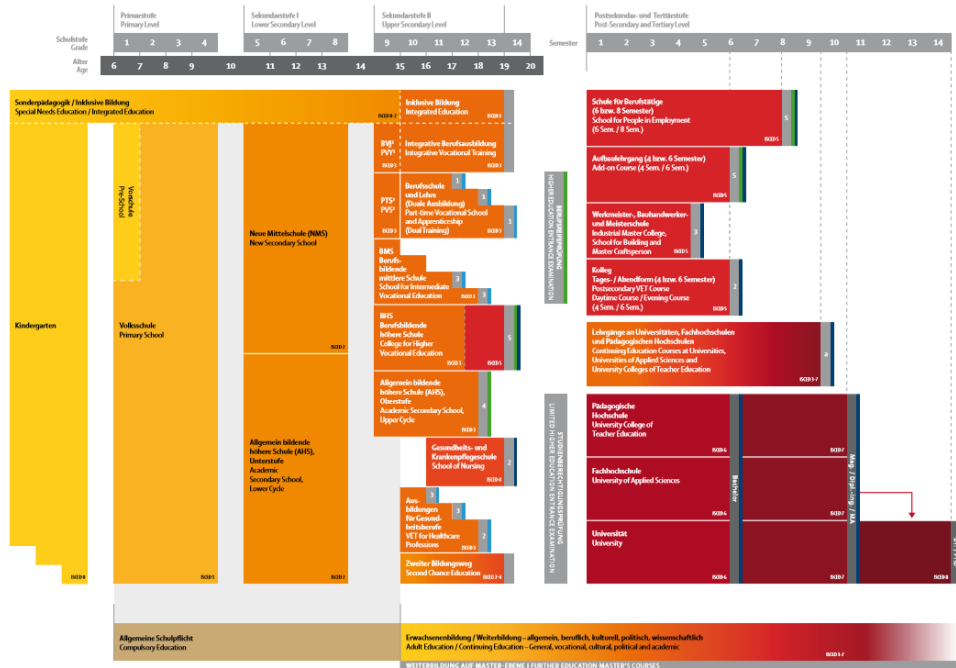
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The following graphs¹³ illustrate this.

Austrian National Qualification Framework
Vocational education



Das österreichische Bildungssystem
The Austrian Education System
bildungssystem.at



Legende des Bildungssystems | Key Education System

- Lehrabschlussprüfung (AP) | Apprenticeship Examination
- Reifeprüfung | Diploma Examination
- Abschließungsprüfung | Leaving Examination
- Reife- u. Diplomprüfung | Leaving and Diploma Examination
- Zulassung zu weiterführenden Studien nach Entsch. im Einzelfall | Admission to further studies on case-by-case basis
- Berufliche Erstqualifikation | Initial Vocational Qualification
- Allgemeiner Hochschulzugang | General Higher Education Entrance Qualification
- Höhere Berufsbildungsqualifikation | Higher Vocational Qualification
- Berufsvorbereitungsjahr (BVJ) | Vocational School Pre-Vocational Year

ISCED – International Standard Classification of Education 2011

In Austria, schooling is compulsory for nine years (from age six to 15). Compulsory education starts with four years of primary schools (*Volksschule* or *Grundschule*). Another four years, from age ten on, pupils attend either lower grades of a higher secondary school (*Allgemeinbildende höhere Schule (AHS)*) or - after a restructuring of the Austrian education system in 2015/16 - a “New middle school” (*Neue Mittelschule*).

¹³ https://www.bildungssystem.at/fileadmin/user_upload/PDF/Neu_mit_BMB_Logo/DEEN_PlatatBS_2018_web.pdf

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The ninth school year can be attended in a polytechnical school (*Polytechnische Schule*) which focusses on vocational orientation and preparation towards an apprenticeship, or one of the following other (vocational) school types:¹⁴

- Higher general secondary school and grammar school (*Allgemeinbildende höhere Schule (AHS)*; 9th – 12th school grade) conclude with a general school-leaving examination (*Matura*).
- Intermediate vocational schools (*Berufsbildende mittlere Schule (BMS)*; 9th – 11th / 12th school grade) combine general education subjects with a full VET qualification for specific occupations (e.g. engineering, fashion, agriculture, tourism, business administration etc.). They conclude with a technical examination.
- Higher vocational schools (*Berufsbildende höhere Schule (BHS)*; 9th – 13th school grade) offers in-depth general education and a high-level specialist training in theory and practice and conclude with a technical examination and the general school-leaving examination (*Matura*).

After completing the ninth school grade, people have to continue scholar education or go into professional training (apprenticeship - *Lehre*) until the age of 18 (respectively until successful completion of a further educational level). Vocational educational training is highly prominent in Austria. 75% of pupils, who have completed the nine years of compulsory schooling choose a VET pathway afterwards. The major significance of VET in Austria is also shown in the diversity of programmes, not only school-based but also in the dual training sector.

Dual vocational education and training (apprenticeship) is offered for around 200 apprenticeship occupations. In general, 80% of the training time is conducted in a training company, the other 20% the learners spend in an occupation-specific part-time vocational school. Apprenticeships lasts between two and four years (most of them three years).¹⁵

The school-leaving examination (*Matura*) allows to enter higher education pathways (university, academy, college, etc.). The variety of studies in Austria is broad and covers from technical studies, humanities, arts, training for teachers etc. nearly all possibilities there are.¹⁶

Exercises related to the textile and clothing industry are in most cases already implemented in technical schools in Austria, covered in the curricula of these schools. The EDU4TEX team recommends to implement such activities already in general schools with lower grades. However, it should be mentioned that therefore

¹⁴ <https://www.migration.gv.at/en/living-and-working-in-austria/children-and-education/educational-systems/>

¹⁵ <https://refernet.at/en/vet-in-austria/description>

¹⁶ <https://www.migration.gv.at/en/living-and-working-in-austria/children-and-education/educational-systems/>

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it is probably necessary to adapt the EDU4TEX exercises where schools might not have full access to necessary technical equipment for conducting highly specific technical exercises (e.g. schools without a technical laboratory), or to limit them to the parts they have infrastructure for or try to find a collaborating organisation/ company for the remaining activity parts (e.g. in conjunction with a company visit).

To attract more pupils for an education in a special sector, i.e. the textile and clothing industry in this case, many schools in Austria organise company visits and might enlarge their scope to interesting companies and research organisations in this sector. Either a representative of the company comes to the school to present their business or the pupils go to visit the company. Short-term internships for a few days or a week can support a familiarization with the textile sector. They are, in general, foreseen in technical schools (although the duration might vary and last longer) and considered in their curricula. Further, some schools support programmes, in which the parents take their children to their workplace for a day to show them around and present possible work processes. Some schools also invite parents to come to class to simply talk about their work. This approach might particularly be more explored on behalf of the textile and clothing industry at lower school grades, to show interesting tasks, innovative/ interesting results and products and/ or career opportunities.

4. Contents and Materials

One of the aims of the contents is to illustrate the variety of activities and attractive careers in textile companies, providing new opportunities and developing new partnerships between the industry and education.

Our overall ambition is to improve the level of students' and teachers' knowledge of opportunities within the sector by providing new learning materials and organising practical activities both within and outside the classroom.

The contents and materials developed will support the teachers and students to change perceptions about the modern textile industry, opening up new career options and providing new opportunities for young people. The materials used in the exercises are described in each Practical Exercise.

| | | | |
|-------------------------------------|---|--|---|
| General Materials | Frames Screens Raclettes Textile printing table Emulsions Frame wash tank | Conductive threads Cables LEDs Textile fabrics Battery Needle | Textile materials Conducting wires fabrics T-shirts of diferente sizes VÍdeo Worksheets |
| Testing Equipment | Flammability Lightfastness Abrasion Stretch | | |
| Technological Material | Microscope Magnifying glass 3D printing | | |
| Textiles Intelligent | Textiles with special effects Textiles with dirt repellent Textiles odor neutralization | | |
| Printing products | Thickening agent Fixative Binder | | |
| Pigments or special pigments | Thermochromic or hydrochromic Squeegee and printing frame Oven to dry and polymerize the drawing or motif | | |
| Electronic Materials | Arduino LilyPad, Sensors, actuators; | | |

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| | Video production tools; PC Electronic components: resistors, tin |
| Optional materials | Lilypad Arduino |

5. Practical Exercises

The 7 practical exercises intend to promote young students' knowledge of the textile and clothing industry, and were developed based on an active work methodology, through experimentation. During the implementation of the exercises, students are invited to make use of the equipment's, materials and also relate the theoretical and practical aspects in a practical way. This way it may also promote individual development, such as:

- **Critical Thinking** - the methodology motivates to think actively about what is being seen and / or done and thus establishing new and deeper connections.
- **Scientific curiosity** - student's development can become much more complex if s/he has an interest in learning and discovering.
- **Autonomy** - students are invited to participate in practical planning and to use all materials and equipment available, then to discuss about the results.
- **Team work** - these activities involve teamwork and healthy discussions that may stimulate debate, unity and cooperation, leading to a reflection on what they are doing and how it will influence others.
- **Educational use of technology** - can be used to bring more dynamism, organization and efficiency of activities. From there, students may come to a better understanding on how electronic equipment is capable of offering many utilities besides leisure and communication.
- **Self-confidence** - initially, students are likely to feel insecure and uncomfortable in the scientific laboratory environment if this is something new, as if they have the impression that they do not belong to such a place. It is very important to leave them and encourage them to use the equipment, especially the "delicate" ones, such as microscopes. Gradually, they will lose their fear of handling new equipment by giving them more confidence.

The exercises were developed taking into account their applicability in different contexts: in the classroom, at home or in technological labs and the contents cover different areas such as: financing, marketing, mathematics, ICT, electronics, among others, and could be used as part of one teaching subject or in conjunction with different ones.

Practical Exercise 1: Careers in the fashion & textiles industry – The world of work

| Practical Exercise Careers in the fashion & textiles industry – The world of work | |
|---|--|
| Summary | <p>This resource aims to support students & teachers when thinking about careers in the textile industry.</p> <p>It includes information on:</p> <ul style="list-style-type: none"> - The range of business areas the textile industry covers; - Reasons why a young person should consider a career in the fashion & textiles industry; - What the modern fashion & textiles industry is like (Information on the modern textiles industry including evidence that it is a growth industry); - How many different roles there are in the fashion and textile industry (information on the different sectors in the industry). <p>This resource aims to support students & teachers when thinking about careers in the textiles industry. It is prepared for a set of two 90 minute classes.</p> <p>With this set of activities the intended learning outcome is to raise students' awareness on the areas of fashion and textile industry in order to identify and broadly characterize careers.</p> |
| Materials and Equipment Requirements | <p>Vídeo</p> <p>3 Worksheets</p> |
| Location | <p>Classroom</p> <p>ICT Classroom</p> |
| Staff/Specialist Staff/External Staff required | <p>Teacher</p> <p>Careers Advisor</p> |
| Health and Safety Requirements | <p>Not Applicable</p> |
| Student Age Range | <p>16-18 years old</p> <p>It could be used with any year group but it is particularly designed for post 16 students</p> |

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| Curriculum Areas included/Subject Areas | This material was specially designed to be applied in the subject of English as Second Language (ESL). | |
| STEM related content | Any in particular. General knowledge about careers | |
| Potential from trans-national activity/competition | This resource is intended to be used as a starting point with general background information for any other more practical activities related to the topic of fashion and textile industries. Therefore, it is prepared in a way that can be used / adapted to any country. | |
| Methodology | <p>Time: 12 min. Supplies: (white)board</p> <p>Time: 8 min. Supplies: Internet video</p> <p>Time: 15 min. Supplies: Previous Internet video and Power point with the areas listed</p> | <p><u>Lesson 1 – 90 minutes</u></p> <p>Activity #1: Brainstorming & discussion</p> <ul style="list-style-type: none"> - In groups, Students (STs) discuss which areas they associate textiles/fabrics with: <i>In which areas do we need fabrics in our daily life?</i> - Teacher (T) writes the question on the whiteboard and gives about 5 minutes for the groups to discuss; Class discussion about the topic. T. writes the main ideas on the whiteboard. <p>Activity #2: Video watching</p> <ul style="list-style-type: none"> - Sts. watch a video (https://www.youtube.com/watch?v=3492J1asSuM) and compare it with the information they have previously discussed in groups completing it with what they have listened in the video. <p>Activity #3: Brief class discussion</p> <ul style="list-style-type: none"> - A brief class discussion about the areas in which textiles are applied follows: <div style="border: 1px solid black; padding: 5px; margin: 10px 0;"> FASHION / HOME / SPORTS / MILITARY / MANUFACTURING / MEDICAL / </div> <ul style="list-style-type: none"> - Functional apparel (performance enhancement, conductive fabric and wearable electronics); - Protective apparel (protection against: fires and flames; hostile environments; chemicals, oils and lubricants; bacteria; |

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| | <p>Time: 10 min. Supplies: (white)board</p> <p>Time: 20 min. Supplies:(white)board; Worksheet 1 – “20 Reasons Why you Should Consider a Career in the Fashion & Textiles industry”.</p> <p>Time: 25 min. Supplies: Worksheet 2 – “Fashion and Textiles: a growth industry”.</p> | <p>hazardous gases; other occupational hazards);</p> <ul style="list-style-type: none"> - Industrial filters (cleaning oil spills, pollution prevention, fresher air, cleaner water, safer products); - Biomedical textiles (sutures, stent grafts, repair meshes, tissue engineering scaffolds); - Architectural textiles (façades, tensiles, interior structures); - Geo textiles (reinforcements for dams and canals); - Automotive textiles (claddings, filters and engine components, tyre cords, anti-squeak tapes, roof reinforcement, switches and operating parts, dash insulators, carbon fibre wheels); - Aircraft textiles (lighter, stronger); - Aerospace textiles (spacecraft, space station interior, space suits). <p>- During the discussion unknown vocabulary is explained and some personal questions may be asked to Sts., e.g., which of the areas they identify themselves with, which ones they would consider for a future career...</p> <p>Activity #4: Brainstorming & discussion</p> <ul style="list-style-type: none"> - Still in groups, bearing in mind all the extensive areas previously discussed, students think about some reasons why they should consider a career in the fashion & textile industries and share ideas within their group of work. - Reasons are presented and discussed with the whole group. Main ideas are written down on the whiteboard. <p>Activity #5: List of reasons & discussion</p> <ul style="list-style-type: none"> - Sts. are given a list of 20 reasons why (young) people should consider a career in the fashion & textiles industry (worksheet 1). - They compare their previous outcomes with the ones in the list and choose the ones they consider the most important, presenting their reasons. |
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| | <p>Time: 10 min. Supplies: Worksheet 3 – “How many different roles are there in the fashion and textiles industry?”.</p> <p>Time: 60 min. Supplies: Computers</p> <p>Time: 20 min. Supplies: Computers</p> | <p>Activity #6: <u>Reading</u></p> <ul style="list-style-type: none"> - Before reading the text, the Sts. are asked to give a definition of Textiles Industry. - Sts. now read the text “<i>Fashion and textiles: a growth industry</i>” and underline the main ideas presented in the text and complete a table with that information. - A class discussion on the assigned task follows. <p><u>Lesson 2 – 90 minutes</u></p> <p>Activity #7: <u>List of jobs</u></p> <ul style="list-style-type: none"> - Sts are presented with a list of different careers related to the fashion & textiles industry – worksheet 3. - T. and Sts. read, analyse and comment on the list. <p>Activity #8: <u>Research Task</u></p> <ul style="list-style-type: none"> - Sts choose a career from the previous list on worksheet 3. - Each student will look up the information on the handout about the career chosen using the internet or other resources available. <p>Activity #9: <u>Oral Presentation</u></p> <ul style="list-style-type: none"> - In the end, each student will stand and share the information about their career with the class. - Students can create a power point slide to put into a presentation for the class. <p><u>Follow up activities:</u></p> <ul style="list-style-type: none"> - Students can make a poster advertising the careers. - Invite a guest speaker to come and talk to the class about careers in fashion. |
|--|--|--|

Practical Exercise 2: Educational Display Blinds

| Educational Display Blinds | |
|---|---|
| Summary | <p>Create Blinds for school class rooms. (Educational Display Blinds).Students to design Blinds.</p> <p>Companies to make Blinds.</p> <p>Students to test the Blinds.</p> <ul style="list-style-type: none"> - Flammability - Lightfastness - Abrasion - Stretch <p>Company logo to go on bottom of blind</p> <p>Students will work on the financing side. So if they want to sell the blind they can find out how much they are to make, test and design.</p> <p>The studio school are to help on the design of the blinds along with marketing materials and videos.</p> <p>Pupils will produce a persuasive “pitch” on the product in English.</p> |
| Materials and Equipment Requirements | <p>Testing equipment for:</p> <ul style="list-style-type: none"> - Flammability - Lightfastness - Abrasion - Stretch |
| Location | Blind Company / In School |
| Staff/Specialist Staff/External Staff required | Company specialist and Teacher(s). |
| Health and Safety Requirements | See CLEAPS advice for all Science tests done in school |
| Student Age Range | Years 7, 8 and 9. Year 12 & 13 to lead on asthetics of the blinds along with the with marketing materials and videos etc. |
| Curriculum Areas included/Subject Areas | Careers, Science, Maths, Art, Design & Technology, Media, Business and English |

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| STEM related content | Testing, Financing, Developing and Designing, Marketing. |
| Potential from trans-national activity/competition | Competition for the best blind design – could be a Dragons Den type activity where pupils pitch their blinds and include how they were made, tested and marketed. |
| Methodology | <p>Students will design the Blinds.</p> <p>Companies will make the Blinds.</p> <p>Students will test the Blinds with company.</p> <ul style="list-style-type: none"> - Flammability - Lightfastness - Abrasion - Stretch <p>Students will work on the financing side. So if they want to sell the blind they can find out how much they are to make, test and design.</p> <p>The studio school students are to then design the blinds and produce the marketing materials and videos.</p> <p>Pupils will produce a persuasive “pitch” on the product in English.</p> |

Practical Exercise 3: Creative Lab

| Practical Exercise Creative Lab | |
|---|--|
| Summary | <p>Creative Lab</p> <p>The Creative Lab aim is to awaken in youngsters the interest in scientific, technological and experimental knowledge. The activities have a practical and at the same time playful and pedagogical character, looking for physical involvement and the development of cognitive structures. The experiential approach contributes to scientific knowledge and the diffusion of knowledge and understanding of the physical world, as well as the skills development of exploration and discovery. The creative lab integrates the following activity:</p> <p>Interactive Industry - in an interactive and fun way students will be able to carry out experiments and test the new functionalities in textiles (example: special effects, dirt repellent; odors neutralization; among others) in an environment of safety and creativity on industrial technology, addressing different sectors of activity. Young people will have the opportunity to manipulate and use technological material such as: microscope, magnifying glass, 3D printing, robotics, energies, among others.</p> <p>Students' discovery-based learning enables them to learn for themselves and promotes curiosity to explore materials and equipment while teaching about professions.</p> |
| Materials and Equipment Requirements | <p>Technological material:</p> <ul style="list-style-type: none"> • Microscope; • Magnifying glass; • 3D printing; <p>Textiles Intelligent - such as textiles with special effects, dirt repellent, odor neutralization ...;</p> <ul style="list-style-type: none"> • Frames; • Screens; • Raclettes; • Textile printing table; • Emulsions; |

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| | <ul style="list-style-type: none"> • Frame wash tank. |
| Location | <p>This activity involves the handling of specific materials and should be developed in:</p> <ul style="list-style-type: none"> • Technology Centers Laboratories; • Schools laboratories; |
| Staff/Specialist Staff/External Staff required | <p>The staff specialist should have technical skills in the textile area and product development, as well as transversal skills such as:</p> <ul style="list-style-type: none"> • Soft skills: ability to listen, self-confidence, motivation, initiative, teamwork, time management; • Leadership skills: motivation of others, conflict management, autonomy, leadership; • Cognitive competencies: planning and organization; innovation and creativity; troubleshooting; • Communication skills, • ICT skills; • Numeracy skills. |
| Health and Safety Requirements | <p>The conditions of hygiene, safety and health should be guaranteed. The space and the equipment must obey the norms and rules of security and the activities must be conducted and supervised by the staff specialist.</p> |
| Student Age Range | <p>Youngsters between the ages of 10 and 18.</p> |
| Curriculum Areas included/Subject Areas | <p>This activity promote competencies in the following curricular areas:</p> <ul style="list-style-type: none"> - Foreign language - English: use of technical terms; - Physics - Chemistry; - Mathematics; - ITC; - Transversal skills. |
| STEM related content | <p>The activity developed fits the school curriculum.</p> |
| Potential from trans-national activity/competition | <p>Provided the adapted space, has the conditions for its realization, and specialized technicians the Creative lab can be developed nationally and internationally.</p> |

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| Methodology | <p>The creative lab is expected to be developed in 90-minute sessions. The development of this activity will contemplate 3 moments:</p> <p>1st moment - Introduction:</p> <p>Active method: presentation of the staff specialist and the group;</p> <p>Expositive method: presentation of the activity and objectives;</p> <p>Interrogative method: present the central lines of the contents and verify prerequisites on the subject.</p> <p>2nd moment - Development:</p> <p>Expositive method: introduction of the basic concepts of the textiles intelligence, presentation of materials and introduction of stamping concepts;</p> <p>Active method: Perform the experience creative stamping; apply basic manual stamping processes, complying with safety and hygiene standards.</p> <p>3rd moment - Conclusion:</p> <p>Active method: Projects Presentation;</p> <p>Expositive method: Synthesis of contents by the staff specialist;</p> <p>Interrogative method: General evaluation of the activity.</p> |
|--------------------|---|

Practical Exercise 4: Smart Textiles 1

| Practical Exercise Smart Textiles 1 | |
|---|---|
| Summary | <p>To help students understand better the huge range of possibilities the textile industry offers, it is interesting to work on the Smart Textiles sector. Smart Textiles, also known as smart garments, smart clothing, or smart fabrics, are fabrics that enable digital components such as a battery and a light (including small computers), and electronics to be embedded in them.</p> <p>Especially, this activity consists of developing a luminescent cloth with the possibility of being handled with some pressure sensors in order to activate the lights. So, two technologies will be included into the cloth, pressure sensors made by conductive threads and electroluminescent technology. By the material provided the student must develop a piece of garment with luminescent function controlled by a tactile sensor. The student must work on:</p> <ul style="list-style-type: none"> - Design the garment - Develop the garment with the fabrics provided - Design the circuitry between the LEDs, the battery and the tactile sensor and sew it to the fabrics - Design the pressure or tactile sensor - Insert the LEDs and the battery onto the fabric <p>The final development must cover two functionalities, the first one is to conform a piece of garment and on the other hand, is mandatory that this piece of garment produce light.</p> |
| Materials and Equipment Requirements | <ul style="list-style-type: none"> - Conductive threads - Cables - LEDs - Textile fabrics - Battery - Needle - Designs and info about how to conform a tactile sensor <p>Optional materials:</p> <ul style="list-style-type: none"> - Electronic components: resistors, tin, ... |

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| | *Characteristics and specifications of electronic components will vary depending on the internationalization extent of the activity. |
| Location | Educational centre and at home |
| Staff/Specialist Staff/External Staff required | Fashion designer Electronic engineer, or technology expert |
| Health and Safety Requirements | No chemical products used. Batteries must be manipulated under especial conditions. The use of sewing machines or needles could represent some safety troubles. |
| Student Age Range | 15-25 |
| Curriculum Areas included/Subject Areas | Fashion, Electronics, Design, |
| STEM (science, technology, engineering, math) related content | Science: Technology: <ul style="list-style-type: none"> - Development and design of clothes Engineering: <ul style="list-style-type: none"> - Interconnection between electronic devices - Prepare a business plan Maths <ul style="list-style-type: none"> - Do calculations about the thread needed for each design |
| Potential from trans-national activity/competition | Could be implemented as a national or international competition in which some groups of students compete each other to develop the most interesting garment. The jury will consider aspects such as: <ul style="list-style-type: none"> - Aesthetic aspects - Functional aspects - Light emitted - ... |
| Methodology | The methodology is proposed as follows: <ul style="list-style-type: none"> - Create a team: Form a team of 2 – 5, think of a name, decide job roles; Team Manager, Manufacturing Engineer, Designer, Resource Manager, etc. - Business plan: Plan and prepare a business plan, develop a budget and raise sponsorship. |

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- Design the garment and circuitry: Using design software, design the garment and the circuitry to be used in the smart textile.
- Analyse: Try different fabrics and different conductive threads to perform the cloth according to its comfortability and functionality.
- Cloth testing: Once the smart cloth is developed the comfortability and functionality must be assured and should be according the international standards.
- Oral presentation: Prepare a 10-15 minutes presentation to perform to a panel of judges covering all aspects of the challenge.
- Portfolio judging: prepare a report documenting the manufacturing process of the smart cloth and the business strategy.

In addition, in case of becoming a transnational competition, the methodology above described:

- Results displaying: Put together an informative display showing every step of the project. Think about your “brand” identity.
- Engineering and design judging: Judges question teams on how their smart clothes has been manufactured and why particular designs were chosen.
- Catwalk: Time to show the resultant cloth and its functionality.

Practical Exercise 5: Smart Textiles 2

| Practical Exercise Smart Textiles 2 | |
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| Summary | <p>To help students understand better the huge range of possibilities the textile industry offers, it is interesting to work on the Smart textiles sector. Smart textiles, also known as smart garments, smart clothing, or smart fabrics, are fabrics that enable digital components such as a battery and a light or sensors (including small computers), and electronics to be embedded in them.</p> <p>In this project the student must develop a heatable garment. With the material provided the student or group of students must be able to develop a piece of a garment with heatable function:</p> <ul style="list-style-type: none"> - Design the garment - Develop the garment with the fabrics provided - Design the connections and circuitry with the battery - Sew the conductive yarns in the garment with your heatable design - Integrate the batteries and electronics in the textile <p>The final development must cover two functionalities, the first one is to conform a garment and on the other hand, is mandatory that this piece of garment produce heat.</p> |
| Materials and Equipment Requirements | <ul style="list-style-type: none"> - Conductive threads - Fabrics - Battery - Needle |
| Location | Educational centre and at home |
| Staff/Specialist Staff/External Staff required | <p>Fashion designer</p> <p>Electronic engineer, or technology expert</p> |
| Health and Safety Requirements | <p>No chemical products used.</p> <p>Batteries must be manipulated under especial conditions.</p> <p>The use of sewing machines or needles could represent some safety troubles.</p> |
| Student Age Range | 15-25 |

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| Curriculum Areas included/Subject Areas | Fashion, Electronics, Design, Informatics |
| STEM (science, technology, engineering, math) related content | Science: Technology: - Develop and design of clothes - Program electronic devices (Arduino) Engineering: - Interconnection between electronic devices - Prepare a business plan Math |
| Potential from trans-national activity/competition | Could be implemented as a national or international competition in which some groups of students compete each other to develop the most interesting garment. The jury will consider aspects such as: - Aesthetic aspects - Functional aspects - Heat sensation - ... |
| Methodology | The methodology is proposed as follows: - Create a team: Form a team of 2 – 5, think of a name, decide job roles; Team Manager, Manufacturing Engineer, Designer, Resource Manager, etc. - Business plan: Plan and prepare a business plan, develop a budget and raise sponsorship. - Design the garment and circuitry: Using design software, design the garment and the circuitry to be used in the smart textile. - Analyse: Try different fabrics and different conductive threads to perform the cloth according to its comfortability and functionality. - Cloth testing: Once the smart cloth is developed the comfortability and functionality must be assured and should be according the international standards. - Oral presentation: Prepare a 10-15 minutes presentation to perform to a panel of judges covering all aspects of the challenge. |

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- Portfolio judging: prepare a report documenting the manufacturing process of the smart cloth and the business strategy.

In addition, in case of becoming a transnational competition, the methodology above described:

- Results displaying: Put together an informative display showing every step of the project. Think about your “brand” identity.

- Engineering and design judging: Judges question teams on how their smart clothes has been manufactured and why particular designs were chosen.

- Catwalk: Time to show the resultant cloth and its functionality.

Practical Exercise 6: Smart Textiles 3

| Practical Exercise Smart Textiles 3 | |
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| Summary | <p>Transfer knowledge on the textile sector, on its evolutionary trends and on its employment opportunities.</p> <p>The field that will be explored is related to smart-textiles, which are particularly attractive to young's and are suitable to include a multi-sectoral dialogue.</p> <p>They will analyze:</p> <ul style="list-style-type: none"> - the characteristics and performances of textile materials that allow to incorporate digital components (sensors, actuators, microcontrollers); - fields of application: sportswear, personal protective equipment, medical, fashion... - the measurement of properties with particular attention to sustainability in terms of technological solutions and products with a lower environmental impact and safe for the consumer. <p>Will be involved students of the last year of the High school Fashion and Electronic addresses.</p> <p>With the coordination of trainers and researchers, the students will experiment the co-design of a double-valued e-textile prototype: garment for sportswear and personal protective equipment.</p> <p>This activity will allow students to bring their own distinctive technical skills, as well as relationships, into the working group.</p> <p>Some of the specific objectives:</p> <ul style="list-style-type: none"> - Knowing materials, processes and textiles and interactive textiles; - Analyze the state of the art and the fields of application of smart textiles; - Know the basic principles of interactive electronics, materials, technologies and tools; • Apply textile and electronic prototyping techniques applied to textiles; • Measure properties (product performance and safety); <p>The output of the experimentation is the production of video for orientation purposes related to:</p> |

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| Summary | <p>Smart-textile, fields of application and interviews with young people already entered in the world of work;</p> <p>story telling of the training experience that involved the students, with interviews;</p> <p>tutorial on the use of Arduino based on the prototype created.</p> |
| Materials and Equipment Requirements | <p>Textile materials: conducting wires, fabrics;</p> <p>electronic materials: <i>Arduino LilyPad</i>, sensors, actuators; video production tools; PC.</p> |
| Location | High schools and Research Centres |
| Staff/Specialist Staff/External Staff required | <p>Technicians and researchers in the textile, clothing and technical sectors;</p> <p>electronics experts.</p> |
| Health and Safety Requirements | Gloves, gowns. |
| Student Age Range | 17-25 years old |
| Curriculum Areas included/Subject Areas | Textile, Fashion and electronics |
| STEM related content | <p>Materials Science, Textile Technology, Electronics, Coding, Chemistry, Textile Engineering, Electronic Engineering.</p> |
| Potential from trans-national activity/competition | <p>A national or trans-national competition could be organized. Students groups compete in order to develop the most interesting smart-textile in terms of:</p> <ul style="list-style-type: none"> - Aesthetic aspects - Functional aspects |
| Methodology | <p>Interactive lessons, workshop activities (learning by doing) through the creation of an interactive electronic prototype with sensors and actuators.</p> |

Practical Exercise 7: Printing T- shirts

| Practical Exercise Printing T- shirts | |
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| Summary | <p>The objective of this activity is Printing T- shirts so that students get to know one of the productive processes of the textile industry.</p> <p>In Alcoi and Region (Valencian Community, Spain), there are many textile finishing industries that include the printing process. The products of these industries are mainly destined to the home textile sector.</p> <p>This sector needs qualified staff, so through this activity we try to motivate students to choose textile studies.</p> <p>In this practical activity, students have to print their own T-shirt manually with the teacher's help.</p> |
| Materials and Equipment Requirements | <ul style="list-style-type: none"> - T-shirts of different sizes. - Printing products: thickening agent, fixative and binder. - Pigments or special pigments such as thermochromic or hydrochromic. - Printing table. - Squeegee and printing frame. - Oven to dry and polymerize the drawing or motif |
| Location | Textile laboratory |
| Staff/Specialist Staff/External Staff required | Teachers of Textile Vocational Training |
| Health and Safety Requirements | <ul style="list-style-type: none"> - Protection gloves - Lab coat - Safety glasses |
| Student Age Range | Secondary Education students (14-16 years old) |

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| Curriculum Areas included/Subject Areas | <p>This activity can be included within the subject of Technology for compulsory secondary education. This subject is inside the curriculum of compulsory secondary education and baccalaureate according Decree 51/2018 April 27th.</p> <p>In vocational training, specifically in the medium-level training cycle of Production and Finishing of Textile Products, this activity is a part of the module of Printing (code 1043). This module is inside the curriculum established in the Royal Decree: 1591/2011 November 4th.</p> <p>Science, Technology and Mats.</p> |
| STEM related content | <p>The activity is practical and students only have to print their own T-shirts. It can be included as a transversal activity within the Technology subject.</p> <p>The printing process includes science (chemical interactions with fabric and dyes, crosslinking process, printing paste composition, etc.), technology and engineering (to need a specific process with different variables as pressure, speed, dry, etc.) and maths (to calculate the printing paste compositions).</p> |

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| Potential from trans-national activity/competition | <p>Practical activity.</p> <p>CURRICULUM COMPETENCES according to Decree 51/2018 April 27. - Linguistic communication competence (communication with classmates and teachers). - Mathematical competence and basic competences in Science and Technology (to know a new process with maths and science competences). - Learning to learn competence (to know a new process). - Social and civic competences (respect the turn to print). - Sense of initiative and entrepreneurial spirit (initiative to ask and carry out the activity).</p> |
| Methodology | <p>The steps of the printing process are the following:</p> <ol style="list-style-type: none"> 1. Firstly, the teacher has to prepare the printing paste. It is composed of thickening agent, fixative, binder and water. The products quantities to be used will vary depending on the commercial brands and it is sometimes necessary to add auxiliary products. Commercial brands always provide the technical files of each product and how to prepare a common printing paste. 2. Secondly, when the printing paste is ready the teacher can add the pigment to give it colour. It is possible to use more than one pigment. Usually an initial paste without colour is prepared and it is divided into different proportions according to the colours to be used. 3. The printing frame is designed and prepared previously in an engraving company. 4. On the one hand, the size of the frame to be used will depend on the motive or design you want to print and the T-shirt size. On the other hand, the colours that make up the drawing or selected design must be taken into account, since a printing frame is needed for each colour that makes up the drawing or design. 5. When the teacher prepares the printing paste and selects the printing frame with the adequate squeegee, the printing frame is placed on the T-shirt which is placed on the printing table. |

Practical Exercise 8: Fashion & Technical effects**Practical Exercise | Fashion & Technical effects****Summary**

The objective of this activity is the making of a textile manipulation of fabrics (eg. DEVORE' effect") on a garment as a result of a images research based on a given topic.

Students have to create an image on paper. This image has then to be transferred on the garment. As the devoré effect is obtained by the corrosion of the fabrics it is possible to do that on material with cellulosic presence.

In order to verify the presence of cellulosic components of the fabric a lab test has to be done.

This activity can be carried out during the open days and during the classes.



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| Materials and Equipment Requirements | <ul style="list-style-type: none"> - Lighter - Microscope slides - Goggles - Reagents - Pipette - Blotting paper - Microscope - Research books, magazines, web sites,... - Paper, felt tips, pencils... - Devore' substance - Gloves - Fabric samples and garments - Iron - Washbasin - Dryer - Dissemination in the media |
| Location | Classroom and technological-laboratory. |
| Staff/Specialist Staff/External Staff required | Textile and chemistry course teachers and lab teachers and lab assistant. |
| Health and Safety Requirements | Gloves and goggles |
| Student Age Range | From 15 to 19 |
| Curriculum Areas included/Subject Areas | Textile, Chemistry, Science, Humanities. |
| STEM related content | Lab testing, researching, textile developing and designing. |
| Potential from trans-national activity/competition | Research based on personal knowledge. Practical activity. |

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| Methodology | <p>Students will design or making samples or garments, then they will test their samples or garments with test laboratory:</p> <ul style="list-style-type: none">- Flammability- Microscope slider- Others <p>Students will modify their products with textile manipulation technics :</p> <ul style="list-style-type: none">- Devoré effect- Others <p>During activities students will produce professional pictures and videos with other support (teacher and other students).</p> <p>Methodology by step:</p> <ol style="list-style-type: none">1. Fibre analysis.2. Image research and topic definition.3. Working on samples /garments with textile manipulation techniques.4. Material collecting and final results processing through portfolios.5. Other... |
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