

# E&PDE

## 2018

### 20th International Conference on Engineering & Product Design Education

6-7 September 2018

Hosted by the Dyson School of Design Engineering  
Imperial College London, UK

#### Editors

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Ahmed Kovacevic  
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**Diversity**  
**& Conformity**

# DS 93: Proceedings of the 20th International Conference on Engineering and Product Design Education (E&PDE 2018), Dyson School of Engineering, Imperial College, London. 6th - 7th September 2018 Diversity or Conformity

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Year: **2018**

Editor: **Erik Bohemia, Ahmed Kovacevic, Lyndon Buck, Peter  
Childs, Stephen Green, Ashley Hall, Aran Dasan**

Series: **E&PDE**

ISBN: **978-1-912254-02-6**

Website: **[epde.info](http://epde.info) (<http://epde.info/epde2018>)**

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# DESIGN THINKING VIA FLIPPED CLASSROOM

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## ABSTRACT

A new generation of learners is growing up with information and communication technology (ICT) as an integral part of their everyday lives. They want to be active and experiential learners, proficient in multitasking, and dependent on communication technologies for accessing information and interacting with others. The old approach to education and training is ill-suited to the intellectual, social, motivational, and emotional needs of the new generation. In the 21<sup>st</sup> century, there is a need to fundamentally change that practice. These changes are also occurring in design education.

This paper aims to describe a creative learning experience, based on the “flipped classroom” methodology and game mechanisms with role-play activities, developed by IDEActivity Centre to explore the Design Thinking (DT) process and tools. The workshop designed for flipped DT learning is an experiential format applicable in any context, whether educational or corporate, in a public or private institution. The learning experience was experimented in a didactic module of Product Design on a Master’s course at the Politecnico di Milano.

*Keywords: Design Thinking, Flipped Classroom, 21<sup>st</sup> century skills, Design Education*

## 1 INTRODUCTION

As part of the Politecnico three-year plan on the perspectives of education, it emerges that the **skills** required to designers and the **characteristics of the incoming students** are radically changing. This requires an **evolution of the didactic models**. Modifying the traditional lectures is in many cases an evidence-based move: synthesis of research shows that lectures are not very effective for teaching skills, values or personal development; they have the sole goal of transmitting information [1] [2].

In line with the whole international education system [3] the actions undertaken are aimed at supporting **innovative didactics** [4] which give value to the student’s **passions and abilities**, that increase **flexibility and multi-disciplinarily**, that boost *soft skills* and project-building didactics and deal with the subject of the digitalization of education [5].

Over the past few years, the education system has highlighted the potential value of student-centred learning environments in which students are actively engaged in higher-order tasks and take charge of their own learning [6]. In this scenario, university starts to **experiment** “*initiatives of innovative didactics*”, in different forms: transversal skills/*soft skills*, innovative delivery with multidisciplinary contents, giving value to digital opportunities and relationships with the external world.

Our teaching project, which promotes forms of **innovative** learning (*flipped/blended classroom*) of the Design Thinking (DT) process, can be situated within this framework of didactic renewal.

The work presented in this paper describes the effort made in generating a model that would not only boost the previously identified characteristics, but work on the contents that make the students proactive in the classroom [7]. The process for the construction of the DT model via flipped classroom started with the study of blended learning with a focus on the flipped classroom and the exploration of the skills that young people ought to acquire to meet the future challenges.

## 2 NEW MODELS AND SOFT SKILLS: THE FLIPPED PRINCIPLES

Recent advances in technology and social media are fundamentally reshaping our living and learning and have completely unlocked new directions for education research with consequences on the acquisition of skills [8] [9].

The modern set of skills is considered fundamental for people to face the complexity of the contemporary age. It comprises not only relevant knowledge and skills, but also a range of personal

qualities and the ability to perform adequately and flexibly in familiar and unknown situations. Creativity and the ability to produce ideas, knowledge and innovations are key players [10]. Hence, the need has arisen to rethink educational models that exploit the potential of new digital technologies and social media to develop 21<sup>st</sup> century skills, such as creativity, problem-solving, critical thinking, and collaboration.

**Blended Learning** is a formal education model that takes place in an organised and structured context, in which: “a student learns at least in part through online delivery of content and instruction with some element of student control over time, place, path, and/or pace and at least in part at a supervised bricks-and-mortar location away from home”; and the dimension of online learning and in a physical context are coordinated between them in order to offer an integrated learning experience [11]. Four models of Blended Learning that categorise the majority of programmes are identified in relation to how the online learning and in-presence methods are alternated [11]: the **Flex model** is *personalized and flexible* depending on the student’s requirements, the **Self-Blend model** supplements the traditional path with some online courses, the **Enriched-Virtual model** has a full-time online path, but is completed with in-presence meetings with the lecturers and peers; and lastly, the **Rotation Model**, of which the use of **online and in-presence methods** are alternated according to a predefined calendar drawn up by the lecturer. The flipped model belongs to the last one [12].

What is a flipped classroom? Many definitions are essentially based on the idea that the passive role of students during the traditional lesson is replaced by the concept of active learning, i.e. an approach where the traditional lecture which transmits information takes place outside the classroom and is replaced by active in-class tasks and pre-/post-class work [2][9][13]. One of the most complete studies is the one by Abeysekera and Dawson (2015) in which they define the flipped classroom as a set of pedagogical approaches that: (1) move most information-transmission teaching out of class, (2) use class time for learning activities that are active and social and (3) require students to complete pre-and/or post-class activities to fully benefit from in-class work. To complete the definition of the flipped classroom, we can add what is maintained by Bull (2013) [14]: “using technology in a way that allows the teacher to spend more time addressing individual needs of learners and interacting with students instead of lecturing.”

Now that we have a working definition of the flipped classroom, we are ready to discuss the theoretical frameworks used to guide the design of in-class activities. Indeed, as recommended by Bishop and Verleger, (2013) [9], the researchers employing the flipped classroom have to leverage the existing research and theoretical frameworks to guide their use and design of in-class activities. The criteria that have to be met so that an approach can be considered “flipped” according to their survey are: out-of-class activities must include compulsory video lectures; in-class activities are required, and must involve interactive learning activities-specifically, the primary in-class component cannot be lectures.

According to Talbert (2014) [15], for a flipped classroom experience to be effective, it should include: 1. highly structured pre-class assignments which are geared towards introducing the students to the new theoretical concepts; 2. means of accountability to ensure that students complete the required pre-class assignments and out-of-class work; 3. well-designed sense-making activities for the students to engage with during lecture time; 4. open lines of communication throughout the course so that students can interact freely with the instructor.

We took into consideration the points listed above in designing a framework for the flipped classroom DT module, described in the next sections.

### 3 THE FLIPPED CLASSROOM DESIGN FRAMEWORK: EXPERIENTIAL LEARNING

The flipped classroom module designed for the exploration of the Design Thinking (DT) process is based on the development of a project-building activity, starting from a brief, which goes through all the phases of the DT process. This creative experience of learning allows getting to know and learning the fundamental notions of DT, studying in depth the phases of the design process and its tools in the pre-class work activity, and putting them into practice on a design challenge, during in-class activity, enabling an active approach to learning.

The module has been designed with role play mechanism in which the participants must take on a role throughout the course of the experience.

As said previously, the underlying premise of “flipped classroom” is that students review lecture materials outside the classroom and then come to class prepared to participate in learning activities guided by the lecturer or teacher, therefore the experience has been designed considering the three distinctive times of the flipped classroom, defined as follows: “Before Class” and “After Class” which take place remotely outside the classroom and “During Class” which takes place in the classroom in the presence of the lecturers.

Starting from the consideration that the learning objectives must be: SMART (Specific, Measurable, Assignable, Realistic, Time related), we have formulated a hypothesis of the **expected results of learning**. Each learning objective has been formulated from the student’s perspective, using: **a verb** (as the activity the student must be able to do); **an object** (the content of the action) and the **context** (where the student will apply the competence acquired).

We have therefore worked on three specific levels: *acquisition of the basic notions of DT* through digital tools, exploration of *group dynamics and process facilitation between peers, and development of soft skills* useful for the process (creativity, problem solving, communication, etc.)

After having identified the key phases of the DT process, we designed the activities and the specific tools the student should perform before, during and after the lesson, also assigning an estimated time for each activity. We planned in details the in class learning activities and the **pace** to be kept as well as the learning activities to be performed outside the classroom, to be realistically quantified with respect to the **overall commitment** of the student. The whole DT process is therefore putted into practice and carried out collaboratively during the activities in the classroom, after having been explored and learnt individually remotely through the didactic material prepared by the research team and shared digitally through the Slack platform.

The next sections relate the setting of the experience: the design thinking process, the Slack tool and the team’s role play are illustrated first for greater clarity in the description of the designed activities.

### **3.1 Setting the learning experience – DT process, Slack tool, Team roles**

The whole didactic experience has been constructed on DT process framed by the IDEActivity method [16]. The IDEActivity design process is **a human-centred design process which, using the potential of creativity and the approach of Design Thinking**, invites people with different backgrounds to actively collaborate for the exploration and definition of a challenge and the development of innovative ideas or strategies.

It focuses on two main stages, Explore and Generate, each of which integrates and amalgamates different known techniques with others developed ad hoc.

**The first stage, Explore**, fosters and facilitates the analysis of the context, the market and people, (re)defining a clear objective and constructing project scenarios that can reveal new opportunities. It is divided into two phases: **Clarify Goals** and **Define Opportunity**.

**The second stage, Generate**, has the aim of making the ideas tangible, generating adequate solutions in line with the context and the objectives of the project. It is divided into two phases: **Idea** and **Prototype**.

The whole process is done through creative sessions based on a series of tools, designed to stimulate creativity and generate suitable concepts in line with the given context and objective.

The four phases defined above represent the key points of the DT process to be transferred, learned and carried out through the didactic experience.

#### **3.1.1 Slack tool**

Whatever the specific context, “flipping the classroom” relies heavily on technology, employing easy-to-use and readily accessible digital technology.

The developed format makes use of the social media tool “Slack”, both to guarantee a common thread through the activities in the classroom and remotely, keeping a continuity of learning, and to facilitate the collaborative work using a social language suitable for a new generation of learners.

In the experience, Slack allows sharing the learning material from tutors to learner through the dedicated thematic channels which, at the same time, facilitate the creation of discussions and debates organised by subject. Slack represents the space of digital work where the learners can measure themselves up against the didactic material received and with respect to the learning results obtained during the in-class activities. It facilitates the creation of a DT learning community thanks to the functions of messaging and instantaneous feedback integrated with the software.

The work space of Slack for the learning experience of design thinking via a flipped classroom was designed by preparing 6 thematic channels.

### **3.1.2 Team role-play**

The didactic experience has been developed considering the integration of game mechanisms to involve people in active collaboration, deep immersion and reflection.

The reason why such game-based collaboration can be so effective is that it puts the participant right into the middle of things and lets him or her work their way around as an active participant in the events of the times [17].

The game mechanisms have been reproduced through the definition of 3 roles which the learners have to take throughout the didactic experience, remotely and in the classroom. These roles allow an immersive involvement in the experience and have been designed to create the right conditions to generate discussions, lead reflections and thoughts, collect and re-elaborate insights, and to ensure active collaboration, both in class and out of class.

The 3 roles represent the necessary roles of a design team that have to solve a challenge collaboratively:

- **Facilitators:** their role is to make the collaboration easier for the participants making the team work at its best. The main job is to learn how to manage the activities Before the class design session and facilitate them During class.
- **Researchers:** they represent the workforce that will bring information about the context, the business, the users, key insights and ideas to the table. They have an independent role of research Before the class activities, and report to the Slack Guardians. They also have a collaborative and active role During the in-class design session.
- **Slack Guardians:** their role is to guide the community and manage the communication with the team, Before and After class activities, through Slack. A Slack Guardian keeps the conversation about the different topics going, asks trigger questions that can help the Researchers to stay on the right track and suggests sources of inspirations such as interesting links, new tools or case studies.

For each role precise instructions have been created to carry out the “Before”, “During” and “After” class activities, explaining the meaning of their role, the didactic material available and the interaction with the “Slack” tool and the fellow students.

## **3.2 Process activities – learning material, design tools and guidelines**

The objective of the didactic experience is teaching the IDEActivity design process through the flipped classroom approach. The activities designed for the module intend to let the participants to completely organise, prepare and run the collaborative session according to the pre-established roles. The activities foreseen for the Explore and Generate phases have been divided into two consequential blocks so that each stage has a “Before Class” time for preparation and learning, a “During Class” time for practical activity and reflection and an “After Class” time for feedback of the work.

The presence of at least 5 participants per group is fundamental to correctly perform the activity, distributed as 1 facilitator, 1 Slack guardian and 3 researchers. The number of members of the team can vary up a maximum of 8 with the roles distributed proportionally.

The exchange of roles in the team in the explore and generate stages is fundamental to allow all the participants to carry out in a different way the collaboration inside the work team, either as the facilitator who manages the team and leads it to attaining the objectives throughout the whole process or as a researcher or community manager.

### **3.2.1 Before class**

This is the moment when the learner studies and reflects autonomously on the didactic material provided by the lecturers through the Slack channels.

The didactic material includes role instructions, learning materials, tools and guidelines aiming at preparing the learners in putting the process in practice during the in-class activities according to the pre-established roles. Together with the role instructions, the Facilitators received the “Activity Cards” which explain in detail the objective of each activity, how to facilitate the group during the activity and the results to achieve. For each activity, a collection of design tools has been made available as well as a collection of learning materials, i.e. in-depth study of the techniques and tools to perform



during the activity. They also received an agenda of the activities to fill selecting the most suitable tools in the provided collection.

The Researchers received specific instructions for their role and a series of tools and guidelines which support them in their research activity before delivering in the classroom. The correct performance of this activity guarantees good results especially in terms of solving the design challenge.

At this moment of the didactic experience, the Slack Guardians have the fundamental role of managing the learning inside the digital community, by making the participants able to reflect on the didactic material provided, on the ongoing results of the design challenge, enabling them to develop critical thought. This role is fundamental because it guarantees the correct preparation of the participants in view of the activities in the classroom. They receive through the Slack channel instructions and stimuli on how to conduct their activity.

### **3.2.2 During Class**

This is the moment in which the learner actively puts its acquired knowledge into practice, reinforcing it with the support of the lecturers. The activity in the classroom is carried out like a real session of collaborative design. The participants, each one with its own role, are working in teams, previously formed.

The Facilitator has the task of introducing the activities to the group, meticulously explaining their objective, the ways of carrying them out and the result to be obtained. One after the other, the activities are carried out by the group under the guidance of the Facilitator with the support of the Slack Guardian. They should put the Researchers in the conditions of using the prepared and selected tools for the activity, sharing with them the knowledge acquired and enabling their creativity to solve the design challenge.

The team is constantly followed and supported by the lecturers and expert tutors who provide the roles with tips and insights to best carry out the activity. The tutors also create the best conditions to guarantee efficient learning. On the one hand they support the teams in forming a well-established and cohesive group, suggesting short activities, such as icebreaking and energisers, designed to facilitate the creation of a favourable creative climate, which encourages a team spirit and the sharing of objectives.

On the other hand, they supported individual learning by preparing long periods of debriefing at the end of the activities, to reflect on the work done, on the difficulties found in the different phases of the process and in the use of the tools and on the application of DT in other areas of their interest.

### **3.2.3 After Class**

This is the moment in which the learner reflects autonomously on the work done, preparing feedback on the results obtained in the classroom and sharing it through the dedicated Slack channel.

This moment allows going back over the work done in the class and to dwell calmly on aspects which are unclear. The channel represents the container of the research and of the developments related to the design challenge, allowing an history keeping of the learning journey that allows for an in-depth reflection of the achieved results and of the critical points throughout the whole process.

## **4 CONCLUSIONS**

The overall student perceptions during the master course experience are somewhat mixed but positive. The students found hard to understand the mechanism of the flipped classroom and the rules assigned during the explanation, but they appreciate the in class interactive activities which put their creativity and their intelligence at the centre.

Compared to traditional DT teaching, we can report that this flipped module has the potentialities of:

- Provide students with a complete overview of the DT process in pre-class activities that is a prerogative of the teacher in the traditional format. This allow to have an in-depth level of understanding and awareness of the design steps within the DT process.
- Give students more responsibility for their learning experience providing them with a well-structured guidance to facilitate the DT process driving their peers in the development of a design project.
- Follow students throughout the process, keeping tracks of their work thanks to the Slack tool. This tool helped us to provide a better assessment with prompt/adaptive feedback on individual

thoughts and work group. It also allowed to build a community of interest around a topic in which peers are enabled to assess their understanding thanks to the role game mechanisms. Empirical tests suggest that there is an improvement in the student learning compared to traditional methods. However, we have not developed a tool that can assess learning, which is a problem present in the whole of literature.

As suggested by different researchers, in order to ensure progress, future research on the Design Thinking via the flipped classroom should employ controlled studies that objectively examine student performance during a semester, with both traditional and flipped approaches.

This module was designed for training workshops about DT with small group of people. Further work is needed to adapt it in a design class within universities with a wider number of students. Engagement mechanisms and incentive to prepare for class need to be improved too.

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