INNOVATION BOOT CAMP:
TEACHING INNOVATION IN A SUMMER SCHOOL SETTING

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ABSTRACT

Striking a suitable compromise between "University Innovation" and "Hands-on Innovation" can be challenging. Ideally, a university innovation course should be inspiring and motivating whilst retaining a research-based core of knowledge. In this paper, we present a format for teaching a three-week summer school in health-tech innovation, which has been very well received by students and collaboratory partners alike. The format is structured according to the Double Diamond model of innovation and contains a framework for structuring in-class and out-of-class activities, ideal for the three-week timeframe.

KEYWORDS

Innovation, Health-tech, Blended Learning, Summer School, Standards: 1, 3, 7, 8

INTRODUCTION

Innovation and entrepreneurial mindsets are often characterized as desirable character traits for both students and potential employees. Achieving the seventeen goals for a sustainable future recently published by the United Nations (Griggs et al., 2013) will require these skills in abundance. Teaching innovation in a normal semester setting can be challenging as the students have to balance their workload between the various courses comprising their semester curriculum. Though challenging, the semester format can be held to high academic standards utilizing the rich scientific innovation literature (Brown, 2009; Buchenau & Suri, 2000; Dyer et al., 2011; Keeley et al., 2013; Liedtka & Ogilvie, 2011; Smith, 2015) allowing for research-based teaching. Unfortunately, the academic focus often comes at the expense of the rush and excitement of focused innovation workshops within a shorter timeframe such as boot camps, short-term challenges, and innovation competitions. These formats tend to generate highly motivated students but leave little time for teaching the students established knowledge in the field and valuable tools of the trade including business models, value propositions, and personas. Striking a suitable compromise between the "University Innovation" and "Hands-on Innovation" styles of teaching can therefore be challenging. Changing the venue of a traditional semester course for a three-week summer school has allowed our university to combine the best of both worlds, yielding highly motivated students with a high degree of team spirit and entrepreneurial mindset whilst retaining an academic curriculum. In this paper, we present our current format for the summer school in the hope that others may find inspiration therein.

METHODS

Double Diamond Innovation Model

We use the Double Diamond model, originally devised by the British Design Council (British Design Council, n.d.) to structure our teaching of innovation (Figure 1). This model consists of two main phases or diamonds, the first focusing on the understanding of a given problem, whilst the focus of the second diamond is on the corresponding solution. Both phases are split into a divergent and convergent phase with the divergent phase focusing on generating many problems/solutions through a brainstorm-like approach whereas the convergent phase aims toward finding the best possible problem/solution. In this manner creative, divergent thinking is encouraged whilst retaining an ultimate goal of finding achievable, realistic, and profitable solutions (Cropley, 2006). The use of separate diamonds forces the students to consider the problem in depth before being allowed to design solutions thereby avoiding the classic fallacy of engineers having to design a problem fitting their enamored solution.
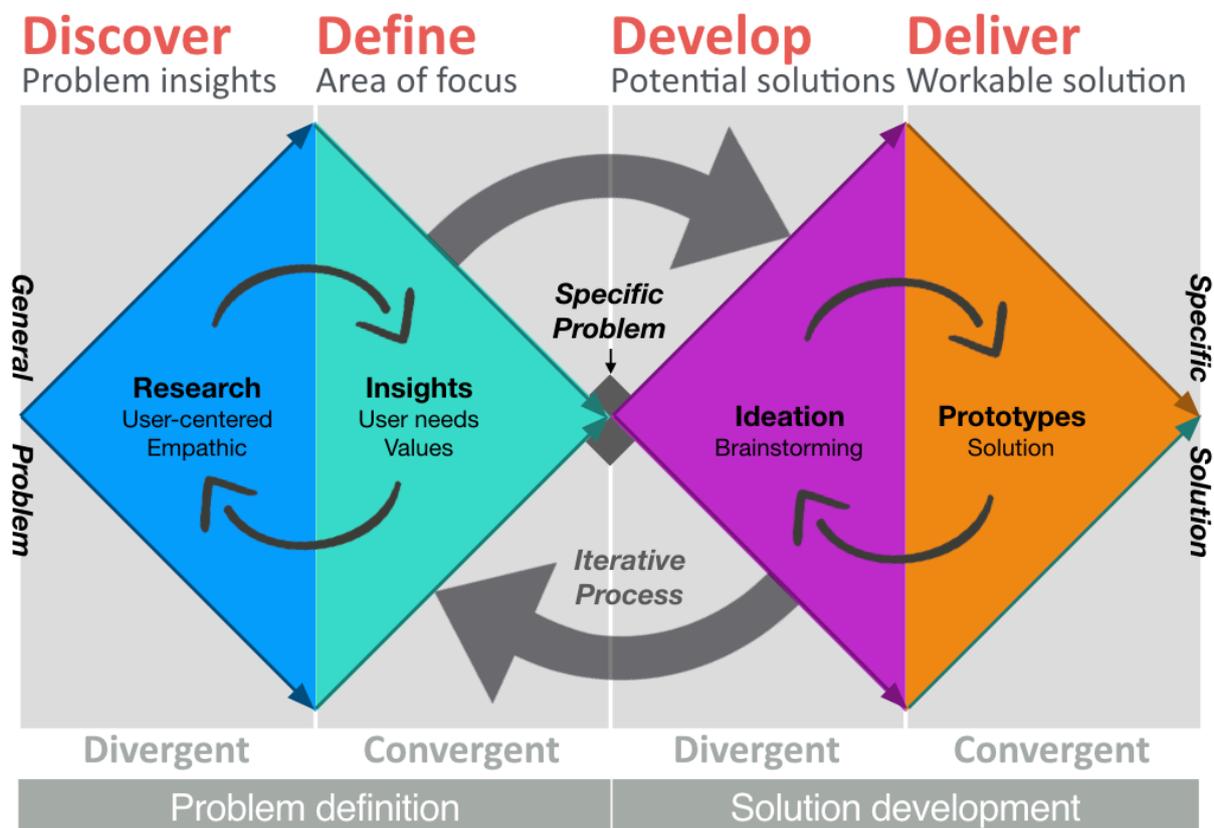

Figure 1. Double Diamond innovation model. Based on (British Design Council, n.d.)

As indicated on Figure 1, the students are encouraged to use an iterative approach – if a given problem turns out to fizzle at a later stage they should feel free to return to the divergent problem phase *Discover*. Likewise, should a promising solution prove financially untenable in the convergent solution phase *Deliver*, we prefer the students to return the *Develop* phase to further explore other potential solutions – or begin the whole cycle anew by returning to the problem diamond in an iterative process.

Curriculum (Table 1)

The summer school begins with the students being introduced to the field, format, and curriculum of the course. The students are assigned to groups, which are designed to be as interdisciplinary as possible. As part of the introduction, the groups play the ESHIP (abbreviation for **E**ntrepreneur**ship**) role-playing game (Thrane & Basaiawmoit, 2015) introducing the students to the Design Thinking (Brown, 2009) rationale underlying the Double Diamond model. Subsequently, each Double Diamond phase is introduced through a theoretical lecture (Table 1, underscored text) with a following practical exercise according to the methodology recommended by PACE; Promoting a Culture of Entrepreneurship (Blenker et al., 2016). In this manner, the students achieve familiarity with the various tools and techniques in each phase. This is followed by hands-on sessions (Table 1, green background) in which the students have to employ the techniques on their respective problem domains under the supervision of instructors. The diamonds are approximately equally distributed across the three weeks, with the first half of the summer school focused on the problem definition, and the latter on the development of a suitable solution.

Table 1. Summer School Curriculum.

Week 1	MONDAY	Tuesday	Wednesday	Thursday	Friday
08:15 - 09:00	Introduction	*DISCOVER*	Pitching: NABC	DISCOVER: Fieldwork	DISCOVER: Fieldwork
09:15 - 10:00			Pitching: NABC		
10:15 - 11:00		*DISCOVER Exercise*	Pitching: Exercise		
11:15 - 12:00			External Partner		
12:45 - 13:30	ESHIP Innovation Game	DISCOVER: Preparation	DISCOVER: Preparation		
13:45 - 14:30					
14:45 - 15:30					
Week 2	**Monday**	**Tuesday**	**Wednesday**	**Thursday**	**Friday**
08:15 - 09:00	*DEFINE*	DEFINE: Converge	*DEVELOP*	DEVELOP: Ideation	*DELIVER*
09:15 - 10:00					
10:15 - 11:00	*DEFINE Exercise*		*DEVELOP Exercise*		*DELIVER Exercise*
11:15 - 12:00					
12:45 - 13:30	Persona	DEFINE: Converge	DEVELOP: Ideation	DEVELOP: Ideation	VPC
13:45 - 14:30	DEFINE: Converge				DELIVER: Converge
14:45 - 15:30					
Week 3	**Monday**	**Tuesday**	**Wednesday**	**Thursday**	**Friday**
08:15 - 09:00	DELIVER: Prototyping	DELIVER: Prototyping	DELIVER: Fieldwork	Pitch: Practice	Innovation panel presentation
09:15 - 10:00					
10:15 - 11:00					
11:15 - 12:00			BMC	Pitch Presentation	Winner
12:45 - 13:30	DELIVER: Prototyping	DELIVER: Fieldwork	Pitch: Practice	Internal Pitch Evaluation	
13:45 - 14:30					
14:45 - 15:30					

First Double Diamond: Problem Definition

DISCOVER Phase

As a part of this phase, the students are required to find an external partner whom they wish to collaborate with during the summer school, e.g. a hospital department, general practitioner, or private company. The aim of the *Discover* phase, is to empathize with the external partner's problems through a thorough understanding their daily life, frustrations, needs, and wishes. Preparing the students for this, they are schooled in sociological techniques including semi-structured interviews based on Karl Tomm's question types (Tomm, 1988), observation studies, the five-why's method, and mindmaps. Concurrently, the students research the specific domain in which their external partner works. The students conduct a field study visiting the external partner in order to observe their work situation, workplace environment, interview relevant staff, and find as many possible problems as possible. The problems are then categorized into themed problem areas serving as the starting point of the subsequent convergent *Define* phase (Figure 2).
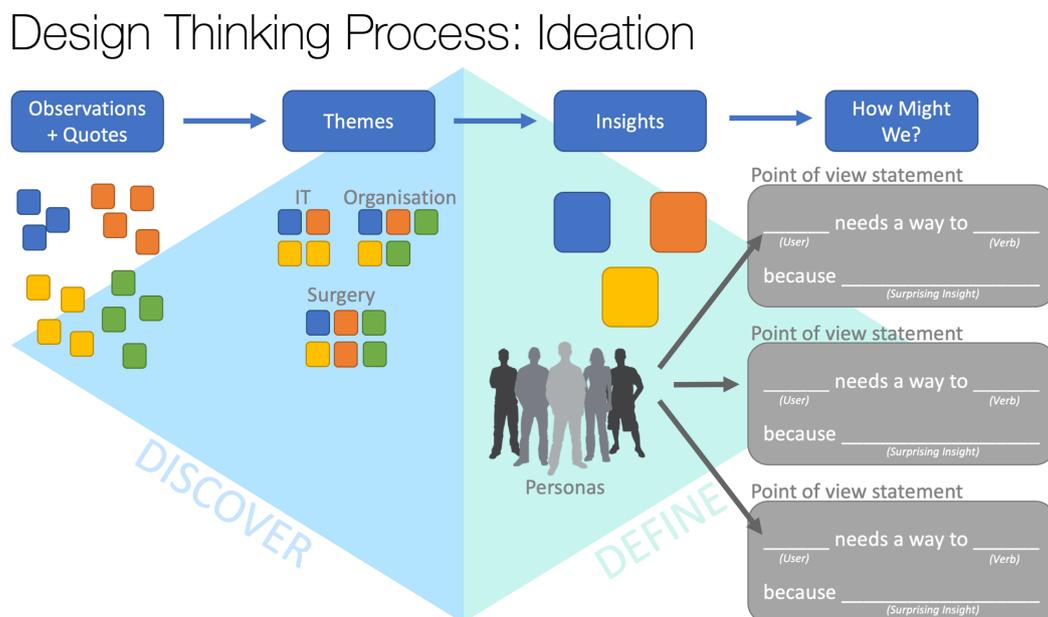

Design Thinking Process: Ideation

Figure 2. Overview of our use of the first two double diamond phases.

DEFINE Phase

The first diamond concludes with the *Define* phase, in which the students condense the people encountered into *personas*, i.e. idealized representations of the user groups they have observed, including their frustrations, needs, and wishes (Grudin & Pruitt, 2002). The personas are used to focus the subsequent solutions on the given end users to prevent poor problem-solution fit. Each of the categorical themes employed in the *Discover* phase are used to condense the findings into concrete problems utilizing an iterative process of categorization, synthesis, and problem formulation into "How might we" point of view statements in which the formulate their concrete personas need to find a way to do something because of their unique challenges (Figure 2). Finally, the findings are structured according to the right half of the *Value*

Proposition Canvas (Figure 3), a commonly used innovation tool developed by Strategyzer to categorize the problems into Pains, Gains, and Customer Jobs (Pritchett, 2014).
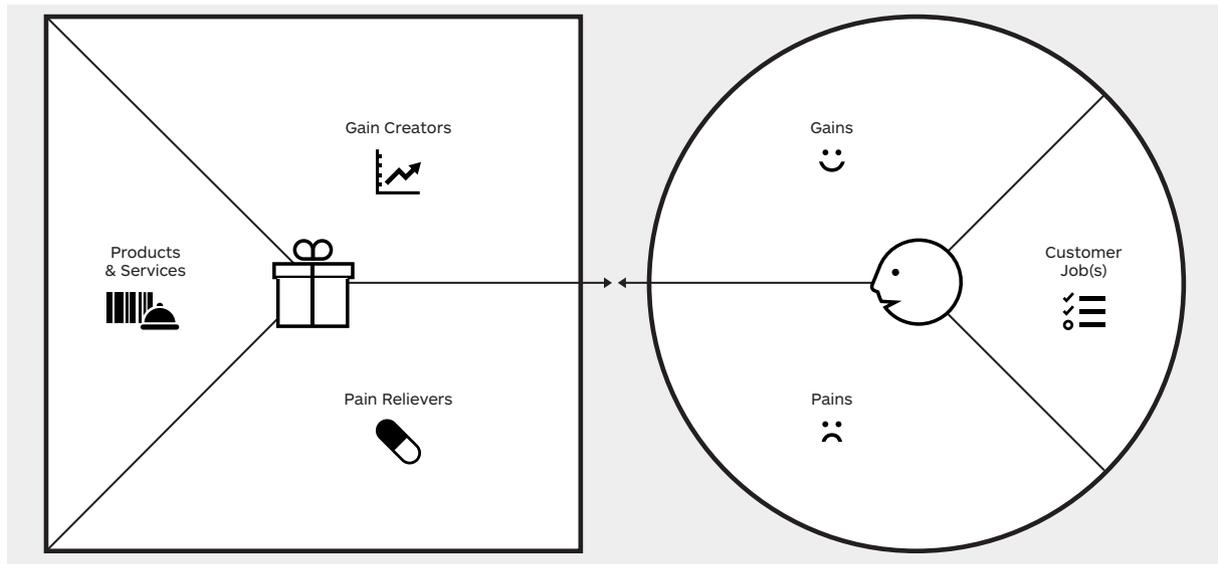

Figure 3. The Value Proposition Canvas (Strategyzer, 2019b)

Second Double Diamond: Solution Development

DEVELOP Phase

This phase is initiated using brainstorming together with creative ways of extending the ideation through creative insights, e.g. brainwalking, "yes, and", mindmaps, and megatrends including the 17 UN goals for sustainable development (Griggs et al., 2013). In this manner, the students have to derive at least 50 ways of solving the chosen problem – this quantity is specified to prevent the sole focus on the "obvious" solutions derived in the first Double Diamond. Though students are explicitly forbidden to think about solutions in this diamond, no amount of cajoling by the faculty can completely eliminate their focus on this their favorite process. By forcing an extended number of solutions, new and surprising solutions may emerge. In this phase, the students are also required to begin prototyping, ranging from 3D scanning and printing, to cardboard mockups, virtual mockups of software user interfaces, drawn sketches, and so forth.

DELIVER Phase

In this phase, the students begin focusing on the specific solution they wish to deliver. Using the previously filled out right half of the *Value Proposition Canvas* (Pritchett, 2014), the students now have to counter the pains, gains, and customer jobs with corresponding gain creators, pain relivers, and products & services (Figure 3). Prototypes are further developed from low- to high-fidelity, and business models are explored through the *Business Model Canvas* from Strategyzer (Osterwalder & Pigneur, 2013) (Figure 4), in which the students have to consider the financial viability of their proposed solution by considering details such as revenue streams, channels, customer segments, key partners, and cost structure. The proposed solution has to be presented to the participating external partner to receive feedback on the suitability of the derived solution.
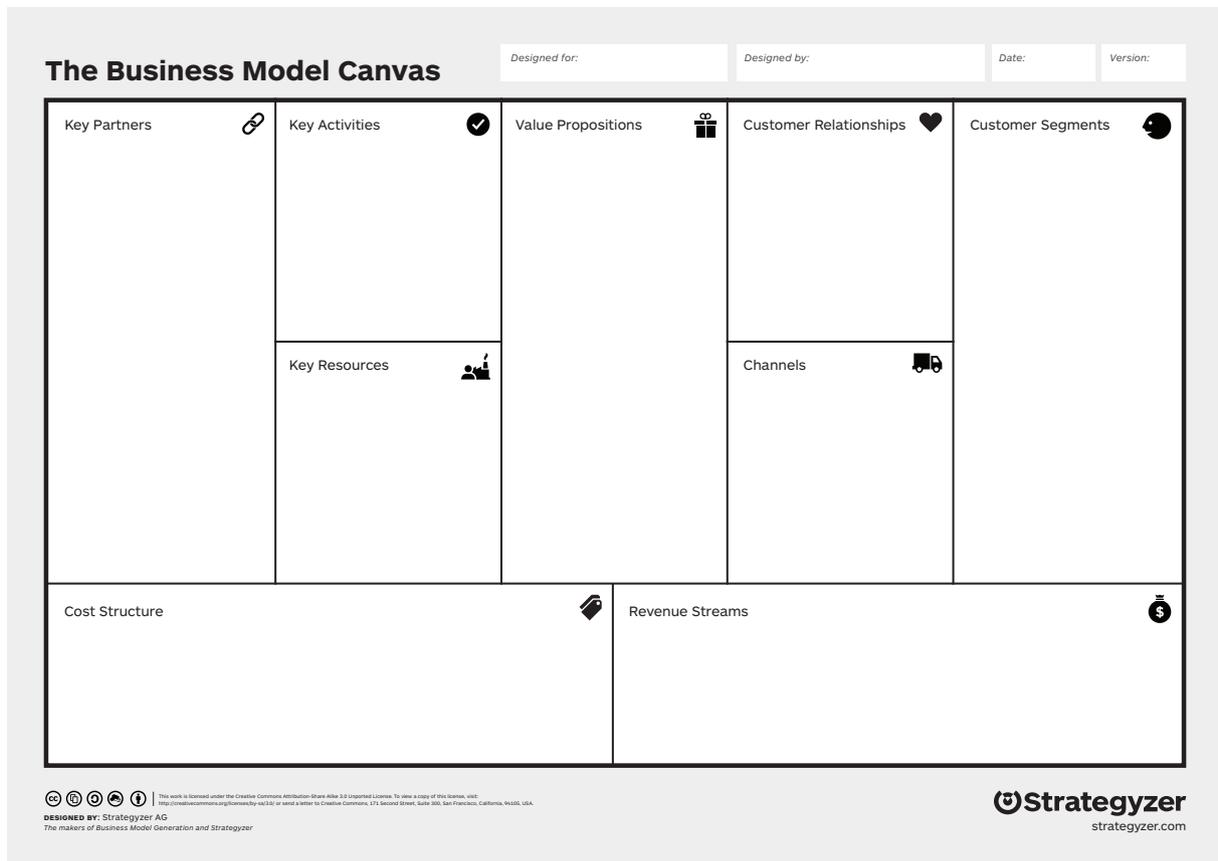
Figure 4. The Business Model Canvas (Strategyzer, 2019a)

Pitching

At an early point, during the first week of the summer school, students are introduced to the NABC model (Needs, Approach, Benefits, Competition) for structuring pitches (Carlson & Wilmot, 2006). As with the Double Diamond phases, the initial presentation is followed by exercises where the students practice pitching and review pitches in the Danish version of Dragons Den according to the participants use of structure, visual aids, content, non-verbal communication (body language, voice usage, gesticulation, clothing, posture), and the general quality of the idea (Table 2). The same review structure is used again in the final evaluation, where the pitches of each participating group is reviewed by their peers according to the same criteria.

Table 2. Pitch Grade Criteria

Content	Horrible (1)	Bad (2)	Neutral (3)	Good (4)	Excellent (5)
Structure					
Visual Aids					
Content					
Non-verbal Communication					
Idea Quality					

Blended Online Learning Environment

To maximize the use of the in-class presence for lectures, exercises, and teamwork, the out-of-class curriculum consisting mainly of scientific literature, book excerpts, and online videos is organized according to the STREAM model (Godsk, 2013). Each task has an assigned test allocated inside our learning management system (BlackBoard, Washington DC, USA). The course is evaluated using a pass/fail criterium with the pass grade based on obtaining a minimum score with points allocated for each test, compulsory hand-ins (marked by dark blue in Table 1), and a final internal evaluation (Figure 5). During this evaluation, the students present their two-minute pitch before the internal teachers and receive points according to their use of the NABC model, and use of the Double Diamond Phases, and associated tools. Their use of the latter is examined through verbal examination. The last day of the summer school, each group present their pitch again for an external evaluation panel who are selected on the basis of their experience judging innovation contests. This evaluation is purely for appointing a winner and has no bearing on the passing of the course. Basing the point evaluation on an internal panel is done to allow the students to focus on their final pitch without worrying about passing or failing the course. As can be appreciated from the table in the upper-left corner in Figure 5, the homework points are somewhat skewed towards the beginning of the course necessitating preparing for the summer school before attendance. The pass score threshold is carefully chosen to allow the students to pass without hitting a perfect score on the tests, whilst requiring a modest score on the internal evaluation.
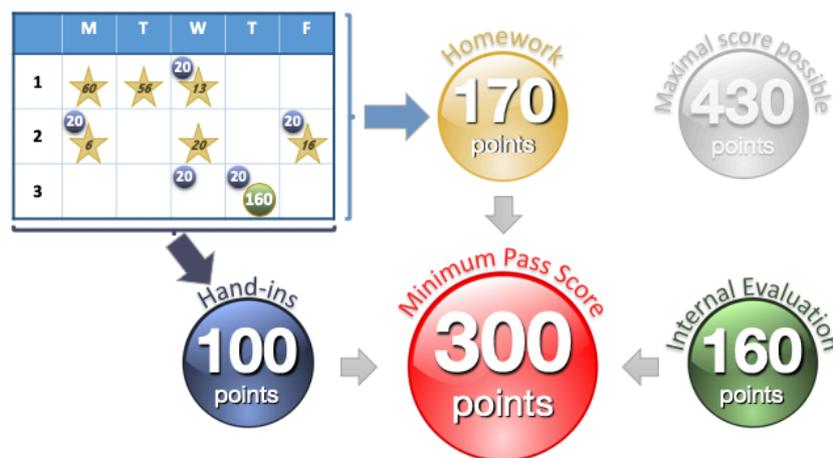

Figure 5. Point allocation for each course activity.
The upper-left table shows the distribution
of the homework/hand-in grades.

CONCLUSION

Though the time constraints of a three-week Summer School can seem limiting and prohibit a deeply academic course approach with sufficient time allocated for preparing each course day ahead of time, we believe we have struck a good compromise with the presented structure. The use of quizzes associated with each homework, a clear point structure for evaluating the pass/fail criterium, an easily understood Double Diamond framework for innovation, and inclusion of many recognized tools for developing innovative projects (NABC, Personas, VPC, and BMC) yield highly satisfied students. Combining the theoretical "academic innovation" with an external partner highlights the applicability of the methods in the real world.

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BIOGRAPHICAL INFORMATION

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