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Students Model Startup Processes – An Embedded Approach to Entrepreneurship Education

I. Introduction

Business environments are changing rapidly everywhere. Even successful, established companies have realised that they continuously need to re-evaluate and adjust their business models.[1] But these companies are often unprepared for the necessary transformation of their business models and organisations.[2] By contrast, startups provide a flexible, agile and innovation-friendly culture already. Such a culture enables quick learning and the rapid development of new business models.

Current entrepreneurship methods like customer development[3], the business model canvas,[4] or lean startup[5] understand business modelling as a continuous process of iteration, evaluation, and adaptation through validation of hypothesis.[6] Following this systematic approach, entrepreneurship itself is a process of learning. Thus, a theory of entrepreneurship requires a theory of learning.[7] Although the definition of Entrepreneurial Learning (EL) is diverse, all explanations involve the ability of an entrepreneur to learn, develop, and change.[8]

Indeed, the complex nature of entrepreneurship makes it a hard topic to teach.[9] Entrepreneurship is understood as a field that:

1 *dpa*, veröffentlicht im Handelsblatt am 4.2.2019.
2 *Schallmo*, Jetzt digital transformieren; *Kreutzer/Neugebauer/Pattloch*, Digital business leadership.
3 *Blank*, The four steps to the epiphany.
4 *Osterwalder/Pigneur*, Business model generation.
5 *Ries*, The lean startup; *Maurya*, Running lean.
6 *Eisenmann/Ries/Dillard*, Hypothesis-Driven Entrepreneurship: The Lean Startup.
7 *Minniti/Bygrave*, A dynamic model of entrepreneurial learning, pp. 5–16.
8 *Wang/Chugh*, Entrepreneurial Learning, pp. 24–61.
9 *Gibb*, In pursuit of a new "enterprise" and "entrepreneurship" paradigm for learning, pp. 233–269.

> "[…] involves the study of sources of opportunities; the processes of discovery, evaluation, and exploitation of opportunities; and the set of individuals who discover, evaluate, and exploit them.[10]"

The field is driven by two phenomena: (I) the presence of lucrative opportunities and (II) entrepreneurial individuals. Entrepreneurial competence is generally seen as a mindset and process to create and develop economic activity within a new or existing organisation. In consequence, entrepreneurial individuals are relevant for startups, which are special forms of new ventures defined as temporary organisations in search of such business models,[11] as well as for corporate business development.

Over the past years, the focus in entrepreneurship education, generally understood as pedagogical programs or processes of education for entrepreneurial attitudes and skills[12], has shifted from teaching solely entrepreneurial knowledge and skills to the so-called entrepreneurial mindset.[13] This mindset is a set of attitudes or cultural habits, a set that is often learned through entrepreneurship rather than being explicitly taught.[14] This changes the perspective on courses specifically designed to teach entrepreneurship. Instead, entrepreneurship becomes an interdisciplinary topic, whose educators and students have different levels of entrepreneurial background and expertise.

University-based management science education is criticised for lack of business relevance and its inability to adapt to quickly changing management practices.[15] Our teaching practice suggests that any integration of real practice problems in the classroom increases student motivation. Findings for the application of Problem-Based Learning and Cooperative Learning in the classroom confirm this conjecture.[16] Since 2013, we have brought students to work together as consulting teams with startups that pose as their clients in an agile project management setting. The task of the teams' task was to develop activity models for important and suitable startup business processes. The students were Bachelor students in the last year of a business administration studies course executed in cooperation with Siemens AG at the HWR Berlin (Berlin School of

10 *Shane/Venkataraman*, The promise of entrepreneurship as a field of research, p. 218.

11 *Faltin/Ripsas*, Das Gestalten von Geschäftsmodellen als Kern des Entrepreneurship.

12 *Fayolle*, Handbook of Research in Entrepreneurship Education.

13 *European Union*, Building entrepreneurial mindsets and skills in the EU; *Harmeling*, Re-storying an entrepreneurial identity.

14 *Hannon,* Teaching pigeons to dance: sense and meaning in entrepreneurship education, pp. 296–308.

15 *Kotte*, Hochschulschrift.

16 *Ghufron/Ermawati*, The Strengths and Weaknesses of Cooperative Learning and Problem-Based Learning in EFL Writing Class, pp. 657–672.

Economics and Law). The founders were part of the university's own incubator, which is located at a Siemens production site in Berlin.[17]

In this article, we discuss the collaboration of two groups of learners, students and startups during an agile term project. Startups were chosen as clients due to their limited resources and because business process modelling (BPM) is not a typical startup skill. Although entrepreneurship education was not the focus of this collaborative project, we observed, year after year, that the student-startup collaboration contributed to students' entrepreneurial learning. Hence, we asked ourselves the following questions:

I. What were the challenges posed by the startups, what did the students achieve, and how did both experience their collaboration?
II. Which didactical models and methods are applicable in this case, and what can we learn for entrepreneurship education?

Structurally, we'll address each of these questions respectively before attempting to combine them in our conclusions, using digitality as a potential common framework. We will deal with the first question primarily through a case study and the second by means of a literature review.

II. Methodology

We begin our investigation with a descriptive single case study[18] of the BPM course ("the **course**", our unit of analysis). The course contained several **projects**. In each project, a team of 3–4 students collaborated with a startup. The objective of each project was to model startup **business processes**. We selected three representative examples of these projects. These examples were drawn from different instances of the course.

We collected data over a period of five semesters between 2013 and 2017. The main data came from project documentation created by the project teams themselves in the form of a final team presentation and a final personal essay with reflections on the collaboration. For one example, the team members were interviewed after the project. This case was already addressed in a blog post written by one of us[19] and was also the subject of a Bachelors thesis,[20] which generated primary data in the form of a participant survey and interviews.

17 *Kny*, HWR Berlin eröffnet neuen Gründungscampus Siemensstadt.
18 *Yin*, Case Study Protocol, pp. 84–86.
19 *Birkenkrahe*, Studierende modellieren Startup-Prozesse.
20 *Hodel*, Erhöhung des Lernerfolgs, durch die Einbindung der Studierenden in reale Unternehmensprojekte.

Secondly, a structured literature review[21] regarding relevant concepts of entrepreneurial learning and entrepreneurship education was conducted. The review was structured with the help of a general learning design framework. This was important for identifying the underlying basic theoretical assumptions and their implications as a foundation for the conceptual approach of this paper. In order to answer research question II, a synthesis of the literature findings and the case provided a specific didactical concept of the course. In conclusion, we discuss the function of the course within the existing entrepreneurship education programme of the school.

III. Case study

1. Basic course setting

The course was part of a co-operative Bachelor of Business Administration program conducted jointly with Siemens AG. The term "co-operative" only relates to the organisational set-up: course participants were selected by Siemens, and worked at the company as working students during the whole length of the Bachelor program. Every semester, they were released from work for two months to complete a teaching term. "Co-operative learning" in the didactic sense[22] only took place during the Bachelors thesis research phase, when the students had the option to use the company for a choice of topic and for support. The course took place in the last term of the program. The students were advanced and had already several years of work experience at Siemens AG. On average, 20–40 students attended the course in one semester. Teaching was conducted in the classroom in weekly seminars of four hours. The course learning objectives included methods for applying BPM in the firm, such as: process modelling, organisational storytelling, Minto Pyramid principle, and scenario planning.

The students also learned to apply Scrum,[23] a well-established agile project management method also typically used by startups. The students were tutored in the use of additional software tools: web conferencing and holding virtual team meetings, instant messaging apps for course communication outside the classroom, group-based virtual task management, canvassing for project positioning and planning, building, checking and sharing process models, dialogue-based animations, project results documentation, and shared classroom

21 *Hart*, Doing a literature review.

22 *Slavin/Leavey/Madden*, Effects of cooperative learning and individualised instruction.

23 *Schwaber*, SCRUM Development Process.

protocols. All course materials and links to all the tools mentioned were served via the central learning management system of the school.

2. Startup selection and project facilitation

The projects were organised before the start of the course. This organising process was the same during the whole observation period. Only during the last two terms (2016–2017), did a now-defunct startup, Link-Projex[24], help us with project facilitation in two courses. Link-Projex acted as a broker between the lecturer, the student teams and the startups. However, the projects were not structurally affected by adding the broker; this only led to a broader portfolio of collaborating startups and simplified project coordination. The price paid for this support was a loss in transparency and control.

a) Prior to the project

The lead-up phase before the project involved a 1–2 month long planning period. The startups were self-selected. The coordinator of the incubator[25] invited the lecturer to a meeting to pitch the project idea to the startups. A crucial element of this pitch was the achievements of students of previous years.[26] Interested startups then met with the lecturer to discuss details and negotiate the terms of startup participation. In some cases, this negotiation included additional startup support by the lecturer in the form of coaching and mentoring services. These services have since been added to the support infrastructure of the Startup Incubator Berlin.[27]

An important part of this phase was the selection of startup business processes that were suitably challenging for the students. The selected business processes needed to be compact enough to be addressed in the course of at most eight weeks. But the business processes also had to be ambitious enough. If possible, they needed to be processes that the startups could not address themselves before the end of the project. In most cases, it was possible to find suitable processes. Usually, especially if the startups were in an early phase of their development, the business processes themselves were barely defined at the beginning of a project.

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24 *Startup Incubator Berlin*, profile of Link-Projex.

25 Between 2013 and 2017, we worked with three incubators: Startup Incubator Berlin (2013–2017), SPARK at Charité Berlin (2017) and Social Impact Lab, Berlin (2016).

26 Before working with startups, the lecturer piloted this collaborative concept with administrative processes at the HWR Berlin itself. The results of this pilot served as examples for the first implementation of the concept with startups.

27 *Startup Incubator Berlin*.

Typically, one startup contributed more than one business process to the course. Usually, 3–4 startups participated and contributed 1–2 processes each. Thus in any given semester there were 6–8 project teams, and each team worked with only one startup and one business process. A team typically consisted of 3–5 students. In addition, the startup had to identify at least one person who would be available as the project lead on the client side. This person was then matched with a contact in the student team. The participating startups also had to agree to be present during the initial and the final project events.

b) During the project

The course itself began with a kick-off event. At the start of this event, the participating startups presented themselves and the business processes that each team would work on. The student teams were randomly assigned to the startup clients by the lecturer in advance. At the end of the kick-off event, the students and the startups spent some time getting to know each other and agreeing on a basic framework of collaboration and communication (e.g. character and frequency of meetings and emails, sharing of material etc.).

From then on, the students worked independently using the agile project management method Scrum, which they had learned only hours before the kick-off event. This dynamic remained constant throughout the course: every week, the students were learning a new method, which they would apply in their projects as part of the classroom exercises. Depending on their specific challenges, they could themselves decide how to position the method within the portfolio of solutions presented to the startup clients.

Working with Scrum meant that the teams had to present prototypes of their results every two weeks in class during short sprint reviews – presentations of the work already done, the issues encountered during the last sprint and the planned tasks for the following sprint. The startups were invited to these sprint reviews. As a rule, they did not attend the in-class sprint reviews but arranged meetings outside of class.

With regard to communication with the startups in between sprint reviews, the student teams were on their own unless the students (or the startups) signalled that there were issues to be resolved. In this case, the lecturer would provide informal coaching advice. These issues, which occurred rarely, were usually related to fears of the students that they might not meet the expectations of the startups. They were rooted in the fact that both students and startups had usually had no experience with either consulting or Scrum. The issues could always be sorted out quickly by talking to the student teams alone.

The project ended with a final sprint review in the form of a formal, short (45 minutes) final presentation of the results. Because of the continuous contact

between students and startups, these presentations did not normally contain any surprises. Rather, they were an opportunity for the lecturers and for the other teams to witness the culture of collaboration that had developed over a period of a little more than six weeks.

Each student team also had to hand in their project documentation containing the customer requirements and all of their main results. Each team member had to submit an individual essay reflecting on their personal experiences during the project and documenting their personal contribution to the project as a whole.

c) After the project

The project officially ended with the final presentation and the project documentation. However, the student teams understood that they were, informally at least, viewed as consultants by the startups. In at least half of the cases each semester, the students would meet with the startups again to help facilitate an optimal transfer of the results to the entire startup team. In several cases, students were invited to present their results to independent observers.

Additionally, selected project results were shown regularly as examples of best practice in other classes, for example in MBA courses on solving complex problems or in specialised courses on BPM methods.

Some students completed their theses under our supervision: often, the topic of the thesis was either inspired or directly related to the work these students had done with the startups.[28]

3. Selected projects

Each project posed a different business challenge. Given the many participating institutions and startups, the spectrum of business processes was vast. Between 2012 and 2017, forty projects were completed altogether.

The following project examples demonstrate the breadth of the challenges for the students and their achievements, which are remarkable not just because of their value but for the wealth of methods picked up and used to respond to the challenges. All startups were nascent, about three to six months into the incubation process.

28 Examples: *Langendorf*, Knowledge management at the Berlin startup "iversity"; *Kaminski*, Promotion of intrapreneurship through entrepreneurship education.

a) Internationalisation strategy for a sports team app

The product of the startup ("HelloCoach[29]") was a mobile application to organise and schedule sports teams. The customers were sports clubs and their coaches, whereas the end users were team members. The startup saw the potential for rapid global expansion. While they knew the issues involved, they were not clear what to do, and when – they needed help with identifying the best process to expand internationally. The specific requirements were:

- Strategic end-to-end internationalisation process
- Relevant touchpoints (brand messages to reach out to potential customers)
- Market analysis by country
- Implementation checklist

The student team consisted of four members. Delivering this type and level of analysis within only a few weeks would have been challenging even for a team of professional strategy consultants, yet the students delivered all the required results at a high level of quality. One of their results was a detailed internationalisation strategy process model as a high-level BPMN process model[30] in the form of a so-called "happy path", with three folded sub-processes "market analysis", "touch point analysis" and "implementation path" (translated from German).

During the final project presentation, the students characterised the collaboration with the startup as a "win-win" because of the added value for the startup and the students' opportunity to apply everything they had learned during the course to their task. This particular project had not always looked like a perfect match – there had been miscommunication at the start, and the students were anxious about not meeting the startup's perceived high expectations.

The team had to develop new skills in order manage the communication challenges. One member said:

> "I learned that it is important to communicate boundaries and say 'no' if the client's wishes cannot be met."

29 See http://www.startup-incubator.berlin/portfolio-items/hellocoach/.

30 Business Process Model and Notation. See http://www.bpmn.org/ for the specification of this process modelling standard.

Another student contrasted her experiences at Siemens with the project experience:

> "Working for [a] large company like Siemens made me understand especially bureaucratic business processes, regulations, and authorities. By contrast, startup work is more dynamical, faster and riskier."

This student appreciated being able to witness the differences between large firms and startups first hand.

The student team's sensitivity to the issues faced by large companies became apparent when they began their final presentation with a quote by the German liberal-conservative politician and former president of the Federation of German Industries (BDI), Hans-Olaf Henkel:

> "More companies are going to overtake us because we were not prepared for globalisation."

Related to the methods studied in the course, all students highlighted the importance of learning business process modelling methods and being able to apply them to their current work situations at Siemens.

b) Transparent transactions for a music merchandising company

The startup's project ("mokka merch"[31]) was a platform to bring musicians and designers together to design and sell merchandise without having to handle the electronic transactions involved. The client requested a concept that would give the participating musicians complete transparency of all transactions and sales figures.

This process was especially challenging because of the number of different stakeholders involved, which included the startup platform, musicians, designers, merchandise suppliers, a cloud-based accounting application service, and so on. Also, there was no published best practice for the students to use as a starting point. In addition to delivering the process as requested, the team established contact with potential service providers, obtained quotes and made a recommendation for a third party platform that could provide the required payment service.

The student team consisted of four members. They created a short, 45-second video prototype in the form of a simple story animation, which could be used as a marketing film for potential customers.

31 See http://www.startup-incubator.berlin/portfolio-items/mokka-supply/ and https://mokka-merch.com/.

The process models created by this team were particularly well structured, clear and readable, which made it easier for the startup to implement the team's suggestions.

The team members used the Trello application as a digital task manager. They said that this improved their time management and simplified sharing tasks among members:

> "The possibility to include deadlines, links or questions in Trello made it possible to keep a current overview [of all activities] – our project work was made very efficient and well-organised."

In the initial meeting with one of us and during the kick-off presentation, the startup founders presented themselves as being more interested in art and music than in business – almost as if their startup activity had been an unintended side effect or an afterthought of their primary mission in life – to enable musicians to sell their merchandise without hassle. The "About Us" page of their website read:

> "We serve – equipped with [a] keyboard, paint bucket, and stamps we make our contribution to art, culture, and noise." Below this mission statement, there is an anonymous quote: "The boys are Okay."

By contrast, the team of Siemens students seemed motivated by the startup product, but they were also unapologetic, straight shooters when it came to business. This difference of approach did not, however, affect their communication – rather, it seemed to improve it: team and startup communicated via email and, increasingly, via WhatsApp, an instant messenger better known for friendship-based networks. The team's project report documented the communication in detail and included a screenshot from a WhatsApp conversation. It demonstrated how the students put pressure on the startup to make a decision regarding one of their recommendations. In their personal essays, the students also talked about the frequent back and forth between startup and student team.

One team member said that this collaboration project

> "…was the most instructive of my entire study [at university]."

She emphasised that

> "…an authentic view of hierarchical, entrepreneurial, and especially procedural structures that could not differ more from those of a large corporation."

The student also said she enjoyed working for

> "…a positive result that can add value to a young enterprise."

Another student emphasised how working with the right digital tools and digital media for a given purpose can improve efficiency. Using business process modelling forced her, she said,

> "…to think in small steps and approach a process chronologically and highly focused [...] in order to develop individual solutions." She appreciated that modelling made her see the core issues clearly, and not get lost in the "totality" of the issues."

c) Financing options for an innovative surgery product

This project was one of three collaborations with the SPARK entrepreneurship program at Charité Berlin. The startup members were off-site and heavily involved in their demanding clinical day-to-day jobs. This made it more difficult for the student teams to get enough time with the startup. Also, the founders were considerably older and less likely to use the instant messaging service favoured by the students (WhatsApp). Because of these special conditions, we did not require final reports from the teams. Instead, we conducted short interviews with the team members after the project.

The startup's product ("FiXatas") was a ready-made surgical knot that could dramatically reduce the time spent on standard medical situations requiring sutures. The student team's task was to generate funding and financing options, including identifying potential partners and clarifying the process that could lead to such a partnership.

The founder had no business experience whatsoever, and the team spent considerable time educating him about entrepreneurial concepts. They asked one of us (J.G.) for advice, who told them about the concept of "founding in components" by Faltin[32]. In their final presentation, they transferred this concept to their project in the form of this strategy metaphor:

> "Think of the founder as a composer who has a goal and who knows how to use [musical] instruments. A composer cannot play all instruments [in an orchestra]. His job is to [...] be able to combine instruments in new ways, to reconcile and coordinate individual instruments. Likewise, the entrepreneur must firstly come up with a concept that consists of components, secondly he must find partners, who offer these components professionally, and thirdly he must coordinate and control the concert of all components."

As consultants, they provided the founder with a concept, ideas for potential partners, and a startup founding process that showed how and when to use this particular strategy.

32 *Faltin*, Kopf schlägt Kapital.

The team of three students was highly motivated by the product: in the first sprint review, they said that they were proud to

> "…support a project that can save lives".

In the final presentation, they showed a short animated film, in which the founder himself (with a look-alike avatar) explained the advantages of his product to three very different target audiences: a surgeon who is pressed for time in the operating theatre; a military commander who is worried about casualties on the battlefield; and a pet owner who is concerned about the well-being of her cat.

This project was considered so successful that the student team was asked to present their findings at a conference held by the incubator a few months after the end of the term. The incubator project leader thought that the techniques developed by the students to educate their client should be transferred to other startups in the clinical field who experienced similar difficulties. In 2018, this startup won a prize in a regional startup business plan competition.[33]

The students cited the client's indecisiveness and his lack of strategic business focus as the greatest obstacle to a successful project. As the positive outcome of their collaboration showed, this initial constraint did not spoil the project; instead, it became an additional source of motivation for the students.

In an interview conducted after the project ended, one student said that they recognised early on that the founder was overstrained with the double burden of work and founding a startup. They took note of his use of business "stereotypes". Subsequently, the student team managed to communicate their critique without provoking resistance or hostility, and their concept opened his mind to a more nuanced approach.

The students also highlighted the importance of learning to think in a process-oriented way. They confirmed that process-orientation had made them try to find simple solutions for complex problems. This team emphasised the differences in working with a startup compared to working within a large company like Siemens.

4. Discussion (Collaboration Case Study)

We asked ourselves: "What were the challenges by the startups, what did the students achieve, and how did they experience their collaboration?" In this section, we will discuss related contrasts that were observed and experienced across all projects.

33 See https://youtu.be/nxM5Z9GBzGA.

a) Enterprise vs. startup

The students noticed that the difference between new and established organisations played out in different ways during the projects.

Collaborating with any startup poses a general challenge. Startups are under intense pressure, especially during the first few months of their existence. The founders need to establish a high-performing team, they must interact with multiple stakeholders and networks to learn to sell their idea, and they have to work out a detailed business plan, just to name a few. Usually, there are only few individuals needed to attend to many urgent tasks. As a result, they are grateful for help, especially if it comes for free. At the same time, they cannot fritter away their hours in too many meetings, which is why they tend to be protective of their time.

In the case of the Siemens students, the students were already accustomed to working in a project-based environment. At the same time, they were insecure about the startups, whose culture they correctly perceived as different from an established corporate culture. This sometimes resulted in confusion at the start of the project. Also, the lack of problem definition and clarity about what exactly the startups needed or wanted to achieve sometimes made communication between students and startups more difficult.

These cultural differences emerged, for example, when scheduling meetings. Some startups could not be relied upon show up for meetings, or to be adequately informed and well-prepared. This led to frustration on the student side.

However, despite the culture differences, the student teams and the startups had in common the agile project management Scrum methodology. It was a steeper learning curve for the Siemens students to get used to Scrum, but once they did, they could immediately use the same vocabulary as the startups. This made it easier to share results and assess strengths and weaknesses of people, products, and processes.

b) Collaboration vs. competition

Earlier, we spoke of a "culture of collaboration," which was apparent during the final presentation. This culture emerged despite a number of competitive aspects.

Generally, all the teams were competing with each other because the projects, through the grades for the final presentation, were judged and compared with one another. In this regard, the use of a grading rubric helped by providing transparency and clarity. The startups were always explicitly but informally involved in the project evaluation, because they were asked to communicate a summary of their experiences with each project team to the lecturers after the course had ended. These summaries always confirmed the quality of

the collaboration that had already been visible during the project. Using the Scrum methodology probably also made it easier to observe team performance from beginning to end of a project

The teams were called "consulting" teams and the startups were called "clients" to motivate the students. But the project was still completed as part of a university course, and the startups were explicitly hoping for research-led investigations into their problems and for well-validated, relevant solutions. In order to support this approach methodologically, the students were continually challenged to improve the scientific quality of their project results. They were reminded that they operated both as consultants and as action researchers.

On the micro level, competition among teams was fostered because the teams were continuously asked to present their results and at times vote on them anonymously. However, competition in connection with digital communality, and open sharing of all intermediate results, led to stronger individual teams and tied the teams closer together instead of dividing them.

There was one interesting exception that cast a different light on the matter of competition. In one semester only, due to logistics issues, there were sets of teams that shared both a client and a process. (In all the other semesters, each student team used a different process, even when they had the same client.) However, the competitive aspect soon disappeared. Each team that shared a client and process went down different paths as soon as they had spent more time with the client. This worked because clients here were more interested in seeing different possible solutions than getting the best of similar solutions, and they complimented all teams on the diversity of their approaches.

c) Theory vs. practice

The primary objective of the course was to instruct using theory and abstract concepts, impart information, and test student knowledge. The secondary objective was to allow the students to experience project work with real clients. All of the students strongly felt the difference between this course and other courses. It was highlighted in every single personal essay. More advanced students, especially, saw the advantage of applying their theoretical knowledge to solving real rather than academic problems.

The teaching of theory and concepts was not abandoned, however. The concept mentioned most by the students was business process modelling – probably also because it received the greatest attention in the syllabus. As a result, when the students were called upon to model complex business processes, they knew what to do.

Theory was also important with regard to the scientific validation of the project results. Several startups expressed appreciation for being connected to a

different pace and a different climate in the form of a university course. They saw the value of academic rigor as an approach that took more time and energy than just "going for it."

Across the many different startup companies and organisations and their business process problems, the relative importance of theory vs. practice varied, of course. A few startups were breaking new conceptual ground, but the majority were trying to capitalise on known business models.

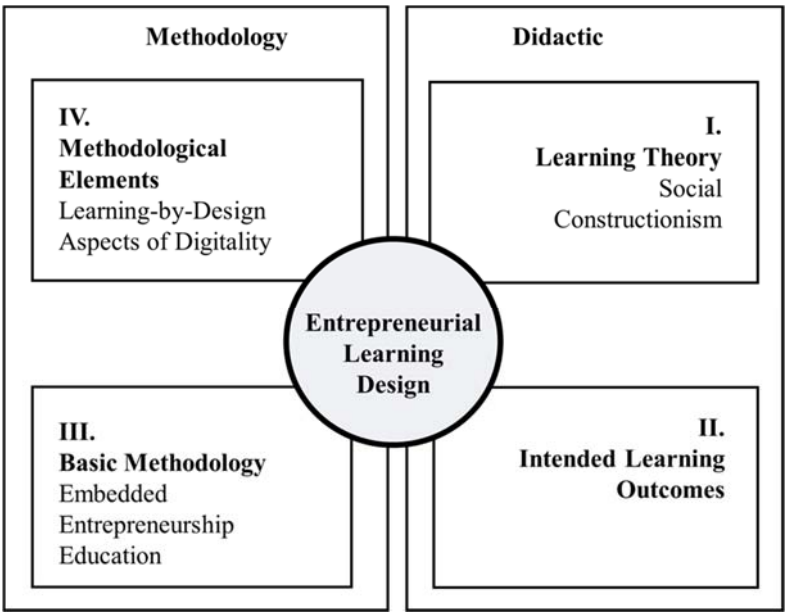
Throughout the projects, the normal tension between theory and practice, between the classroom and the real world, was significantly reduced because the students continuously applied every single theoretical lesson and method they learned to their real world projects, using the theory to create artefacts such as business process model diagrams, animations, and video prototypes, as shown in the examples.

IV. Entrepreneurship Learning Design of the Course

To answer the question of which didactical models and methods are applicable in this case, we chose a general learning design framework[34] for structuring the results of the literature review that was conducted in the field of entrepreneurial learning and entrepreneurship education (Figure 1). The framework combines didactical as well as methodological components, which should be considered when designing a course.

34 *Bruns/Gajewski*, Multimediales Lernen im Netz, p. 11.

Figure 1: Learning design framework for student-startup collaboration



For this case study, we will first describe the modification of the two didactic components of the framework followed by the methodological ones. We will then discuss each component directly as it relates to lessons learned about entrepreneurship education from the course. We will put a special emphasis on the aspect of digitality in the methodological part. Finally, we will discuss the implications of the case to the entrepreneurship education program of the HWR Berlin.

1. Social Constructionist Perspective on Entrepreneurial Learning

To avoid tapping into established paradigms and to enable solid scholarly effort, we will begin with the underlying ontological and epistemological assumptions of our research.[35] This is especially relevant for entrepreneurship as

35 *Shane/Venkantaraman*, The promise of entrepreneurship as a field of research, pp. 217–226; *Busenitz/Plummer/Klotz/Shahzad/Rhoads*, Entrepreneurship Re-search (1985–2009) and the Emergence of Opportunities, p. 14 ff.

a relatively young research stream. Didactical models help to describe such assumptions and serve as landmarks to derive learning design criteria.[36] Therefore, they can be seen as learning theories as well.

This paper puts a social constructionist lens on learning. In general, social constructionism rejects the understanding of behaviour as influenced by stable traits, attitudes or characteristics. The research focusses on the individual's social practices and social interactions.[37] In contrast to constructivism, the attention is given to the relational rather than cognitive aspects of social interaction. With regard to entrepreneurship research, the research interest shifts from trying to find out what about a person is entrepreneurial or not, to exploring how entrepreneurial activities (as entrepreneurial learning) are constructed and coordinated between individuals through joint acts and conversation in relation to their contextual environments and cultures.[38] Social constructionist theory assumes that individuals accept information from each other as evidence of "reality." This shared meaning creation reduces their uncertainty. Moreover, individuals need to make sense of or justify their decisions. That is why the behaviour of individuals changes when they receive information that is inconsistent with their behaviour. During this process, individuals develop recognizable patterns. These routines socially construct their reality.

Several frameworks have been developed to address the learning processes of entrepreneurs.[39] The majority follow cognitive or constructivist ideas such as Kolb's experiential learning cycle.[40] Rae[41] (2005) adopts a social constructionist perspective on entrepreneurial learning (EL). With this, he also takes up the constructionist work of Jason Cope.[42] Rae's conceptual model tries to capture the complexity of the EL process by combining the cognitive and social dimensions of EL with an emphasis on the context of emerging entrepreneurship in technology-based ventures[43]. EL is described as a dynamic process of awareness, reflection, association and application that involves transforming experi-

36 *Bruns/Gajewski*, Multimediales Lernen im Netz, p. 13.

37 *Winter*, Sozialer Konstruktionismus, pp. 123–135.

38 *Flechter*, Social constructionist thinking, pp. 160–172; *Chell*, Towards researching the "opportunistic entrepreneur", pp. 63–80.

39 e.g. *Holcomb/Ireland/Holmes/Hitt*, Architecture of entrepreneurial learning; *Minniti/Bygrave*, A dynamic model of entrepreneurial learning.

40 *Kolb*, Experiential learning: Experience as the source of learning and development.

41 *Rae*, Entrepreneurial learning: a narrative-based conceptual model, pp. 323–335.

42 *Pittaway/Thorpe*, A framework for entrepreneurial learning: A tribute to Jason Cope.

43 *Seuneke/Lans/Wiskerke*, Moving beyond entrepreneurial skills: Key factors driving entrepreneurial learning in multifunctional agriculture, pp. 208–219.

ences and knowledge into functional learning outcomes.[44] It comprises cognitive, behavioural, and affective or emotional learning.[45] EL is affected by the context in which learning occurs, and it includes the content of what is learned as well as the processes through which learning takes place.[46]

Consequently, entrepreneurship education should emphasise active and collaborative learning, interaction, and collaboration, as well as reflection of experiences. This differs considerably from typical traditional educational programme learning environment. Entrepreneurship education should create real-life learning environments where unexpected events can occur.[47]

2. Intended Learning Outcomes of Entrepreneurship Education

Describing the intended learning outcomes makes explicit what learning discourses the course can provide for both learner groups: the students and the startups.

The intended learning outcomes for entrepreneurship courses are divided into methods, concepts and mindset (Table 1). The rubric describes categories of learning outcomes and their classification in cognitive and affective domains based on a taxonomy for educational objectives[48]. This rubric serves as an orientation for entrepreneurship educators at Berlin School of Economics and Law (HWR Berlin) to make explicit which course can provide which learning outcomes. This is necessary to fulfil the need of learners with different levels of entrepreneurial expertise. The learning outcomes were solely developed and adapted for the context of the HWR Berlin, but are very similar to the categories found in the literature review.[49]

The category "Methods" presents actual methods of entrepreneurial practice as business model design, customer development, validation, or prototyping. The category "Concepts" represents a category of theoretical concepts like innovation, business administration vs. entrepreneurship, or value proposition, which where adapted to the real-life context. The category "Mindset" can be understood as the constellation of motives, skills, and thought processes that

44 *Cope/Watts*, Learning by doing–an exploration of experience, critical incidents and reflection in entrepreneurial learning, pp. 373–397.

45 *Cope*, Toward a dynamic learning perspective of entrepreneurship, pp. 104–124.

46 *Politis*, The process of entrepreneurial learning, pp. 339–424.

47 *Cope*, Entrepreneurial learning and critical reflection: Discontinuous events as triggers for "higher-level" learning, pp. 429–450; *Pittaway/Cope*, Simulating entrepreneurial learning: Integrating experiential and collaborative approaches to learning, pp. 211–233.

48 *Krathwohl/Bloom/Masia*, Taxonomy of educational objectives.

49 e.g. *Pittaway/Edwards*, Assessment: examining practice in entrepreneurship education.

entrepreneurs use to sense, act, and mobilise under uncertain conditions, thus contributing to entrepreneurial success[50].

Table 1: Intended learning outcomes rubric

Taxonomies (cognitive domain)	**Intended Learning Outcomes**			Taxonomies (affective domain)
Creating	Participants can adjust entrepreneurial methods according to their needs	Participants create new academic concepts of entrepreneurship		
Evaluating	Participants evaluate entrepreneurial methods	Participants evaluate academic concepts of entrepreneurship	Participants consciously act entrepreneurially	**Characterisation**
Analysing	Participants discuss entrepreneurial methods	Participants analyse academic concepts of entrepreneurship	Participants compare entrepreneurial thinking to other thinking	**Organisation**
Applying	Participants use entrepreneurial methods in practice	Participants apply academic concepts of entrepreneurship	Participants see and believe in the benefits of entrepreneurial thinking	**Valuing**
Understanding	Participants understand entrepreneurial methods	Participants understand academic concepts of entrepreneurship	Participants are able to work entrepreneurially and enjoy it	**Responding**
Remembering	Participants remember entrepreneurial methods	Participants remember academics concepts of entrepreneurship	Participants experience working on entrepreneurship challenges	**Receiving**
	METHODS	**CONCEPTS**	**MINDSET**	

Student learning outcomes were primarily located in the "Mindset" category. The case shows that the students experienced working on entrepreneurship challenges and thereby received the shared meaning about what an entrepreneurial mindset is via discourse and interaction. They responded to the challenge positively. Even when they had negative feelings about the way startups worked, they socially constructed their understanding about entrepreneurial practice. Referring to Rae's model mentioned above, students experienced learning processes in the theme "personal and social emergence" as they narratively constructed their future identity in dialogue with the founder's identity. As an example, some students mentioned that working entrepreneurially could be a part of their future career, while other students developed empathy for founders, but could not see themselves in such a role.

50 *Haynie/Shepherd/Mosakowski/Earley*, A situated metacognitive model of the entrepreneurial mindset, pp. 217–229.

One student group[51] achieved unexpected learning outcomes from the "Concepts" Category. This was strongly linked to the founders' specific process demands, which required more understanding of entrepreneurial concepts. As a result, the student group sought advice and transferred a suitable entrepreneurial concept to the project.

Learning outcomes concerning startup entrepreneurship do not seem to be that tangible because we did not emphasise them during the course. In our third example, the founder received basic training in entrepreneurial concepts from the students. But the main focus of learning for the startups was on adapting the student results to their businesses and on acquiring business management know-how.

3. Embedded Approach of Entrepreneurship Education

We can distinguish different approaches to entrepreneurship education (EE), each related to a different didactical practice and intended learning outcome. The following basic methodologies describe the four most common approaches:[52]

- *About* – describes mainly traditional forms of educational practice, driven by the intention to raise awareness or share knowledge about entrepreneurship. This approach is mainly led by content or subject and therefore focused more on knowledge than skills or experience.
- *For* – is an approach where students tend to engage in projects that enable them to acquire entrepreneurial skills and competencies. The focus is on experiential and project-based learning with the aim of preparing them for future entrepreneurial activities.
- *Through* – represents in most cases a crossover between "through" and "for" as it includes practice of entrepreneurship in a safe environment. The focus is on courses that engage students in running real companies or consultancy within an entrepreneurial context.
- *Embedded* – when EE is included in courses that focus on other disciplines or subjects. The aim is to provide entrepreneurship education within non-business subjects to raise awareness and provide experience of entrepreneurship within another discipline.

The dominant form in this case was the "embedded" approach. The other approaches mentioned were embedded within a course focused on business pro-

51 *fiXatas,* see example cc. above.

52 *Pittaway/Edwards*, Assessment: examining practice in entrepreneurship education, p. 782.

cess modelling with an emphasis on providing a form of entrepreneurial learning relevant to the entrepreneurs' field of interest.

Nevertheless, there were also aspects of the "through" form since the basic methodology of the course followed a significant trend in EE from classroom-centred education to experiential learning.[53] This meant exposing the students largely to real-life entrepreneurship contexts and group-based experiential learning.[54] The course was designed, accordingly, to encourage students' empathy with the world of the startup founders and with their experiences – for example the uncertainty and complexity of new ventures.[55]

4. Digital Methodological Elements for Designing Artefacts

A constructionist perspective on entrepreneurial learning emphasises that learners are active builders of knowledge. Consequently, this perspective implies construction of external artefacts that are shared by learners. The basic methodology of Learning-by-Design expects students to design such artefacts (e.g. videos, processes, prototypes).[56] In this case study, artefact creation is part of the learning outcome and related to real life experiences. Designing artefacts also offers learners the opportunity to approach tasks differently, and internalise both content and associated conceptions. Digital methodological elements were used in the courses for designing such artefacts.

The individual methodological elements or tools used in the course can be divided into two categories: project infrastructural methods (Scrum, Trello, Slack, Moodle, and Adobe Connect) and project content methods (Project Canvas, process modelling, Minto pyramid principle, video prototypes, animation, and scenario planning). The former support project delivery, the latter were potential project deliverables. While all teams were instructed on how to generate the content, it was their own choice if they wished to use it in the final presentation for the clients. All tools were free of charge.

The methods listed in Table 2 were covered in all courses. They were almost all taught in almost identical ways, with four hours per subject, split between lecture, discussion and practice. The only exception was the topic

53 *Pittaway/Cope*, Simulating entrepreneurial learning: Integrating experiential and collaborative approaches to learning, pp. 211–233.

54 *Harms*, Self-regulated learning, team learning and project performance in entrepreneurship education, pp. 21–28.

55 *Gibb*, In pursuit of a new "enterprise" and "entrepreneurship" paradigm for learning, pp. 233–269; *Pittaway/Cope*, Simulating entrepreneurial learning: Integrating experiential and collaborative approaches to learning, pp. 211–233.

56 *Han/Bhattacharya*, Constructionism, learning by design, and project based learning.

business process modelling (BPM): this method was taught in two consecutive sessions of three hours each, with additional (offline) exercises given to the students. This was partly because of the importance of BPM for the projects, but also because of the final exam, which consisted of a number of BPM problems. All infrastructure methods were, of course, covered and discussed throughout the project, but they were addressed explicitly only at the start to get the student teams started. The methods are presented below in the order in which they were introduced to the students.

Table 2: Digital methodological elements and corresponding artefacts used in the course (in the order of their introduction to the students)

Digital methodological element	**Artefact**
Managing projects in an agile way	Scrum[57] Burndown Chart
Instant Messaging	Slack[58]
Managing tasks using the cloud	Trello[59]
Using a learning management system	Moodle[60]
Using a web conferencing application	Adobe Connect[61]
Planning projects (holistically)	Project Canvas[62]
Modeling business processes	BPMN 2.0 models
Developing logical structures	Minto Pyramid Principle[63]
Telling organisational stories	Video prototype
Making 3D animation films	Plotagon[64]
Scenario planning (forecasting)	Scenarios[65]

Independently, the students also used various cloud sharing applications (like Dropbox, Google Drive, One Drive etc.) and generic instant messenger apps (like WhatsApp). We did not, however, collect any data on tool usage, since we considered them to be more at the level of telephone lines, the Internet itself or

57 *Theocharis/Kuhrmann/Münch/Diebold*, Is Water-Scrum-Fall Reality? On the Use of Agile and Traditional Development Practices.
58 https://slack.com/.
59 https://trello.com/.
60 https://moodle.org/.
61 https://www.conf.dfn.de/.
62 http://overthefence.com.de/project-canvas/.
63 *Minto*, The Pyramid Principle, Logic in Writing and Thinking.
64 https://www.plotagon.com.
65 *Wack*, Scenarios: Uncharted Waters Ahead.

wireless LAN – as parts of an almost ubiquitous infrastructure used by the students as a matter of course and not requiring instruction.

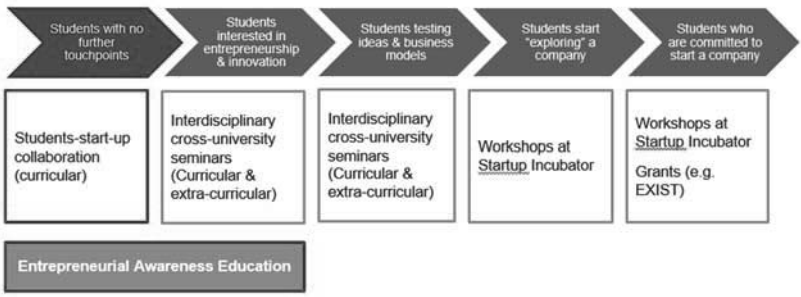
5. Discussion Entrepreneurship Learning Design

We asked ourselves the overall question: "What can we learn from this case for entrepreneurship education?" We already discussed particular aspects of the entrepreneurial learning design of the course. Next, we will broaden the discussion in terms of what can be learned from entrepreneurship education in general and especially in the context of HWR Berlin.

The learning design for the student/startup collaborations in our case can help to design future collaborations in other business courses, e.g. in marketing. Moreover, it makes explicit what kind of entrepreneurial learning processes can be primarily stimulated through a collaboration.

Looking at the entrepreneurship education portfolio of the HWR Berlin we identified a gap. We can now add another dimension of "entrepreneurial awareness education"[66] to our existing program (Figure 5). Traditionally, this kind of education was only open to students interested specifically in entrepreneurship and innovation. This includes students who voluntarily choose an entrepreneurship course or those who have to take the course in order to make contact with entrepreneurship. In this case, the students did not voluntarily choose the course because of entrepreneurship. The topic was a by-product, initiated by lecturers.

Figure 2: Entrepreneurship education portfolio of HWR Berlin



In order to avoid misunderstandings, this project should not be seen as missionary work for entrepreneurship. As a mindset approach, entrepreneurship is em-

66 *Liñán*, Intention-based models of entrepreneurship education.

bedded in the course because of its assumed potential to empower and transform the students. But we are aware that

> "we must avoid the tendencies to apply entrepreneurship in virtually any context no matter how far removed it is from the act of recognising and capitalising on opportunities for the purposes of economic or social gain; or to label literally any phenomenon as being "entrepreneurial" simply because it is different from the status quo."[67]

Moreover, to clarify the purpose of entrepreneurship education for the whole university, the starting point lies in socially constructed shared meanings of the term entrepreneurship within the university's community. Different conceptualisations of entrepreneurship (for example those focused only on ventures) could reduce the potential of entrepreneurship education as a booster for the development of an entrepreneurial mindset. That is why we see this case as an example that supports the following description of entrepreneurship education as

> [...] a process which develops individuals' mindsets, behaviours, skills and capabilities and can be applied to create value in a range of contexts and environments from the public sector, charities, universities and social enterprises to corporate organisations and new venture startups [68].

Additionally, this project has already begun to contribute to a shared conceptualisation within the HWR Berlin. Presentation of the project in the educator community, i.e. in Brown Bag Seminars and the like, initiated a discussion about such shared meanings. Finally, the project served as a catalyst for new forms of pedagogy and collaboration with different internal and external stakeholders. As a result, the collaboration between entrepreneurship education and the Startup Incubator at HWR Berlin was expanded.

V. Discussing Digitality

Traditional learning theory has mainly been concerned with optimising knowledge transfer processes between lecturer and student and, much later, also between student and student. In order to do this systematically, a certain degree of stability on either side of the transfer is required. Digitisation alters this situation profoundly: it requires continuous adaptation to fast-changing circumstances, both for lecturers and students. This has resulted in a demand for "digi-

67 *Kuratko/Morris*, Examining the future trajectory of entrepreneurship, p. 14.

68 *NESTA*, Developing Entrepreneurial Graduates, Putting entrepreneurship at the centre of higher education, p. 12.

tal didactics"[69] at universities, and for a "digital entrepreneurship" perspective[70] among startups. These are expressions of a wider and deeper change towards a "digital culture", which challenges existing cultures.

The media-theoretical approach of Stalder[71] suggests that digital culture is characterised by three forms of exchanges: (1) referentiality – e.g. when publicly available material is used to produce new artefacts, (2) communality – e.g. when an online collective determines the frame of meaning, and (3) algorithmicity – e.g. when decision processes are increasingly automated and data-driven. The driver behind all of these is the Internet as an enabling global communication infrastructure.

This particular concept of digitality is fairly new and not well understood enough yet, we think, to explain the experiences made by the participants in our collaborative projects. We asked ourselves instead: how do our findings relate to this concept of digitality? Do the student-startup projects belong to a digital culture of teaching and learning according to Stalder's criteria?

In our case, almost all startup products were digital products and the processes investigated by the students were digital business processes, often related to automation or online customer relationships. In his extensive review of entrepreneurship research, Steininger observed this relationship with IT as a "facilitator", to make the operations of startups easier, and as an "ubiquitor", where IT becomes the business model itself.[72]

The application of the methods and tools introduced to the students resulted without exception in digital artefacts (cp. Table 2). Partly because of this, our whole investigation could be conducted, aided, and completed within the digital realm drawing on digitally recorded data. Consequently, referentiality is clearly present in this work.

In order to complete the time-consuming tasks of creating, improving (through collaboration with the startups), and presenting the business process models, the students used cloud-based collaborative portals (in our case, Signavio[73] for BPMN and, for conversations, Slack). Many activities in these portals are automated – e.g Signavio aids process model creation that tests a model's compliance with the BPMN 2.0 standard; Slack employs bots and plugins to automate repetitive activities when messaging. Algorithmicity is, therefore, a

69 *Jahnke/Norberg*, Digital Didactics: Scaffolding a New Normality of Learning, p. 129.

70 *Nambisan*, Digital Entrepreneurship: Toward a Digital Technology Perspective of Entrepreneurship, pp. 1029–1055.

71 *Stalder*, Kultur der Digitalität.

72 *Steininger*, Linking information systems and entrepreneurship, pp. 363–407.

73 https://www.signavio.com.

pervasive feature of our case. Information overload, however, was never an issue.

Communality is itself one of our key results – as seen in the visible culture of collaboration between course participants with very different backgrounds and goals. However, this form of communality is weak compared with Stalder's interpretation, which focusses on digital communities as the main givers and guardians of shared meaning. This interpretation is perhaps owed to Stalder's post-structuralist position. By contrast, our explanation, applied in entrepreneurship education, is not constructivist but constructionist: digital communities give meaning to their shared culture, but so do other things.

Hence, Stalder's three characteristics of digitality are visible within the fabric of our case.

VI. Limitations and Directions of Future Research

We employed a mixed method approach by combining a rich narrative (case study) with a learning-theoretical investigation (literature review). The limitation of the rich narrative lies in its weak theoretical foundation – because of this, we cannot present strict logical connections and have no checklists to quickly transfer our experiences to another setting. We can also not rule out that students might have had previous other touchpoints with entrepreneurship in other contexts e.g. professional experience, family, or friends. Instead, before transferring what we learned to another school, course, or program, the process that we followed would have to be adapted to the new context. We have now given instructions on how to do that.

Another limitation is the skewed emphasis on students over startups: both groups were actors in our cases but we did not have nearly as much data about the startups in terms of their experiences and their learning as we did about the students. It would be interesting to complement or extend this study with a study that collects more data from the startups themselves.

We looked at entrepreneurship learning in the context of a collaboration that was specifically centred on creating business process models for startups. Future research could investigate the learning effects for startups in such a collaboration. Also, the collaborations could be focused not on process but on different aspects of entrepreneurship, like product design, team leadership, or networking. It might be useful to check what other informal learning environments could be defined for students and startups.

Another direction of future research could focus on the gamut of methods used to solve the startup business problems. Our results already show that the students need to be committed to the startups. Possibly not all of these methods

need to be present to achieve the desired outcome. Which of them are best suited for their purpose, and which ones had better be replaced or dropped altogether?

There are other dependencies, which we did not explore – including the locality and character of the partners and incubators and the possible relevance of the Berlin entrepreneurship ecosystem, but also the fact that our students were business administration students. A more systematic study of these dependencies might yield valuable insights into existing patterns of behaviour.

Further research activities within student-startups collaborations based on a longitudinal grounded theory approach could contribute to a deeper understanding of the social construction of learning outcomes. Such an analysis might suggest which pedagogical method would best support the intended learning outcomes. In order to avoid following one dominant learning paradigm, we could potentially integrate other perspectives on learning like, for example, Hodel's cognitive approach,[74] and try to integrate it into further theory building.

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74 *Hodel* (2016) shadowed a course on business information systems (BIS – a course type A in table 2) in the summer term 2016. His main interest was to find out if certain learning success factors derived from neuro-scientific research were visible in this course.