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What makes entrepreneurial learning difficult: cognitive conflicts or cultural clashes?

Oskar Hagvall Svensson 

Department of Communication and Learning in Science, Chalmers University of Technology, Gothenburg, Sweden

ABSTRACT

As more entrepreneurial experiences are integrated into engineering programs, students are faced with new challenges they need help in managing. While previous research has identified entrepreneurial activities that engineering students struggle with, the antecedents of these difficulties have not been directly investigated. Drawing on an ethnographic study in a project-based entrepreneurship course, this paper investigates difficulties as caused by both *cognitive conflicts* and *cultural clashes*. The findings suggest that difficulties with entrepreneurial activities do not necessarily stem from lack of entrepreneurial capabilities on behalf of students, they can just as well stem from legitimate conflicts of interest that students and teachers need to navigate. As such, difficulties cannot always be solved by students learning more about entrepreneurship. As shown in the study, collaborative and externally oriented learning activities – mainstays of project-based entrepreneurship courses – particularly contribute to putting competing social demands on students.

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Introduction

The importance of equipping engineering professionals with entrepreneurial competences has recently been recognised in engineering education reforms, spurring discussions about different strategies for integrating entrepreneurship into the engineering curriculum (Standish-Kuon and Rice 2002; Kriewall and Mekemson 2010). In this context, engaging engineering students in learning *through* entrepreneurship rather than only *about* entrepreneurship has often been deemed a promising strategy, seeing as such learning experiences can foster general competences that are valuable for any contemporary engineering career (Mäkimurto-Koivumaa and Belt 2016). This includes, for instance, ability to collaborate, manage uncertainty and to work with complex socio-technical problems (Bacigalupo et al. 2016). Accordingly, many engineering institutions currently invest in integrating more innovation projects and other practical experiences of entrepreneurial processes in engineering programs (Hagvall Svensson et al. 2020).

Much research suggest, however, that engaging in entrepreneurial activities is a difficult affair, especially for students (Lackéus 2014; Täks et al. 2014). Certain aspects of entrepreneurship have been found particularly troublesome, such as dealing with entrepreneurial failure (Bolinger and Brown 2015), navigating risk and uncertainty (Rose et al. 2018; Hatt 2018), and applying entrepreneurial methods and logics (Günzel-Jensen and Robinson 2017) – different from the methods and logics usually taught in academia (Sarasvathy and Venkataraman 2011). Such difficulties should

CONTACT Oskar Hagvall Svensson  oskar.hagvall.svensson@efd.gu.se

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not necessarily be avoided, seeing as they bring potential for profound learning experiences and more long-lasting learning outcomes (Schmidt and Bjork 1992). However, if poorly managed, difficulties may lead to cognitive overload (Kirschner, Sweller, and Clark 2006) and to students opting out of or feeling excluded from learning opportunities (Dean and Jolly 2012; Waitoller and Kozleski 2013). Accordingly, attending to difficulties in entrepreneurial learning has recently been put forth as a part of the 'moral duty' of educators who engage students in entrepreneurial projects (Dean, Wright, and Forray 2020).

When it comes to what makes entrepreneurial activities difficult for *engineering* students, specifically, little is known. Some close-up studies of entrepreneurship courses for engineering students have highlighted entrepreneurial activities that engineering students find difficult, such as pitching and teamwork (Täks et al. 2014; Rose et al. 2018). However, the more fundamental question of *why* these activities are challenging has not been directly investigated. As such, extant literature on entrepreneurship in engineering education provides educators little guidance on how to interpret the difficulties they observe and on how to best support students who are struggling.

This conceptual and empirical paper interrogates two alternative sets of antecedents to engineering students' entrepreneurial learning difficulties, starting from two theoretical frameworks which posit contrasting explanations for why students struggle with learning entrepreneurship. The paper investigates difficulties as caused by both *cognitive conflicts* (Posner et al. 1982; Gorsky and Finegold 1994) and *cultural clashes* (Kolikant and Ben-Ari 2008; Akkerman and Bakker 2011), drawing on ethnographic material from a project-based entrepreneurship course at a Swedish university of technology. These two theoretical frameworks were chosen starting from preliminary empirical observations as well as from analysis of what theories have been employed in previous work focusing on other student groups (see e.g. Bolinger and Brown 2015; Neergaard and Christensen 2017). Through the study, two cognitive conflicts and three cultural clashes encountered in entrepreneurial learning are highlighted, forming two alternative explanations for why engineering students struggle with entrepreneurial activities. Contrasting these explanations, the paper further discusses under what circumstances it is especially important to consider cognitive vis-à-vis socio-cultural antecedents to entrepreneurial learning difficulties.

The paper is structured as follows: First, the two alternative theoretical frameworks are presented and compared. Second, the methodology of the study is described. Lastly, findings are highlighted and discussed.

Theoretical frameworks: cognitive conflicts and cultural clashes

In this section, two alternative theories concerned with difficulties in learning are compared. This comparison is summarised in Table 1, including each theory's epistemological underpinnings, explanations for why difficulties arise, and pedagogical implications.

Two perspectives on learning and knowledge

Cognitive conflict and cultural clash theory – as their names imply – draw alternatively from a cognitive and a socio-cultural tradition in educational research (Newstetter and Svinicki 2015; Sfard

Table 1. Two theories of difficulties in learning.

	View of learning	Explanation for difficulties	Pedagogical implications
Cognitive conflict	Learning is the acquisition of cognitive resources. Learning is a cognitive process.	Difficulties arise because of students' (inadequate) conceptions.	Teachers should support conceptual change toward expert-like thinking.
Cultural clash	Learning is the participation in communal practices. Learning is a cultural process.	Difficulties arise because of competition between multiple (incompatible) practices and norms.	Teachers should create space for practical negotiations and mutual understanding.

1998; Barab and Duffy 2012). From a traditional cognitive perspective, knowledge is seen as a property held by individuals. Studies in this vein are interested in individual *acquisition* of knowledge through the development of cognitive resources (Sfard 1998). Learners are recognised as active constructors of knowledge, using their existing cognitive resources – notably discussed in term of ‘mental models’ or ‘conceptions’ – when interacting with new problems and in interpreting cues from their environment (Piaget 1964; Kolb 1984). Since knowledge is viewed as an individual and cognitive property, it is often treated as (relatively) context-free and it is assumed that learners may carry it with them from learning environments to other contexts. Sfard (1998) notes that the cognitive tradition has traditionally dominated educational research, a dominance that is still maintained in many applied fields of educational research, such as engineering education research and entrepreneurship education research (Newstetter and Svinicki 2015; Kyrö 2015).

In contrast, from a socio-cultural perspective, knowledge may be seen as a communal, culturally shared, property. While culture is easily associated with ethnicity or nationality, what is intended here is the norms and practices of communities structured around certain activities (Feldman and Orlikowski 2011; Lave and Wenger 1991; Brown and Duguid 1991), such as – but not limited to – disciplinary or professional communities. Socio-cultural learning theories do not discuss knowledge in terms of conceptions that students hold. Instead, *having* knowledge is ‘replaced with the noun “knowing”, which indicates action’ (Sfard 1998, 6). Specifically, knowing is *participating* in communal practices, the ongoing and recurring actions that structure communal endeavours, in line with the norms of the community. Learning, from this perspective, is a process of becoming a participant of specific communities, traditions or practices (Lave and Wenger 1991). Because it is assumed that norms and practices are negotiated among the participants of the community, knowledge is viewed as fundamentally context-bound and situational.

Two explanations for difficulties in learning

The two theories come with diverging assumptions about the mechanisms giving rise to difficulties in learning. In line with cognitive conflict theory, difficulties are thought to stem from alternative conceptions or beliefs conflicting with each other in a certain situation (Posner et al. 1982). When analyzing difficulties in terms of cognitive conflicts, students’ conceptions of an activity or of underlying problems or phenomena are put into focus. Specifically, the conclusion is often drawn that students hold inadequate, naïve, or inhibiting conceptions (Driver and Erickson 1983; Eaton, Anderson, and Smith 1984). When students do not perform in line with researchers’ or teachers’ expectations, it may thus be proposed that they are acting in line with these misconceptions. Likewise, when students report frustration with learning activities, it may be proposed that they are experiencing cognitive dissonance because new experiences or information clash with their preconceptions.

Socio-cultural theories instead centre explanations on clashes between competing practices with conflicting norms, that is, cultural clashes (Kolikant and Ben-Ari 2008). When analyzing difficulties in terms of cultural clashes, social practices and norms that are actualised in the learning activity are put into focus. Specifically, the conclusion is often drawn that students are participants in multiple communities – not only the discipline, profession, or craft that learning activities are modelled on – and that the practices and norms of these communities put competing or outright conflicting demands on students’ behaviour in certain situations (Akkerman and Bakker 2011). When students do not perform in line with researchers’ or teachers’ expectations, it may thus be proposed that they are instead acting in line with the practices and norms of another community. A classic example is discussions of how studying constitutes a social practice of its own, and that students thus often engage in ‘doing school’ rather than approaching learning activities as part of professional practice (Jiménez-Aleixandre, Bugallo Rodríguez, and Duschl 2000). When students report frustration with learning activities, it may be proposed that they are experiencing a cultural dissonance caused by a perceived incommensurability or discontinuity between the communities they participate in

(Bronkhorst and Akkerman 2016; Waitoller and Kozleski 2013), an impossibility to act in line with (all) their different memberships or identities.

Two directions for educational practice

Finally, building on these diverging assumptions regarding why difficulties arise in learning, the two perspectives come with different pedagogical implications. When discussing cognitive conflicts, it is usually assumed that these may lead to both constructive and destructive outcomes. Under the right circumstances, the cognitive dissonance that students experience may act as an impetus to transform their conceptions and accommodate new and more accurate information about a certain activity or phenomenon (Gorsky and Finegold 1994; Limón 2001; Meyer and Land 2003). However, such a situation can also lead to cognitive overload and/or a regression to more naïve conceptions (Meyer and Land 2005; Kirschner, Sweller, and Clark 2006). Accordingly, in order to foster conceptual change towards more expert-like thinking, teachers should help students resolve cognitive conflicts through an active examination of the appropriateness of different conceptions. This includes both giving students opportunities to articulate and review their own understanding of a certain activity or phenomenon and providing them with information on conceptions that are in line with research evidence on the matter.

It is similarly posited that cultural clashes can have both constructive and destructive consequences. Under the right circumstance, the cultural dissonance that students experience when they start to engage in a new discipline, profession, or craft can lead to renewed or deepened participation and a bridging of intersecting communities (Kolikant and Ben-Ari 2008; Akkerman and Bakker 2011). However, cultural dissonance encountered in learning environments may also lead to a sense of exclusion from learning and/or an opting out of disciplinary or professional communities (Dean and Jolly 2012; Waitoller and Kozleski 2013). Accordingly, in line with a socio-cultural perspective on learning, teachers should not exclusively focus on getting students to correct themselves to fit into the disciplinary or professional community. Rather, teachers should make sure that cultural encounters in learning environments are 'fertile' (Kolikant and Ben-Ari 2008). This means that both students and teachers need to engage in sense-making and negotiation to seek mutual understanding as well as ways of organising and participating in learning activities that satisfy the demands of multiple communities. As put by Akkerman and Bakker (2011), 'the emphasis is on overcoming discontinuities in actions or interactions that can emerge from sociocultural difference rather than overcoming or avoiding the difference itself' (136).

Materials and methods

To interrogate why engineering students struggle with certain entrepreneurial activities, the paper combines ethnographic fieldwork (Delamont 2012) with an alternate templates strategy (Langley 1999), focusing specifically on the cognitive conflicts vis-à-vis the cultural clashes encountered in entrepreneurial learning. As outlined by Langley (1999), making sense of the same set of observations in terms of alternative theories serves to investigate a phenomenon – in this case difficulties in entrepreneurial learning – from complementary vantage points while simultaneously creating an opportunity for qualitative theory evaluation. In short, seeing the same empirical material through the lens of multiple theories draws attention to what observed events each theory puts in focus and makes understandable and, conversely, what observed events each theory potentially misses or distorts.

The fieldwork in question was undertaken in four iterations of a project-based entrepreneurship course. In the course, the author took part as both researcher and member of the teaching team, engaging in fieldwork from a position of observing participant (Alvesson 2003b). Motivated by preliminary observations of students' recurring struggles with specific entrepreneurial activities, the initial purpose of the fieldwork was to enumerate these difficulties. However, the inquiry soon

spurred more fundamental questions regarding how these difficulties should be interpreted and addressed.

Research context

The course was given at a Swedish university of technology, primarily to undergraduate students. The focal point was a student-led team project which ran over the duration of the course (nine weeks). Across the four iterations, the number of students varied between 30 and 50. The course was given three times as a mandatory part of a technical bachelor program. In one iteration, the course was given as an elective for bachelor's and master's level students across eight different engineering programs.

In the projects, students were to generate and develop business ideas into feasible business models. The main instructional vehicle for the projects was facilitator-led workshops introducing idea development methodologies that centred mainly on design thinking, business hypothesis testing and development of strategic partnerships using stakeholder interaction (Brown 2009; Sarasvathy 2009; Ries 2011). The workshops included exercises ranging from brainstorming business ideas and creating business model canvases to simulating customer interaction and producing proto-pitches. At the beginning of the process, students were divided into teams of 4–6 by the teachers. The teams then generated initial ideas through mapping out their competences, resources, and networks. Between the weekly workshops, students were tasked with identifying and contacting actual stakeholders connected to their nascent business models, using these interactions to develop, validate, or reject parts of their value propositions. At the end of the course, students pitched their business models to a panel of invited guests from academia and industry. Apart from this project process, the course featured two team supervision sessions, three reflection seminars, and a series of individual reflection essays. In the reflective essays, students (1) identified challenges they had faced, (2) analyzed these challenges in light of entrepreneurship concepts introduced in the course, and (3) drew out learnings for future work.

Materials and fieldwork procedures

Several modes of data collection were applied from the outset, seeing as cognitive conflicts and cultural clashes may be identified and reported both by students themselves and by teachers/researchers starting from observations of students' performance. Students' own accounts of their experiences were probed through informal in-situ conversations during classroom observation, through surveying students' reflective essays, through retrospective interviews as well as through course evaluation surveys and subsequent course evaluation meetings. Further, students' engagement in learning activities were directly investigated through classroom observations, recordings of team discussions, and document analysis. The full extent of the empirical material is described in Table 2.

The fieldwork was semi-structured in nature to allow both for exploration of preliminary findings – for instance further investigation of entrepreneurial activities that had been tentatively identified as particularly difficult for students – and for emergence of new and/or contradictory observations.

Table 2. Summary of material collected over four iterations of the course.

	Classroom observation (hours)	Recorded team discussion (hours)	Reflective writing (pages)	Interviews (number)	Evaluation survey (respondents)	Evaluation meetings (number)
Iteration 1	18	–	175	8	14	2
Iteration 2	11	–	190	–	24	2
Iteration 3	14	–	230	–	11	2
Iteration 4	12	13	102	4	21	2
In total	55	13	697	12	70	8

Classroom observations were conducted when the author was not an active instructor, that is, during project workshops, at team supervision sessions, and at the final pitches. Retrospective interviews were undertaken with individual students as well as student teams and ranged from 30 to 70 minutes. Interview respondents were sampled purposively (Robinson 2014) through preliminary readings of individual reflective essays, striving to access diversity in reported difficulties. In interviews and course evaluation meetings, stimulated recall based on classroom observations and reflective essays was used to openly discuss different interpretations of what happened in and between classroom sessions.

A number of additional strategies were employed to ensure that students felt they could speak candidly as they accounted for their experiences. While researching from an insider position is commonplace in both engineering and entrepreneurship education research (Blenker et al. 2014) – ideally facilitating far-reaching access to the research context and practically relevant research findings – insider researchers need to be mindful of how their relationship to respondents influences data collection (Alvesson 2003b). To mitigate potential negative effects, participation in the study was voluntary and students were informed that their accounts would be anonymised and would not affect their grades. Furthermore, interviews – where respondents engage in impression management (Alvesson 2003a) – were conducted after the course had ended and grading was finished.

Analysis procedures

In line with ethnographic methods, the analysis process was continuous, iterative, and prolonged, starting not after the fieldwork had ended but rather at the very beginning of data collection (Miles and Huberman 1994). There were two phases of more intense analytical work, identifying cognitive conflicts and cultural clashes through two theoretical thematic analyses (Braun and Clarke 2006). First, the fieldwork material was coded for (1) *conceptions* of entrepreneurship and entrepreneurial practice voiced by students, (2) traces of *cognitive conflicts*, situations in which students' conceptions of entrepreneurship and entrepreneurial practice seemed to come into conflict with new experiences gained, and (3) signs of *conceptual change* in students' understanding. The two cognitive conflicts that were identified in this analysis formed a first explanatory model of why students in the course struggled with their entrepreneurial projects. However, as this first explanatory model could not completely account for the observed difficulties, the material was alternatively coded for (1) *practices and norms* that were actualised in the learning activities, (2) signs of *cultural clashes*, situations where practices and norms collided and were left unresolved, and (3) *negotiations* engaged in by students and teachers to achieve an accepted mode of participation.¹

In both phases, strategies were employed to avoid 'staying native' (Alvesson 2003b) and to ensure reflexivity (Malaurent and Avison 2017) in the process of interpreting why students struggled with certain aspects of the course. First, using and contrasting multiple theories highlights precisely that observations can be understood from different angles and that the meaning of an observation is not 'set', but constructed in the relating of single data units to the entirety of the material and to an overarching narrative informed by theory (Gabriel 2018). Second, a continuous process of writing up and discussing emerging findings with others (students, teachers, and educational researchers) involved more participants in the analysis process. Moreover, somewhat different levels of reliability and significance were ascribed to the data sources during analysis. Specifically, the reflective essays served more as supplementary rather than primary material, seeing as they were produced as part of the assessment and because a few students confessed in interviews to having skewed their accounts of difficulties in the essays in order to have something more powerful to write about.

Findings

The findings are presented in two parts. First, two cognitive conflicts that the students encountered in their entrepreneurial projects are introduced. Second, three cultural clashes are outlined. In Table

Table 3. Cognitive conflicts, cultural clashes, and how they complicate entrepreneurial activities.

Entrepreneurial activity	Cognitive conflicts		Cultural clashes		
	Actualising or developing ideas	Isolation or collaboration	Being professionals and doing entrepreneurship	Being friends and doing entrepreneurship	Doing school and doing entrepreneurship
Stakeholder interaction	<ul style="list-style-type: none"> Students perceive that stakeholder interaction primarily serves to sell or implement an existing solution, rather than to get new information. Early stakeholder interaction, before the business model is 'finished', is not seen as useful. 	<ul style="list-style-type: none"> Students underestimate the importance of learning from others and entrepreneurship is viewed as entirely self-serving. Seeking input from stakeholders is viewed as stealing their ideas and wasting their time. 	<ul style="list-style-type: none"> Students feel that stakeholder interaction in early stages of their projects breaks with what is expected of them as professionals. Students do not leverage their professional networks because they do not want to lose face. 		<ul style="list-style-type: none"> Students avoid stakeholder interaction because it breaks with what they expect out of course projects; it is not perceived as a reasonable demand to put on students. It is viewed as a threat to being able to finish course deliverables, as it unveils new information that needs to be accounted for.
Business modelling	<ul style="list-style-type: none"> Students do not view ideas and business models as malleable. This puts substantial pressure on idea generation, as they feel they should 'come up with' a solid idea from the start. Revising central features of the business model during the process is perceived as having to start over and actualise a new idea. 	<ul style="list-style-type: none"> Students perceive that every aspects of their business model needs to be unique. Modelling their ideas on other businesses is viewed as inappropriate. 	<ul style="list-style-type: none"> In comparison to the established organisations they already work in, students are less invested in and proud of the business models they develop in entrepreneurship courses. 	<ul style="list-style-type: none"> Students are not necessarily open with their thoughts on the feasibility of the business model, because challenging each other's ideas breaks with what is expected of them as friends. 	<ul style="list-style-type: none"> Students do not make sure they believe in and are committed to their idea, as they are anxious to start working on any idea to not 'lag behind' in the course. Revising key features of the business model is perceived as a threat to polishing course deliverables.
Entrepreneurial teamwork	<ul style="list-style-type: none"> Students perceive that the success of their project is primarily contingent upon the inherent potential of their current idea and do not invest in developing a well-functioning team dynamic. 	<ul style="list-style-type: none"> Rather than negotiating an idea that every team member are invested in, students either struggle to get the team to work on 'their' idea or give up, agree to work on 'someone else's' idea and do not try to make it their own. 	<ul style="list-style-type: none"> Students prioritise spending time on working alongside school over engaging in their team projects. 	<ul style="list-style-type: none"> Students fear that bringing up conflicts of opinions regarding for instance levels of ambitions or ways of organising will brand them as socially uncomfortable and jeopardise their relationships with their other classmates. 	<ul style="list-style-type: none"> Students structure their teamwork and roles in line with what is usually effective for school projects rather than what is effective for entrepreneurial practice, for example through dividing the project into isolated writing tasks.

3, both the cognitive conflicts and the cultural clashes are summarised, and the way in which they served as antecedents to difficulties in three focal entrepreneurial activities (stakeholder interaction, business modelling and entrepreneurial teamwork) are explicated, forming two alternative accounts for the difficulties that students faced.

Cognitive conflicts encountered in entrepreneurial learning

Two cognitive conflicts encountered by the students were identified: a conflict between understanding entrepreneurship either as a process of *actualising* or *developing* ideas and a conflict between understanding entrepreneurship either as a process of working in *isolation* or working *collaboratively*.

Actualising ideas or developing ideas. Students often came into the course viewing entrepreneurship primarily as a process of *actualising* business ideas. While this is not necessarily a complete misunderstanding of what entrepreneurial practice is about, this conception was not aligned with how students were expected to practice entrepreneurship in the course, which focused primarily on business idea *development* in the nascent phase.

This cognitive conflict complicated both stakeholder interaction and business modelling. As an example, Victor talked about how he initially struggled with stakeholder interaction because he did not see the point in contacting stakeholders so early in the process:

My initial feeling was that if I talk to people that are not up to speed with what I'm talking about, they will not understand. [...] I pictured that you create something and then sell it, rather than that you try to understand and then adapt. [...] You usually see a company and their products, and you focus on the product. And you start thinking that the nature of the process is that the product comes first. (Victor, Interview)

Here, Victor is quite explicit about the way he initially 'pictured' and was 'thinking' about entrepreneurship: as a process in which you first 'create' a product or service and then interact with potential customers in order to 'sell' it. When asked to interact with stakeholders after having just barely sketched the outlines of his team's business model, Victor consequently struggled to understand what the point of such interaction would be, since he and his team had not yet fashioned a product or service which they could present to stakeholders. It was not until Victor had modified his conception of entrepreneurship, to also accommodate the process of interactively probing the market and adapting the business model accordingly, that early stakeholder interaction made more sense and was easier to engage in for him.

Working in isolation or working collaboratively. A second cognitive conflict that complicated certain project activities concerned who drives and benefits from entrepreneurship. Specifically, many students initially expressed that engaging in entrepreneurship means working in *isolation*. This conception was not aligned with how students were expected to practice entrepreneurship in the context of the course, which focused on *collaboration* in several regards. The students needed to work collaboratively in their teams and were also encouraged to involve stakeholders in their idea development process, seeking mutually beneficial business models.

This cognitive conflict was actualised for example in the introductory ideation exercises when the students were shaping their first business models. David explained how his engagement in the ideation exercises was complicated by the fact that he had expected team members to individually bring readymade ideas to the table which they could pick and choose from, and that he was anxious about not being creative enough to come up with a good idea to contribute with. Later in the process, when he had modified his conception, he was able to see business modelling in a new, more collaborative, light:

When you really sit down together and brainstorm you can get a lot of ideas. It is something you can do as a collective. You don't just say 'See you in two weeks and we'll see if someone has had a good idea'. Or 'I will just get an idea eventually; sooner or later it will come to me in a flash of lightning'. (David, Interview)

After revising his conception of entrepreneurship, David could focus his attention on actively engaging with his team members ('really sitting down together') in order to jointly move their development process forward. David later extended this analysis to include the relationship between the team and external stakeholders in shaping key features of the business model:

I have felt as though it should come from us, from the inside, rather than coming from the outside. That it needs to be completely my or our idea. (David, Interview)

Here, David indicates that he initially felt that an entrepreneurial team should not ask others for help, because every part of a business model needs to come 'from the inside'. This conception again complicated his engagement in the project, particularly making it more difficult to navigate stakeholder interaction.

As is illustrated in Table 3, these two cognitive conflicts constitute a first account of why the students struggled with their entrepreneurial projects. However, as will be shown below, some of the observed difficulties, upon further examination, were more readily accounted for in terms of cultural clashes.

Cultural clashes encountered in entrepreneurial learning

Three cultural clashes encountered by the students were identified, between on the one hand *doing entrepreneurship* and on the other hand *being professionals*, *being friends*, and *doing school*. Together, these cultural clashes form an alternative account for why the students struggled with their entrepreneurial projects.

Being professionals and doing entrepreneurship. The first cultural clash, connected to several project activities, was one between *being professionals* and *doing entrepreneurship*. A significant number of students already had jobs in parallel to their studies – often in the industry they were training for – and spent a considerable amount of time on working. This meant that the students were upholding an established professional practice, apart from the more nascent entrepreneurial practice, as they were engaging in their projects.

This complicated certain learning activities where their professional and entrepreneurial practice put conflicting demands on their behaviour. For example, David expressed that the kind of contact they were expected to have with stakeholders in the course clashed with what he felt was expected of him as a professional:

[In the course] you are afraid that you will contact a company with something that feels a bit lame. When I'm at my job, I am proud of what I do. In the course, we had a half-finished idea, and it didn't feel nice to call someone and talk about that. (David, Interview)

The cultural clash here lies in what initiator and respondent in stakeholder interaction can expect out of each other depending on whether the interaction is part of a nascent entrepreneurial practice or an established professional practice. In David's statement, we may glean that in his professional context, a key to maintaining good relationships to other companies is to only contact them when you have something well-thought-out to offer. For David, it was difficult to satisfy this aspect of his professional practice while at the same time engaging in stakeholder interaction as a part of his entrepreneurial practice, because the business model David and his team were working on was still only 'half-finished' and potentially 'lame'. From David's account, it may be gleaned that the learning activities sometimes posed threats to students' professionalism. This meant that even though some students already had developed professional networks that could have been very useful in their projects, they often chose not to rely on these networks.

Apart from indicating that entrepreneurial learning is indeed complicated by cultural clashes, David's situation speaks directly to certain limitations of accounting for the difficulties that students encounter in terms of cognitive conflicts. Rather than acting on his individually held conceptions, David appeared to be acting on socially perpetuated practices and norms in his professional

community – specifically, trying to be ‘nice’ to people in his professional network – when he shunned certain aspects of early stakeholder interaction. Furthermore, to the extent that David was acting on his conceptions, his actions seemed to be guided by his conceptions of his concrete professional practice and not only by his conceptions of a – for him – more abstract entrepreneurial practice.

Being friends and doing entrepreneurship. A second cultural clash, connected primarily to difficulties with entrepreneurial teamwork, concerned prioritising between *being friends* and *doing entrepreneurship* in situations where these two practices posed conflicting demands on students’ behaviour.

As an example, Simon expressed that although he believed that things could clearly improve in terms of group dynamics in his team, he opted not to bring this up because he felt that it might ‘jeopardize’ his reputation in the class:

It has happened a couple of times that I have chosen not to bring up conflicts because I have felt that it may jeopardize relationships. Perhaps not the relationship to that specific person, but it feels like there is a risk of getting a bad reputation. It has happened before that some people have had conflicts in their groupwork and then that has triggered a weird mood in the whole class. (Simon, Interview)

In relation to his statement, Simon indicated that he and his fellow students, instead of engaging in trying to improve their entrepreneurial teamwork, ignored their difficulties and waited out the weeks they were supposed to work in this particular group. This meant that even though students did learn about how to improve group dynamics in an entrepreneurial process, knowledge which could have made this learning activity less challenging, they sometimes actively chose not to apply this knowledge to their own projects.

In the situation described by Simon, socio-cultural rather than cognitive mechanisms appear to be salient, seeing as he and his fellow students did not only act based on their individual conceptions of entrepreneurial teamwork, but also on what was socially acceptable among their peers. From Simon’s statement, we may glean that in entrepreneurial learning, there are other consequences at stake for students than just the entrepreneurial quality of their projects, social consequences that may be more important for students.

Doing school and doing entrepreneurship. Finally, there were clear indications that students were often *doing school* rather than *doing entrepreneurship* as they were engaging in their entrepreneurial projects, meaning that students often did what was appropriate to finish school deliverables rather than what was beneficial for the development of their business model.

This third cultural clash complicated many of the learning activities. For example, Emma described how she and her fellow students strategically stopped engaging in stakeholder interaction and steered clear of revising their business models when they had reached a certain point in their projects:

We had done everything we needed, we had solid ground to stand on. If we had kept on, we could have reached a setback. I think people settled. We didn’t want to have to change our idea the week before deadline. (Emma, Interview)

In her statement, Emma pinpoints a clash between doing more entrepreneurship (‘keeping on’ developing the business model) and doing school (doing everything that is ‘needed’ to meet the school ‘deadline’): engaging in stakeholder interaction means unveiling new information regarding the feasibility of the business model, information that after a certain point in the course could complicate the process of finishing school deliverables. In other words, doing what is most beneficial for the development of the business model can be at odds with doing what is strategic in terms of passing the course. Emma’s statement illustrates that when faced with such situations, students often gave priority to doing school over doing entrepreneurship.

Again, the way in students managed such situations speaks to the limitations of accounting for difficulties in terms of cognitive conflicts. First, to the extent that Emma and her team were acting on their conceptions, they appeared to be acting on their conceptions of schooling rather than their conceptions of entrepreneurship and entrepreneurial practice, in line with their primary

ambition to finish and hand in school deliverables. Furthermore, to the extent that they were (also) acting on their conceptions of entrepreneurship, Emma indicates – by describing how students ‘settled’ for a suboptimal business model – that it was a conscious choice to not enact their most sophisticated version of entrepreneurial practice. Although their actions are easily interpreted as stemming from not being able to perform entrepreneurship proficiently, this choice indicates strategy rather than inability. Enacting a more sophisticated version of entrepreneurial practice was not ‘needed’ in order to reach the more pressing goal, that is, passing the course.

Discussion

As more entrepreneurial learning experiences are integrated into the engineering curriculum (Standish-Kuon and Rice 2002; Kriewall and Mekemson 2010; Mäkimurto-Koivumaa and Belt 2016), students and teachers alike are faced with new difficulties to be navigated. While the need to support students as they engage in entrepreneurial projects has been highlighted in previous work (Dean, Wright, and Forray 2020), and while extant literature on entrepreneurship in engineering has identified some entrepreneurial activities as particularly challenging (Täks et al. 2014; Rose et al. 2018), the antecedents of these difficulties have rarely been investigated. In this paper, both cognitive and socio-cultural antecedents have been explored, finding two cognitive conflicts and three cultural clashes encountered in entrepreneurial learning.

Theoretical implications

The findings suggest that engineering students’ difficulties with entrepreneurial activities – in our case primarily stakeholder interaction, business modelling, and teamwork – can be understood in at least two ways. First, engineering students may have misconceptions about entrepreneurship and entrepreneurial processes. Students can, for instance, view entrepreneurship as the work of lone heroes with ingenious ideas, guiding them to focus on individual effort and investing too much time in looking for the ‘right’ business idea before interacting with stakeholders. Such conceptions are often deemed widespread and problematic in entrepreneurship literature (Taylor and Thorpe 2004; Sørensen 2008; Raible and Williams-Middleton 2021), whereas most entrepreneurial methods conversely emphasise collaboration and continuous improvement (Sarasvathy 2001; Crilly 2018; Fletcher 2006). Second, engineering students may participate in other socio-cultural practices that clash with their entrepreneurial projects. While this dynamic has been highlighted in previous work concerned with other student groups, it is mainly clashes between problematic ‘schooling’ practices and entrepreneurial practices that has been discussed (Neergaard and Christensen 2017; Günzel-Jensen and Robinson 2017; Nielsen and Gartner 2017). In this study, two additional cultural clashes were identified, between on the one hand doing entrepreneurship and on the other hand being professionals and friends.

These additional cultural clashes indicate that engineering students’ difficulties with entrepreneurial activities are complex and cannot always be solved by students learning more about entrepreneurship. While misconceptions of entrepreneurship can be scrutinised and corrected, students’ friendships and engagement in professional activities should reasonably be viewed as valuable rather than something regrettable that they should leave behind. At least, engineering students’ difficulties with entrepreneurial activities should not be viewed in isolation. Because students simultaneously engage in doing entrepreneurship, doing school, being friends, and being professionals, efforts to overcome difficulties with entrepreneurial activities may need to address several of these practices.

Further, the findings indicate that there are certain pedagogical circumstances under which cultural clashes are particularly salient and tangible, where it is particularly important to consider legitimate conflicts of interest as antecedents to difficulties in learning. For one of the cultural clashes identified in this study, between on the one hand doing entrepreneurship and on the other hand

being friends, the most tangible conflicts of interests came with the teamwork activities. For another cultural clash, between on the one hand doing entrepreneurship and on the other hand being professionals, the most tangible conflicts of interest came with the stakeholder interaction activities. Had the emphasis in the course been on individual practical and/or theoretical work within the confines of the classroom, both these cultural clashes would presumably not have been as troublesome. As such, the findings indicate that socio-cultural antecedents to difficulties in learning are particularly salient when learning activities are collaborative and externally oriented. Seeing as entrepreneurship course in engineering education usually include group work and often include seeking input from external stakeholders (Creed, Suuberg, and Crawford 2002; Aadland and Aaboen 2020; Hagvall Svensson et al. 2020), socio-cultural dynamics are particularly important to consider when organising such courses.

Implications for engineering education practice

The paper speaks to both the challenges and the rewards of integrating entrepreneurship into the engineering curriculum through engaging students in entrepreneurial projects. Seeing as engineering students encounter both cognitive conflicts and cultural clashes as they take on entrepreneurial practice, such learning experiences have the potential to transform both how engineering students think about and how they practice entrepreneurship. However, these beneficial effects do not come automatically, students need adequate support to work out their cognitive conflicts and to navigate the multiple socio-cultural practices that they engage in.

While a first key to designing appropriate scaffolding for students is to diagnose why students are struggling (Hmelo-Silver, Duncan, and Chinn 2007; Van De Pol, Volman, and Beishuizen 2010), this study shows that performing such diagnosis is not trivial. On a general level, educators may be aided by relying on triangulation both in terms of data sources and in terms of learning theories. When it comes to analyzing observations of students struggling, the theoretical frameworks and coding schemes put forth in this study may facilitate an at least two-dimensional analysis, identifying cognitive conflicts and cultural clashes to work with in helping students overcome difficulties. Further, when teaching project-based entrepreneurship courses featuring stakeholder interaction, business modelling and teamwork, educators may be served by investigating and addressing the specific cognitive conflicts and cultural clashes identified here.

A second strategy – given the limited time teachers usually have for analyzing learning processes – is to hedge the bets, simultaneously implementing some scaffolding aimed at cognitive conflicts and some at cultural clashes. On the cognitive side, teachers can find opportunities to examine and give feedback on students' conceptions of entrepreneurship, for instance through concept mapping (Bolinger and Brown 2015), visual-based exercises (Ellborg 2021), or reflection activities (Hägg and Kurczewska 2016). On the socio-cultural side, teachers should ideally get to know the practices and communities students engage in, finding opportunities to talk not only about disciplinary concepts, but also about the practical realities of the classroom and how it can facilitate space for entrepreneurship among and in-between other valued practices. Teacher–student dialogue along these lines can be facilitated for instance through engaging students as partners in shaping learning environments (Mercer-Mapstone et al. 2017).

Implications for future work

There is a pressing need for more research on both intellectual and social demands put on engineering students as they engage in different forms of entrepreneurial learning. When it comes to understanding the difficulties that engineering students face in learning entrepreneurship, findings from this study indicates that there are socio-cultural dynamics other than those that have been explored in previous work that deserve attention. While some research has described potential clashes between schooling practices and entrepreneurial practice (Günzel-Jensen and

Robinson 2017; Nielsen and Gartner 2017; Neergaard and Christensen 2017), the nature and implications of engineering students' friendships and professional relationships should be explored in future work. Of particular importance here is identifying ways in which these practices can strengthen and enrich each other rather than compete. Further, while findings from this particular course context suggest that some entrepreneurial activities are closely connected to significant cultural clashes, future comparative studies across contexts could more properly isolate circumstances such as (1) whether learning activities are undertaken in groups or individually and (2) whether students are tasked with contacting people outside of academia, investigating the effect of such circumstances on the kind of difficulties students report and what kind of support they need.

When it comes to improving support and scaffolding, design-based research developing and evaluating the effects of different support interventions could offer additional concrete materials and learning activities for educators to use when teaching entrepreneurship to engineering students (cf. Lönngren, Adawi, and Svanström 2019). Such work could also invest more directly in developing diagnosis tools that educators may use in designing scaffolding interventions that target the kind of difficulties their specific students are facing, ideally including both recommendations on data sources and analysis procedures.

Finally, the findings from this study should compel engineering education researchers to reflect upon their interpretations when analyzing why students struggle with specific aspects of entrepreneurial practice. A first step towards such reflexivity (Malaurent and Avison 2017; Gabriel 2018) is to make the role of theory more explicit in data analysis processes. Engaging in explicit theory triangulation (Hoque, Covalski, and Gooneratne 2013) constitutes a more ambitious approach. Here, drawing on socio-cultural on learning may be particularly fruitful, as a counter-point to more dominant cognitive perspectives. Future work using other fundamental theories of learning and difficulties in learning could additionally unveil new dynamics. For instance, the analysis put forth here does not speak to gender dynamics or other power relations potentially causing engineering students to struggle with entrepreneurial activities. Such antecedents could be explored in future work drawing more explicitly on socio-political theories of learning and education (Gutiérrez 2013; Beddoes and Panther 2018; Philip et al. 2018).

Conclusions

As engineering education institutions worldwide are making efforts to integrate entrepreneurship into their programs, it is imperative that the development of entrepreneurial competences made possible by these initiatives is not thwarted by the difficulties engineering students face as they start to engage in entrepreneurial practice. To develop research-based responses to these challenges, inquiry into what makes entrepreneurial learning difficult for engineering students needs to be strengthened. This paper has contributed by investigating and comparing two sets of antecedents to students' difficulties, identifying two cognitive conflicts and three cultural clashes engineering students can encounter when learning entrepreneurship and illuminating the learning activities in which they are most salient. Through these findings, the study shows that entrepreneurial activities are complicated not only by lack of entrepreneurial capabilities on behalf of students, but also by legitimate conflicts of interest that students and teachers need to navigate. Engineering education institutions should respond accordingly, making sure that entrepreneurial learning activities do not overwhelm students, neither intellectually, nor socially.

Note

1. A less formal aspect of our data collection and analysis took the shape of implementing changes in the course structure and adding new learning activities to address identified difficulties. Following the same sequence as our two-stage analysis procedure, the initial changes were informed by assumptions that difficulties stemmed from students lacking understanding of entrepreneurial action. These changes centered on developing new

lectures and integrating new literature seminars with the aim of supporting students' conceptual development. Seeing as many difficulties remained after the introduction of these activities, new changes and additions were made informed by a more socio-cultural perspective on learning. These changes centered on creating more space for systematic negotiation of intersecting social practices, for instance introducing some team development activities running parallel to the projects. While students still reported struggling with certain aspects of their entrepreneurial projects after these changes, some challenges seemed to cause less frustration and serve more as a source of learning.

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Notes on contributor

Oskar Hagvall Svensson is a higher education researcher at the department of Communication and Learning in Science, Chalmers University of Technology, and at the department of Economics, University of Gothenburg, Sweden. His current research interests include higher education pedagogy, education for sustainable development, and STEM-education.

ORCID

Oskar Hagvall Svensson  <http://orcid.org/0000-0001-7876-0120>

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