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THE SOURCES AND DYNAMICS OF EMOTIONS IN ENTREPRENEURSHIP EDUCATION LEARNING PROCESS

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Abstract. The study investigates student experiences of entrepreneurship education and focuses on gaining a better understanding of the main sources of emotions as well as the role and dynamics of emotions in learning. Data was collected in three entrepreneurship education settings in Estonia, Finland and Namibia using in-depth interviews (N = 79) and was analysed using qualitative thematic analysis. As a result, three themes highlighting the main sources of emotions were identified: 1) new kind of learning environment, 2) collaborative learning, and 3) challenging tasks. The learning environment sub-categories were: 1a) uncertainty and confusion, 1b) theory versus practice and 1c) support from outside. The collaborative learning sub-categories consist of: 2a) teamwork, 2b) time pressure and 2c) individual differences. Challenging tasks had the sub-categories: 3a) overcoming knowledge and skills gaps, 3b) interacting with the outside world and 3c) leadership and managing people. In addition, dynamic patterns of emotions in the course of learning processes were identified.

Keywords: emotions, entrepreneurship education, learning environment, collaborative teamwork, challenging tasks, dynamic pattern, thematic analysis

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1. Introduction

Emotions are always present in learning processes, and are triggered by a variety of elements such as personal and contextual factors, instructional strategies, prerequisite knowledge, learning goals, motivation, etc. Recent studies within the field of education, entrepreneurship education and beyond imply that emotions have a major impact on learning motivation, self-regulation and identity building (Cope 2003, 2005, Efklides and Petkaki 2005, Efklides and Volet, 2005,

Gibb 2002, 2010, Heron 1992, Kyrö 2005, 2008, Mezirow 1991, 2003, 2006, Pekrun 2005, Pekrun et al. 2007, Pintrich 2004, Pintrich and Zusho 2007, Pittaway and Cope 2007, Pittaway and Thorpe 2012, and others). Many of these studies indicate that even though student emotions develop in the social context, it is still unclear how such a process can be supported so that it enhances student learning, and how negative emotions could be put to productive use (Efklides and Volet 2005, Pekrun 2005). Furthermore, Pekrun (2006) states that many studies focus on a single emotion or single functions of emotions, leading to fragmentation and a lack of a more integrative approach. Kyrö (2008) calls for more research on affective constructs in education due to their potential to empower entrepreneurial learning. Similarly, Cope (2003) underlines the need for more research on the social dimension of the learning process and its relation to emotional intensity, as this has an impact on reflection and learning.

Following the line of thought presented above, the aim of this paper is to gain a better understanding of the role and dynamics of emotions in entrepreneurship education learning processes and of the most important sources that are causing these emotions, both negative and positive.

2. Emotions in education and entrepreneurship education

The role of emotions in student learning has recently emerged as an important new field of educational research. Studies have addressed questions such as what emotions are experienced by students, what functional importance these emotions have for learning, and whether modified instruction and teacher behaviour can foster student emotions (Pekrun, 2005). For example, Järvenoja and Järvelä (2005) identified five different sources of emotion: *self-related*, *context-related*, *task-related*, *performance-related* and *social-driven*. Pekrun (2006) and Pekrun et al (2007) introduced the control-value theory of achievement emotions, according to which emotions are directly tied to achievement *activities* and achievement *outcomes*. Thus, as they point out, this can be reflected in the enjoyment arising from learning when goals are successfully met or anger about task demands or other pressures. According to Pekrun (2006), *activity emotions* are associated with on-going achievement-related activities, and *outcome emotions* are related to the outcomes of these activities. Depending on circumstances, these emotions can be positive or negative, and activate or deactivate learners. Since emotions affect student interest, engagement, achievement, personality development and social climate in different educational settings, they are central to psychological health and well-being (Pekrun 2006). Most importantly, emotions influence student academic performance and are linked to motivation, use of learning strategies and self-regulation (Pekrun et al. 2007).

In line with Pekrun's theory, Pintrich and Zusho (2007) also claim that motivation and self-regulation both play an important role in learning and achievement for college students. Pintrich and Zusho (2007) offer three com-

ponents that seem to have been widely used in different motivational models: 1) beliefs about one's ability or skill to perform a task (expectancy components), 2) beliefs about the importance and value of the task (value components), and 3) feelings about the self, or emotional reactions to the task (affective components). All these components are also present in the control-value theory (see Pekrun 2006, Pekrun et al. 2007).

Sansone and Thoman (2005) suggest that dynamic patterns of positive and negative emotions occurring over time lead to either good or bad learning processes. They add that these qualitatively different patterns of emotional experiences at various stages of engagement may also lead to distinct learning outcomes. Furthermore, they state that there is a need to develop new methodologies for uncovering the important dynamics in learning over time (Sansone and Thoman 2005). D'Mello et al (2005) complement this by claiming that confusion that is triggered by contradictions, conflicts, anomalies, and other factors can even be beneficial in learning if regulated appropriately. Therefore, it is important to understand the role and dynamics of emotions in different kinds of learning contexts and use this knowledge wisely in pedagogical practices.

Within entrepreneurship education only a few researchers have explored the emotional aspects of teaching and learning. Some have highlighted that this is an important area where further research is needed (Kyrö 2008, Gibb 2005), but very few have studied it explicitly. Cope (2003, 2005, 2010) has prioritised emotions within entrepreneurial learning, but his research has mainly focused on informal learning environments. A notable and potentially valuable exception has been Pittaway and Cope (2007), focusing on how to simulate entrepreneurial learning in an educational setting based on action and experiential learning theories. Their empirical data showed that emotional exposure created through group dynamics played a major role in effective student learning. Even more, in entrepreneurship education there is a preference for creating real-life time pressured learning environments with unexpected events (Cope 2003, Gibb 2008, Pittaway and Cope 2007). This means learning where the learners have to take responsibility of their own learning, to control their achievement as an individual learner and as a member of a social learning environment. Experiential learning typically involves various challenges, problem solving situations and dilemmas that generate high levels of emotion, which can have an important impact on learning and identity-building processes. All this places learners under extreme levels of emotional pressure and 'personal exposure' associated with running a small business (Cope 2003), and brings the emotional content of the learning – what it really feels like – as the focus (Cope 2003, Gibb 2010, Pittaway and Cope 2007).

Experiential learning theories that have distinct humanist connections and emerge from the field of adult education (e.g. Heron 1992, Kolb 1984, Mezirow 1991, and others) are often used as the basis for entrepreneurship education. In educational research, similar theoretical principles are presented by social-constructivist theories of learning (e.g. Gergen 1994, Tynjälä 1999) and their applications, such as the Model of Integrative Pedagogy (see Tynjälä, 2008;

Tynjälä and Gijbels, 2012, and Täks et al. 2013). Even though the abovementioned theories use different theoretical concepts, their pedagogical implications can be very similar. For example, both focus on metacognitive and self-regulative skill development, constant and creative problem solving, collaborative social learning, interaction with the real world, the integration of theoretical and practical knowledge, critical thinking, and constant reflection in the learning environments where the teacher is the facilitator of student learning.

3. Purpose of the study

Cope (2003), Pittaway and Cope (2007) and Gibb (2008) emphasise that learning environments based on experiential and socio-constructivist theories create real-life, time pressured and unexpected flows of events that place students under high levels of emotional pressure as well as personal exposure. However, the role of emotions in these contexts is seldom examined. Therefore, the purpose of the present study was to examine the role and dynamics of emotions in entrepreneurship education. In more detail, the following research questions were addressed:

- What are the main sources of negative and positive emotions in entrepreneurship education learning process?
- What kinds of dynamic patterns can be identified?

4. Method

4.1. Context, sample and procedures

The data for the study were collected from the students in entrepreneurship interventions in three countries – Estonia, Finland and Namibia. These are small societies in different phases of their economic development: one matured economy, one transitional economy and one developing economy. *The Estonian data* (N = 48) were collected from a socio-constructivist learning setting, an entrepreneurship course for engineering students from the TTK University of Applied Sciences that lasted four months. The students were fourth year full-time engineering students from three different disciplines: two Automotive Engineering student groups, one Resource Management in the Field of Clothing and Textiles and one Technical Design and Technology of Apparel group. The entrepreneurship course followed the principles of integrative pedagogy (Tynjälä 2008, Tynjälä and Gijbels 2012, Täks et al submitted) and was mandatory for all participants. The aim of the course was to simulate real-life activities, based on project-based, interactive and collaborative learning, and to focus on integrating theory and practice. A basic principle in the pedagogical design was learning by doing. The data were gathered in two parts; videotaped semi-structured group-interviews (N = 48) right after the course, and in-depth individual interviews with selected students from the same

group (N = 16) approximately two months after the course. All the data were audio-recorded and transcribed verbatim.

In Finland and in Namibia, the data were gathered in two experiential learning settings: Proacademy and Prolearning, in universities of Applied Sciences in Tampere, Finland and Windhoek, Namibia. The *Finnish* students had been studying for a 3.5 year programme for a Bachelor degree, where the last two and half years were spent at the Proacademy. Instead of lectures and exams, the learning process was supported by coaches, and the process included the latest professional books, tools and theories relating to organisational and situated learning. The students set up a team company and integrated their learning needs to support the development of the team and sustainable company. In Namibia, the learning model used similar experiential learning principles, as the Namibian Prolearning programme is based on the model of the Finnish Proacademy described above. The *Namibian* students were mainly from a business administration programme studying for a five-year honours degree, where the last two years are spent in the Prolearning programme.

The *Finnish* data (N = 18) were gathered during 2.5 years of Proacademy studies. The students were interviewed three times using individual semi-structured interview schemes: at the beginning, in the middle and at the end of the programme. The interviews were audio-recorded and transcribed verbatim. The *Namibian* data (N = 13) were gathered and organised similarly to the Finnish research, but in addition, a fourth interview was held approximately one year after the studies with ten students (N = 10). Both in Finland and in Namibia the students applied for the entrepreneurship programme and were selected based on individual interviews.

The interview questions used in the present study were similar in the three study contexts and included, for example, the following themes:

- Comparison of the subject with other courses
- Discussion of the issues that were handled during the courses
- Discussion of the students' role as a learner during the courses
- Discussion about the motivation, relations and emotions about the entrepreneurship and entrepreneurial learning, and
- Expectations and reservations of the learner to this kind of learning

4.2. Data analysis

As mentioned earlier, the purpose of the study was to identify sources and dynamics of emotions in entrepreneurship education. We were especially interested in features that would be common to different contexts, different disciplines and different countries and therefore the data gathered in the three countries was treated as one database. To identify similarities, a thematic analysis (Ryan and Bernard 2003, Braun and Clarke 2006) was applied with the aim of identifying and illustrating sources of emotions, as well as the role and dynamics of emotions throughout the learning process. Braun and Clarke (2006) state that the rationale for choosing this methodological approach makes it possible to

provide rich and detailed qualitative data that can be used within different theoretical frameworks. To identify the underlying ideas and assumptions that involved the interpretation of data, the six-phase model of thematic analysis by Braun and Clarke (2006) was applied as follows: 1) getting familiar with the data, 2) generating initial codes, 3) searching for mutual themes, 4) reviewing found themes with related sub-themes, 5) defining and naming the themes, 6) producing the results. This was achieved by iteratively moving back and forth between the coded data set and discussing the findings at different phases of the analysis with all the researchers involved in the process.

During the data analysis and discussions among the researchers, the dynamic patterns of emotions started to emerge. For a more systematic analysis, firstly positive and negative emotions of each theme and sub-theme were identified and compared. Secondly, these identified expressions of emotions were iteratively located and relocated in different situations in the entrepreneurial courses until the main dynamic pattern from negative toward positive emotions throughout the learning process was identified. Finally, as a result of this systematic iterative analysis, the expressions of emotions were divided into three main sections that also highlight the dynamics of the emotions in different phases of the learning process.

5. Results

5.1. Sources of emotions

Data analysis indicates that the most frequent sources of emotions can be divided into the following themes:

- 1) new kind of learning environment
 - 1a) uncertainty and confusion
 - 1b) theory versus practice
 - 1c) support from outside
- 2) collaborative learning
 - 2a) team work
 - 2b) time pressure
 - 2c) individual differences between the learners
- 3) challenging tasks
 - 3a) overcoming knowledge and skills gaps
 - 3b) interacting with the real world
 - 3c) leadership and managing people

5.1.1. A new kind of learning environment

The first powerful source of emotions emerging from the data was the transition from a traditional learning environment to an activated learning environment based on socio-constructivist thinking and the Model of Integrative Pedagogy (in

Estonia) or experiential learning theory (in Finland and Namibia). The theme a *new kind of learning environment* was divided into three sub-themes: 1a) uncertainty and confusion related emotions, 1b) theory vs. practice related emotions, and 1c) emotions related to support from outside. Example quotes of these themes are exhibited in Table 1.

Table 1. Emotions related to the transition from traditional to activated learning environment

Main theme	Sub-themes	Quotes from the data
1. New kind of learning environment	1a. Uncertainty and confusion	<p>“We have had so many subjects where we just sit, write and listen... but now we had to look and think everything by ourselves; independently” (Estonian, male)</p> <p>“I feel good about it. A little bit scared at the same time because I know it will be challenging but also feel good about it because I want to try something new...” (Namibian, female)</p> <p>“... okay, we are used to being told what you should do and what you should not do. Now you have to learn on your own. And it’s very challenging...” (Namibian, female)</p>
	1b. Theory vs. practice	<p>“I feel relieved because you can really see that even when I do my own reading I got enough time to contextualize what I’m reading. I got enough time to apply what I’m reading. Because what I can read yesterday, I can really apply today. Unlike in the old tradition what I can read today, I only apply it after I graduated. So to me, the feeling is really of a professional. Of somebody who is trying to be an expert in the field.” (Namibian, male)</p> <p>“I am wondering if I can really learn enough theory here, as during my last year studies we had a lot of theory. Do I actually learn here? ... but I have thought that you really learn by doing... still, I am still thinking if there will be some theoretical things, which I don’t learn here?” (Finnish, female)</p>
	1c. Support from outside	<p>“The fact that people did not actually believe in the course, especially from the management side and from other lecturers ...so it was a bit difficult for doing the course that people did not really have a lot of faith in.” (Namibian, male)</p> <p>“They train mechanics here ... subordinate ... entrepreneurship is rather discouraged in this school.” (Estonian, male)</p>

Since the emphasis was on learning by doing in all three learning settings, the students had to take responsibility for their own learning. They had to face new situations, cope with uncertainty, solve problems, find a balance between theory and practice and seek relevant information by themselves. This caused confusion and stress, especially at the beginning of their studies. Support from ‘outside’ the programmes, from the management and co-lecturers as well as from fellow students, was reflected by the students as a very important factor of learning motivation.

The transformation from a traditional learning environment to an active, collaborative learning environment raised questions among the students about learning goals, uncertainty about the theoretical grounding of the learning as well

as self-regulation issues. Students in all three learning environments studies experienced the change in the learning environment as transformative, which caused strong negative emotions (worry, stress, frustration, annoyance, and anxiety) and a sense of uncertainty. The variation in learning experiences helped learners to realise and see different angles, as well as recognise the advantages of this kind of learning. Table 1 presents examples of student experiences of situations where a *new kind of learning environment* was a source of emotions.

5.1.2. Collaborative learning

The second powerful source of emotions was related to the *collaborative learning* and team work environment that could be divided into three sub-themes: 2a) team-work related emotions, 2b) time-related emotions, and 2c) emotions related to individual differences. Some examples of these sources of emotions are exhibited in Table 2.

Table 2. Emotions related to collaborative team work

Main theme	Sub-themes	Quotes from the data
2. Collaborative team work environment	2a. Team work	<p>“If we can make it as a team through this challenge we can make it through the next.” (Namibian, female)</p> <p>“... teamwork is very important, and right now even with the job that I'm doing, we have a team, it came like an easy thing, because I'm already used to working in a team. So I think one of the most valuable things that I've learned is teamwork.” (Namibian, female)</p>
	2b. Time management	<p>“The most difficult was to find the time ... it was really challenging, but once we got together, we managed to work well.” (Estonian, female)</p> <p>“To tolerate the stress and the matter that you have to work a lot with high speed... and also then you understand that if you leave some things undone, it will also harm the other team members... you learn to think also about the others and not just about yourself.” (Finnish, female)</p> <p>“... /./ We work, we are like talking, we are there, and everybody has their different ideas, their different view on certain things. So we'll sit there for hours just discussing one thing and then we don't come to a conclusion-“ (Namibian, Female)</p>
	2c. Individual differences	<p>“... when you have to work with different people ... everybody has their background, vision ... it makes it difficult to fit everything and make people move in the same directions...” (Estonian, male).</p> <p>“././the most difficult in this group././ Even though I knew the people it's like okay we're never this close. And it's like sometimes is like the personality clashes and all those different opinions and those who do not reconcile with your opinion And then it's like you don't know how someone else is going to feel when you say something or when you oppose ... “ (Namibian, male)</p> <p>“It has not been easy to try to forget my own ideas and be more objective to understand the views of my team mates and not just stick in my own ideas...” (Finnish, male)</p>

Even though being the source of emotions, both positive and negative, the team work experience was considered necessary and useful. Team pressure and team support helped to overcome the stages of learning where frustration and negative emotions dominated. Time management was considered challenging and came up during the interviews quite often. The constant lack of time was considered stressful, but also helpful to keep students up with the study-related tasks. At the beginning of their entrepreneurship studies many of the students in all countries felt insecure and puzzled trying to find their own place within the team. Adjusting to the new team members with different socio-cultural backgrounds, previous knowledge and learning conceptions was considered challenging as well as fascinating, involving both negative and positive emotions. However, during the studies the students noticed the strength of the team and the opportunity to learn a lot from each other. They started to value team skills as important skills for future work life, i.e. dealing with different kinds of people.

5.1.3. Challenging tasks

The third source of emotions related to challenging tasks and could be divided into three sub-themes: 3a) overcoming knowledge and skills gaps, 3b) interacting with the outside world, and 3c) leadership and people management (Table 3). Financial calculations, sales prognosis, leadership and budgetary issues were found to be the most challenging tasks, especially in cases where the learners lacked previous knowledge and experience.

A supportive team environment was recognised as being a great source of motivation and helped to deal with difficult tasks. Also, interaction with the real world was considered challenging: in the Estonian case students were hesitant about talking with potential customers. In Namibia and Finland, the teams were doing business with real customers with real budgets, and these interactions caused a lot of positive and negative emotions. Leadership issues were considered both difficult and rewarding, complicated when conflicts appeared, and positive when the team performed well. Consequently, all the challenges mentioned were experienced as difficult and even frustrating at times, but after successfully completing challenging assignments, the participants recognised having learned a lot and found their studies valuable and fulfilling.

In general, the aspects of learning that caused a variety of emotions seemed to result in better self-awareness and self-confidence, and therefore, possibly improved the self-regulative abilities of those participating in the study. In addition, data suggest that all students consequently experienced an improved ability to cope with uncertainty, especially in the case of Finland and Namibia (due to the extent and nature of the programme).

Table 3. Emotions related to challenging tasks

Main theme	Sub-themes	Quotes from the data
3. Challenging tasks	3a. Overcoming knowledge and skill gaps	<p>“Well, this financial part of the business plan was the time when we had disagreements within the group. I think we just didn’t know how to do it /.../ but on the other hand, this gave us motivation to continue and resolve the exercises, and in general we had a very motivating atmosphere in the group, none one of us was ready to give up.” (Estonian, female)</p> <p>“... I did like doing the presentations, but to go through all the material, to prepare it, was challenging and presenting the way that others understood it ...” (Estonian, male)</p> <p>“Those challenges that were completed successfully made us all extremely happy and relieved.” (Namibian, female)</p> <p>“I think the most of the positive emotions came from when we succeeded with the project.” (Namibian, female)</p>
	3b. Interacting with the real world	<p>“... to conquer your own fears, as here you need to be kind of very active yourself. You have to call people you don’t know, make contacts, sell your own products... so at the beginning it is quite scary, as earlier you did not need to do that at all.” (Finnish, male)</p> <p>“It’s the point of these projects, as there we have real customers and you need to do a good job for these customers, no matter how tired you and the others are, but you have to do your best and that’s of course stressful...” (Finnish, male)</p>
	3c. Leadership and managing people	<p>“...occupying the position of business leader /.../ and these thirteen individuals come to you with personal problems, problems they have with their team members. And then you have to sit and look at both sides of the story/.../ all the friendships are there, but we have to be professional at the same time.” (Namibian, male)</p> <p>“You have to be the leader to drive the company forward... because the vision comes from you /.../ but organising team work and delegating and dealing with people makes it complicated /.../ challenging and fascinating /.../ you have to motivate your team /.../ even those who were scared or hesitant at the beginning.” (Estonia, male).</p> <p>“I learned how to manage the team, to be a leader. I had to find different methods and use techniques to motivate the team members to work for our vision. Not everybody is able to motivate themselves, and sometimes you had to be strict and concrete as well...” (Estonia, male)</p>

5.2. Dynamic patterns of emotions in entrepreneurship education

The data from three different countries and learning settings showed that emotions not only played an important role in entrepreneurship education, but that they also followed certain identifiable patterns in the course of the learning process. We call these patterns ‘waves of emotions’ and they are presented in Figure 1. The figure is divided into three main sections: 1) emotions that dominated at the beginning of the learning process, 2) emotions that appeared important throughout the learning process, and 3) post-learning emotions. As can be seen in Figure 1, the three main sources of emotions (learning environment,

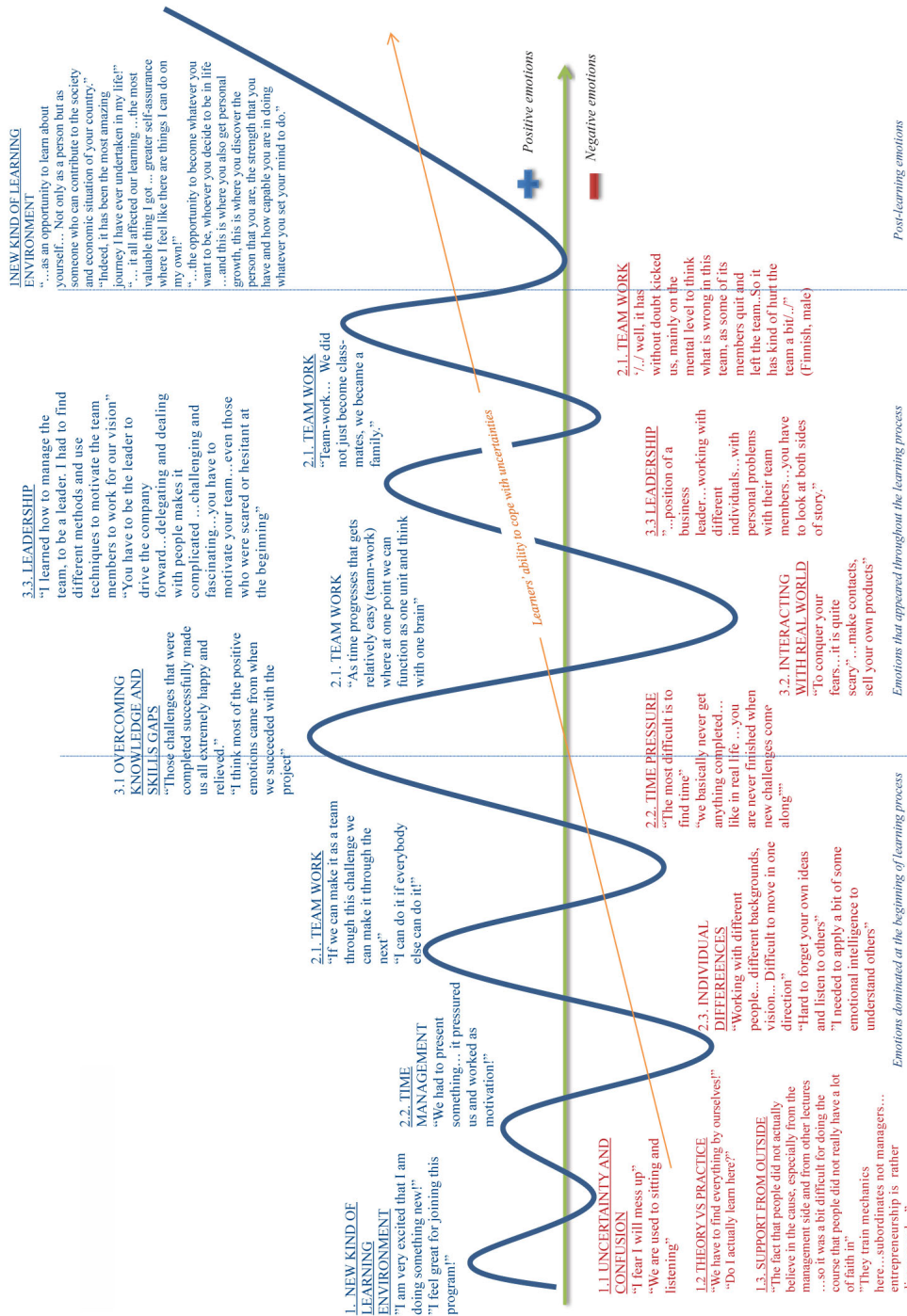


Figure 1. The waves of emotions.

collaborative learning and challenging tasks) with their sub-sources are strongly interrelated with each other during the learning. In addition, it is evident that the meaning and role of emotions changed when the collaborative team work improved in the learning process. In general, a collaborative team work environment seemed to be central in coping with either confusion reflected in theme 1 (learning environment) or challenging tasks reflected in theme 3, indicating that team work is a crucial source of support during this kind of learning experience. In addition, transformation of learning environment (theme 1) causes a lot of emotions, especially at the beginning of the studies (mainly negative) and after the end of studies (positive). The data also indicated that positive emotions, constant reflection, dialogue and feedback on the achieved outcomes during the learning helped students to overcome the difficulties that were experienced. Time management seemed to play a key role throughout the studies, being an important but challenging factor related to success in team work and the achievement of the learning goals.

The straight yellow line in Figure 1 illustrates students' increased ability to cope with uncertainties throughout the learning processes in different themes. The figure also illustrates the intensity of emotions during different phases of the learning process and related to different themes. For example, the negative emotions were strongest when related to interacting with real world and to individual differences, whereas positive emotions were strongest in situations where knowledge and skills gaps were overcome and especially at the end of the course when the students could see the benefits of the new kind of learning environment as a whole. It has to be kept in mind, however, that the intensity illustrations here are only suggestive and are not based on objective measures.

6. Discussion

The current study focused on gaining a better understanding of the most important sources of positive and negative emotions, and the role and dynamics of emotions in entrepreneurship education learning process. The findings were derived from individual interviews from three different educational settings – Estonia, Finland and Namibia. As a result, three main themes of sources of emotions were identified as follows: 1) learning environment, 2) collaborative learning, and 3) challenging tasks.

When comparing our study results with earlier findings by Järvenoja and Järvelä (2005), similarities and differences in the identified sources of emotion can be seen. While their study resulted in 5 sources of emotions, that is, self-, content-, task-, and performance-related and socially driven, in our study these sources were included in the sub-themes. For example, sub-theme 1a, uncertainty and confusion, is a self-related source of emotion, sub-theme 1b, theory versus practice, is a content-related source, and sub-theme 1c, support from outside, is a socially driven source. Therefore, these sub-themes describe the sources of emotions in a

more detailed way. On the other hand, of our three main themes, only one, challenging tasks, relates directly to Järvenoja and Järvelä's sources of emotions. The two other themes in our study, a *new kind of learning environment*, and *collaborative learning*, refer to the context of learning and the process of learning, respectively. Consequently, these main themes describe sources of emotions at a more general level. The differences in the sources of emotions may be related to the level of education and the nature of the learning environments.

In addition to these results, the data highlight that both positive and negative emotions play an important and beneficial role in learning as long as there is a balance between positive and negative emotions. This supports earlier findings by Pintrich (2004) and Pintrich and Zusho (2007) stating that motivation and self-regulation, which exist in close interplay with emotions, play a significant role in learning. Pekrun (2006) and Pekrun et al. (2007) highlight that activity and outcome emotions are closely related, and these relations could also be seen in our results.

Our findings have important pedagogical implications. As to the first main source of emotions, a new kind of learning environment (theme 1), sharing the feelings and knowledge, having constant dialogue, reflection and feedback within the team from the peers and the coach/teacher proved to be effective coping strategies to overcome negative emotions, as well as the challenging tasks in the learning process. In addition, management support or the lack of it seemed to play an important role. Therefore, it is essential to consider these issues when adapting this kind of learning setting into school programmes.

The other important source of emotions, collaborative learning (theme 2), seemed to play a central role in learning, and that should be taken into account in planning similar kinds of learning settings. If emotional aspects are neglected and problems in teams remain unsettled, it could possibly lead to an overload of negative emotions and bad learning experiences (D'Mello et al 2005, Sansone and Thoman 2005).

Being aware of how learning can be supported, as well as when and what kind of support is needed helps the learners to overcome even the most challenging tasks (theme 3) and can turn negative emotions into positive learning outcomes. Consequently, understanding what could be done to engage, activate and enhance positive emotions in order to support motivation, self-regulation and deep learning is crucial (Pekrun 2006, Pintrich 2004, Pintrich and Zusho 2007) in these kinds of learning environments.

In addition to the sources of emotions, the study identified the hypothetical pattern of emotions, 'Waves of emotions' which help us understand *what* kinds of emotions emerge and *why* these emotions appear during entrepreneurship education learning processes.

These dynamic patterns with positive and negative emotions in entrepreneurship education suggest how to regulate the learning process so that confusion, contradiction and conflicts could be directed toward positive outcomes. The patterns also raise the notion of what could be done in order to help a learner believe in his or her

ability to perform a task, and to see the value of tasks that lead to positive feelings about themselves. The learning environment should be organised so that it encourages students to experience different emotions, and even to fail occasionally, but to see those failures as learning opportunities. Therefore, the hypothetical pattern of 'waves of emotions' in learning environments with real-life authentic content contribute to designing learning experiences that prepare students to cope with the turbulent business environments and uncertainties of their future work as entrepreneurs or intrapreneurs. In addition, these findings contribute to a better understanding of the complexity and dynamics of emotional patterns in entrepreneurship education learning process, offering ideas to assist in planning instructional strategies. It should be noted that these implications are not limited to entrepreneurship education, but can be applied in various domains of education when real-life and authentic content is integrated into a learning environment. However, these emotional patterns should be researched and analysed further in individual level.

Finally, the results support and provide deeper insight into the relationship proposed by Cope (2003) between the 'emotional intensity' of the event and the associated depth of personal reflection and learning' (p.446). An implication from this study that is perhaps counter-intuitive is that educators should regard negative emotions as an important and valuable trigger to deep learning, provided that they monitor and support the process carefully in order to avoid any detrimental effects on motivation and learning. In this study, both negative and positive emotions played an important role in learning. In line with the saying 'no pain, no gain' it has even been proposed that negative emotions should be regarded as a valuable aspect of education (Kyrö et al. 2011). Therefore, we suggest that teachers and students should be made aware that different emotions are involved in the learning processes, and that in situations where negative emotions emerge, appropriate actions may turn them into sources of better self-awareness and self-regulation, which in turn may lead to deeper learning. Therefore, the main implication of our findings is that emotions should be taken into account when designing learning environments and discussed in learning situations using different tools for reflection.

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