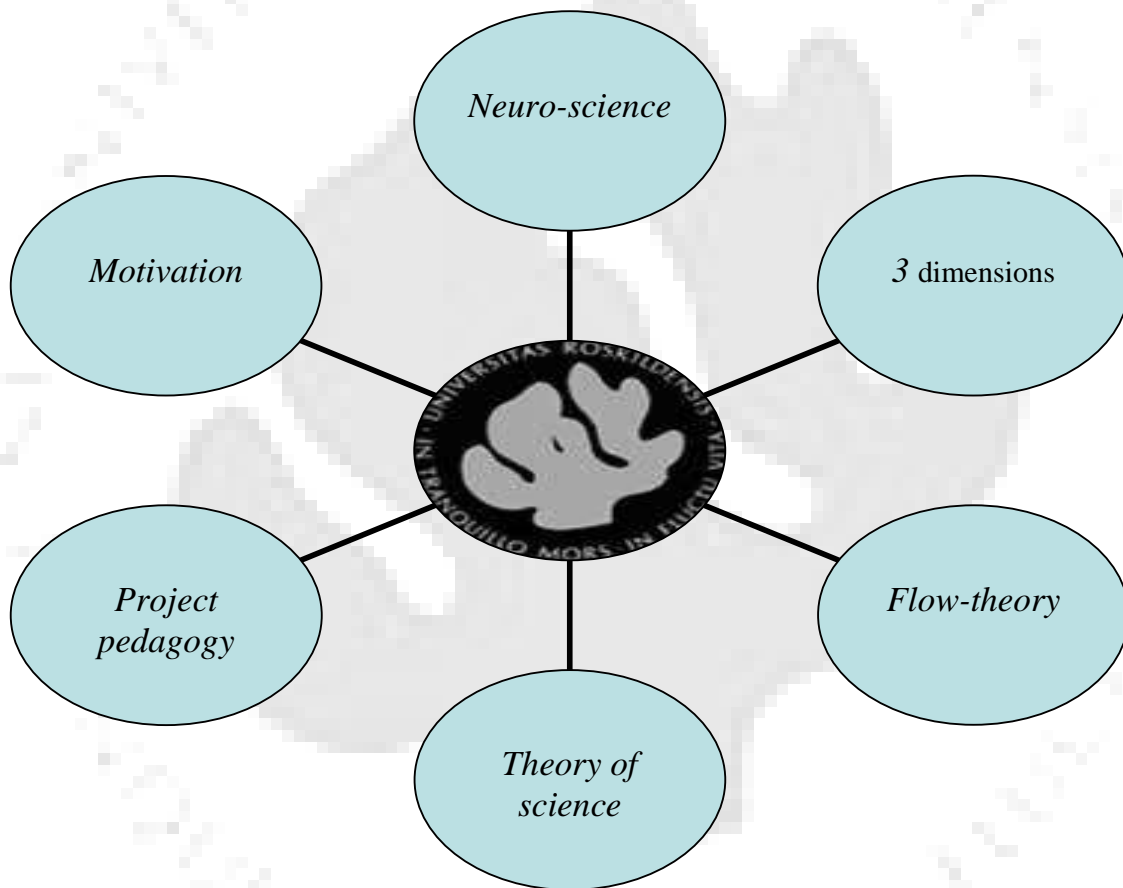


LEARNING AT RUC



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1 – Introduction

1.1 Motivation for the project

“The ego falls away. Time flies. Every action, movement, and thought follows inevitably from the previous one, like playing jazz.” (Csikszentmihalyi 2007c)

The words are taken from the man behind the flow-theory, Mihály Csikszentmihályi¹ and they sound captivating. They describe the state ‘flow’ in which the theory claims that humans learn the best.

Also from the field of natural science there appear evidence that our emotions are highly related to our learning processes – this is researched in neuroscience. There seems to be a consensus that the level and quality with which the learner engages in the learning situation highly affects the learning process.

As students at Roskilde University (RU) we are naturally interested in knowing if the university offers us the best facilities for learning.

RU was founded in 1972 on the idea that *project pedagogy* is the best way of providing education in respectively social science, natural science and the humanities.

Looking at contemporary research results on learning from the field of the humanities as well as from the natural sciences and comparing them with the theories on learning that constitutes the pedagogy of RU, it would be interesting to see if the objectives of RU are actually actualized in the best way possible.

70-80% of an average students time at Roskilde University is spend on project work (“Principles of education and research – Roskilde University”). Thus the project pedagogy constitutes the most important framework for learning for students at RU. Project pedagogy is indeed important to the students as well as to Roskilde University as an institution and has been so from the very beginning.

Thus our main question becomes:

Focusing on contemporary theories on learning, is the project pedagogy at Roskilde University facilitating the learning of academic skills in the best way possible, if not how can it be improved?

¹ Professor in psychology at Claremont Graduate University in Claremont, California

We mentioned how it seems that emotions play a significant role in learning. Since the emotions that arise in any situation are highly dependent on the motivation with which we engage in the situation, the motivation of the learner has to be known, if we want to improve the learning that is taking place.

Our research questions therefore become:

- What is learning?
- What are the theories behind learning at RU?
- What is project pedagogy at RU?
- How can one distinguish good research and science from bad?
- How do neuroscience and flow-theory describe learning processes?
- What motivates students at Roskilde University?

1.2 Dimensions

We have chosen to include two dimensions in this project: ‘subjectivity and learning’ and ‘philosophy and theory of science’.

The dimension of ‘subjectivity and learning’ occurred logically since the whole project regards theories of learning. This is therefore also the dimension we will focus at.

We have taken in the second dimension ‘philosophy and theory of science’ so that we are able to approach critically the different epistemologies used in the project. The relevance of highlighting epistemological considerations in this project is to make the foundation of our investigation approaches as clear as possible.

This is said especially with the part about neuroscience in mind. In this section we will be referring to data collected and analysed in the sphere of natural science, incorporating this into the hermeneutic approach of the rest of the project. In order to make the contribution from neuroscience fruitful we found it necessary to point out the differences between the research approaches.

This second dimension helps us and the reader in judging the scientific value of our project and therefore also in answering our research-question of how to identify good research and science.

1.3 Delimitations

As it is stated in our main question we have chosen to focus on the learning of academic skills. It will be clear in our report how learning can refer to a countless number of aspects from learning to ride a bike to learning how to manage one's feelings. Whenever we have found that learning of other things however can improve the learning of academic skills we have taken account. This is the reason for our focus at emotions because emotions are closely connected to learning as we mentioned in 1.1. In project pedagogy there is for the same reason a focus on gaining competencies such as flexibility and co-operation.

A different view at our question is if the learning of academic skills also equips students with the skills and competencies that are required from the labour market and society. This is an important and interesting question but in order to confine the problem we have chosen to leave it out.

Furthermore we have chosen to focus only at learning at the humanistic studies at RU. This has as well been done to limit ourselves and the humanistic studies were a natural choice for us since it is the line for our studies.

1.4 Structure

We will proceed in the order we have asked the research questions. First of all we will give a brief introduction to the term learning as it is understood in common. Thereafter we will move on and start explaining the learning theories behind RU. In this chapter we will be using Knud Illeris' theory of learning concentrating on his book "Three dimensions of learning". Next we will describe the actual project pedagogy and define it as it is practiced at RU. Here we will use the book "Projektpedagogik – hvorfor det?" written by Lars Ulriksen.

After these two chapters we will now be aware of the situation at RU and we will at this point introduce a general introduction to parts of theory of science. With these premises in mind we can progress and bring in the additional theories, neuroscience and flow-theory, from the fields of natural science and the humanities respectively.

Continuing with the question of what motivates students, we will pay attention to motivational theories and bring forth empirical work we have conducted at RU.

Through these chapters we will have answered our research questions and will therefore be able to come up with a qualified discussion of the best way of learning. The discussion will lead way for our conclusion and answer to our main question of whether and how the project pedagogy at RU can be improved.

2 – Introduction to learning

1.1 What is learning?

In this abstract, we will be exploring what it is we really mean by learning, that is; what does learning embody? But before we define what learning is, we need to look into the various researches that have been done so far on learning and contrast them to what it is today. We also need to look at the various theories and developments in this field of studies over the years. This crucial part of human beings has been debated for centuries, and the long term research conducted is still in a process of coming to a significant result. Let's now consider the dictionary meaning of learning for a start; The Oxford Advanced Learner's Dictionary explains learning: "as a process of learning something; the knowledge one gets from reading or studying". It further explains learning as gaining knowledge or a skill by studying, from experience, from being taught. In order to understand learning, it is clearly unsatisfying to solely base all our understanding on the dictionary meaning of learning.

Nevertheless, this gives us a basic understanding of what it is. According to a database on learning, it describes learning as what it is not, the author simply quoted an extract supporting his argument:

I want to talk about *learning*. But *not* the lifeless, sterile, futile, quickly forgotten stuff that is crammed in to the mind of the poor helpless individual tied into his seat by ironclad bonds of conformity! **I am talking about *LEARNING* - the insatiable curiosity that drives the adolescent boy to absorb everything he can see or hear or read about gasoline engines in order to improve the efficiency and speed of his 'cruiser'. I am talking about the student who says, "I am discovering, drawing in from the outside, and making that which is drawn in a real part of *me*." I am talking about any learning in which the experience of the learner progresses along this line:** "No, no, that's not what I want"; "Wait! This is closer to what I am interested in, what I need"; "Ah, here it is! Now I'm grasping and comprehending what I *need* and what I want to know! (Carl Rogers 1983: p. 18-19)

Moreover, in order not to be too philosophical about what learning is and what it is not, we will describe learning in relation to this project (learning at RU) and the area of context it is focused on. Also, it will be looked into from the **socio-culturalist** point of view.

Learning is a situated cognition (process of knowledge and perception) within a real-life community with a seamless connection between individual, social, historical and cultural processes; thus, evolving apprenticeship in becoming knowledgeable. (McGregor 2007 pp.47-62)

This process involves participation of more experienced or an expert other; this appropriates understanding through a contextual and interactive participation.

1.2 Introduction to the Theories of Learning

Learning is a highly complex aspect of human activity and many theories have been developed to try to generalize about how it arises. However, many theorists agree that people construct their knowledge themselves, but there are disagreements about how learning occurs and where it occurs (solely in the mind, or through body engagements or simply through language) (D. McGregor 2007. p.50)

There are various types of learning theories and models. These models approach learning from different perspectives. Some learning theories focus on learning that serves as the basis for social skills development. However, the focus of learning in this project will (as stated in 1.3) be directed towards academic learning.

As specified in most of the articles and text books on learning, the following four theories (Mark K. Smith .2003) have been widely used to explain the processes of learning. However, these are not the only theories of learning, but they constitute an overview of prominent learning theories.

- The behaviourist orientation to learning
- The cognitive orientation to learning
- The humanistic orientation to learning
- The constructivist orientation to learning

1.3 The Behaviourist Orientation

The behaviorist defined learning as an objectively focus on observable behaviors and discounts mental activities. Behavior theorists define learning as nothing more than the acquisition of new behavior.

Experiments by behaviorists identify **conditioning** as a universal learning process. There are two different types of conditioning, each yielding a different behavioral pattern:

Classic conditioning occurs when a natural reflex responds to a stimulus. The most popular example is Pavlov's observation that dogs salivate when they eat or even see food. Essentially, animals and people are biologically "wired" so that a certain stimulus will produce a specific response.

Behavioral or **operant conditioning** occurs when a response to a stimulus is reinforced. Basically, operant conditioning is a simple feedback system: If a reward or reinforcement follows the response to a stimulus, then the response becomes more probable in the future. For example, leading behaviorist B.F. Skinner used reinforcement techniques to teach pigeons to dance and bowl a ball in a mini-alley. (Marton&Booth 1997 p.5)

1.4 The Cognitive Orientation

This theory focuses on the inner mental activities of the human mind and is valuable and necessary for understanding how people learn. Mental processes such as thinking, perception, information processing, memory, knowing, and problem-solving need to be explored. Knowledge can be seen as schema or as symbolic mental constructions. Learning is defined as change in a learner's schemata. We will come back to cognitive learning in 3.2.

As a response to behaviorism, people are not “programmed animals” that merely respond to environmental stimuli; people are rational beings that require active participation in order to learn, and whose actions are a consequence of thinking. Changes in behavior are observed, but only as an indication of what is occurring in the learner's head.

1.5 The humanistic orientation

The humanistic theory is a paradigm that emerged in the 1960s and it focuses on the human freedom, dignity, and potential. A central assumption of humanism, according to Huitt (2001), is that people act with intentionality and values. This is in contrast to the behaviorist notion of operant conditioning (which argues that all behavior is the result of the application of consequences) and the cognitive psychologist belief (which argues that the discovering knowledge or constructing meaning is central to learning). Humanists also believe that it is necessary to study the person as a whole, especially as an individual grows and develops over the lifespan. It follows that the study of the self, motivation, and goals are areas of particular interest.

Key proponents of humanism include Carl Rogers (cf. 3.2.2) and Abraham Maslow. A primary purpose of humanism could be described as the development of self-actualized, autonomous people. In humanism, learning is student centered and personalized, and the educator's role is that of a facilitator. Affective and cognitive needs are the key, and the goal is to develop self-actualized people in a cooperative, supportive environment. (Huitt, W. 2001b)

1.6 The Constructivist Orientation

Constructivism is a philosophy of learning founded on the premise that, by reflecting on our experiences, we construct our own understanding of the world we live in. Each of us generates our own "rules" and "mental models," which we use to make sense of our experiences. Learning, therefore, is simply the process of adjusting our mental models to accommodate new experiences. Furthermore, learning is a search for meaning. Therefore, its focus is that learning must start with the issues around, which students are actively trying to construct meaning of. Meaning in itself requires understanding wholes as well as parts, and parts must be understood in the context of wholes. Therefore, the learning process focuses on primary concepts, not isolated facts. Also, the purpose of learning is for an individual to construct his or her own meaning, not just memorize the right answers and regurgitate someone else's meaning. Since most education is inherently interdisciplinary, the only valuable way to measure learning is to make the assessment part of the learning process, ensuring it provides students with information on the quality of their learning. (D. McGregor. 2007 p.51 – 53)

Having reviewed the conceptual understanding of what learning is in general, we will now explain in detail the theories of learning practiced at RU as well as the two other newer theories which are the flow theory and neuroscience.

3 - Chapter 1: Three dimensions of learning

3.1 Introduction

The major inspiration behind the project pedagogy practiced at Roskilde University comes from Knud Illeris who has developed a learning theory on basis of many other learning theories. Knud Illeris is a Danish professor in pedagogy and psychology and has been employed at RU for many years. The starting point for our evaluation of RU will therefore be a description of his theory and the foundation will be his book “Three dimensions of learning” from 2002. Though this book is newer than RU many of the ideas contained in it were already flourishing at RU’s beginning.

The general understanding of learning held by Knud Illeris (Illeris 2002. p. 14-21 and p.227-229) includes all processes which lead to psychological changes of a rather lasting nature including psychodynamic development (e.g. changes in feelings, attitudes or motivations), socialisation and qualification as long as they are not a mere result of genetic-biological conditions as maturation or ageing or forgetfulness. He sees learning as an inborn skill as well as a desire in every human being and it is never too late to learn – i.e. lifelong learning is possible.

The main idea behind his work is that learning always is facilitated through the interaction of cognition, socialisation and emotion and these three dimensions are presented by respectively Piaget, Marx and Freud.

The three dimensions occur like this: Two processes are needed for learning to take place: 1) a direct or indirect social interaction process and 2) an internal psychological acquisition process. The social interaction process (1) has to do with the environment in which the person acquires knowledge whereas the psychological process (2) involves how the knowledge is received and adjusted in the persons mind. The latter mentioned process (2) can also be split into two, namely a cognitive- and a psychodynamic part. Thus we have the three dimensions: social, cognitive and psychodynamic.

Now we will have a closer look at the three dimensions.

3.2 Cognitive learning

(Illeris 2002, Chapter 3)

The cognitive learning theory was shortly mentioned in the general introduction to learning and we will here elaborate the theory on the basis of Knud Illeris’ understanding. Very simple cognition means thinking. According to The Concise Oxford English Dictionary it refers to: “the mental

action or process of acquiring knowledge through thought, experience, and the senses” and this process: “...include perception, reasoning, acts of creativity, problem-solving, and possibly intuition”.

In Knud Illeris’ presentation of cognitive learning he is using the theory of Piaget and he adds to this theory by using the works of two other psychologists namely Nissen and Kolb. The strength of Piaget’s theory is, as Knud Illeris sees it, the fact that he was a biologist and the theory is therefore founded on genetically-biological facts which say that the human ability to learn is a development of the species’ struggle for survival.

Piaget understands learning in two different ways: dynamic (motivations and drives behind learning) and structural (content and nature of learning) but he is only concerned with the latter mentioned part. The theory is concentrated on what is called *process of equilibration* in which the learner adapts to the environment as well as adapts the environment to personal needs. According to Piaget this adaptation happens in two kinds of processes: assimilative in which the individual adapts to the environment and accommodative in which the individual adapts to the environment. These terms will be elaborated in the next sections. The process of equilibration is thus a question of a balancing between the assimilative- and accommodative processes. Piaget’s theory is therefore based on this interaction of assimilation and accommodation and Nissen adds a third kind of process namely the cumulative.

3.2.1 Assimilative processes

Assimilative learning is additive in nature. This means that the learner learns by adding new knowledge to schemes of already existing knowledge. Schemes are what Piaget used to describe sets of experiences and knowledge in the mind. Knowledge gained from assimilative learning can be remembered in many different situations as long as it has similarities to the environment in which it was learned. A characteristic example is a normal school lesson in e.g. chemistry where the students add what the teacher teaches them to what they have learned in previous chemistry lessons. Assimilative learning processes are hence typically in what Illeris calls the subject-oriented teaching method. Subject-oriented teaching is namely focusing on a specific subject in which the students should gain general knowledge, understanding, and skills (Illeris 2006 p.54).

3.2.2 Accommodative processes

Accommodative learning is also called transcendent learning. It takes place when the new knowledge does not fit into the schemes of already existing knowledge and the learner therefore

needs to reconstruct the schemes. Knowledge gained from accommodative learning can be activated regardless of the situation or context and it is therefore the best basis for the development of e.g. flexibility, creativity and openness. Transcendent refers to the 'going beyond' and 'passing of limits' that happens when schemes are being altered and accommodation is thus actually a very demanding and challenging process in which the individual is confused and anxious. Energy, good motivation and boldness are therefore needed and these can be found in the second dimension which we will describe in 3.3. The accommodative processes are typical to take place in the teaching method Illeris calls problem-oriented and which will be explained in the chapter about project pedagogy.

Carl R. Rogers, an American psychologist, worked with a term he called 'significant learning' which is similar to accommodative learning. We will turn back to Rogers shortly in 3.7. This learning is characterised by its impact on personal development and attitude. We will also shortly introduce a special kind of accommodation called reflection or reflexivity. It covers the current phenomena in our society of how everything learned is being put in perspective to oneself and the meaning it has to oneself (Illeris 2002. p.46- and p.91). This kind of accommodation is more energy-demanding than any of the others as it involves a development of the self. We will come back to this concept in 3.7 where we will see that it is significant when dealing with students.

3.2.3 Cumulative processes

Cumulative learning takes place when the new knowledge does not fit into an already existing scheme and a new scheme thus needs to be created. This learning process happens a lot in the earliest years of life but also later when it is needed to learn something by heart which cannot be connected to anything familiar e.g. a telephone number. Another example of cumulative learning is the learning of how to ride a bike. The learning is thus also called mechanical learning. Knowledge gained by cumulative learning is situation-attached and it can therefore only be remembered in the environment in which it was learned.

Accommodation might instantly seem as the better among the three but since it depends on schemes from both cumulative- and assimilative learning Knud Illeris is emphasising that none of the three are to be seen as better than the others. Remember also that Piaget understood all learning as embracing both assimilative- and accommodative processes.

3.2.4 Further account for the cognitive dimension

As mentioned Knud Illeris is also using the theory of Kolb (Illeris 2002 p.37) and this is on the grounds that this theory adds important nuances to Piaget's theory. We will here just describe the main nuance shortly. Kolb works with assimilation and accommodation as Piaget but in addition he also works with what he calls diverging and converging. Divergent describes how a single idea or problem generates into many ideas or solutions. It has to do with a learning situation in which there are many equally correct answers. Converging covers the learning situation in which you can distinguish between right and wrong e.g. mathematics and there therefore only is one correct answer.

Knud Illeris finds that this model exceeds Piaget. He though still believes that the main focus should be on the assimilative and accommodative processes but these can have the direction of either diverging or converging. Illeris has in his studies found that convergent knowledge typically is gained by subject-oriented teaching and divergent knowledge by problem-oriented teaching. This is important for us to notice because we are looking at project pedagogy which involves the problem oriented method. Furthermore are we in our project focusing mainly on the humanistic studies and in these there is no clear distinction between right and wrong but instead it relies greatly on interpretations.

An account for the cognitive dimension has now been made and it has been showed how learning is a process of adaptation happening by assimilation, accommodation or cumulation. We will move on and look at the second dimension which, as we will discover, is closely connected to the cognitive as they are both part of the psychological acquisition process.

3.3 Emotional learning

Above we described how Piaget only focused on the structural part of learning i.e. the content and nature of learning. Freud, in contrary, was looking at the dynamic part of learning i.e. the drives and motivations behind learning. In the second dimension: emotional learning, Knud Illeris therefore mainly focuses on Sigmund Freud and his theory of *personality development*.

It is though very important to be aware of the fact that the cognitive and emotional dimensions always are working side by side as a part of the internal psychological acquisition process.

The word emotion is very complex and the term has no single universally accepted definition.

So a couple of definitions are mentioned in dictionaries it states that an emotion is a psychological feeling which comes automatically by different occasions and not by intention. A feeling can be sad, happy, hateful, or loving (Oxford English Dictionary).

In terms of psychology a mental feeling is characterized by happiness or hurt, surprise or hope, pleasure or pain (Oxford English Dictionary).

Emotional learning is a state of mind. It concerns the psychological side of learning i.e. the conditions inside a person. In terms of psychology it means a psychodynamic process involving psychological energy transmitted by feelings, emotions, attitudes and motivations. This learning dimension mostly deals with development- and personality psychology and moreover is it deciding and influencing on the internal psychological conditions of learning processes.

Cognitive- and emotional processes intertwine as before mentioned and for instance are emotions always attached to cognitive structures. Together are the two processes helping the development of personality. In the early years of life cognitive and emotional functions are almost united. In pre-school time they become gradually more separated. At the age of six the two spheres start to separate but meanwhile they still have connections and both are involved in all the acts of learning and actions.

An ability to learn is part of the human potential for life fulfilment, satisfaction and goal achievements. In mankind there is as mentioned a desire to absorb knowledge and skills. The energy to learn comes from the psychodynamic basis for learning as we also mentioned when describing accommodative processes.

Cognitive learning processes make way for the formation of psychological structures. These structures are always emotionally 'obsessed'. The emotional situation plays an important role in how the learned are remembered.

We will now elaborate what roles cognition and emotions play respectively and next how they interact. Cognitive processes create and adjust schemes via assimilation, accommodation and cumulation. Emotional experiences on the other hand produce relatively stable emotional patterns. In assimilative processes the emotions are usually unconscious whereas they are conscious in accommodation because the learned affects you more and challenges your pre-understanding. Because the patterns are only relatively stable they change along with the development and reconstruction of schemes. The emotions affect the learning result cf. how the cognitive structures are 'obsessed' with emotions. It is confirmed in how for instance a motivated student is better at remembering what is learned and better at using it later even in other contexts.

For learning to take place psychological energy is demanded. The energy comes from an inborn survival potential which can be understood in two parts: a life fulfilment potential and a resistance potential. The life fulfilment potential is a drive inside us which e.g. makes us desire learning. The resistance potential is describing the energy that is released when life fulfilment is threatened. It is not always possible to distinguish between the two and the psychological energy comes from either one of them or both. In theory the life potential is carried out through assimilation since it strives to connect things and the resistance potential through accommodation because it has to deal with disturbing blockages. The energy is activated and regulated by emotions and motivations in both the cognitive- and emotional dimensions.

The emotional process of learning includes thus both knowledge, emotions, assimilation, accommodation and the potentials for survival materialised in life fulfilment and resistance.

3.4 Social learning

Social learning is the third dimension Illeris focuses on. He also calls it the social-societal dimension. Illeris explains that when we deal with humans we can never overlook this social-societal dimension because we are social beings. When people have interaction among each other the knowledge they acquire by interaction is social learning. The demand of society from people to meet their requirement is societal learning.

In the modern capitalistic society and also in Knud Illeris' book 2002 the understanding of the social-societal dimension is in connection with Karl Marx: "The human essence is no abstraction inherent in each single individual .In its reality it is the ensemble if the social relations." (Marx 1845-1969, Illeris 2002 p.19)

According to the Marxist idea societal conditions have major importance in the nature of human learning. However, Illeris is aware that the ideas of Marx cannot be converted directly into our modern society and he therefore uses successors of Marx who have loosened the bonds to Marxism and Soviet e.g. Engeström.

Social learning interacts with the totality of the two other dimensions. It is mainly connected to the interaction between people and thereby participation in communities, but it also has to do with individual's interaction with materials. Here is included for instance the media world and books. Every material is namely impacted socially – they are given names and being related to by humans. By relating to materials you therefore indirectly relate to the social surroundings. The social and societal dimension is thus an external condition of learning. Still, the individual uses his/her own

perspective and the psychological aspect is therefore also playing a key role in the relation to materials and surroundings. We will in our project naturally focus on the community in school and specifically group work because this is an integrated part of project pedagogy.

Learning and socialisation are two linked concepts because all learning contributes to socialisation and all socialisation generates learning. Knud Illeris is distinguishing between six groups of interaction according to learning depending on how involved and active the learner is: perception, transmission, experience, imitation, activity and participation. We will now shortly introduce these groups who often overlap though.

Perception: the individual notices an input from the surroundings but is passive. An example is a scent impression.

Transmission: an individual wants to convey some kind of message in general or to another individual. The receiver might be more or less interested and active.

Experience: perception and transmission can be part of experience but you though usually talk of experience if the individual is benefiting from the input by being active.

Imitation: the individual is copying an act of another person.

Activity: the individual seeks influences to use in his/her area of interest.

Participation: The individual who is learning has influence in a goal-directed group activity.

Participation is therefore relevant when looking at group work in project pedagogy like we do.

This dimension of learning depends upon group dynamics. When a group interacts and influence each group member there are dynamic processes and they include norms, roles, relations, developments and a need to belong. This dimension of learning develops the group member's practical competencies and acknowledgement of others through interactions. According to Knud Illeris social learning therefore has a close relation with community and practice; it creates meaning and identity and changes the participants experience and development. The experience and development which participants gain from group work have significance for development of organization and education cf. chapter about project pedagogy.

In the dimension of social learning there is interaction between the individual and its surroundings, in analysis process it depends on historical and societal conditions. The background of the social dimension of learning has relation to the existing structure of the society. Learning in institutions are requirements deriving from political and societal purposes.

There are societal conditions that influence the external learning situation and process. The social-societal dimension is not, as the psychological acquisition processes, affected by biological-genetic influences but instead by the context of individuals' historic-societal surroundings.

In the first two dimensions the individual is in focus and the action happens in the individual seeing the outside world. In this third dimension the surroundings are in focus and the action is how the individual react to these surroundings.

Illeris mentions Flemish researcher Danny Wildemeersch whose work mainly deals with social and educationally perspectives. He explains social learning like this: “combined learning and problem solving activities which take place within participatory systems such as group, social network, movements and collectivities, operating with real life contexts and thereby raising issues of social responsibilities.” (Illeris 2002 p.135) It is here seen how social learning takes place in participatory arrangements.

The main point that Knud Illeris draws on basis of Wildemeersch' work is derived from the terms social responsibility and reflexivity. Social responsibility is connected to processes of problem solving; it can be compared to social learning and is a way to behave. It is described as a broad concept but in educational context it includes “responsibility for one's own learning”, and the individual's responsibility in group work and for one's own actions. It is closely connected to reflexivity which we briefly defined in accommodative processes. Reflexivity is unavoidable in light of today's infinite choices but in adding a social commitment to reflexivity you ensure that it does not end up in selfishness. Social responsibility qualifies therefore learning through reflexivity.

3.5 Management methods²

We mentioned shortly two different teaching methods under assimilative- and accommodative processes. Illeris furthermore separates each teaching method into three management methods; the teacher-controlled, the self-controlled and the participant controlled.

The teacher-controlled education is run by teachers. This is the traditional education system, where the teacher “guides” the student towards a specific way of learning. The positive thing about it is that the student has someone to lean up against, but the negative side is the lack of motivation and independency from the student.

² We have in this section used Knud Illeris' new book “Læring”, 2006 pp. 254-257 since it gave a good description of these terms. The terms however are not new, but have been used by Knud Illeris for many years which we also see in project pedagogy.

The participant controlled education is run by all the members of the education; teachers, students and to some extent parents, secretaries etc. In this model the members create the system in cooperation. The teacher makes sure learning stick to the laws and commandments, and the students make sure the learning is relevant, and that the teaching creates the learning which is wanted. This system gives the students influence on their learning, which again gives them a motivation for learning and a quality in the teaching process. This makes the learning process their own learning and gives them responsibility.

The self-controlled education is, according to Illeris, very difficult to separate from participant controlled education, because there normally always will be some extend of supervising or teaching involved in the learning. He therefore mostly sees it as a part of the participant controlled education. To sum up these educational management methods, Illeris prefers the participant controlled method. Here, the student can develop his creativity and ideas, and at the same time to some extend get responsibility towards his own life and education which, as we will discover later, is what the late-modern student want.

3.6 External- and internal learning conditions

(Illeris 2002, Chapter 10, mainly p. 184-191)

Knud Illeris is describing how the environment in which you learn and also the motive and energy for learning always is affecting the learning result. Both external and internal conditions are therefore influencing and this is in accordance to the three dimensions which include both the psychological aspect and interaction with the surroundings. Since we are interested in a good learning result at RU we will look a bit at these conditions. In 8 we will introduce a more general view of motivation.

When relating to institutionalised learning i.e. learning in schools Knud Illeris is stressing the factor that the skills learned in school will be attached to the context of school and it is thus difficult for students to use them in the outside world. In order to use the knowledge in other contexts it must be gained through accommodative processes as mentioned earlier. There are furthermore still other problems with learning in the school context pointed out by Illeris: The grade system in school is promoting competition instead of co-operation, discipline instead of independence, and superficial adaptation of what needs to be learned instead of creative learning. The competences gained in school are often contradicting the competences needed in current society. The students become good at going to school while many are shocked the day they enter the “real” world and need to use these competences. A way to enhance the learning via external conditions will be introduced in 4.

The internal condition in students is also important for the learning result and this involve the motivation for learning. When talking of motivation Illeris prefers the research done in life-span psychology which has found out that motivations vary according to your age and current life situation. This brings us therefore to the next section about young people's motivation:

3.7 Learning processes of students

(Illeris 2002, Chapter 11, mainly p. 212-216, " and Illeris, Katznelson, Simonsen and Ulriksen 2002 section 2.3)

Since our project is aiming at evaluating the learning conditions for students at RU we will now shortly describe how Knud Illeris explains the explicit learning processes of young people. The conditions for learning may namely change during the life-span. It is here worth mentioning that the characteristics further are a result of the current society and they change in line with society's changes. (This is a characteristic of social constructionism cf. 5.7 and 5.9). The following is the description given by Knud Illeris in 2002. We are aware that this is five years ago but we consider it to entail important observations applying to the society year 2007.

The learning process of youth can shortly be described as the stage between children's- and adults' learning processes. Where children uncensored accept everything presented to them in their eagerness to learn, adults want critically to decide what to learn and the youth find themselves in this crossing. They are becoming increasingly independent and selective and are good at taking personal responsibility for the learning they want to achieve.

Today the characteristic of the youth's learning processes is furthermore that they are centred on the creation of a stable identity due to the fact that traditional roles have been dissolved. Traditions and norms have been rebuked and have for a big part been replaced by an enormous focus on individuality and exactly the development of one's individuality.

The development of personality is a challenging task and the young people integrate it in all they are doing including studying. If the education system does not welcome the youth's need for identity-shaping it can hence result in unmotivated students. The young people want to find personal relevance and meaning – also in school.

A new cognitive capacity of thinking is available from the youth years enabling them to grasp a greater understanding of contexts. It results in young people asking critical questions in all sorts of areas in their striving to make ends meet and understand how the world is functioning (Illeris et al. 2002, section 2.3).

The youth years are characterised by especially accommodative learning versus childhood in which assimilative processes are more common. The reason is again the process of creation of an identity which involves radical changes and reconstructions.

We have now noted that the shaping of an identity and development of the self are crucial to young people and furthermore that the school must take into consideration this aspect in order to have motivated students. We therefore took a look at how Knud Illeris is describing the development of personality (Illeris 2002 chapter 5). We will not go into depth with all the terms he uses in this context but instead just come up with what we found to be an important input in regard to our project.

Education systems that want to approach personality-oriented students must according to Illeris (Illeris 2002 p.90) offer problem-oriented work with participant control (cf. management methods).

These principles are boosting the motivation in young people which we will explain in next chapter about project pedagogy.

We mentioned in 3.3 how it is the cognitive- and emotional processes that help the development of personality. A crucial part of personality is the self which is defined as self-experience and self-relating and can thus be paralleled with what we earlier introduced as reflexivity and reflection.

This definition of the self is taken from Rogers (Illeris 2002 p.94) who as mentioned worked with significant learning (accommodative learning involving a change of the self). These terms deal with the individual's relation to society plus intrinsic choices such as lifestyle and identity and they therefore cover both the emotional- and societal dimensions. When related to learning they focus mainly on the development of the self and happen through accommodations (Illeris 2002 chapter 5).

In 8 in which we introduce a general understanding of motivation of students we also investigate the claim that students take the task of personal development with them in school.

Before ending this chapter about Knud Illeris' learning theory we will describe a practical way of implementing his theory in practice:

3.8 Experiential learning

(Illeris 2002, Chapter 8)

Experiential learning is the learning concept in which Knud Illeris sees all of the three dimensions of learning best expressed because here all of the three dimensions are of subjective importance to the learner. The word experience is what in Danish is called "erfaring" and he uses it to describe this specific relationship between the three dimensions. The subjective importance of all the three dimensions gives the learner an experience of the learned and by this it exceeds the common understanding of learning e.g. from a book. In experience we acquire knowledge which seems

relevant to the self (cognitive), emotions and motivations needs to be attached (emotional) and what we learn affects our relationship with the surroundings (societal) and vice versa. The experience is created in the interaction between the individual and the environment.

Illeris is inspired by John Dewey and Oskar Negt (Illeris 2002 p.147). Dewey emphasised that the quality of the experience is essential. It must involve a growth resulting in a personal desire to learn more i.e. gain more experience, as well as it must involve the principle of continuity: the experience relies on earlier experiences and affects the quality of experiences to come. In this continuity you therefore go beyond the present experience. The role of the teacher is to guide the experience in this direction. In this area of environment Negt comes in and points out how the individual not so much should gain experience to fit into our democratic society but instead use the experiences for realising social inequalities and then break them. (This is another characteristic of social constructionism cf. 5.7 and 5.9). This idea has been a main inspiration behind Danish experiential pedagogy and the more practical guidelines of how to implement it came from Ziehe. Ziehe put up certain criteria for learning as experiential:

- it must have subjective relevance to all of the three dimensions of learning
- there must be continuity cf. Dewey above
- the learner must be present, committed and self-aware and can therefore not play a passive role
- it must happen in a social context. The human being is social by nature and learning alone must be only short-term
- there must be exemplarity i.e. reflection of something socially relevant (the term is described in the chapter about project pedagogy)

What is now called *project pedagogy* was developed on top of these criteria, and we will in the next chapter give a thoroughly introduction to the content of this term. We have in this chapter gone through major aspects of Knud Illeris' learning theory so that we will be able to match it up to the project pedagogy practiced at RU and compare it to other learning theories in accordance with our purpose of this project.

3.9 Sum-up of chapter 1

Key points in Knud Illeris' theory are listed beneath.

- Learning is an inborn skill, it is a desire in every human being and life-long learning is possible. Learning is facilitated through the interaction of cognitive-, emotional-, and social processes
- Cognition means thinking. In this dimension learning is a process of adaptation happening by assimilation, accommodation or cumulation
- Emotions are very important for learning. Emotional learning is a state of mind concerning conditions inside a person. Psychological energy is involved in emotional learning and is transmitted by feelings, emotions, attitudes and motivations. Emotions play an important role in how the learned are remembered and thus a motivated student is better at remembering what is learned
- Cognitive- and emotional processes intertwine. Together are the two processes helping the development of personality
- The social dimension cannot be overlooked because we are social beings. It concerns interaction between people and with materials. All learning contributes to socialisation and all socialisation generates learning. Social responsibility qualifies learning through reflexivity
- Different management methods can be used in education whereas the participant controlled is seen as the best
- Young people are centred on creating a stable identity and the school has to meet with this desire in order to motivate the students. Problem orientation and participant control are key words.
- A good way to integrate all three dimensions is through experiential learning and on this basis project pedagogy was developed.

4 - Chapter 2: Project pedagogy at Roskilde University

4.1 Introduction to project pedagogy

In our main question we are asking how well the project pedagogy practised at RU is facilitating learning. In this chapter we will explain *what project pedagogy is* and *how it is being practised at RU*. All along the way we will draw parallels between project pedagogy and Knud Illeris' "Three dimensions of learning" which we made an account for in last chapter. It is especially worth noticing how the criteria for experiential learning (cf. 3.8) are being met in this project pedagogy. The theory described in this book is an expansion of the theory Knud Illeris developed in the early 1970ies and which was the inspiration behind RU. We will thus now look at how the practiced pedagogy at RU is connected to this.

Project pedagogy has ever since the start of RU in 1972 been the characteristic image of RU. Traditional academic activities such as courses and lectures are seen as only additions. Though the courses, as it is today, have to fill 50% of the studies, students themselves say that they spend around 70-80% of their active study time on projects as they consider them more important and profitable than the courses. Project pedagogy is thus the main medium of learning at RU. ("Principles of education and research – Roskilde University" and www.ruc.dk)

Our source of describing project pedagogy at RU is a report written 25 years after Ru's beginning by a Danish education researcher (Ulriksen 1997). The background of this publication is texts from the first decade of RU's history (Illeris, Hultengren, Borgnakke) as well as newer evaluations and books (Olesen, Jørgensen og Skovmand, Hansen og Larsen, Nielsen og Jensenius). Moreover do researches ran at RU in the middle of the '90ies play an important role in the account. All observations and claims in this chapter derive from this book where no other references are made.

The publication describes the seven different aspects of **project pedagogy** practiced at RU:

Project organization, problem orientation, participant control, exemplarity, interdisciplinarity, experience orientation and group work.

We will start with a general introduction of these aspects and later bring in critics taken also from the before-mentioned book. We have in our representation of the aspects chosen to focus especially on how these aspects are explained to *facilitate learning* and *boost the student's motivation* since these angles have highly relevance to our project of how to improve students' learning, cf. also the chapter about students' motivation. Furthermore our attention is mainly at how the aspects are implemented today and we will thus not comment much on the changes that have been made since

1972. This has two explanations. First of all our focus is on the contemporary state. Secondly, the changes that have been made are not so much due to learning reasons but due to economic reasons and especially politically demands. The reasons for using project pedagogy have thus not changed much.

4.2 Project organization / Project work

The idea of project work comes from the Americans Kilpatrick and Dewey who emphasized 'learning by doing'. Their educational research worked as important inspiration in the founding of RU. The goal behind project work is academic qualification. Through performing a project students gain knowledge of that with which they are working. Project work can be organised in different ways, but at RU the best way - in regard to learning results - is understood when linking it with problem orientation and participant control - principles that will be explained in the following sections.

In project work the students contribute themselves by choosing e.g. which methods to use or how to organize the work. This results in another trait of project work: the exceeding of a merely reproduction of knowledge because the students are active and co-managers. The students become more independent than they do by traditional school tasks. It is very important that the students feel a belonging to the project. This motivates them as does the idea of methods and theory working together in order to fulfil the goal. In this way the methods and theory have a bigger purpose because they are seen in a relationship and this enhances learning.

4.3 Problem orientation

In problem orientated project work it is not sufficient to work with merely questions or tasks – one must work with problems.

There are two criteria for the problems: it must be a problem for the participants (subjective) and it must be a problem in society (objective). The reason for working with problems is that it helps the students having the motivation demanded for accommodative processes to take place. Therefore it is crucial that the subjective relevance is present in which the student experience that the problem is relevant.

The objective relevance can be split in two parts:

- 1) In this part the objective relevance is about the world outside university. The problem's target must be that the students obtain a more correct understanding of society. It may be necessary for

students to settle with wrong assimilations they possess and thus go through accommodations. In this way the objectivity is connected to the subjectivity.

2) The problem must be relevant to the demanded qualifications the student must gain through education i.e. it is relevant for the education.

We can in the relationship between the subjective- and objective relevance draw parallels to the reflexivity and social responsibility explained in the last paragraph of 3.4. If we go back and look at the criteria of subjective relevance to the three dimensions in 3.8 we also see that it is being met here.

The problem orientation is contrasting an orientation towards subjects and disciplines. It is the problems deciding which disciplines to involve in solving the problem and hereby are connections and wholes in the real world discovered. It also means that the theories are not only picked up but they are experienced, processed and criticised and this enhances the quality of learning.

We will here make a reference to a book called “Problem-oriented Project Work” (Olsen and Pedersen 2005 p.15). The book is a tool book in problem-oriented project work written out of experience at RU and it has namely also found that analysing and being critical results in better skills than simply remembering facts. They bring up Blooms taxonomy (Benjamin S. Bloom ed. 1956) which consists of 6 levels:

1) knowledge 2) Comprehension 3) Application 4) Analysis 5) Synthesis 6) Critical evaluation.

The 3 first steps (1-3) of Blooms stair of knowledge is basically about learning, remembering and use and application of knowledge, whereas the three last steps (4-6) is more about the ability to break down the knowledge in smaller parts, compare it, be critical towards it, discuss it, and develop new ideas or theories upon it. Problem orientation is according to this book at the high levels of this taxonomy and these last steps are what makes research and projects good.

Remember also that Knud Illeris was a big proponent of problem oriented teaching methods versus subject oriented methods and he described how young people need to find personal relevance in their studies.

Reasons for using problem orientation at RU have to do with the motivation as mentioned and are thus also connected to learning abilities cf. Piaget and accommodation. Working with real problems prepares students for real life experiences and it makes it easier for the students to use the gained knowledge in other contexts than school (cf. 3.6 - Knud Illeris and external learning conditions).

4.4 Participant control

The participants are understood as both the students and the teacher/supervisor. The students are in control by deciding what problem is relevant. Hereby they feel a greater motivation and open up for obtaining personal competences because they feel the relevance to themselves as also mentioned in previous aspects. The supervisor has the role of guiding the students in the direction where accommodative learning processes will take place. Accommodative processes are as described in 3.2.2 very demanding and the students might not go through them if they do not receive this guiding.

The original idea behind participant control was more power to the students. This wish derived from the 1960ies youth battle with the traditional education system and its professor dominion. Today the idea is relevant in the light of Ziehe's observation of students who do not accept just anything given and who demand personal relevance. Knud Illeris argued as well for participant control in 3.5 as the better among the three management methods: teacher control, self control and participant control. A criterion for experiential learning in 3.8 is that the learner must be present, committed and self-aware and there are good opportunities for this when the learner is in control.

4.5 Exemplarity

The plan of exemplarity is to work with *parts reflecting a whole*. The reasoning behind it is partly that it is naturally impossible for students to get in touch with every aspect in every subject. What they work with should therefore be of such quality that it can represent other aspects as well. On the basis of this principle it is chosen which material to work with within a given area. There are other reasons for exemplarity. One of them is the idea that a subject should not be gone through from beginning to end but instead it should be taught as a one out of many ways of thinking and this is met in the exemplary principle. For instance it is seen as better to learn how a scientist thinks instead of which formulas he uses. Yet another reason is coming from Negt cf. one of the criteria for experiential learning in 3.8. It was in last chapter described how Negt wanted students to realise social inequalities and this wish is as well reflected in the exemplary principle because it facilitates a realisation of connections and totality in the world and the students' own lives as part of it. According to Negt the whole to be reflected was the society and it should be relevant for the worker class (cf. objective relevance in 4.3) preferably have impact on their liberation. At the same time the field should be enclosed in the students' interests. These criteria draw certain lines for relevant material. In the beginning of RU the criteria of reflection of the worker class' struggles followed naturally from the problem orientation. Back then an awareness of problems dealing with the

structure of society was natural. Today there is not this common political understanding among people at RU and the whole is often seen as a subject area or the use of methods. Hereby the first reason given for exemplarity is ruling and it means that almost any topic can be exemplary.

4.6 Interdisciplinarity

The main purpose of interdisciplinarity is that the students are not bound to work within a specific subject but instead they can freely move between different subjects according to their relevance to the problem and the basis studies are clear manifestations of this. Interdisciplinarity brings therefore opportunities for more qualified solutions to the problem. The principle gives the students an overview of many subjects and is hereby contrasting the opportunity to dig deep in a single subject. It reflects the world students meet outside the university which is neither separated in subjects but often a mix-up of them all. Different ways of interdisciplinarity exist according to whether the different disciplines and elements are intertwined in the solution or juxtaposed as different views on the same problem.

Reasons for including this aspect in project pedagogy at RU are that it gives a more complete world view, the current society wants holistic persons and it motivates the students. Furthermore it decreases the risk of students choosing the wrong study direction because they start out with a broad introduction which they can use as basis for a later specialisation.

4.7 Experience foundation and experience orientation

Within the principle of experience it is perceived that learning is obtained when experience is gained and it is therefore orientated towards experience (experience orientation). The already gained experiences which the students have are often involved naturally as the students choose the problem and thus the term 'experience foundation'. This emphasizes the relevance to the students own life giving rise to motivation which again gives better conditions for the accommodative learning processes. It also helps the students in making ends meet and clarifying their world view which according to Illeris was an inseparable part of their life as students cf. 3.7. Remember as well Dewey's concept of continuity in 3.8 which was a criterion for experiential learning.

Troubles can occur where the experience foundation is in contrast with the demands of the university regarding content and theories.

The original idea of the establishment of critical awareness through experience orientation is today substituted with the creation of individual's life-project and experience orientation is as well used to create the individual's need for world-clarification and qualification cf. again 3.7.

4.8 Group work

Group work means that the project work is practised in groups of students. It is proved that the learning effect is greater in groups than when individuals work on their own (Ulriksen 1997 p.43). In group work the problem can be analyzed more profoundly and the students teach each other through discussions. This is a main reason for group work at RU. It was also explained in experiential learning 3.8 how humans are social beings and learning therefore must happen in a social context. The competence of being a team player is requested at the job market and this is thus another important reason for including group work at RU. Group work implies that the subjective relevance that has been mentioned in other aspects needs to harmonize with the other group members' interests. All the aspects need in this way to bear in them a collective element. An integration of the social dimension described in 13.4 is here very clear.

It is also worth noticing how Knud Illeris described that a negative result of the grade system was the promotion of competition among students cf. 3.6. This is settled in group work where co-operation naturally becomes a key tool.

4.9 Evaluations and criticism of project pedagogy

A general presentation of each aspect has now been made along with the different reasons of including them. The purpose of the book "Projektpedagogik – hvorfor det?" which has been the foundation for this chapter, was to discuss project pedagogy. An evaluation of project pedagogy made in 1996 among teachers and students at RU was thus integrated and we will here mention the main points since these are of relevance for our project.

The evaluations stressed that there is an unsettled relationship between the project pedagogy's orientation towards real problems and the formal learning demands. On this basis critics found the academic skills of students weak because the read material might be modest and the choice of theories and methods are not critical enough. The problem here involves the principle of participant control because supervisors who challenge the choice of material might be regarded as disrespectful to the students' co-management. It involves also the problem orientation since the material is chosen on basis of the problem. It can end with theories being taken out of their context. Positive findings regarding problem orientation are the involvement of the students as well as the development of qualifications such as research skills, team work, using methods and going through a process. It is also worth mentioning that results have shown that the negative effects declined the longer a student had been using this study-form. We can say that this supports the idea behind 'learning by doing'.

Also the students' evaluations reflect that they miss this foundational teaching in academic tools and skills and even the teachers mention this. The criticism is hereby pointing at a problem within the principle of interdisciplinarity. Remember how this principle was explained as giving overview but not so much depth. On the other hand it would challenge the experience foundation if specific teaching in skills became reality because this would rely on the subjects and not the students' experiences. Both teachers and students wish for an improvement of the teacher's pedagogical skills, a better communication of technical demands to methods, and in general a development of evaluation methods along with the teaching and of project work in regard to content.

Many students state that they miss a specific academic identity by which they can place themselves in society. An academic identity can be difficult to grasp when gained through interdisciplinarity because it is not well defined. Instead it is very unique for each and every student depending on the exact projects they have worked with. This is a potential but can be a problem if it is not acknowledged by the surrounding society. Criticism is that too much focus is on the solution of the problem while there is not much reflection on the specific theories used and the context from which you take the theories. This can cause superficiality.

We mentioned in the beginning of this entire chapter that some changes in project pedagogy have been made as a result of economic reasons. One of them is the size of the groups which today is object for criticism. Experience shows that groups of 8-10 people are too big but still this is today's reality at RU because the relation between the amount of students and teachers has increased steadily. This results in some students going solo which is an opportunity at RU though it is not welcome. When students go solo it threatens the principle of group work and it is happening more and more these days also as a part of an increased individualisation process among students cf. self realisation in 8.

Regarding participant control we explained how the supervisors ought to guide the students in a direction of experiencing accommodation. This relationship between students and teachers can become a problem if the students do not find this direction relevant (cf. subjective relevance in 4.3) and they therefore start seeing the supervisors as rulers. It can be difficult for the students to reject suggestions from the supervisor when he/she is the one to judge them at the exam, though they know that supervisors should not be more than advisors. This conflict is biggest when it regards a disagreement about the objective relevance whereas a disagreement of which academic skills need to be acquired is not as serious because the supervisor here rather is allowed to function as a teacher with expertise in the given area.

The objectivity and subjectivity within problem orientation has been discussed widely. It has never been clear how the relevance to society should be understood. In the beginning it was often interpreted as a political relevance and thus some disciplines have felt illegitimated especially natural science and humanities. When they yet have tried to fulfil the demand of objectivity the result has been that it just worked as a formal fulfilment without being truly relevant.

When the societal relevance is interpreted in a political view it triggers another problem namely that it imposes a common political understanding. This common understanding is not present today. Some have therefore denied the societal relevance and relies on only the pure subjective and the academic relevance. This whole confusion results in students seeing objective relevancies as merely limitations for what they *feel* like working with and find relevant. This again leads to the fact that some students find it artificial to find a problem, especially a societal problem, in their area of interest.

4.10 Conclusion

The aspects of project pedagogy can as above be analysed one by one but in practice at RU they are closely connected as we also discovered in the criticism of project pedagogy (cf. 4.9). For example appears the interdisciplinarity naturally when the foundation of the project is a real problem and the participant control follows naturally from the demand that the problem must be relevant to the students.

In everyday language at RU the implemented project pedagogy is mentioned as “problem oriented project work” and the other aspects are indirectly included in this term. When looking at the university’s homepage 2007 you find that the main grounds for problem oriented project work are for the students to achieve new knowledge and new comprehension (“erkendelse”)³.

As we have gone through each aspect it stands clear that the motivations of students, accommodative learning and attainment of specific competences have been important factors behind the intention of project pedagogy. There is thus a clear link between project pedagogy and Knud Illeris’ arguments for accommodative learning and involvement of emotions. All of the three dimensions from last chapter are also met through the various principles. The psychodynamic dimension is showing itself every time the personal relevance to the student and the student’s motivation is being aimed at. The social dimension is most clearly emerging in group work and participant control but is also present in for instance exemplarity where the whole concerns the

³ ”På RUC er det problemorienterede projektarbejde i centrum. Det betyder at du som studerende har mulighed for at lære og opnå ny erkendelse ved at arbejde med konkrete problemstillinger der tager udgangspunkt i virkeligheden.” Retrieved Nov.26th 2007 from: <http://studieguide.ruc.dk/projektarbejde/>

surrounding society. The cognitive dimension is the goal behind the entire pedagogy and is hence present in project work and when skills such as problem solving are developed.

The clear links we have found between the project pedagogy and Knud Illeris' theory of learning is understandable since RU was based on his ideas. We will therefore have to look further into contemporary learning theories, and research the area for challenging and/or agreeable theories which we can attach to our knowledge gained so far or which may change this knowledge. This is needed in our research of whether we actually can improve the learning at Roskilde University.

4.11 Sum-up of chapter 2

In this chapter we have presented the different aspects of project pedagogy at RU and drawn parallels to Knud Illeris' learning theory. A review of main points from the chapter follows:

- Project pedagogy is the main medium of learning at RU
- The term project pedagogy cover seven principles which in reality all are intertwined: Project organization, problem orientation, participant control, exemplarity, interdisciplinarity, experience orientation and group work.

5 – Chapter 3: Theory of science

5.1 Introduction to theory of science

When looking at contemporary theories on learning, we have to consider how scientific these particular theories actually are. But in order to analyse the theories for scientific truths or falsies, we have to have a general knowledge about what science is. That is, however, not that simple. Many philosophies of science have had an influence on the definition of science, and the discussion of the definition is still going on today.

According to Thurén (Thurén, 2004) there are two actions which describe science.

- Science seeks the truth
- Science is in a constant move

That is however a paradox, because if science is constantly moving, we can never know the truth. Therefore scientific truth will at all time be temporarily.

There is, according to Thúren, two opposite ways to avoid this scientific paradox. The two poles are called dogmatism and relativism.

5.2 Dogmatism and Relativism

Dogmatism is to know what the truth is. To only look at the world from one or few point of view's and choose which truth is the "real" truth. If the dogmatic person meets challenging science (anomalies) he will deal with these by denying them or claiming that they are false. In that way he chooses some universal truth, which is not temporarily.

Relativism is on the other hand to have no real truth, but rather many small truths. The relativist will look at all theories equally, and accept them all as some kind of truth. If there is a "real" truth, it is not possible for the relativist to reach it. You can call this pole for cynical sense or rationality. In one way it makes sense to be open towards all theories, when we know they are temporarily, but on the other hand, the relativist will then never make any conclusions, or statements as to which theory is more likely than the other.

The reality is more coloured than these two poles, and we will now try to point out the most significant theories which have affected the science.

Of theories which come from the world of natural science, but which also have been used in many other disciplines, we want to illustrate Positivism, Paradigms by Thomas Kuhn and Falsification by Karl Popper.

Of theories which mostly come from the humanistic world, we would like to illustrate Hermeneutic theory and Social Constructivism.

To scale the theories inside a Dogmatism (D) \leftrightarrow Relativism (R) scale, you could draw it like this:
D - Positivism - Falsification - Paradigms - Hermeneutic theory - Social Constructivism - R

5.3 Positivism

Positivism is mainly based on, like Dogmatism, that there exists some science which you can count on as *positive- or secure knowledge*.

The idea is to critical investigate every claim and every observation and thereafter delete everything that you don't know for sure, - Everything that you have believed to know, but which you don't really know.

What is left is the secure knowledge –the proved knowledge. And from this step you can build on new knowledge again.

There are two sources of secure knowledge;

- 1) What we can *observe* with our *senses*

The claim is that we can find secure truth by quantitative empirical studies. To use a finite, but large, amount of hypotheses to conclude something infinite. When you draw conclusion from empirical studies, it is called *induction*. Induction can never be considered as 100 % secure truth because your senses always can be manipulated, but if the conclusion is both *reliable* and *valid* you can come very close to the truth.

Reliability; involves that the measurement is done correct, that all things are taken in consideration, and that no coincidences have an influence on the conclusion

Validity; is the relevance for the investigation. It doesn't matter how perfect the reliability is, if the conclusion does not solve the problem or fulfils its goals.

- 2) What we can *calculate* via our *logic*

Logic can be described as Thúren writes it in his book: "It's an empirical truth that a person is at a specific place at a specific time. But it's a logical truth that this person at the same time not can be at another place."(Thurén 2004 p.16)

If you follow the rules of the logic, it will always be secure truth. (2+2 will always be 4. A married man can never be single etc. When you draw a conclusion which is logically connected with the premises, but not necessarily with the reality, it is called *deduction*.

When looking critical on Positivism, the problem which turns up is the problem of induction. It is impossible to verify a theory build on induction because you then have to verify an infinite number of cases. But as soon as you find one case which is false, you can falsify the theory. And this is where Popper turns up.

5.4 Falsification by Karl Popper

Falsification by Sir Karl Popper is exactly to find the false case, instead of verify an infinite number of cases. He introduces the hypothetic-deductive method, which is a way to find a conclusion or a solution on a problem. You set up a big amount of hypothesis or premises which can solve the problem and thereafter you make a deductive conclusion upon them. When you have done that, you end by checking the hypotheses for falseness. If one of the hypotheses is false, the theory is falsified. In that way Karl Popper solves the problem of induction in Positivism.

But Popper does something else as well; he changes the whole idea of what science is. From being something you can observe and calculate upon, it becomes *all* the theories which are falsifiable. That means all the theories which have a possibility of being false, without necessarily being false. That idea excludes for example tautologies e.g.: “Either it rains or it does not” and religious arguments e.g. “This is happening because it is the will of God” because these theories always will remain true. But also theories which are depending on your interpretation can maybe not be falsified either.⁴ This is though a little unclear in Poppers definition of science. On one hand he argues for literary theories to be falsifiable and therefore science, on the other hand he does not see human studies falsifiable because they are interpretations of actions and therefore never can be falsified. You can then question if interpretations of texts written by humans not are the same as interpretations of human beings? Just because you can find prove in the texts or by asking the author, how can you know if it is not an interpretation of the text or author and thus un-falsifiable? Another thing Popper is unclear about is the hypotheses which are added *Ad Hoc* to the theory while you are doing the research. These Ad Hoc hypotheses are mostly things taken for granted or without awareness, according to Popper. They are not added as a hypothesis in the hypothetic-deductive method, but just added unconscious.⁵ Sometimes these ad hoc hypotheses, which you not

⁴ E.g. “Your idea is that a person has been abused as a child. It doesn’t matter if the person says yes or no, because the “no” will be seem as a repression of the truth”

⁵ E.g.: A research about the reason for death at a hospital: One of the theories is that increasing hand washing will help. One ad hoc hypothesis is here that soap plus water is the best way of washing hands, because it is a pre-understanding that this is the best way to wash hands.

either falsify or verify, can be a help to come to the conclusion, but sometimes they can destroy the meaning of the theory.

It is also unclear to see exactly where Poppers is placed on the D-R scale mentioned earlier. On one hand he says that you never are able to verify a theory as truth, but on the other hand he considers un-falsified (but falsifiable) theories as (almost) true until they have been falsified.

5.5 Paradigms by Thomas Kuhn

What Popper sees as ad hoc hypotheses, Kuhn sees as “silent knowledge”, Silent knowledge is pre-understandings, meanings or unconscious knowledge, taken for granted or as truth. All the silent knowledge in one area or discipline is together in what Kuhn calls a Paradigm. Scientists build their theories in order to make them fit into these paradigms. Many hypotheses will not fit into the paradigm. These unsuitable hypotheses are called anomalies and one day the number of anomalies will create a crisis, the paradigm will fall together and a new and better idea will arise and create a new paradigm.

For every Paradigm which arises, the science will according to Kuhn get closer to the truth. Try to imagine an old farm which falls together because the ideas of house material do not fit to the farm anymore. A house of bricks arises from the ruins, after that a skyscraper etc.

But the problem for Kuhn here is that paradigms not always create a revolution, when a new is invented. Actually a lot of science works in different paradigms side by side, without convincing each other that one of them is closest to the truth e.g. the different kinds of ideology critiques in social science, or brick houses beside farms and skyscrapers.

According to Kuhn there will be something in all theories which does not fit to the paradigm; therefore every theory is falsified from the beginning. For him there is no real truth, therefore he is closer to the middle in the D-R scale.

5.6 Hermeneutic theory

This leaves us to one of the major critics against the positivistic theory (and by that also Kuhn and Popper). The critic is that the Positivistic theory forgets one important cognition source: the understanding of the human being.

We know more than we can measure or calculate. We know something from ourselves, how we feel and think (introspection) and through that we can understand other people's action, feelings and experiences (empathy, intuition). So by the fact that we can understand other human beings like our selves, we can interpret their action, and thereby make conclusions.

The Hermeneutic idea of science is that even though all the ideas and theories about humans are discussable and un-falsifiable, even though these theories always will be affected by your pre-understandings, goals and expectations, they still give more details and more aspects to the field which again makes us come closer to the truth. So the different paradigms will, according to the Hermeneutic theory, just give a wider perspective of the truth.

The Hermeneutic method is talking about “the spiral”. It’s a way to deal with your pre-understanding. The idea is to research the same subject again and again for many times and in different ways and for each time you will change your pre-understanding in order to get closer to the truth.

The hermeneutic theory is of course mostly limited to humanistic disciplines, but the interesting thing is that it settles with Poppers idea, that un-falsifiable theories are not truth. Here it actually claims that with the freedom and creativity of the human interpretation we can get closer to the truth, and therefore it is actually scientific. Because if science seeks the truth and is in a constant move, it is exactly what the human studies do, according to the hermeneutic theory.

5.7 Social Constructivism

The newest and mostly used theory seizes on the idea of pre-understanding. The earlier mentioned theories are also aware of the pre-understanding, but they don’t see it as a big problem or a problem at all. Some of the earlier theories do even see the pre-understanding as the settled truth. The big significance here is that social constructivism believes that *all* actions, thoughts and ideas are dependent on the social constructed pre-understanding in the society or culture. Or in different words; any thing invented or constructed by members in a society or a culture that only exists because the members agree to behave like it does.

According to Social Constructivism (Gergen, 1997) this means that empirical studies never can be regarded as scientific truth and you never can conclude anything on empirical studies because it always will be taken out of a context and a social construction.

But what you can do with empirical studies is to illustrate some interesting or challenging ideas for the world, which can make people questioning their social construction or human behaviour. Or you can try to trace some patterns of conduct with special significance to the society, and by that come up with an idea of the truth at this specific place at that specific time.

The main idea of Social Constructivism is to reflect over yourself and your social constructions in order to be aware of all factors and by then come towards the truth. When you shape an

understanding of the culture you live in with social constructions, you will at the same time create future constructions, which maybe are closer to the truth.

In that way it is very difficult to use Social Constructivism for any science, because they don't think you can ever generalise any research. Therefore Social Constructivism is almost out in the Relativism-end on the D-R scale.

It is not easy to make a conclusion on what the definition of science is. And thus what truth is. But when we now know the different theories, we can use them to take a critical look at the contemporary theories on learning in order to see their merits and drawbacks.

Furthermore we would like to introduce three kinds of explanation methods, which normally are used in explaining and arguing for theories.

5.8 Explanations methods

You can split explanation methods up in 3 parts; Causal-, Intention- and Function Explanations (Thurén, 2004).

- Causal Explanation, or reason explanations is when you explain things or occasions with the past. Something which has pushed the things to become what they are now. It is explanations in the positivistic way, build on observation and intellect only. The explanation is about nature, human and animals.
- Intention explanations depend on someone who intentionally wants to attain something. The action or thing is controlled against a goal instead of being pushed on from behind because of an action. Intention explanations are, like causals, building on observation and intellect, but also on understanding of the human in the hermeneutic way. It is explanation about human only and to some extends animals.

Intention and Causal explanation explains “changes” –*they are diachronic*

- Function Explanations explain actions as a cycle from good to bad and back again with a feedback-mechanism for every time it goes back to the beginning. (E.g. the eco-system, the economic circulation etc.) It is a more abstract way of explaining actions. It is an explanation which sees the action as a part of a system with a function. It sees the system as a whole, of nature, which repeats itself again and again. Furthermore it sees the action as a timeless machine, which keeps on running –*a synchrony*.

These three explanation methods do not exclude each other, but they rather complete each other in argumentations and explanations.

5.9 Illustration

As an illustration of theory of science we will end this chapter by turning to Knud Illeris and look at how he places himself in the science field. Knud Illeris is using a large number of theories in order to compose his own understanding of the complexity of learning. One could therefore believe that it would be a difficult task to place him in a specific category in the theories of science. Still he is aware of this and argues how he nevertheless can understand the three main theories of Piaget, Freud and Marx in the light of constructivism more specifically social constructionism⁶. This is also what we noted two times in the chapter of the Three Dimensions. That Piaget belongs to constructivism is obvious because constructivism is partly developed by him. Furth, who Knud Illeris uses widely in his book, has found so many similarities between Piaget and Freud that Illeris sees it all right to place Freud in the constructivist area as well. For instance argues Illeris that the human drives, which Freud worked with, can be paralleled to Piaget's process of equilibration. By placing the theories in the specific category of social constructionism, which is a part of social constructivism⁷ in which sociality is seen as a constructive force, the third dimension is met. At last Illeris describes his theories of learning as a challenge towards the society and its social construction or pre-understandings on learning. (Illeris, 2006, pp. 271-273) Therefore he sees himself as a social constructivist.

We are now aware about both the general theories of science and three ways of explaining theories. We can then look at the contemporary theories on learning with a critical view.

5.10 Sum-up chapter 3

- According to Thurén, 2004 Science will always seek the truth and in the same time be in a constant move; thus science is temporarily
- Two poles on looking at science are either Dogmatism, which sees the world in truth –not truth or Relativism, which see everything as some kind of truth
- In between these poles you find Positivism, Falsification and Paradigms in Natural Sciences, and Hermeneutic theory and Social Constructivism in the Humanities
- There is three ways of explanation theories; Causal, Intension and Function explanations

⁶ p. 238-239, "The three dimensions of learning"

⁷ <http://filebox.vt.edu/users/rteague/PORT/SocialCo.pdf>: "Kenneth Gergen is one of the leading supporters and developers of the social constructivist school of thought. It is essential in understanding the social constructivist theory that you understand Gergen's view of the subject. Gergen supports a form of social constructivism referred to as social constructionism."

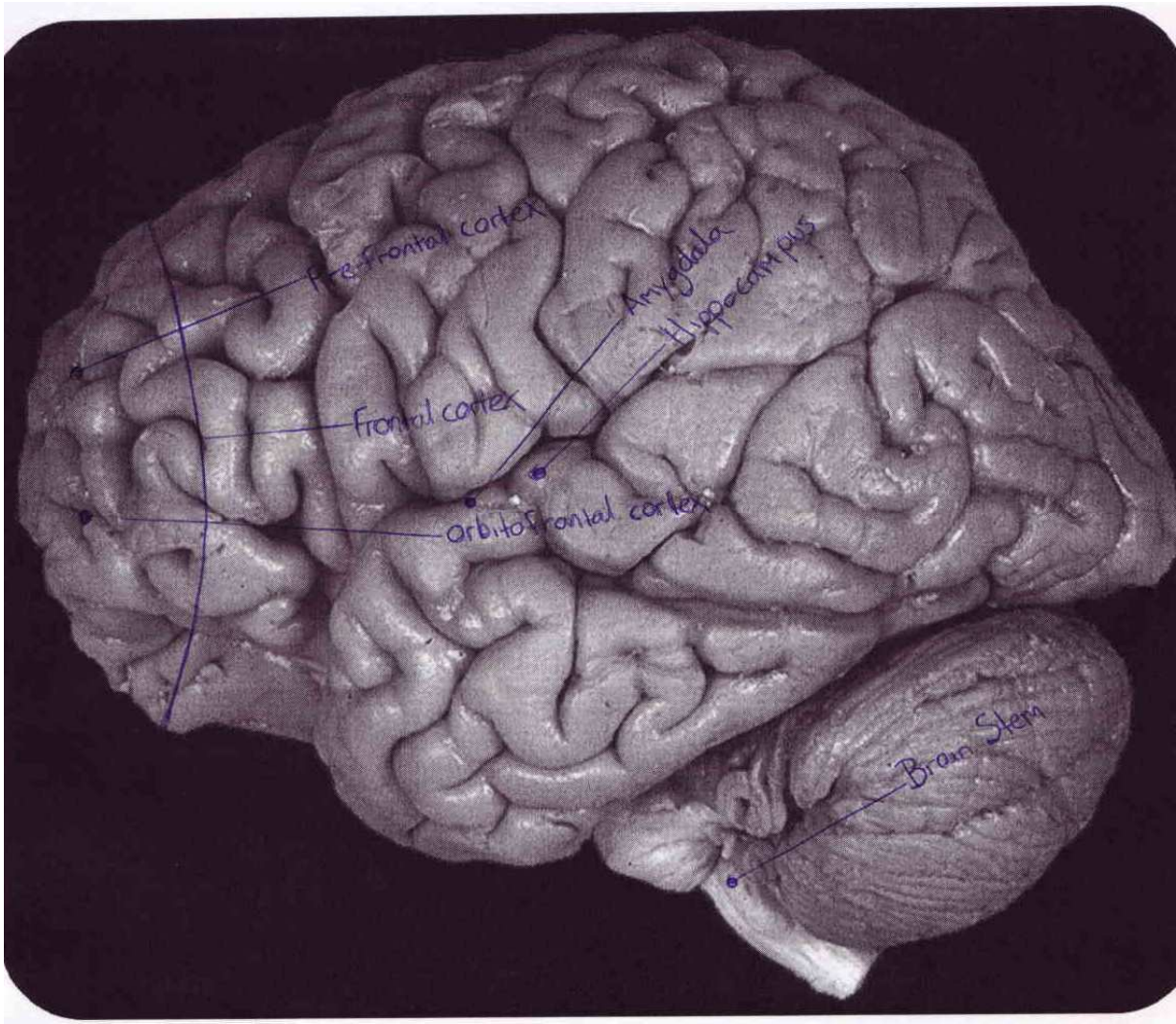
6 – Chapter 4: Neuroscience

6.1 Introduction to Neuroscience

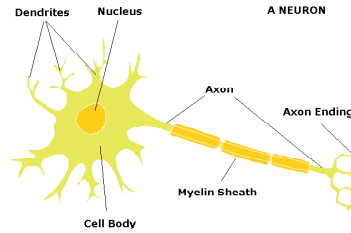
We have now presented different theories about learning, what it is, how it takes place etc. However many theories they all agree in one point: learning happens subjectively. This is not to say that learning happens independently of the outside world, this in fact would be difficult, but it happens inside the person, not outside. Exactly this point has untraditionally given rise to a new field of studies concentrating on learning and memory, namely the so-called neurosciences having the brain as the object of their studies. It is untraditional because neurosciences work with issues like learning and emotions, usually objects of the studies of humanities, applying methods belonging to the study of natural science. As we shall discuss in the end of this chapter this attempt to combine two historically different traditions of science does give rise to conflicts. However, if for no other reason, then at least because of its untraditional nature, it might have something to offer to the understanding of the object of this project i.e. learning. Let us therefore have a look at neuroscience and some of the results brought about in this field.

6.2 The brain

It is generally recognized that we see, hear and learn with the brain. Before we proceed to discuss the actual learning process, let us just have a look at this brain.



Together with the spinal cord the brain constitutes the central nervous system. It consists of highly specialized *neurons* or brain-cells organized in intricate networks or ensembles each responsible for their own function. The neurons meet in so-called *synapses* through which an electro-chemical process takes place as a mean of communication. Any activity of the brain including that of cognition is an activity of neurons firing, i.e. communicating.



Boeree, Dr. C. George: <http://webspace.ship.edu/cgboer/theneuron.html>

Quoting Knud Illeris, learning is whatever leads to “relatively lasting changes of capacity whether it be of a motor, cognitive, emotional, motivational, attitudinal or social character”. (Illeris 2002, p. 17) This understanding of learning is supported by neuroscience and would generally be explained as a change in the neuronal structure and activity (Gerlach 2007, p. 73). Let us have a look at this changing brain.

6.3 The changing brain is the learning brain

One of the most significant discoveries of neuroscience is the discovery of the continuous *plasticity* of the brain; that is a lifelong “ability to adapt to changing circumstances and acquire new information” (Blakemore&Frith 2005 p.123). Such adaptation happens as a process of change; it is this change we call learning. Cf. also Piaget’s understanding of adaptation in 3.2.

Generally neurons behave and develop similar whether they are located in the fore- or hindbrain. Thus *conditioning* as explained by the behaviorist (cf. 1.3), mechanical learning (cf. 3.2.3) and learning math has the same neuronal foundation all though located in different regions of the brain. The fact that Knud Illeris describes the changes of capacity resulting from learning as relatively lasting (cf. 3.1) suggests a close relationship between learning and memory. In fact, on a neuronal level the learning process *is* a process of encoding memory. The rules the brain follows to convert collections of electrical impulses into memory is referred to as the *memory code* (Tsien 2007).

Now one must be aware, that when it comes to learning and memory and its relation to the brain, we are at the peak of contemporary science and the results are still being discussed. However, let us have a look at some of the hypothesizes significant for our project.

6.4 A definition of memory

There are many ways to categorize memory. One distinction would be between static and dynamic memory (Young 1987).

Due to natural selection at the time of birth each individual is provided with potentialities suitable for its future environment. These potentialities are given by the genetic code or memory and develop according to the stimuli experienced by the individual. Thus a baby is born with the potentiality for language but obviously if the child is not exposed to language, there is no way it will learn it (Madsen&Bless 2007 p. 208). For many years, educational theorists believed that there were critical periods in which the child had to acquire certain skills, and if it missed the chance to acquire the skill within this period, it simply lost its chance. There seem to be little evidence that this is actually the case (Gerlach 2007 p. 85). If anything, we should refer to these periods as sensible periods, since the neural structures responsible for the particular function seem to be more sensible to the stimuli in this period. Because genetic memory does not change, we refer to this type of memory as the static memory.

The dynamic memory includes both declarative memory, that which we know about and are able to express by means of natural language, and silent memory such as how to ride a bike, both of which include both short-term and long-term memory.

Now let us have a look at the memory code. How and where is information processed?

6.5 Plasticity Mechanisms and the Memory Code

Canadian neuropsychologist Donal Hebb wrote in his book *Organization of Behavior*: “When an axon of cell A is near enough to excite a cell B, and repeatedly or persistently takes part in firing it, some growth process or metabolic change takes place in one or both cells such that A’s efficiency as one of the cells firing B is increased.” (Blakemore&Frith 2005 p.133)

Memory seems to follow the principle, “what fires together, wires together!” (Blakemore&Frith 2005 p.133)

A neuron is activated when the cognitive or motional function it represents is active. Research carried out on London black-cab drivers by Eleanor Maguire and her colleagues has shown a significant difference in size of the posterior hippocampus, a neural structure essential for spatial navigation and spatial memory, when compared to that of non-cab-driving men of the same age (Blakemore&Frith 2005 p.125). One could argue that men with a small posterior hippocampus are less likely to become cab drivers, because they do not have the same potentiality to find their way as those with a bigger one. This of course would explain the data. However, Maguire suggested the other way round: the more you use your spatial navigation skills, the bigger your posterior hippocampus becomes. This hypothesis is supported by much research on both human and animals and has been important in understanding the *plasticity* of brain as mentioned in 6.3.

Today it is widely accepted that specific kinds of tasks are learned within specific brain regions (Lombroso 2004). Essential to the so-called declarative memory is the hippocampus. The amygdala on the other hand, seems to have great importance for emotional learning. We shall discuss both the declarative and the emotional learning more detailed in 6.6 and 6.6.3 in this chapter.

Only recently short-term memory has been shown to be a separate quality of the brain and not just a step towards long-term memory (Vianna 2000). Thus most science has been concentrating on the long-term memory and how this is processed. In Jungerman, Davis and Laroche 2007 four forms of plasticity that seem to constitute the neural foundation for memory are listed (Davis&Laroche 2007).

These are the four:

1) Long-Term Potentiation 2) Long-Term Depression 3) Synaptogenesis and 4) Neurogenesis.

Long Term Potentiation or LTP involves an increase in responsiveness of a neuron that lasts for days, perhaps even weeks. It is a change in the *post-synaptic mechanism*, influencing the receiving side of the synapse increasing its sensitivity. As all other changes it is activity dependent. Thus, if neuron A fire rapidly over and over then neuron B becomes more responsive to A, provided that A and B share synapses.

Long Term Depression or LTD has the opposite effect of LTP and weaken and/or eliminates existing synapses based on the rule 'use it or lose it'. Recent evidence suggests that synaptic elimination or pruning can play a role in learning. For instance a certain behavior might have been appropriate in one environment but might be inappropriate in another. Changing a habit involves not only acquiring a new habit but also eliminating the old. Furthermore LTD is essential for the fine-tuning of functional networks.

Neurogenesis is the generation of neurons and *synaptogenesis* is the generation of synapses.

Whereas neurogenesis and synaptogenesis are more significant in the childhood, most adult learning can be explained as an effect of LTP and LTD (Gerlach, Christian 2007p. 84).

Another significant discovery of neuroscience is the discovery between learning and emotions.

Cognitive science ignored for many years social and emotional processes as being significant for the learning process. Even Piaget (cf. 2.2) only included emotions as the natural desire for learning, but did not further study the effect of the emotional processes present in the learning situation (Nørby 2007 p.115). However, the last 15 years more attention has been given to the supporting and rational functions emotions may have in relation to learning and problem solving. Let us then have a look on how emotions affect the learning brain.

6.6 Learning and emotions

There are different ways in which emotions may affect and direct the learning process. Especially three qualities are significant and relevant to this project, namely:

1) emotions are associative 2) emotions are rational and 3) emotions are arousing.

Even though there is no complete and consistent definition of emotions to rely on (cf. 3.4), certain characteristics seem to apply to emotions; emotions are physiological, psychological and behavioral. On a physiological level certain brain structures are involved, the autonomous nervous system is active and perspiration and gasping may occur. On the psychological level information processing is taking place and subjective feelings arise. On the behavioral level certain postures or movements may be involved.

6.6.1 Emotions and association

Unlike reading a book or attending a lecture emotional learning often happens as a relatively automatic process unintentionally and associated with certain objects, situations or thoughts (Nørby 2007 p.103). Especially two neural structures are important to this emotional learning, namely the amygdala and the orbitofrontal cortex, a structure in the frontal cortex.

The amygdala is especially related to basic emotions such as fear or angst. A neutral stimulus is likely to generate revulsion or fear if once experienced as harming. If we for instance experience sickness having eaten mushrooms, it is likely that we will generate revulsion next time we are presented to such stimuli. Same, if a person has threatened us, we will automatically generate fear and the physiological and behavioral responses to that, if we meet the person again.

The orbitofrontal cortex is responsible for a similar kind of emotional learning but is related to more abstract thinking, supported by the prefrontal cortex. It processes emotional learning in relation to a mathematical problem in the same way that the amygdala did in relation to the mushrooms. If we once have had a negative experience with a mathematical problem, we are likely to experience the same negative feeling next time we are presented to a similar problem. However, as all kinds of learning it depends on the intensity and frequency of the experience. Strong emotions experienced over and over are more likely to arise again than less intense emotions experienced only once.

It is important to state that emotions are not just happening to us, but are very much a function of our *appraisals* or interpretation of a certain situation. However we tend to habituate to certain appraisals. The first time e.g. someone is being mean to us, we might analyze the situation carefully, asking ourselves, what happened, how and why did it happen etc. Whatever conclusion or interpretation we reach it is likely to stick with us, such that next time we experience a similar

situation we will have the same interpretation and the associated emotion will arise almost spontaneously.

The orbitofrontal cortex also responds to positive reinforcement such as rewards in the form of pleasant touch or speech.

Whereas emotional experiences stored in the amygdala resulting in a certain reaction pattern are very difficult to change, the orbitofrontal cortex is much more flexible and plastic.

6.6.2 Emotions and rationality

It is experimentally shown that normally functioning persons produce an emotional signal just before they make a choice that has caused a negative experience in the past (Nørby 2007 p.102). This signal might or might not be experienced consciously but anyways it will have the same effect; we will avoid that choice. An important theory for understanding this function is the somatic-marker hypothesis introduced by Antonio Damasio 1995. *Somatic* refers to the bodily involvement, i.e. the feeling, ('soma' is Greek for body) and *marker* because it marks an image. He suggests that the somatic markers "forces the attention on the negative outcome to which a given action may lead, and functions as an automated alarm signal which says: Beware of danger ahead..." (Damasio 1996 p.173). The somatic markers are related to the emotional memory in the orbitofrontal cortex and results from a previous experience of that image, i.e. situation.

The somatic marker-hypothesis explains why we, when facing a problem, concentrate on a limited number of solutions when the number of potential solutions is in fact limitless. The somatic markers simply exclude the solutions that has proven to be wrong in the past and thus caused a negative experience. This is true for mathematical problems, problems in social sciences and problems in everyday life. If recognizing any situation of life as some sort of a problem, in the sense that there is a limitless number of ways to respond to the situation, somatic markers somehow determine everything we do. This is the rationality of emotions.

As stated before in 6.6.1 emotions are very much determined by the way we interpret a given situation. Just hearing the name of a person we dislike might cause irritation; had it been the name of our partner on the other hand, it is likely that it would have caused pleasantness. Since the name itself has no inherent quality, it is what we associate with the name that causes the emotions to arise; thus a matter of interpretation.

On the other hand our emotions also affect the way we interpret a situation. Different emotions have been related to qualitatively different forms of information processing (Nørby 2007 p.105). Generally the idea has been that positive emotions reinforce existing knowledge structures and routines and

negative emotions encourage one to identify the character of the situation eventually to be able to solve the problem. If we relate this to Piaget's distinction between accommodative and assimilative we may say that positive emotions are related to assimilation and negative emotions are related to accommodation (cf. 3.2.1 and 3.2.2)

A characteristic of the information processing is that it tends to be affected by the present emotion, so that it becomes more congruent with that emotion, even though the emotion originates from somewhere else, e.g. that the sun is shining. Research has shown that persons in the process of solving a problem tend to let their emotions affect their judgment. However, when they are told or become aware of that they are under the influence of irrelevant emotions, the influence stops (Nørby 2007 p.106).

6.6.3 Emotions and arousal

The brain stem is known to be co-responsible for the arousal function, without which learning is impossible. Arousal is the level of motivation with which we engage in an activity. Generally speaking when a stimulus meets one of the sensory channels, information is carried through the spinal cord to the brain stem, which then activates the forebrain responsible for the cognitive function and directs the attention towards the object of recognition. Even though we might not understand this as an emotional process, it is an initial rise in the level of motivation.

Another neural structure with great importance to the arousal is the *amygdala*. The amygdala seems to register emotional stimuli in the surroundings and directs the attention towards these. It is in the nature of the brain to give priority to emotional stimuli. Emotional stimuli would be defined as stimuli with importance for the survival of the human or animal experiencing it. Thus we pay more attention to the knife carried by the man coming towards us, than to the color of his shoes. When exposed to emotional stimuli the attention and concentration increase and we can expect a better memory.

Most of us remember very detailed the day of 9/11 2001. Where we were, what we did, how we felt etc. The reason for this is the emotional level present that day. It is the same with the wedding of a dear friend or the first kiss. Strong emotional experiences simply seem to store "better".

However, we should notice that memory is reconstruction and not reproduction. It is not just like a video camera recording objectively everything within its perspective but is very much characterized by forgetfulness and plain mistakes (Nørby 2007 p.109). This is true also for emotionally loaded experiences. Some theorists have hypothesized that emotions also affect the decoding or storing

process qualitatively (Nørby 2007 p.109). Thus affected by emotions we tend to store what is central in a situation and forget about the details.

Not only do emotions affect the level of concentration within the experience, they also affect the consolidation process; that is the process of storing information in the long-term memory. The hippocampus is essential to this process. By releasing chemical messengers like cortisol, often referred to as the 'stress-hormone', the amygdala seems to affect the hippocampus and thus the consolidation process. In an experiment a linear correlation was found between self-reported arousal and later recollection (Nørby 2007 p.110).

However two questions arise: does the correlation between the level of arousal and the quality of the memory continue to be linear? And does it make any difference if it is a positive or negative emotion?

A popular model explaining the relationship between the degree of affect and the quality of the memory is the Yerkes-Dodson-law, which prescribe that mild to moderate affect has a positive effect on the long-term memory, but strong affect disturbs or even prevents it (Nørby 2007 p.110). Thus the relationship is that of an upside-down U. Too much stress hormone seems to disturb the hippocampus such that declarative long-term memory cannot take place.

There is so far no evidence whether positive or negative experiences are stored better. Neither is it known how more specific emotions like anger or disappointment affect the memory process.

However there are two phenomena that are important to know in relation to this issue, namely *affect dependent* and *affect congruent* memory (Nørby 2007 p.112).

That the memory is affect dependent means that we remember the situation better when our emotional state is congruent with the state we were in at the time of experiencing. Thus if we for instance learn something while we are in a sad mood, it is likely that we will recall the information better when we again are in a sad mood.

That the memory is affect congruent means that we store the information that is congruent with our present mental state better than that which is not. This implies that we are more likely to store success experiences when we are in happy mood.

Now, the relationship between arousal and memory may not always be positive (Nørby 2007 p. 114). Most likely, only emotions that are linked to and caused by the learning situation itself actually improve the learning process. If we experience for instance great affect caused by a quarrel we had with our partner this morning, we will not be mentally present in the learning situation, but will be thinking about the quarrel, analyzing it etc. Thus we may distinguish between relevant and irrelevant emotions, where relevant emotions support learning the better.

6.7 Applying scientific criticism

As we heard in the beginning of this chapter; neuroscience studying the processes of learning and memory is a rather unconventional attempt to combine two originally different scientific traditions, namely that of the humanistic tradition on the one hand, and that of the natural sciences on the other hand. As whenever something unconventional is introduced neuroscience has been met with criticism. However, it may be more than just a reactionary resistance. Let us have a look at some of the critical points that have been made so far.

As we mentioned in theories of science (cf. 5.4) Thomas Kuhn sorted science in different paradigms according to pre-understandings about the world, techniques used, and the questions investigated. A paradigm will then be seen as a world with its own language and culture of behavior. When we look at Neuroscience against Pedagogy they will each be in a different paradigm with their own terms and ideas of looking at the world. When one of these two paradigms tries to transfer its knowledge to the other they will thus have many problems in translating each others behavior and language. A so-called transfer problem will arise. An example would be the term “learning” which in neuroscience would be defined by the changes in the brain and in pedagogy, of Knud Illeris, would be defined as a cognitive experience determined by both a social and psychodynamic dimension (cf. 3)

Many non-scientists have thus interpreted and overrated the results from neuroscience in a way so that it is useful for them in pedagogical studies. That has unfortunately caused many misunderstandings and wrong interpretations of neuroscience. An example of wrong interpretation of neuroscience can be seen in the so called “Brain Based Learning” (Steffensen&Schilhab 2007 pp.14-18) which is a learning theory based on neuroscience. An interpretation of this was that a higher number of connections between synapses would make a higher possibility for learning, and therefore less ability to learn with a fewer number of connections. This interpretation would see the age of 1-3 as the best for learning, because humans in this age have most connections. There are though other ways of learning and memorizing than through the connections between synapses and some of them will continue to work throughout life. Therefore this interpretation of the synapses was wrong.

The question is yet how to use the results from neuroscience in pedagogy? How to transfer from one paradigm to another?

First of all the two different paradigms have to understand each other's language, research methods and worldview. To understand that, it is also important to see which scientific school they are working in. Neuroscience is working in the school of natural science, i.e. the positivistic school (cf. 5.4). They are, as mentioned in 5.4, seeking universal explanations from the non-human created world i.e. the nature. Their methods are observations, experiments and use of logic.

Pedagogy, on the other hand, is working in the school of the humanities i.e. by the Hermeneutic theory and Social constructivism (cf. 5.6 and 5.7). It seeks the understanding of the human-created world and the human behavior. The research is founded on every-day interpretations of the human behavior and seeks characters or forms in the human behavior via empirical studies i.e. observations, interviews etc.

We see therefore a big difference in their methods and ideas upon the world. Neuroscience is working with *explanations* in the positivistic way and pedagogy is working with *understanding* in the hermeneutic way.

Though both of them work with empirical studies, the kind of empirical study is different.

Neuroscience works with laboratory experiments. They look for example at a situation with a limited group of neurons reacting to one stimulus. By using that way of empirical study, they are able to manage the reaction and the outcome. Therefore the experiments are easily falsifiable (cf. 5.4).

Pedagogy, on the other hand, works normally in the field, outside the laboratory. They are not only looking at one situation, but many situations with many different stimuli –as it happens in the reality. That makes the results much more complex and unpredictable than the laboratory's results. By looking at the neurons in a laboratory, neuroscience takes the neurons out of the context in which they belong. It is therefore difficult to tell if it actually would happen in the real world. On the other hand, neuroscience will easier be able to make conclusions compared to pedagogy, which in the hermeneutic way takes any situation in consideration and never find one true answer.

Furthermore, neuroscience sees neurons as a foundation of the human behavior. It believes that "*Every phenomena is not anything else than the sum of its parts*" (Emmeche&Schilhab 2007 p.40). By this we can thus explain human behaviour by the sum of its parts that is neurons firing in the brain. The humanities see the world differently. They believe that it is not only the sum of its parts but also a mix of stimuli from the surroundings which together creates the whole. That means that experiences from your social environment also have an input on the human behaviour.

You can split these two different world views in two ways of explanation as we mentioned in theories of science (cf. 5.8). The natural sciences explain by the "causal explanation method". That

means for example that the firing neurons are responsible for the human behaviour i.e. there is a *reason* behind the behaviour. The humanistic studies however explain by the “Intentional explanation method” where the human being has an *intention* and a perspective behind all behaviour.

The question appears now again: how can these totally different views upon human behaviour ever come to a dialogue and cooperation –without misunderstandings and wrong interpretations? Can we ever count on any pedagogy from the view of neuroscience?

The most important factor to be aware of is this transfer problem. The awareness by itself creates a critical view upon the interpretations and usefulness of the results. Just by being aware of the problems –we can deal with them. A bit like we saw it in the end of 6.6.2 .

Furthermore it is important that the transferring should not only be coming one-way from neuroscience to pedagogy, but also that pedagogy can give interesting hypotheses which neuroscience can research deeper into. This will help the communication between the fields to be more fruitful.

Last, but not least, it is very important to be aware of the scientific reliability of neuroscience compared to pedagogy. Pedagogy is an old and very detailed field of human behaviour and learning. It has many years of experience and research behind its theories.

Neuroscience on the other hand, is based on very few and new researches of the brain. Most of the experiments have been done on brains from dead or very sick people, on rats, apes, snails and octopuses. This means results from either non-functioning human brains or normal-functioning animal brains and this is little material to found a science upon. The results of neuroscience might therefore be valid but they lack reliability because of the methods and the material used for investigation (animals and dead- and sick people) (cf. validity and reliability in 5.3)

6.8 Conclusion to neuroscience

The results gained from neuroscience are supporting Knud Illeris’ theory on learning in many aspects. It agrees that learning happens as a change in capacity and it agrees that this capability for change is a life-long quality. Furthermore the results from neuroscience emphasize just as Knud Illeris the level of motivation, the so-called arousal, in relation to learning. The relationship is that of an upside-down U: the more arousal the better learning, until it at a certain level change and the curve continues negatively. Now, arousal may be caused by both negative and positive emotions and neuroscience does not tell whether negative or positive emotions support learning the better. It would be interesting now to investigate this relationship.

Someone who has been investigating such relationship is Mihaly Csikszentmihalyi. Resulting originally from a research in life quality, he developed his “flow-theory” telling us that the experience of *flow* acts as a magnet for learning. Flow refers to a positive state of mind characterized by a high level of involvement and concentration and represents as such what neuroscience would explain as a high degree of arousal caused by positive emotions. Let us then have a look at this flow theory and see what it may bring to our understanding of learning.

6.9 Sum-up of chapter 4

- Learning is a process of encoding memory and happens as a change in the structure and activity of the brain and its parts
- The brain is *plastic*, i.e. able to adapt to changing circumstances, and continues to be so, providing a life-long ability to learn
- Learning and memory seem to follow the principle, “what fires together, wires together.” The more we exercise a certain function, the better we become at that function
- As an adult two mechanisms are dominant when learning:
 - 1) Long-Term Potentiation / LTP and 2) Long-Term Depression / LTD.LTP is a process of neuron B becoming more responsive to neuron A; LTD is the opposite and follows the rule: Use it – or lose it!
- Emotional learning is a process often happening automatically, unintentionally and associated with our experience resulting in certain reaction patterns relevant to the experience. Such reaction patterns are dependent of our interpretations and may be more or less flexible depending on their nature
- Emotions are rational and tell us to avoid choices that have caused a negative experience in the past. At the same time they affect our interpretations as well as the information processing, depending on the strength and character of the emotion. However, it is shown that the moment we are told/become aware that we are influenced by emotions, the influence stops
- Generally it seems like the relationship between the level of arousal or motivation and the quality of the memory is that of an upside down U. We may however distinguish between relevant and irrelevant emotions, where relevant emotions, i.e. emotions linked to and caused by the learning situation, support learning the better

- Memory is reconstruction and not reproduction and as such it is difficult to talk about 'better' memory in relation to emotions, since depending on the strength and quality of the emotion (if it is positive or negative) the storing process happens qualitatively differently
- Finally neuroscience' study of learning and emotions is rather new and the results are still being discussed. Thus it is difficult yet to conclude anything with relevance to a pedagogical practice. The fact that neuroscience and traditional pedagogy belongs to two different paradigms is another reason why it is difficult immediately to the convert the results into practice

7 – Chapter 5: Flow-theory

7.1 What is flow?

The flow theory is developed by Mihaly Csikszentmihalyi and is based on a state of mind referred to as “flow”. This state is characterised by a total dedication towards a single activity, a state where one is capable of mobilising one’s consciousness to an extended degree. (Knoop 2005 p.108) Things involved in the process would seem to flow. Initially Mihaly Csikszentmihalyi developed the theory on the background of a life quality research he had conducted. This research shows that people with a frequent experience of positive emotions and playful engagement i.e. ‘flow-experience’ would generally be more satisfied with their life. As a way to obtain a larger degree of happiness in the everyday life Mihaly Csikszentmihalyi worked out a theory explaining his collected data and called it ‘flow theory’. Research investigating the USA school system has shown that flow is almost absent and that almost all of the worst experiences of young people’s lives took place in the classroom. Though a seemingly simple theory, Hans Henrik Knoop finds that we have a lot to learn from it. The lack flow makes the flow theory quite relevant (Knoop 2005 p.110).

Beneath is listed some typical characteristics of the flow (Knoop 2005 p.109)

- One is totally involved, focused and concentrated
- One is experiencing a kind of ecstasy, raised above the everyday reality
- One is experiencing great clarity by knowing what needs to be done, and to what extend it is going to succeed
- One knows it is possible to solve the task because one’s competences matches the challenge
- One experiences cleanness as a consequence of not worrying about one self and at the same time experiencing a growth exceeding one’s own boarders
- One is experiencing a kind of timelessness due to being totally present in the moment
- One is experiencing an inner motivation as a consequence of the activity being a purpose, and a reward, in itself

Furthermore the experience is of flow pleasant and connected with positive emotions. Negative emotions would disturb the flow by distracting the focus, in the words of Csikszentmahalyi:

Negative emotions like sadness, fear, anxiety, or boredom produce “psychic entropy” in the mind, that is, a state in which we cannot use attention effectively to deal with external tasks, because we need it to restore an internal order. Positive emotions like happiness, strength, or alertness are states of “psychic negentropy” because we don’t need attention to ruminate and

feel sorry for ourselves, and psychic energy can flow freely into whatever thought or task we choose to invest it in. (Csikszentmihalyi 1997 p.22)

Csikszentmihalyi is not necessarily stating that learning does not take place when experiencing negative emotions, but he might argue that the learning acquired during such emotions is less voluntary and thus harder to direct towards the desired object for learning.

Though flow is a state of mind characterised by positive emotions, flow itself is actually preferable to the pleasurable feelings it is connected with (Csikszentmihalyi 1997 p.32):

It is the full involvement of flow, rather than happiness, that makes for excellence in life.

When we are in flow, we are not happy, because to experience happiness we must focus on our inner states, and that would take away attention from the task at hand.

To experience flow one needs to be positive, but should not pay attention to it. The above quote serves as well the purpose of making clearer the somehow blurred relationship between emotions and flow. By distinguishing between the experience of flow and the emotions that are present during the experience Csikszentmihalyi acknowledges a separation of the two.

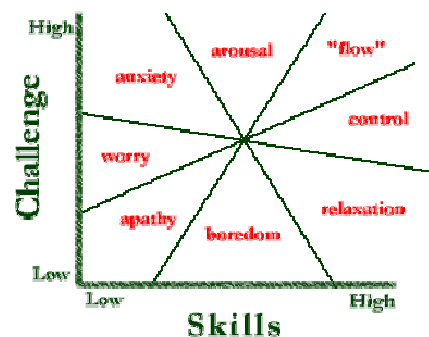
Everyday experiences tell that positive emotions can occur without flow, but since flow is defined as a positive state it does not go the other way around. When defining flow partly as not being attentive to internal processes, investigation of emotions' connection to flow during the experience becomes a problematic issue. Csikszentmihalyi's investigation of the emotional process going on during flow is done by afterwards recalling the emotional quality of the experience. Doubt could be put on the reliability and clarity of such mental investigation. Future brain science might offer a solution, but a "live" personal experience of it is per definition excluded from being possible.

7.2 Flow and learning

"the experience of flow acts as a magnet for learning – that is, for developing new levels of challenges and skills. In the ideal situation, a person would be constantly growing while enjoying whatever he or she did." (Csikszentmihalyi 1997 p.33).

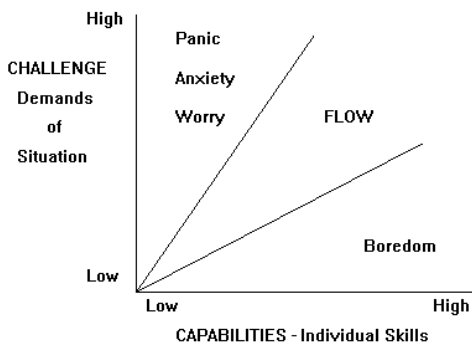
When explaining the flow theory's relevance and strong inherent connection to learning Mihaly Csikszentmihalyi refers to this figure: (Source 1)

The state arousal is a positive mental state of focus, activity and involvement, but it lacks the strength, cheerfulness and control of the flow state. To turn the arousal into flow it is necessary to learn new skills. On



the other hand one might ask what would happen if we find ourselves on the other side of the flow, in the area marked as control? This state is also characterised by positive emotions in the form of happiness, strength and satisfaction, but it lacks the state of concentration, involvement and a feeling that what one does is of importance. To get in flow one should increase the challenges. (Csikszentmihalyi, 1997 p.33).

This implication of a fine balance between challenges and skills can be visualized through the figure beneath (<http://divcom.otago.ac.nz/tourism/research/electronicpubs/mountainmadness/gfx/graph1.gif>):



The higher potential of flow that is to be found in the mental state of the learner, the more the learner will be able to cope with the situations turning them towards flow. “When a person is anxious or worried, for example, the step to flow seems too far, and one retreats to a less challenging situation instead of trying to cope.”

(Csikszentmihalyi 1997 p.33). This makes a self-reinforcing spiral pattern around the balance line between skills and challenges. In a learning situation the arousal and the control state are therefore important states on a practical level because these are of high potential for flow and they can thus be used as guiding points when aiming at flow.

Through learning we grow, becoming more than we were before, and in that sense learning is unselfish, because it results in the transformation of what we were before, a setting aside of the old self in favour of a more complex one. (Csikszentmihalyi 2007b)

When in flow people would afterwards find that they were able to exceed their limits exploring their potential. This is a crucial point of the theory when it comes to learning because the learner through the flow will be changing the perception of his/her own capability i.e. changing oneself. To do so is, according to Mihaly Csikszentmihalyi, the same as to change one’s self: “self - the image each person develops about who he or she is” (Csikszentmihalyi 1997 p.133).

When Csikszentmihalyi is connecting learning with unselfishness he is making the interesting implication that learning in itself has an inherent ethical direction. According to Hans Henrik Knoop this ethical direction creates connection between the possibility for flow to occur and the choice of goal:

Most optimal is it, if the activity, besides being inner motivated, also contributes to a the realisation of a higher goal, that transcends the persons self-interests, because this is in harmony with, and thereby adds to the consolidation of, those aspects of the flow experience,

that leads to, the “exceeding oneself”, and because it thereby contributes to the person’s life with more meaning through the increase importance, the person gets to his surroundings.

(Knoop, 2005, p. 109)

So, by flowing in an action with an unselfish goal, one will be increasing aspects of the flow, by not avoiding the goal pointing back at the self that it is sought to “exceed” and let go of.

Csikszentmihalyi is as well agreeing with Knud Illeris that learning, being a skill of survival, is evolutionary developed to be a joyful process and he even states, somehow implicit in the quote about negentropy, that negative emotions have bad influence on learning. Furthermore he states that learning is as well growth of self towards a more complexity. Putting these four statements together a picture of learning is emerging pointing towards a process growth of the self towards higher complexity, unselfishness and positive emotions.

As Knud Illeris points out the change of emotional patterns and of cognitive structures can be a frightening process if one does not feel some sense of familiarity. Csikszentmihalyi would, with reference to the figure of skills-challenges, probably agree to this and add that unless the learner is willing and able to put aside the protection of the self then neither efficient learning nor flow will take place.

Another interesting point to bring up when investigating the flow theory’s relation to learning is the importance of a feeling of meaningfulness for the occurrence of flow. When a person is in a state of flow the meaning-making is not focused on the result of the action but instead does the process become a meaningful goal in itself. One could say that flow simply is an extreme degree of intrinsic motivation: “Although both (Editors note: intrinsic and extrinsic) are needed to induce people to invest energy in learning intrinsic motivation, which is operative when we learn something primarily because we find the task enjoyable and not because it is useful, is a more effective and more satisfying way to learn.” (Csikszentmihalyi 1991). Cf. 8.2 for a definition of intrinsic and extrinsic motivation.

Motivating the learner by offering the best possibilities of making the process meaningful in itself is exactly one of the aims behind Knud Illeris project pedagogy. He is doing so by emphasising personal relevance and subjective problem orientation in the learning process. Knud Illeris emphasized also group work cf. especially 3.4 and 4.8 and Mihaly Csikszentmihalyi is as well mentioning the benefit of group work:

If you look at academic classes, they would report flow especially when they work on team projects. That's the most enjoyable part of school. Next comes working on your own on a project and you can go down and the lowest one [in promoting flow] is listening to a lecture

and audio/visual. Anything that involves them, that has goals where they can try to achieve, solve a problem, or do something it's going to be much more likely to produce flow.

(Csikszentmihalyi 2007a)

It is clear that there is a connection between problem-oriented project work and the flow theory and the question of interest is now how to apply the obvious relevance on a practical and theoretical level? To do this we need to ask another question: what creates flow in the learning process?

7.3 How to create flow?

Since the pedagogical ideas following from the flow theory are just as concerned about subjective experiences as the flow theory itself, it is impossible to point out concretely what will make the learner experience flow. The flow theory emphasises the perceiver's active role in the creation of the environment, rather than looking at the learning environment as something the subject is passively being influenced by. What can be done to give practical relevance to the theory is to give guidelines as to how to create an environment in which flow is more likely to occur. Amongst characteristics for such an environment are these (Knoop 2005 p.112):

- Possibility to take individual initiative and control oneself with responsibility for the surroundings
- concrete goals
- Manageable and flexible rules
- Possibilities for arranging the challenges so that they fit the skills
- Obvious, non-intimidating information about how well one is doing
- Remove distracting factors so that it is possible to concentrate

To get a better understanding of the list of flow promoting factors we will apply them on a case of a flow-based study form exemplified by Hans Henrik Knoop (Andersen 2005 p.156):

A third grade class is going to have a week of theme- and group oriented, interdisciplinary learning. The first day starts with a teacher presentation for the whole class about the theme followed by the programme for this day's work. Afterwards the student groups start working in or outside the classroom. Some might be reading and writing, some might be searching the net for information, and others might be doing creative artistic work. Everybody has to try working in different ways during the week and it will end up with a presentation by the students. Before each class is over the students meet to do evaluation of the day's class.

How can we apply the case to the flow-promoting factors? The possibility to take individual initiative and control oneself with responsibility for the surroundings is attended to by letting the

students work by themselves. This would as well make differentiated learning, making it possible to fit to the skills of each person and thereby ensure possibilities for arranging the challenges to the skills cf. 7.2. The programme of the day is presented so that the students have a concrete goal and further goals or adjustments of the goal can take place in the smaller groups. When every student has to try different ways of working and when the teacher presents a daily work programme the need of manageable and flexible rules is fulfilled. If the class get too noisy or other disturbances occur it is possible for the students to seek concentration outside the classroom. Finally the everyday-evaluation is giving the students obvious, non-intimidating information about how well one is doing. Besides the class evaluation it is likely, though not mentioned, that the teacher would go around giving feedback during the students' group work.

To know oneself is the first step toward making flow a part of one's entire life. But just as there is no free lunch in the material economy, nothing comes free in the psychic one. If one is not willing to invest psychic energy in the internal reality of consciousness, and instead squanders it in chasing external rewards, one loses mastery of one's life, and ends up becoming a puppet of circumstances. (Csikszentmihalyi 2007b)

Since flow is more likely to occur during a positive state of mind, when seeking flow one deals with a way of practising the mind towards positive emotions and towards knowing oneself. People who are dominated by positive emotions are more likely to experience flow than people dominated by negativity and since we are able to shape the general quality of our lives one should practise one's mind towards positive emotions if one wants the best possibilities for reaching flow. Character feats blocking flow, thus feats connected to people dominated by negativity, are referring to Hans Henrik Knoop (Knoop, 2005, p114):

- Lack of self-understanding. This gives difficulties being independent since one cannot depend on oneself without the required understanding
- Low self esteem which is characterised by not valuing oneself and thereby neither one's choices
- Concentration difficulties
- Experienced monotony
- Experienced stress

Hans Henrik Knoop (Knoop, 2005 p117) refers to 10 similarities to be found between many descriptions of how to be a good leader, arranged by Renato Tagiuri. Though Renato Tagiuri is referring to a research concerning *leadership*, the points still make obvious sense in the context of

and the level hierarchy group work as practised on RU. Since Knud Illeris' model for group work is based on participant control it makes sense to accept that all are leaders.

Hans Henrik Knoop is when mentioning flow in relationship to leadership not explicitly stating that the 10 points could be guidelines directing the group towards flow. Yet, the thought does not seem very wrong when taken into consideration that the 10 points have been put under the subtitle 'leadership and flow' without meeting criticism and that Hans Henrik Knoop later compares Renato Tagiuri's 10 points to a quotation of Csikszentmihalyi. The quote is saying: "This quotation is obviously in line with Renato Tagiuri (Editor's note: referring to his 10 points), but indicates even more obvious than him, how the leadership-behaviour is always dependent on, that the organisation-culture is responsive to this, no matter how good the behaviour is." (Knoop 2005 p.120).

The 10 points are:

- to make the purpose of all jobs completely obvious
- to describe the assignments clearly
- to listen to the workers viewpoints
- to make sure that the necessary resources for completing the task is present
- to be explicit about the evaluation standards
- to reward good work and 'offer carrots' to the students
- to give immediate/quick response on presentations
- to avoid a mixing of personal friendships and leader roles in relation to co-workers
- to admit mistakes and to be honest
- to dare take the decisions that need to be taken

When using these points in relation to flow and education, the positions of leaders and workers would merge to one in form of the group members. These points will not be discussed further now, but will be taken into the discussion as a practical approach of how to stimulate the learning at RU towards more flow.

When talking about requirements of flow in a working group Csikszentmihalyi makes a relevant point in relation to leaders' emotional skills in one of his latest books "Good business: - leadership, flow and the making of meaning" (Knoop 2005 p.120).:

Workers will not place themselves at the service of a leader's vision unless they feel that the rules of the organisation is fairly applied, that their contribution is recognised, and that the integrity is respected...To achieve this end, managers must invest a great deal of their psychic energy in monitoring and enhancing the wellbeing of the group. And above all they have to

develop self-discipline based on self-knowledge, which will prevail them from acting capriciously and selfishly.

The same understanding of a RU context can be read into the above quote, thus organisation would be interpreted as the group.

What the leader/group member needs in order to direct himself and his group members towards flow is a strong ability to know himself/herself and a just as strong ability to discipline himself/herself. When taken that these two features give the ability to handle one's emotions towards positive emotions it is clear that an essential cause of optimal learning is not to be found in the schools or in the pedagogy, but in the students' ability of directing emotions towards positivity and thereby towards flow.

By bringing in the aspect of training or shaping one's consciousness towards flow and happiness as an aim for the pedagogical aspect, flow theory finds its way back to the starting point of the theory; Mihaly Csikszentmihalyi's research concerning life quality and the question of how to improve it. In the flow pedagogy the homework of getting a clearer understanding oneself, and thereby shaping positive emotions and first of all flow, is ultimately constantly present at each conscious moment. "Contrary to what most of us believe, happiness does not simply happen to us. It's something that we make happen, and it results from doing our best." (Csikszentmihalyi 2007b)

7.4 Critics of the flow theory

First, a criticism of the flow theory can begin with the definition of its foundational term: flow. Flow is a purely subjective experience and even an extra-ordinary one. Most people are not very familiar with the flow-experience - on what degree of flow could one actually be said to flow, and how to calculate this? Other subjective experiences which we know better e.g. feelings can be difficult enough to define clearly. One might therefore say that the flow theory is based on a by nature vaguely defined term.

Secondly it can be questioned whether or not this term does actually refer to any existing phenomenon. Flow theorists would find it sufficient validation having personal accounts of flow experiences, where as Positivists and Falsificationists on the other hand would claim that human experience is not falsifiable and thus not science (cf. 5.3 and 5.4).

We could see flow as science defined by Hermeneutic theories, because this theory of science accepts the human introspection and intuition as science. (cf. 5.6). Hermeneutic theory will not accept a human experience as truth, but sees it as a part of the truth. This is however not how Csikszentmihalyi interprets his research results; "I still think that when a person says he is "pretty

happy,” one has no right to ignore his statement, or interpret it to mean the opposite.”

(Csikszentmihalyi, 1997, p.20) By that he refuses to look critical at his result by the statement that humans are telling the truth. This is however against what both Positivism and Hermeneutic theory mean. Positivism would never accept human introspection as truth and Hermeneutic theory would see it as possible truth, but still be critical towards it and investigate whether their introspection should have any connection to their environment or social construction.

You can by that perhaps claim flow to be non-science, and Csikszentmihalyi to be a “light-weighter” in pedagogy?

Another critic could be that Csikszentmihalyi by setting off in a life quality research confuses the aim of his learning theory with the aim of his initial research, making students flow rather than learn. This critic questions whether the learning taking place in the state of flow is sufficient to cover the profound depth of what good learning is. Csikszentmihalyi might be in danger of taking it for granted that because his theory works in one field it is necessarily applicable in other fields as well. In this case the flow theory explaining how to obtain an excellent life is used to explain how to obtain excellent studies. This is again the transfer problem which we mentioned in the critic of neuroscience (cf. 6.7), but maybe this transferring is in a milder way than the one neuroscience is working with, because these two paradigms still both works in the field of humanities.

7.5 Sum-up of chapter 5

- Flow is a state of mind where one is totally absorbed in one’s action
- Learning in terms of the flow theory is a process of growth, implying that one exceeds oneself. It is very much similar to the words used by Knud Illeris
- During flow one **transcends** the self by letting go of negative patterns and distrust of one’s capability. Therefore flow is essential in a learning situation for the learner to exceed his own limits
- Flow theory is a state of extreme intrinsic motivation and emphasis hereby the process rather than the goals, although it recognises goals to be a helpful tool in creating flow
- Emphasising intrinsic motivation is of essential importance for fostering flow
- Flow is totally dependent on the learner’s mind and the theory therefore talks of the possibility of flow due to certain learning environments instead of flow as a necessary consequence of the environment
- Pedagogy of the flow theory understands the learner in a broader context than that of the school setting. It understand the learner as more than just a student. To make the learning

situation flow the learners have to involve themselves emotionally, participate and be willing to set aside themselves in order to grow.

8 - Chapter 6: The students' motivations

8.1 Introduction to motivation

A good educational system must take into consideration the state of its students mind in order to assure that the students get the most out of the education. We will therefore now take a closer look at the students' motivations for learning. Looking at this will help us in evaluating the theories we have investigated and conclude which theories would be optimal to practice at RUC today.

The motivation of students is a broad area and way too big for us to cover in this paper. We therefore want to give only a brief outline of what we have found to be key motivations for students today. First of all we will start out by introducing some general motivation theories as a foundation for our further representation. Later we will present a small survey we conducted among our class mates in the HIB house regarding motivation as well as an interview we had with a student counsellor at RU.

8.2 Motivation theory

Motivation has in the course of time been defined in several ways and we will here outline some of the definitions in order to clarify the exact meaning of the word. In the encyclopaedia of psychology it says: "that which determines the form, direction, intensity, and duration of one's actions."

Other definitions are (Huitt 2001): "internal state or condition that activates behaviour and gives it direction", "desire or want that energizes and directs goal-oriented behaviour", "influence of needs and desires on the intensity and direction of behaviour" and "the arousal, direction, and persistence of behaviour". Contemporary motivation theorists work with the following meaning (Schulz 1998 p.425): "Motivation represents an orientation toward a particular goal, at a particular time, by a particular individual". There are different nuances in these definitions but it seems that motivation is widely understood as an internal condition in the human being which sets off certain actions.

What we now need to find out is which general factors influence people's motivations and especially if there are certain factors that are influential on university students i.e. young people in their learning process.

For thousands of years philosophers have dealt with the question of what makes us do what we do. When the discipline of psychology arose in the middle of the 19th century the psychologists continued the work and new approaches to the question continues to emerge.

A simple and widely acknowledged model of motivation operates with two different kinds of motivation: intrinsic and extrinsic (Huitt 2001). *Intrinsic motivation* (inside the person) comes from e.g. drives integrated in cognitive processes such as creativity and problem solving and carrying out the activity brings therefore by itself pleasure and contentment. Your actions are based on enjoyment, contentment or the feeling of an accomplishment when you gain new knowledge. The significant thing is that you are motivated by the task in itself, and not by influenced by anything outside cf. the flow-experience 7.1. Actions deriving from *extrinsic motivation* (outside the person) are carried out in order to either obtain an external pleasure or avoid external punishment. In school settings extrinsic motivations could for instance be to obtain good grades or avoid failing tests. The motivation to *learn* has by Hermine Marshall been expressed as: "the meaningfulness, value, and benefits of academic tasks to the learner--regardless of whether or not they are intrinsically interesting" (Huitt 2001). Evidence has nevertheless shown that if this motivation is intrinsic the learning result is better because the students put more effort into the learning process and therefore they are also able to grasp a deeper understanding. There are several ways to develop this intrinsic motivation in the students (Huitt 2001). It is important that students can find relevance and purpose in what they are learning and furthermore that the skills can be implied in the real world. It is good if the students have an action plan to achieve certain goals as well as maintain their curiosity. These suggestions are, as mentioned, all directed towards intrinsic motivation and in problem oriented project work practised at RU. At the same time it is affecting extrinsic motivation. Because in the end when the assignment has been delivered there will be an examination of the project. This means that the extrinsic motivation plays its part, because the students have to defend their project and will receive an evaluation. This will end up either in pleasure or punishment, which is significant for the extrinsic motivation. Furthermore the responsibility towards the fellow students in the group work has an extrinsic motivation factor.

We have now discovered that meaningfulness and relevance are important terms when talking about motivation. Also studies show that this is tremendous important when talking of young people and Knud Illeris pointed it out in his theory cf. 3.7. The authors behind the book "Ungdom, identitet og uddannelse" (UIU) which is written in 2001 have through analyzing different relations between today's youth and the educational system found that almost every choice made by a young person today is based on desire for self-realisation. This main characteristic comes into expression by the youth's wish to work with issues which are personally relevant and interesting (Illeris et al. 2002) and brings forth the possibility of self-development. This connection can also be drawn from The

American Heritage Dictionary's definition of the term self-realisation: "the development or fulfilment of one's potential"

The book "Universitetsstudier i krise" (Ulriksen og Simonsen 1998) is supporting the just mentioned fact that students' motivation is closely connected to self-realisation by quotes from several RU-students. The authors conclude that modern students choose subjects according to the possibility of self-rendering and personal gain and they insist that what they learn is personally relevant (Ulriksen et al. 1998 p.13).

The goal of developing one's potential and thereby realise oneself leads us to the American psychologist Carol S. Dweck whose approach to motivation belongs to the social-cognitive. She operates with two dominant motivation goals (Dweck 1999): to validate one's competence and to learn and master new things. Here self-development thus also has a central role in motivation and this idea follows many psychologists' work e.g. that of Erikson, Maslow, Horney, Rogers (cf. significant learning 3.2.2), and Kohut. The works of Dweck are all characterised by the belief that people can change their behaviour. This is in accordance with what we found in neuroscience cf. 6.3. This means that their motivation pattern can be changed and the environment is crucial to whether the students are motivated or not. By the environment Dweck is first of all thinking of the beliefs we hold of ourselves and these beliefs can be changed. We find this to be an important aspect for the education system to be aware of since it means that the school can play an active role in motivating the students for learning e.g. by exercising the suggestions we mentioned earlier. For Carol Dweck the crucial answer though lie in the mindset of the individual student. It is through a healthy way of thinking that success can be obtained in all areas of life including studies. Since young people find themselves in the process of creating an identity the youth is a good era to be taught the right kind of mindset which will bring about a kind of motivation which helps the student to perseverance.

The issue of personal relevance we have made clear in this paragraph can be related to the importance of subjectivity which we explained to depth in the chapter about project pedagogy.

8.3 The survey and the interview

When looking into the theories of students' motivation, we needed an overall view of whether the students actually had these motivations in real life. We therefore decided to make a small survey in form of a questionnaire in our class, just to get a taste of the students' motivation in HIB 03.1.2. The questionnaire consisted of questions we found basic for the motivation at RU inspired from the book "Universitetstudier i krise" (Ulriksen et al. 1998). In the questionnaire our fellow students had to

indicate with numbers ranging from 1-5, how different factors motivate them in their studies. The different factors were: Career, interest, development of personality, gaining knowledge, student life, expectations from family and friends, and gaining competences for the job market. In addition we asked them how well the problem oriented project work at RU supports their motivation.

According to Emil Kruuse in his book; "*Kvantitative forskningsmetoder i psykologi og tilgrænsende fag*" the survey though could have the problem of being too broad, and you would not be able to explain your questions or get explanations on the answers. This could create misunderstandings and wrong answers or wrong interpretations. The survey method has therefore been criticised by the Hermeneutic theory of science (cf. 5) as being too unreliable. The Hermeneutic theory prefers rather the qualitative interviews, which is much more detailed and reliable. This is though, as Kruuse mentioned, a very narrow and time-consuming method, which could be criticised for being too specific. Therefore Kruuse concluded that the most used method is to mix the quantitative with the qualitative, to get both a broad and a narrow point of view. By having this conclusion in mind, we therefore decided to add an interview of a student counsellor to our small survey. The reason for using a student counsellor was that he is a student himself and would have a feeling of the students' motivation through the many conversations he has had with students, and he therefore could explain or detail the things, which the survey could not.

Survey results:

<i>How do the following aspects motivate you in your study?</i> (1= little, 5 = a lot)	1	2	3	4	5	Sum of people answering
Career:	5	4	12	23	11	55
Interesting right now:	2	3	9	19	20	53
Development of your personality:	3	8	13	21	12	57
To gain knowledge:	1	2	11	14	27	55
Enjoy student life:	8	3	12	23	9	55
Expectations from family and friends:	16	15	14	7	4	56
Gain competences for job market:	3	3	10	23	16	55
How well does the problem oriented project work at RU support your motivation?	2	8	13	25	3	51
Amount of answers:	40	46	94	155	102	

We interviewed the student counsellor Allan Hulebæk Hansen who talks to many students with motivation-problems. From his perspective and the survey from our class we wanted to see if there were any similarities in the viewpoints concerning motivation.

We will now take the theories about motivation and see how well they fit with the result of the survey and the interview.

Things that Allan pointed out during the interview were that gaining knowledge is more motivating for the students than developing personality. However this does not mean that the development of personality is not important. Allan lay emphasis on the fact that the development of personality is going on a lot in the study and there therefore seems to be an agreement between the theory and reality (cf. e.g. 3.7). Furthermore competences for the job market are important - especially for students in their final years of studies because they are almost ready to enter the job market. Allan also mentioned that self-realisation is important for the students and this corresponds with the

factors that UIU and “Universitetstudier i krise” described as being very important to a nowadays student.

Things that can affect motivation in a negative way, according to Allan’s experience, are problems in the group work. For example if you are in a group and the group dynamic is unequal there may be argues among the members, or if one student feels he is doing too much work compared to the others. On the other hand he stressed the importance of group work especially for first year students as an essential motivator for them and this is more in accordance with the theories we have explained in 3 and 4.

Another thing that can unstimulate the students can be the imprecise academic identity cf. the interdisciplinarity of project pedagogy in 4.6. This does however, according to Allan, mostly concern the basic year students because they study such a broad field and not yet have a clear idea of their direction. The broadness of the basis years also results in the fact that some basis-year students do not think they gain a lot of knowledge. This critic is backing up the evaluations and critics we accounted for in 4. The unspecific academic identity also decreases the impact of expectations from family and friends as a motivation factor – students simply find it difficult to explain to others what they will become.

The answers from Allan went much more to depth with other aspects concerning motivation than our questions. This gave us new perspectives on the motivations (e.g. the point about how group work not always is motivating). As a final comment we will mention that Allan and the other student counsellors guide students to be motivated by present issues.

That could for instance be those of gaining knowledge, meeting your interest or developing your personality and not the job market and future career. The reason for doing so is that the studies are long-standing and they find it important that the students have something right now⁸.

We find that this is in accordance with the theory of intrinsic and extrinsic motivation.

The similarities we found between Allan’s answer and the result from our survey were however also very interesting to experience. These similarities strengthened the surveys result and could therefore better be compared to the theories on motivation, as Kruuse had argued.

It was the significance of gaining knowledge (rank 5:27 out of 55 votes) where we found the biggest motivation. Students want to become more intelligent and it is actually shown from our survey that this is a greater motivation factor than other factors we included in our questionnaire e.g. *social life, career, and development of personality*. That students want to gain more knowledge

⁸ Quote from our sketch of the interview, see appendix

is also a perfect example of the intrinsic motivation. Still we are aware that intrinsic and extrinsic are often somehow intertwined. The wish for knowledge-gain could for instance also be connected to an extrinsic motivation of getting a good job in the future. It is though a complex matter to settle on conclusions.

To expand your competences for the job market (rank 4:23 out of 55 votes) is also a big “hit” in the survey since it was the second highest ranked question. So from this we see the tendency that the expected personal and interdisciplinary skills for the job market are notable motivations. This is backed up by Allan who mentioned that many students choose RU because of problem-oriented project work in which they learn these competences. This is an important factor because this is what RU with the project pedagogy stands for compared to more traditional teaching methods.

This kind of motivation apparently comes from the circumstances and expectations outside the students and is signified as extrinsic motivation.

Here we found out that both the intrinsic and extrinsic motivation factors play a significant role to a nowadays student at RU; we can't exclude one or the other. Still we also found out that it is not always easy to distinguish between the two and it will always rely on interpretation.

According to Kruuse (Kruuse 1996) there are a couple of errors which you have to take in consideration when making this kind of scale-surveys. We will here make an account of them and relate them to our survey.

First of all, the participants are not able to get the questions described more explicit, which can end up in different understandings of questions or grades (1-5). So we actually do not know if all the participants understood the questionnaire like we meant it.

Furthermore the participants can have difficulties distinguish between the grades in the scale. –What difference does it make to mark 4 compared to 5? The error could occur in our survey because a lot of the answers were ranging between 4 and 5. We do however see this tendency as students being aware of the difference, because we saw a big distinction between number 4 and 5 in the particular questions.

The errors of distinguishing can also be seen in the “Central-tendency” where the participants only choose the central answer in the scale, no matter what has been asked, or the so called “response-style” where the participants have a tendency towards yes or no answers (and not the grades in between). This would in our case mean that they would mark only 1 and 5's.

The results of our survey showed however that the answers were much diverted between 1 and 5; we therefore did not see these errors.

Furthermore you have to be aware of the so-called “time-error-tendency”, where the participants only choose the first answer-alternative in the scale. We neither encountered this problem since our survey was small, simple and the participants had enough time.

We are aware of the errors concerning the quantity of our survey. Because of time pressure we were not able to make a quantitative empirical study which was reliable as a representation of the now-a-day student at RU. The survey only took place within our house and there are therefore only a small amount of answers.

Whether the motivations of the rest of the students at RU are affected in the same way is therefore not clear at all and it is impossible to make a generalisation. Allan is also the only spokesman from the Student Counselling we talked to. His answers may be coloured by his own interpretation and we can therefore not count on them as universal. He was also a little bit worried about mixing up with his own perspectives when answering the questionnaire; his answers were therefore very broad.

Another significant thing is that we thought *development of your personality* would get a higher score, because we saw it close related to self-realisation. But looking closer at the question we see that it was not specific enough. People could have misunderstood it. Therefore we only took useful comments from Allan, but no results from the survey about the self-realisation and whether it is a motivating factor or not.

8.4 Conclusion

In this chapter we have looked at how motivation is described. When we took a closer look we found out that a well-recognised description of motivation is described through intrinsic motivation which occurs from the “inside” of a person and extrinsic motivation that emerges by influence from things “outside” of a person.

We found out from the survey and the student councillor that gaining knowledge is the biggest motivation (rank 5:27 out of 55 votes). Development of your interdisciplinary skills adjusted to the job market is something that is a highly ranked factor of motivation as well.

All of these different aspects of motivation become a part of the self-realisation that is one, if not the most important factor to the student’s motivation. As mentioned before, one of the non-motivating factors is not being able to see the academic identity in the studies, because it can be difficult to see yourself achieve the fulfilment of your potential. This can also be difficult how if your group work is not functioning.

If the university wants to meet the students where they are and thereby promote good learning results the task will thus be to insure that the courses communicate personal relevance and give the students opportunity to cultivate their desires.

Both intrinsic and extrinsic motivation is important to keep in mind when focusing on improving the students' skills.

8.5 Sum-up of chapter 6

- Motivation is an internal condition in the human being which sets off certain actions
- A simple model of motivations divides it into two parts: intrinsic and extrinsic. These terms describe the internal and external factors affecting the motivation
- Meaningfulness, relevance and self-realisation are important terms when talking about students' motivation as well as knowledge gain plays a significant role

9 – Discussion

9.1 Introduction to discussion

We sat off this project wanting to identify if and how it is possible to improve the learning of academic skills at Roskilde University. As we know from neuroscience all kinds of learning share the same neuronal foundation and as such we may use the findings from neuroscience in answering this question. Since Illeris and Csikszentmihalyi were both researching the learning of academic skills their findings too may be included.

A central finding in all of the theories is of the role of the motivation. We have seen that the motivation is important for learning to take place and that it continues to affect the learning process whenever we are learning. Illeris said that the student who is motivated remember better what he or she learns, neuroscience has shown a positive relationship between learning and arousal, i.e. level of motivation, and Csikszentmihalyi suggested in his flow-theory that *flow*, as a state of a high level of involvement and concentration, acts as a magnet for learning

Thus we can conclude on our main question that we can improve the learning of academic skills if we can improve the motivation of the students.

Now a new question arises: how can we improve the motivation of the students? To answer this, we will as well need to include the findings from the chapter on motivation.

Well, first of all let us have a look at how project pedagogy is actually supporting the motivation of the students by analyzing each of the 7 points constituting project pedagogy and their relation to motivation.

Project orientation: If the theme of the project work does not suit the student's interest, it will of course be a boring experience and thus without motivation. But because project work is both participant controlled and problem oriented the relevance for the student is ensured, provided that the student puts in an initial effort in choosing the theme according to his or her interests.

As we read in the motivation experienced meaningfulness and relevance are crucial factors for the student to be motivated. Illeris too mentions the importance of relevance and Csikszentmihalyi mentions the importance of meaningfulness for the occurrence of flow. Furthermore we know from the chapter on neuroscience that the brain gives priority to emotional stimuli causing an increase in concentration affecting the learning result positively.

Problem orientation: It is included in the definition of project work that it has to have relevance for both student and society. Again relevance is emphasized.

Because the student defines the problem, it has its point of departure in what the student already knows and insures as such a sense of familiarity causing the student to feel safe. At the same time it is challenging because of the nature of the problem, a solution to which is most likely forcing some kind of accommodative process or at least a level of abstraction exceeding our pre-defined knowledge or skills. It is in the perfect equilibrium between challenge and skills that we find flow. Instead of learning *about* methods, by problem oriented project work we actually learn the methods by applying them to the problem thus realizing their relevance and usefulness.

Relating the accommodation process as an important element of problem oriented learning with flow, one could suggest that accommodative learning does not necessarily facilitate flow, but that flow might be necessary for a successful accommodation process to take place. Csikszentmihalyi describes how in flow we let go of clinging to the self. Letting go of the self may as well reduce the attachment to ones pre-understandings, emotional patterns and cognitive structures, and thus give the space for accommodative learning to take place

Participant controlled: Since it is the student who knows his or her interest the best, it is almost a necessary consequence of the participant controlled project work that the student experience relevance. Hans Henrik Knoop mentions the possibility to take individual initiative and control oneself as a factor conducive to flow. The fact that it is participant controlled also provides a good opportunity for adjusting the challenges to the skills.

As we remember participant control is the middle way between self-control and teacher-control. Apart from ensuring the academic standard, the supervisor may help to define clear goals and adjust the sometimes chaotic challenges to skills of the students.

Exemplarity: Hans Henrik Knoop states that a common pedagogical condition that obstructs flow is “lack of the experience of being able to use that, which one has learned, to something useful.” (Knoop 2005, p. 114). Working with a project knowing that the usefulness of the methods applied exceeds the limits of project creates a feeling of relevance. Furthermore, goals that exceed one’s own interest are said to be more conducive for flow.

Interdisciplinarity: In this point we encounter a few aspects in which interdisciplinarity may have a negative influence on our motivation.

First of all it could be mentioned that, referring the student counselor Allan Hulebæk Hansen, some students loose motivation because they cannot see their academic identity at RU. This lack of a well-defined academic profile creates confusion in relation to future involvement on the job market. This is mainly an issue for the basic year programme and decreases as the students define their profile throughout their studies. Confusion is of course not beneficial for reaching flow since the confused student would be in lack of meaning and find it difficult to be absorbed.

Secondly another downfall may be that the students will be confused within the concrete learning situation loosing their overview being presented to a wide range of disciplines.

On the other hand it may just as well be argued that the possibility to choose the most reasonable perspectives on the problem provides better chances for a meaningful and successful process leading to an increase of the student's motivation or flow.

Furthermore opening up the wide range of academic disciplines enlarges the field of participant control and with that the advantages already explained.

The last point to mention is that the feeling of interest and relevance towards the chosen problem may be transferred to the disciplines applied, even though they were not of original interest. In this way new fields of interest may be discovered and learning blockages due to past negative experiences may be overcome.

Group work: We already mentioned Csikszentmihalyi's obvious appreciation of group work.

According to student counselor Allan Hulebæk Hansen one of the very motivating factors at RU is the social life, in the first years especially connected to the group work. Applying the group management theories for cultivating flow on this case, one may however address the personal friendships between leaders and co-workers, (because of participant control, students are both leaders and co-workers) as a possible flow disturbing factor.

Another thing to be aware of is the risk that being in group may limit the individual initiative and therefore if not attended to, has a potential for decreasing flow.

As we have seen we cannot conclude that project pedagogy in its nature is either supportive or distractive for the motivation of the student. However, remembering Csikszentmihalyi's quote team projects are especially conducive for flow to arise. Piaget had the idea of learning as desire and as such learning is joyful in nature. When learning is not joyful, when we are not motivated, it is thus because something is obstructing the joy. So what would be blocking a high level of motivation? Csikszentmihalyi mentions five factors that prevent flow from occurring. One should notice how

they are all mental factors. In our survey we found that one of the most important factors for the students when studying at RU is to gain knowledge. According to the student counsellor Allan Hansen, many students at RU have complained that they actually get too little knowledge. Now what is knowledge? If it is the number of pages we have read maybe universities like Copenhagen University exceeds RU in its ability to provide knowledge. However, if it is a matter of having reflected and applied criticism on what we have read RU may be better. The problem then may be that RU is not clearly communicating the competences gained from studying at RU. Allan Hansen mentioned especially the students at the basic year program's confusion about an academic identity and told that this confusion was demotivating to some students. Csikszentmihalyi stressed the importance of concrete goals when creating an environment promoting flow. One conclusion to our main question would then be for RU clearly to define the competences gained. However, the chapter on motivation tells that the learning result is better when the student experiences intrinsic motivation than when experiencing extrinsic and flow may be explained as an extreme degree of intrinsic motivation. Thus to communicate the competences gained at RU would not do it alone as an answer to our main question. This is why Allan Hansen says that he and his colleagues mostly motivate students with present issues, and not things happening in the future.

Now let us then have a look at how it is actually possible to create flow at RU. Since motivation, arousal and flow all refer to a state with a high degree of emotional involvement let us for a moment relate the results from neuroscience about emotions to the practice of project work

We found that what we may refer to as emotional learning happens automatically, unintentionally and associated with our experience resulting in certain reaction patterns relevant to the experience. Such reaction patterns are dependent of our interpretations and may be more or less flexible depending on their nature. Since most experiences in a project work are more or less abstract they will be processed in the pre-frontal cortex and the associated emotions thus in the orbitofrontal cortex. As we remember this is a quite flexible structure and making use of the pre-frontal cortex through reflection and contemplation it is possible to change.

Informed by neuroscience how learning happens on a neuronal level we have one important critique of project pedagogy as practiced at RU. The fact that it is dedicated to the principle of 'learning by doing' has unintended implications that we should be aware of when practicing it. Neuroscience agrees that any learning is 'learning by doing' and follows the principle: 'what fires together wires together'. However it may be naive too believe that we are successfully learning to do project work just by doing project. So why is this the case?

We cannot have an experience of a concrete thing called project work that we can familiarize with. What we can experience are the elements and processes involved in doing a project. Thus depending on the situation and depending on our interpretation of the situation we might experience excitement, anger or stress. Now what we learn from anger is to be angry. Thus before we may actually learn what we are supposed to learn from this process, we need something more. As a minimum we need awareness. We need to know when we are angry before we can actually learn *about* anger and thus how to manage our anger. This applies to any of our experiences. As we saw in the chapter on neuroscience just awareness reduces the influence of our emotions.

We suggest that this inner awareness is combined with an awareness of the outer environment, especially that of the group. To make the group work function smoothly, we may look into how to solve and prevent tensions and misunderstandings causing negative emotions. The smoother the group works the more we may focus on the desired learning. Therefore the leadership tools for group management presented under 7.3 becomes relevant when looking at possibilities of increasing the learning at RU.

Thus we end up with the question: how do we learn to learn from our experiences?

As we saw learning is of a 3-dimensional nature and as such we may try to come up with solutions for each of these dimensions. As we have concluded the best way to improve the cognitive dimension is by improving the students' motivation; an element of the psychodynamic dimension. Since also the 3rd dimension, the social environment is affecting our motivation we end up with two categories of solutions: one relating to the inner environment of cognition and emotions and one relating to the outer environment of group based project work:

- 1) The inner environment: awareness and emotional management
- 2) The outer environment: group management

10 – Conclusion

So here we are; learning at Roskilde University about the learning at Roskilde University. Is this now the best way of learning? Is the project pedagogy facilitating the learning in the best way possible? And if not –how can it be improved?

In our discussion we found that there is especially one factor, which is important for the quality of learning – namely the motivation and especially intrinsic motivation. In addition, all the theories agreed that the feeling of meaningfulness and personal relevance is crucial for the motivation, an idea reflected in the principles of project pedagogy. However, we have discovered that an awareness of how to ensure this motivation in project pedagogy is needed.

Motivation may be referred to as a high degree of emotional involvement. Neuroscience does not conclude whether this emotional involvement should be caused by positive or negative emotions in order to learn the better, but the flow-theory is very clear on this matter: the flow experience may only happen when one has positive emotions. Neuroscience tells us though, that the level of emotional involvement may become too high having a negative effect on the learning process.

Furthermore it tells us that the emotions involved have to be relevant to the learning situation. In our discussion it became clear that the first step towards managing our emotional involvement is to become aware of our emotions.

Flow-theory is emphasising many of the principles behind project pedagogy, and especially group work, as a good way to create positive emotions. This is though provided that the group is managed in a constructive way. It is important that the group members acquire skills in group management because you not necessarily acquire these skills by *doing* group work. Neuroscience also emphasises that awareness of *what* you do is needed for the ‘learning by doing’ to work.

It would acquire another semester of investigation to attach these new perspectives practically on Roskilde University. The main reason for this is the transfer problem of transferring results from one paradigm to another which we mentioned in the theories of science chapter.

We can on basis of our project however conclude that it is crucial that the students not only learn by doing but also are guided in what to do in order to learn the right things.

An idea would thus be to have some kind of guidance or workshop in respectively awareness of emotions and management of group work.

11 – References

NB: Since some of the books are in Danish it has not been possible for all group members to read them.

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12 – Methodology

First of all we will mention that the reason for choosing RU as abbreviation for Roskilde University is that it is used that way on the English version of the university's homepage.

12.1 Knud Illeris and the three dimensions of learning

To find out whether the students at Roskilde University were learning in the best way possible, we had to investigate the theories behind the learning at RU. What was the idea behind the project pedagogy at RU?

Here we decided to use Knud Illeris because his books on learning have been the main foundation for the project pedagogy at RU. We focused mainly on his English version "The three dimensions of learning" 2002 out of consideration to our English speaking group members and the theory expressed in this edition has not changed radically from the books which inspired the foundation of RU. Furthermore we also used his newest edition from 2006 because we here found a better connection between his theory and the project pedagogy which was of great relevance to us. We used a small part from Olsen & Pedersen, 2005 since it showed the different kind of academic learning in an interesting way via Blooms Taxonomy.

12.2 Project Pedagogy

In order to look at how the learning theories work in practice at RU we decided to add a part where we mainly focused on the project pedagogy at Roskilde University. We wanted to include this chapter so that we could be able to criticise whether it makes the students learn in the best way possible or whether it needs changes.

To show this pedagogy at RU, we used Ulriksen, 1997. He discusses in his book the advantages and the critics of having project pedagogy at RU. The reason for using a critical book was on one hand to show how project pedagogy is functioning now and on the other hand to discover critics we could add to our discussion of the best way to learn.

12.3 Theories of Science

When adding a chapter with the theories of science, it was mainly because we wanted to apply a critical view upon our learning theories. This is especially due to our decision of using neuroscience because the background of this science is so radically different from the humanities. With the perspective of theories of science we could apply a critical view upon the validity of the theories and by that compare neuroscience with respectively flow and the three dimensions of learning.

In addition to this we could also cover the second dimension of our project, namely Philosophy and Theory of science.

The material we used to give us this critical tool was mainly the book by Thomas Thurén called “Videnskabsteori for begyndere” 2004. The book was used, even though it was in Danish, because it gave a broad, simple view upon the most used theories on science, while it also added the methodology on how to analyse theories from the perspective of theory of science.

Furthermore we used an article from Gergen, 1997 because this gave us a new theory, which was not added in the book from Thurén, namely the Social Construction. This was important because Illeris describes his theory as working in a constructionist way.

12.4 Neuroscience

We chose neuroscience because it is of the field of natural science and still focuses on pedagogy (humanities). It would therefore be interesting to see if we could find any tools that would help us improving “learning at RU” from this perspective.

Furthermore it is one of the latest theories so we found it interesting to see if there was some completely new knowledge we could add to the project.

We used the book “Nervepirrende Pædagogik – en introduktion til pædagogisk neurovidenskab” 2007 because it is a compilation of different approaches to neuroscience and it was actually published by DPU (The Pedagogical University of Denmark) in order to build a bridge between the natural science’s view of pedagogy and the humanistic view.

12.5 Flow-theory

Neuroscience ends with two ways of emotional arousal, which can make learning possible, namely negative and positive. This is where the neuroscience stops and where flow theory takes over. The reason why we choose flow was exactly to give a perspective of on of the arousals, namely the positive.

Mihaly Csikszentmihalyi is the founder of flow, and we therefore saw it as relevant to use the book “Finding Flow” because he is the author.

Two of his followers who worked further with Csikszentmihalyi’s idea are Hans Henrik Knoop and Jørgen Lyhne. They edited a collection called “Et nyt lærings landskab- flow, intelligens og det gode læringsmiljø” which focuses on the positive flow theory in connection to pedagogy. We chose exactly this book, because of its connection between flow and learning.

12.6 Motivation, survey and interview.

When we chose to include motivation in our project, it was simply because motivation has an important role in the different theories in our project. In order to get more familiar with the kind of motivation concerning students and especially students at RU, we used as inspiration the book “Universitetsstudier i krise” which discusses the different motivating factors from the students’ points of view. To get a broad view of motivation in general we found furthermore a couple of different books on the issue.

We conducted a small survey at RU and had an interview with a student counselor so that we had empirical facts to hold up against the general theory. Though these empirical should be looked at with very critical eyes they still helped us in realizing some things about motivation and students.

13 - Group process- and project work description

The interest for learning which we all shared brought us together around Leif Emil Hansen's project proposal "Learning at RU".

Though we had a common interest in learning we also quickly discovered that our specific thoughts about the subject varied from newer learning theories, the mindset of students, group dynamics, the history of RU and comparison to other universities. We succeeded though in our construction of the research question to meet most people's wishes as we decided to compare the learning theory behind RU with the newest research in neuroscience and flow-theory and as well look at the mindset of students i.e. their motivation for learning. Considering the time this seemed manageable and there was no need for changing the proposed title so it remained all throughout the project: "Learning at RU"

In the first period of the project work we used a great deal of time in investigating the area of learning and the specific theories we had decided to use. Next we made two subgroups: one was looking at the history of RU and the learning theory by Knud Illeris. The other group was looking at the other contemporary theories. As the writing process began we divided the work further among us and each person became responsible of a topic of his/her own interest. In this way we tried to ensure a good motivation.

Through the whole process we have been meeting at least once a week, as well as the subgroups have met in between. During the group meetings we presented our individual progress. It was often necessary to review our main research question in order to assure we shared a common understanding of the problem. As we gained more knowledge on the area we also found it necessary to edit the question a few times. Since we were writing a lot individually these group meetings were very important to keep each other updated on our ideas and thoughts and we also used BSCW for this purpose commenting one another's papers.

This first semester with its general introduction to project work has been especially intensified in our case since we have been writing *about* project work at the same time as *experiencing* project work on first hand. It has helped us a lot because we through reading became aware of important aspects of how to work together and according to our own conclusion in the rapport, project work is one of the best ways to learn. The aspect of interdisciplinarity has for instance shown to be very valuable in our work with both natural science and humanities.

However, it has still been a *process* of learning including first time mistakes, group work trouble and times with lack of motivation.

Being a group of eight people and in addition an international group with people from Denmark, Nigeria and Pakistan has been a challenge, but also a force with our different backgrounds regarding the academic level, culture and pre-knowledge. We have experienced how important the group dynamic meetings, e.g. concerning the individual's weaknesses and strengths, have been for our communication with each other and in making a project together. Our discussions have therefore resulted in many productive and profitable realisations both in regard to the academic work but also on the more personal level. The spirit of the group has all along been constructive and optimistic and this has been helpful for everyone in the times of frustration and stress.

14 – Summaries

14.1 Summary in Danish

I dette projekt sammenligner vi forskellige teorier om læring, så vi i forståelse af disse teorier bliver i stand til at evaluere den projektpædagogik, der praktiseres på Roskilde Universitet Center. I vores evaluering fokuserer vi på, i hvor høj grad de studerende opnår faglige egenskaber.

Vi starter med at introducere Knud Illeris' læringsteori og drager derefter paralleller mellem denne og projektpædagogikken på RUC. Efterfølgende gør vi rede for nogle af de nyeste resultater inden for neuro-videnskab, da der her er gjort spændende iagttagelser indenfor læringsfeltet. Vi inddrager ligeledes en teori kaldet 'flow', der har interessante pointer med hensyn til den studerendes mentale tilstand under læringssituationen. Vi ser herefter på studerendes motivation for at lære og bruger nogle empiriske undersøgelser vi har udført på RUC. Alle teorier bliver holdt op imod videnskabsfilosofi og diskuteret med hensyn til fordele og ulemper.

14.2 Summary in Urdu

لا سٹیبلے یونیورسٹی

تعارف :-
 لا سٹیبلے یونیورسٹی کا قیام ۱۹۶۲ میں ہوا۔ اس یونیورسٹی کا بنیاد رکھنے کا مقصد
 کچھ علم کی مختلف شاخوں جیسے نیچرل سائنس، سوشل سائنس، اور آرٹس گھمپر
 ڈیپارٹمنٹس پر زیادہ توجہ دینا ہے۔
 اس یونیورسٹی میں بنیاد رکھنے والے تین شعبے کی تعلیم دیا جاتا ہے۔ بیچر پول پر، ماسٹر
 پول پر اور پی ایچ ڈی پر۔
 زیادہ تر پروگرام انگریزی زبان میں پیش کیے جاتے ہیں۔ جس سے بین الاقوامی طالب
 علم کے لئے وہاں مقامی ڈیپارٹمنٹس کے درمیان علم کا تبادلہ آسان ہوتا ہے۔

نرننگ ایٹ لا سٹیبلے یونیورسٹی

ابھی میں کچھ کو جس پر اجیٹ کے بارے میں بتانا جاری ہے میں وہ ہے نرننگ ایٹ لا سٹیبلے
 اس پر اجیٹ میں ہم نے مختلف چیزوں پر کام کیا ہے۔ جیسے سب سے پہلے اس کا جرنل لادور
 ویب - سائٹ کے بارے میں کچھ مختلف فلم کی تقریروں کا خیال - سٹیبلے کی تین ڈیپارٹمنٹس
 تھیں۔ جس میں کاسٹیو نرننگ، اموشنل نرننگ، سائیکلو پراسس، وغیرہ وغیرہ۔
 جب سے آخر میں ہم نے اس کا نتیجہ نکالا۔

پروجیکٹ کوئی نہ تم بچے

ہم نے پروجیکٹ کوئی نہ تم بچے کے لئے مختلف چیزیں کی ہیں۔ سب سے پہلے ہم نے کچھ مختلف
 اساتذہ نے اپنے اپنے عنوان کے بارے میں بتایا۔ پھر ہر ایک نے ایک ایک عنوان کو
 سننا تھا۔ وہاں سے لے کر لا سٹیبلے یونیورسٹی میں کھینچنے کے بارے میں سنا۔ ہم نے ایک
 اس پر اجیٹ میں ہم نے دو کتابیں لکھی ہیں۔ اور پانچ ڈیپارٹمنٹس تھے۔ یہ میرا
 پہلا موقع ہے کہ میں اس پر اجیٹ پر کام کر رہا ہوں۔ اس میں ہم نے ڈیپارٹمنٹس کے طالب علموں
 سے مختلف قسم کے فارمز، تقریری اور ہیڈ ہیڈ لکھے۔ اُنہوں نے اسے اگلے
 پروجیکٹ میں ہمیں یہ سلیف کا طریقہ مود دے گا۔

15 – Abstract paper

In this project we compare different learning theories in order to evaluate how the project pedagogy practiced at Roskilde University is facilitating the learning of academic skills in the best possible way.

We look into Knud Illeris' learning theory "Three dimensions of learning" and match it up to the project pedagogy at Roskilde University. Afterwards, we introduce neuroscience and flow-theory as well as looking into how students are motivated for learning using some empirical work, which we conducted at RU. We have discussed the merits and drawbacks of the different theories in the light of respectively; theories of science and in regard to the student motivations. We thereby concluded put simple, that students need to learn how to learn.

16 – Appendix

Summary of interview with student councillor Allan Hulebæk Hansen, Nov. 8th 2007

Allan was first asked to fill out the questionnaire we also had handed out to our fellow students. We asked him to do it in the light of the experiences he has with students seeking advice at the student council. I.e. he should answer in regard to how he thought they would answer. We thought this would give us the best insight in many students' motivations. It turned out, however, that this also gave us answers that were not very specific. As Allan said it: "I experience some students are very motivated by their interests right now, and I experience that some are not". This was the rough answer he gave us to all the motivation factors we had listed and he therefore marked most of the motivation factors at the questionnaire with 3's and 4's. It showed us that students are very different and that the motivation pattern is diverse and not black and white.

Subsequently we interviewed Allan more intensely and we now got more detailed answers and therefore a more comprehensive understanding of the students' motivations and demotivations: Allan said that he experiences knowledge-gain as a big motivator among students he talks with. Further on he stressed that development of personality is playing a key role for the students. With regards to student life/social life as a motivator he said that it is very important for RU-students in specific and that most students are very pleased with the student atmosphere at RU. This is related to project pedagogy and the focus on group work. He specified the meaning of group work in details by explaining how he experiences that it is a central motivator for students at RU especially in their first years of study. On the other hand is group work also a factor that can decrease the stimulation of students because so many problems can occur in the co-operation between students. Bad supervision and the fact that students cannot always do exactly what they want (cf. group work) furthermore decrease the motivation.

He does not see expectations from others as a big motivation and this has to do with the broadness of an education at RU.

He said that many students do not know how to describe what they will be and it can therefore be difficult to "impress" family and friends i.e. live up to their expectations.

In regard to the importance of competences for the job market he mentioned the career-councillor at RU but added that he thinks it plays a substantial role.

His general experience as a student councillor is that the students are in common pleased with the project pedagogy at RU and most complaints are connected with general university rules.

Nevertheless he mentioned few complaints associated to the study: many students at the humanistic basis-studies think it is too broad and that they gain too little knowledge.

According to Allan is one of the tasks for student councillors at RU to ensure that the students find a present motivator. That could for instance be those of gaining knowledge, meeting your interest or developing your personality instead of the job market and future career. The reason for doing so is that the studies are long-standing and they find it important that the students have something right now.

The questionnaire for our class:

How do the following aspects motivate you in your study? (1= little, 5= a lot)

Career:

1 2 3 4 5

Interesting right now:

1 2 3 4 5

Development of your personality:

1 2 3 4 5

To gain knowledge:

1 2 3 4 5

Enjoy student life:

1 2 3 4 5

Expectations from family and friends:

1 2 3 4 5

Gain competences for job market:

1 2 3 4 5

Other things?

How well does the problem oriented project work at Roskilde University support your motivation?

1 2 3 4 5