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# Different Transitions towards Learning at University: Exploring the Heterogeneity of Motivational Processes

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## Introduction

Transitions processes in higher education are characterised by new learning situations and conditions which pose challenges to most students, like entering a new curriculum, participating in new courses taught by new teachers, learning together with new peers and taking new forms of examinations. Each student will react to these challenges in a unique way. This chapter will explore this uniqueness by analysing the heterogeneity of motivational processes. In the first section of the chapter, motivational heterogeneity will be analysed from a theoretical perspective: regulation processes and related challenges from transitions are described drawing on the Integrated Model of Learning and Action (IMLA) (Martens et al., 2013, Martens, 2012). In the second section, empirical results will be presented that illustrate and support the initial claims. In the third section of this chapter, institutional measures will be suggested that will support the motivational aspects of

transitions. This chapter will be concluded with an outlook of which kind of empirical research and theoretical development will be promising in the near future.

## Transition from a motivational perspective

Transition from a motivational perspective means to experience a new (learning) situation. The students' handling of this transition depends on situational characteristics as well as personal dispositions and experiences. These interactions will result in very different patterns of motivational regulation, e.g. the starting situation at university might be experienced as challenging by one student and might result in taking immediate responsibility for the new learning processes. The very same starting situation might be experienced as too demanding by another student arousing feelings of anxiety or insecurity. In the course of studying, this initial assessment might change, resulting in changing motivational patterns: initial anxiety can be countered by increasing feelings of self-efficacy, experiencing successful learning processes. Or repeated negative experiences might result in a stable low motivation without any perspective for change.

We propose that these transitional processes hereby defined as coping with a new learning situation – typically the first semester at university – can be conceptualised within the Integrated Model of Learning and Action (IMLA).

## Regulation processes from the perspective of the Integrated Model of Learning and Action

In the following section we use the Integrated Model of Learning and Action (IMLA) as a systematic framework to describe necessary regulation processes of motivation, cognition, and metacognition. The IMLA is a further development of the rubicon model of action phases (Heckhausen, 1991) that adds a prior phase (the motivation phase) and also incorporates new insight from Julius Kuhl's Personality System Interactions theory (PSI theory) (2000b, 2000a). The PSI theory paves the way to integrate motivational regulation processes that are linked to unconscious, associative and intuitive learning processes. With this additional background the

IMLA can explain a number of learning phenomena that are normally described in different theoretical frameworks (Martens, 2015).

The Integrated Model of Learning and Action (IMLA) covers the same phenomena as concepts of self-regulated learning. Concepts of self-regulated learning are broadened by various motivational concepts such as Pintrich (1999) suggested: goals, attributions, self-efficacy, outcome expectations, self-concept, self-esteem, social comparisons, emotions, values, and self-evaluations. But the general role of motivation for self-regulated learning is still not clearly defined. Most common is the idea that the regulation of motivation is dependent on meta-level knowledge (Wolters, 2003). But from the view of PSI theory (Kuhl, 2000b) it can be assumed that a large proportion of motivational regulation is unconscious and cannot be steered by conscious knowledge. This is congruent with the ongoing debate about the general role of motivation (Baumeister, 2016). So one major goal of the Integrated Model of Learning and Action (IMLA) is to specify motivational processes with greater precision than common models of self-regulated learning.

The Integrated Model of Learning and Action (IMLA) specifies three main phases of learning (see Figure 1):

1. The motivation phase refers to the development of a learning motivation, i.e. the need arises to reduce a perceived learning deficit or to tackle a learning challenge.
2. In the intention phase, a learning intention is formed which can fulfil the learning motivation.
3. In the volition phase, finally, a learning intention is translated into a real learning action.

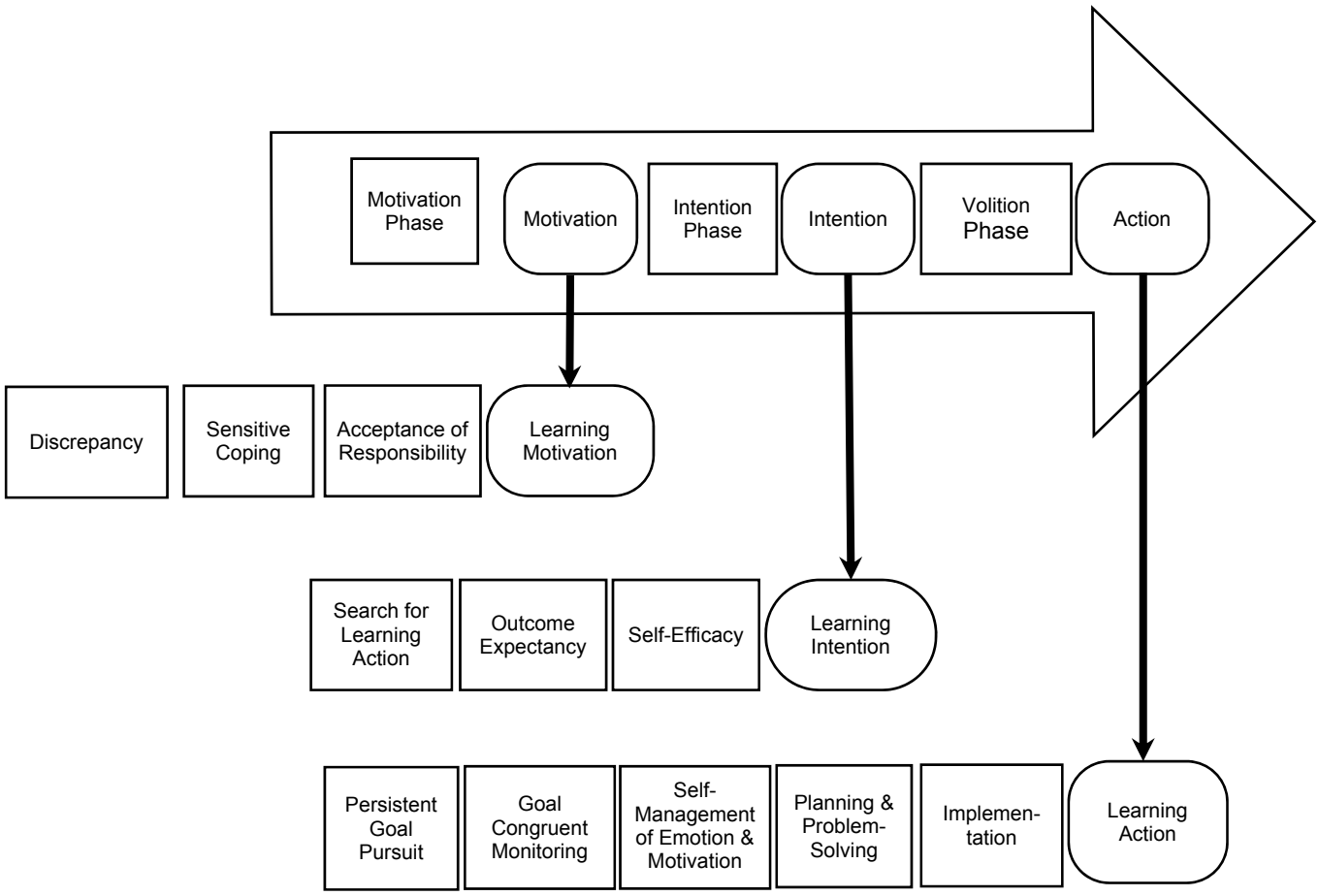


*Figure 1.* The Integrated Model of Learning and Action

## Motivation Phase

The starting point of new learning processes is by setting a new learning aim: the potential learner has to identify a *discrepancy* between the actual and an intended state (see e.g.Hofer, 1981) by analysing the current situation and realising a desired state that can be reached by a learning action. This discrepancy has to be analysed properly despite tendencies to repress negative feelings automatically (*repressive coping*) which might arise due to negative experiences with the topic in question (see Krohne, 1993). To build a proper state of motivation a responsibility for the new learning challenge has to be accepted (*acceptance of responsibility*). It can be assumed that this acceptance is a result of a matching process that connects new study topics to already existing self-schemata. This connection process is described by the PSI theory (Kuhl, 2000b, Kuhl, 2001). Negative affects that are helpful for properly analysing the learning gap have now to be dampened

so that the extension memory (functional characteristics of the extension memory are described by Kuhl, 2000b, Kuhl, 2001) can be addressed forming a new bond of inner self-schemata to the new study topic. By inner self-schemata we refer to a long lasting and stable set of memories that summarise a person's beliefs, experiences and generalisations about the self, in specific behavioural domains.

## Motivation Phase and Transition

It might be very difficult for new students to analyse learning challenges properly: information about future study challenges might not be useful to the students – in most cases they will be described as scientific concepts which the students have not yet acquired and which are therefore hardly comprehensible. Such unprofitable information, too many pieces of information, or a lack of structure can impede students' insight in what are relevant demands and which competencies are expected to be achieved. In addition, open negative communication at study start, e.g. "50% of this start cohort will not pass mid-term examinations", might result in negative affects and therefore hinder processes of taking on deep responsibility for the new subject. Developing a proper responsibility is even more difficult when free choices of study topics are very limited. Limited choices will spoil feelings of autonomy (Deci and Ryan, 2002) and will therefore result in limited responsibility for the learning topic.

## Intention Phase

The intention phase refers to well-known psychological constructs and begins with seeking an appropriate learning action that can fulfil the learning motive that has been developed in the previous motivation phase (*search for learning option*). Subsequently each learning action has to be checked: will the learning action be effective (Heckhausen, 1991) to fulfil the motive (*outcome*

*expectancy*), will the method be applicable for me (*self-efficacy* see also Bandura, 1977) and more specifically will the method be congruent with my inner self-schemata (compare with Kuhl, 2001).

## Intention Phase and Transition

It might be very difficult for students to anticipate the intention phase properly. The aspiration level of learning at university (e.g. more complex knowledge, higher level of specificity and multiple scientific views and even discrepancies about the same phenomena) might call into question well-known learning actions and strategies or even reveal them as useless. So the new students at university have to seek and compare new learning actions that they have not applied so far. Some universities already react to these transitions and offer bridge courses or orientation weeks. But at least an uncertainty may remain whether old learning strategies will still work and how well new learning strategies can be adopted.

## Volition Phase

The volition phase begins with crossing the Rubicon, i.e. the point of no return at which the individual moves from intention to action implementation (Heckhausen, 1991). One learning action has to be chosen that will be set into action in the volition phase. Thus, the first important implementation process is shielding this new action from competing learning actions as well as other actions which might be even more attractive (*persistent goal pursuit*) (Kuhl, 2000b). Mental shielding might not be sufficient at this point and needs support by seeking physical shielding like finding a quiet learning place, turn off facebook or actively eliminating other distractions.

To maintain a balanced motivational state it is also important to monitor if the current implementation processes are still congruent with the inner self (*goal congruent monitoring*). Very strict and inflexible learning processes that ignore inner needs can become very exhausting and can even lead to quitting the process. Kuhl (2001) labels these kinds of self-regulation processes as rigid

self-regulation (see also Kuhl, 2000b). It has to be emphasised that these adjustment processes need a relaxing atmosphere to dampen negative affects. Pressure from teachers might suppress such adjustment processes.

One more important volitional process is *self-management of emotion and motivation* (Kuhl, 2000b). For several learning activities it might not be functional to dwell on negative emotions, e.g. positive emotions and dampening negative emotions are important for creative thinking and for identifying new solutions (e.g. Greene and Noice, 1988). Thus, especially for very difficult learning processes it is crucial to generate positive emotions and also motivational energy to literally move forward. Wolters (2003) claims that these processes can be actively steered with the help of meta-knowledge, but we seriously doubt this: these kinds of motivational regulation processes are deeply connected to the extension memory which is not under conscious control.

Certainly, *planning and problem solving* are also fundamental processes of learning (Kuhl, 2000b). These kinds of processes will be activated by dampening positive affects and emotions. So the absence of positive emotions has to be endured for a while. Of course these processes of rumination and pondering have to be focused on the problem at hand.

Finally, the learning action has to be implemented (*implementation*) (Kuhl, 2000b). E.g. even in a case when no clear solution is at hand, the previous problem solving process has to be finished at some point. Positive affects have to activate the implementation processes of actual learning.

Volition Phase and Transition

It is impossible to cover all volitional patterns that come along with transition processes at university. Thus, we will focus on two hypothetical patterns that may stem from previous action

phases: “high motivation / low intention” versus “low motivation / low intention” that probably will result in dysfunctional patterns of volition.

(a) Low Motivation / Low Intention and consequences for Volition

A rather low acceptance of responsibility (motivation phase) may also lead to low intentions for learning actions (intention phase). So learning actions might not be sufficiently energised to compete for implementation with other rival actions such as leisure activities. As a result, possible learning actions will be easily disturbed by more attractive actions. In extreme cases, this may lead to learning procrastination until the learning actions gets much more urgent, e.g. when examinations come closer.

(b) High Motivation / Low Intention and consequences for Volition

A high motivation combined with low intentions may result in a contrary pattern of volitional regulation, e.g. high acceptance of responsibility (motivation phase) together with low self-efficacy (intention phase) may cause a misbalance that is accompanied by feelings of anxiety (see Lazarus and Folkman, 1987). So there is a great chance that inflexible and rigid volitional strategies will be applied (volition phase) which also might be time consuming (Metzger et al., 2012) and ineffective, e.g. writing flashcards and rehearsal of these cards. These kinds of crystallised volitional patterns that were successful at school level might not be successful at university level any longer, because the quality of required knowledge might change and the learning approach needs to be more flexible and reflexive (e.g. Marton and Säljö, 1984). Furthermore, rigid volitional strategies come along with a lack of positive emotions that will block the extension memory (Kuhl, 2001), and consequentially dampen self-monitoring processes during learning. This might lead to decontextualised learning acquisition: the learned knowledge cannot be applied in a flexible way and becomes inert (Renkl et al., 1996).

## Research Question

In this section we will present results that stem from two different degree programs at Hamburg University. Different programmes represent different learning situations and also reflect different starting situations for transition processes. For analysis purposes we used mixture distribution analysis (see Rost, 2004, Kühnel, 1999). This type of analysis reflects all interaction processes of higher order simultaneously. This means that mixed models are also sensitive for specific situations. We argue that patterns of motivational regulation that only can be identified in one specific course will reflect situational circumstances that trigger motivational processes. The very nature of these analyses also implies that these trigger mechanisms are not working causally: e.g. some students might be more vulnerable to situational influences at the start of the course.

Our goal was to find out if meaningful patterns of motivational processes could be identified. We also we were interested in whether these patterns could be identified across different samples and if some patterns reflected situational influences, too.

## Methods

Based on the Integrated Model of Learning and Action (IMLA) scales were developed to measure the constructs that constitute the three main phases of learning with the help of questionnaires. To identify typical patterns of motivational regulation mixed distribution models (Rost, 2004) were used.

We analysed questionnaires completed by university students at Hamburg University:

Sample 1: B.Sc. Business Economics ($n$ = 205) after two semesters

Sample 2: B.A. Educational Sciences: n=207 (first semester)

In sample 1 bachelor students of Business Economics ($n$ = 205) and in sample 2 n=207 students of Educational Science filled out an online questionnaire. Most scales were adopted from Martens (2000) and modified according to the theoretical frameworks of Martens (2012) and Kuhl (2000b). A 4-point scale was used for the assessment of all items (fully agree, mostly agree, partly agree, disagree).

Table 1. Scales in the Motivation Phase

| Scale | Number of Items | Rasch Reliability (Rasch Analysis) | Mean Assignment Probabilities (Latent Class Analysis) | Example |
|---|---|---|---|---|
| Perceived Threat | 4 | 0,75 | | I often fear that I'll get bad grades |
| Sensitive Coping | 8 | | 0.94, 0.99 | Imagine you hear from your lecturer that the test turned out very badly: "Many of you have failed the examination, but you still have more chances |
| Acceptance of Responsibility | 9 | | 0.94, 0.92, 0.89 | Some students rely solely on the teacher's study material if they do not know something or do not understand |

Table 2. Scales in the Intention Phase

| Scale | Number of Items | Rasch Reliability (Rasch Analysis) | Example |
|---|---|---|---|
| Outcome Expectancy | 5 | 0,81 | In most cases learning leads to the results I expected |
| Self-Efficacy | 7 | 0.82 | When I learn the course content, I draw on extensive personal knowledge |

Table 3. Scales in the Volition Phase

| Scale | Number of Items | Rasch Reliability (Rasch Analysis) | Mean Assignment Probabilities (Latent Class Analysis) | Example |
|---|---|---|---|---|
| *Persistent Goal Pursuit: Maintenance (Efficacy)* | 6 | 0,8 | | I fight my way through the material, even if learning is exhausting |
| *Persistent Goal Pursuit: Distraction* | 5 | 0,82 | | When learning, I allow myself to get distracted easily |
| *Goal Congruent Monitoring* | 6 | 0,84 | | I can tell quite quickly which learning methods will work for me personally |
| *Learning with Peers* | 6 | 0,84 | | I learn mostly together with other students |
| *Self-Management of Emotion and Motivation: success experience* | 3 | 0,67 | | It's fun to notice that I have mastered certain procedures |
| *Self-Management of Emotion and Motivation: generating positive emotions* | 8 | 0,85 | | Even when working on difficult tasks I know how I can stay in a good mood |
| *Effort avoidance after negative emotions* | 6 | 0,88 | | I find that studying for tests is a major burden and I put it off as long as possible |
| *Metacognitive Learning Strategies (based on Wild et al., 1992, see also Pintrich, 1991)* | 17 | | 0.99, 0.97, 0.95 | I try to arrange the material in a way that helps me to remember it better |

*Statistical Analysis*

The statistical analyses were performed with the help of item response theory and its extensions for mixture distributions (see Rost, 2004) with two analysis steps. Firstly, the scales of the three phases were evaluated separately. Secondly, the resulting person parameters of the first step were analysed to identify pattern of motivational regulation.

In the first step, the scales were analysed separately using the mixed Rasch model (Rost, 1990) and latent class analysis (Lazarsfeld and Henry, 1968). The best fitting model was identified by using the consistent Akaike's information criteria (CAIC, Bozdogan, 1987). These information criteria reflect the fit of the observed data to the estimated parameters on a weighted chi-square distribution. Further information about the best fitting model is taken into account by inspecting the Q-Indices (item homogeneity according to the Rasch model). With the WINMIRA program (von Davier, 2001), mixed Rasch models with smoothed score distributions were computed according to the partial credit model. WINMIRA also was used to identify latent-class models according to the partial credit model and class specific parameters.

For most of the scales, the analyses revealed that the one-dimensional Rasch model (partial credit) fits the empirical data better than the competing two-class solution of the mixed Rasch model. Nevertheless, three scale analyses did not result in a continuous latent variable, but in distinct latent classes. For "Sensitive Coping" and "Acceptance of Responsibility" the latent class analysis – according to the CAIC - fit the empirical data better than the Rasch model. This corresponds to prior theoretical assumptions that coping and responsibility are rather qualitative than quantitative processes and validates previous results (see Martens, 2000). Analysing the "Metacognitive Learning Strategies" scale also resulted in a better fit for the latent class analysis, but in this case this reflects insufficient scale homogeneity. The mean assignment probabilities calculated with

latent class analysis for these three scales vary between 0.89 and 0.99 and point to a sufficient discriminability of the according subpopulations.

In the second step, latent class analysis (Lazarsfeld and Henry, 1968) was used to identify the subpopulations that represent distinct motivational, intentional and volitional patterns (see also Martens, 2000). The input data for this second statistical procedure were the estimated person parameters provided by the scale analyses in the first step. The need to combine continuous person parameters from Rasch analysis and distinct class assignments to classes from latent class analysis made it necessary to round the received person parameters to integer values. Furthermore, we collapsed sparse integer values to have at least 10 persons per integer value. By using this procedure, we maintained the measurement quality of the analysis of the first step and avoided model instability due to too many empty cells.

We used various methods to identify the appropriate type of model and number of subpopulations: the consistent Akaike's Information Criterion (CAIC) (Bozdogan, 1987, Bozdogan and Ramirez, 1988){Bozdogan, 1987 #285;Von Davier, 1997 #4002}, bootstrapping (von Davier and Rost, 1996, Efron and Tibshirani, 1994, von Davier, 1997), mean assignment probabilities, and visual inspection. The final decision on the model was supported primarily by the outcome of the bootstrapping procedure proposed by von Davier (1997). In both studies the five-class solution (ordinal LCA with class-specific thresholds) provided the best bootstrap values for all compared models. This means that the identified model does not differ significantly from 200 bootstrapped samples according to the Pearson $X^2$ and the CressieRead statistics (Cressie and Reed, 1984), thus, both models are sufficient to explain the empirical data. However, it cannot be excluded that other models we did not take into consideration might explain the data as well (Rost, 2004).

Moreover, in both studies the mean assignment probabilities for the five-class solution vary between 0.94 and 0.99 and point to a high discriminability of the five subpopulations.

We also analysed both samples together. But the profiles of the latent class analysis get fuzzier this way. This effect can be attributed to the approximation algorithm within the latent class analysis. Similar profiles in both classes will merge and form a bigger subpopulation. But the remaining rest will not be similar and result in different subpopulations.

## Findings

*Patterns of motivational regulation*

The five subpopulations of motivational regulation in sample 1 (see Figure 2) differ foremost in regard to their general level. The scales that discriminate the most between these types are persistent goal pursuit and emotion regulation (regarding the discrimination index). The two biggest subpopulations which represent *pragmatic learning motivation* and *strategic learning motivation* show a mid-range profile of scores. In particular, the pragmatic type shows a low level of perceived threat and a comparable low level of responsibility resulting in low or pragmatic motivation to learn.

Students with an *anxious learning motivation* sensed a high level of learning demands. Combined with sensitive coping and high acceptance of responsibility, this constellation will lead to a high initial motivation. Unfortunately, this high amount of initial energy cannot be transferred to the subsequent intention phase. This subpopulation shows lowest outcome expectancy of all groups and comparable low self-efficacy regarding the intention phase; thus, this low intention results in a low profile in the volition phase as well. The imbalance of high motivation and low intention will be most probably experienced as anxiety (Lazarus and Folkman, 1984).

Students associated with *negative learning motivation* show the lowest profile of motivational regulation. These students took no responsibility for their own learning and reported low scores for self-efficacy. With their low profiles of motivation and intention, it is quite consistent that these students reported difficulties in the volition phase, for example, they tended to be easily distracted by other activities and were not capable of generating positive emotions towards ongoing learning activities.

Students associated with *self-determined learning motivation* (green profile) took responsibility for their learning and showed high levels of outcome expectancy and self-efficacy. This level of motivation and intention continued in the volition phase, including high values for success experience, emotional regulation, effort investment and persistent goal pursuit.

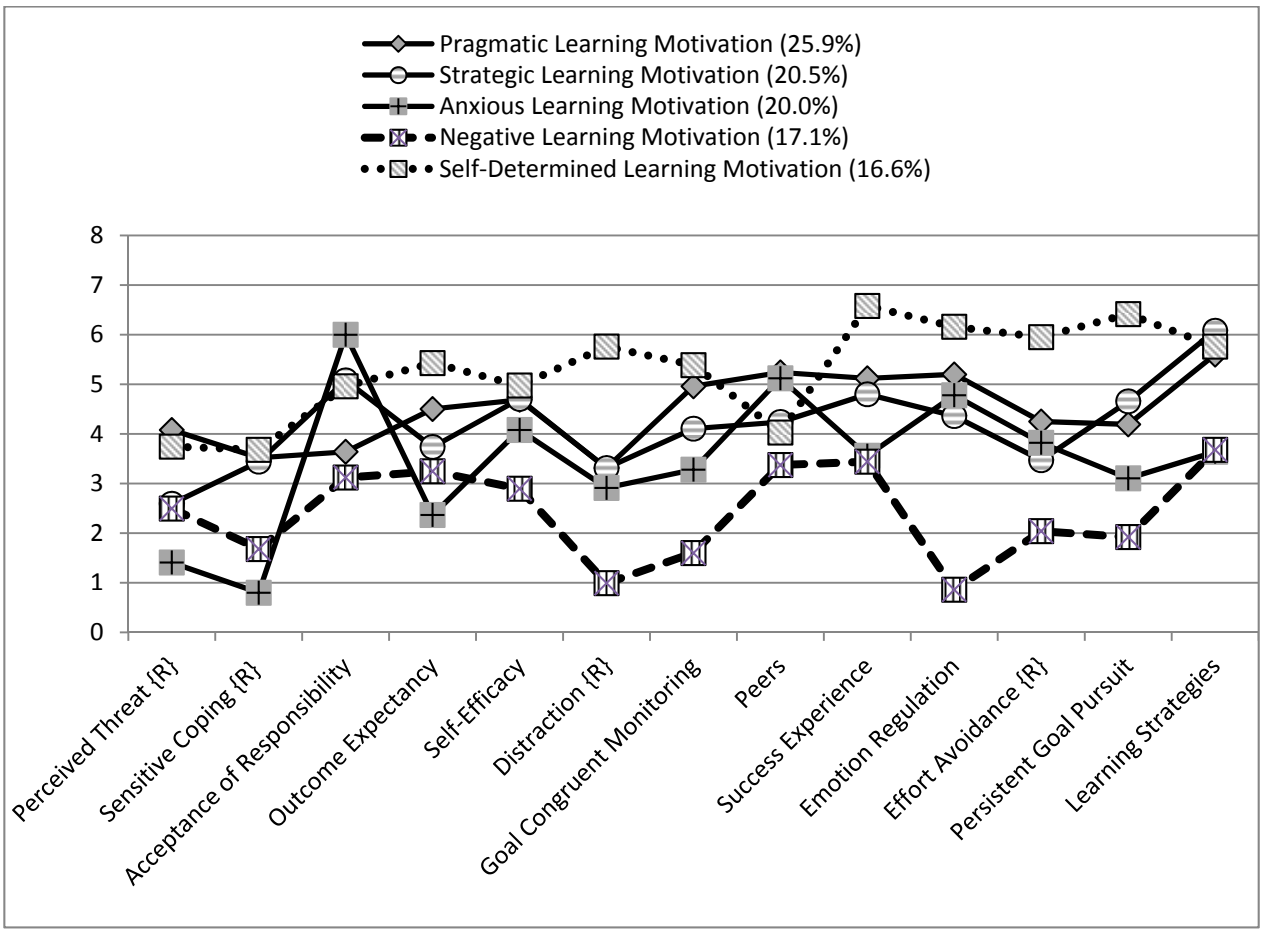


*Figure 2.* Study 1: Business Economics: Patterns of Motivational Regulation (total $n$ = 205)

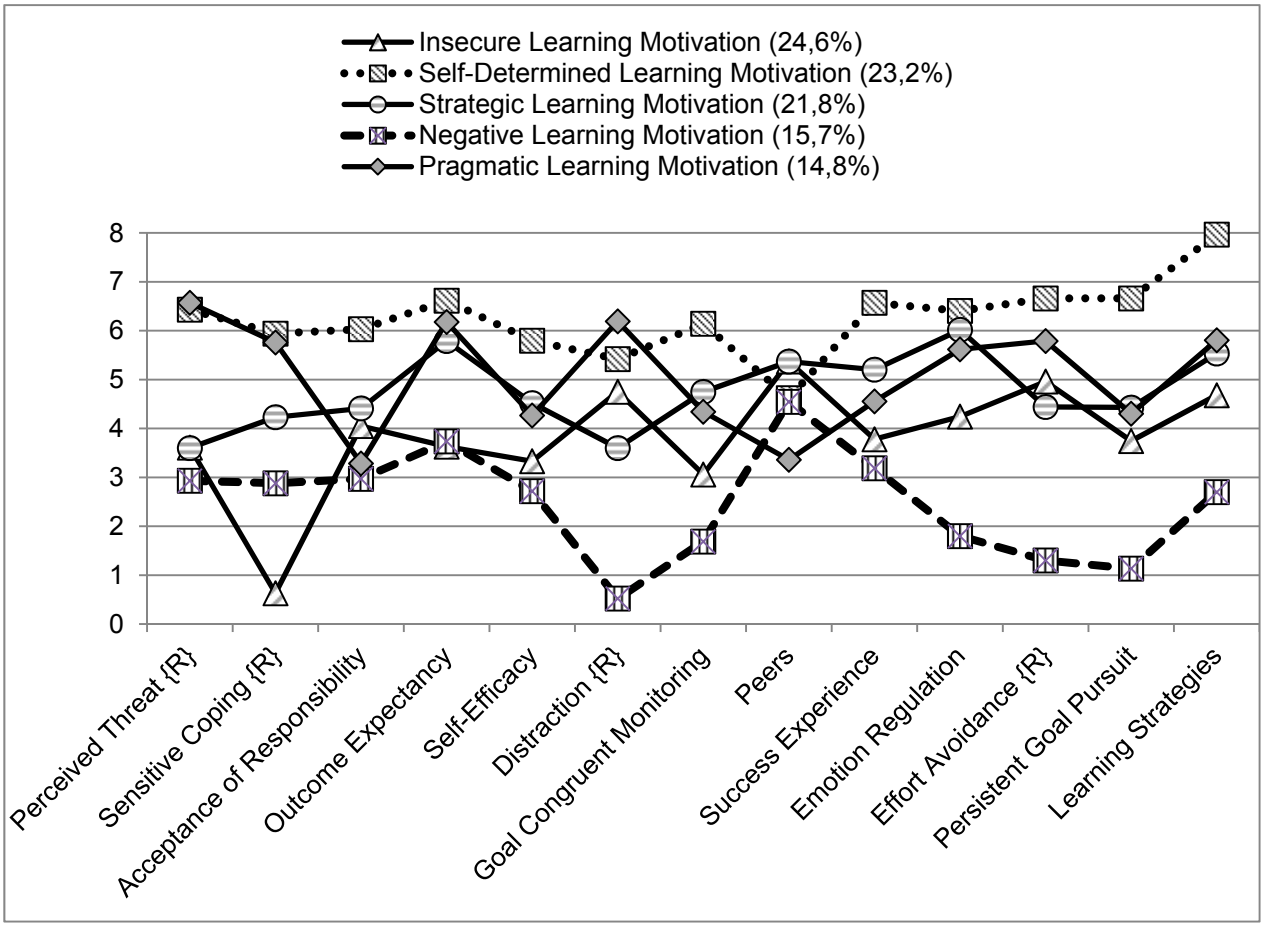


*Figure 3.* Study 2: Educational Sciences: Patterns of Motivational Regulation (total $n = 207$)

In the second sample (Educational Sciences) five subpopulations of motivational regulation were identified (see Figure 3). Four of these patterns are very similar to the ones found in the first sample: self-determined, strategic, negative and pragmatic learning motivation. The fifth group from the first sample, the anxious learning motivation, could not be found in this sample. Instead, a pattern with a low level of perceived threat, a medium level of acceptance of responsibility and a high level of sensitive coping was identified. Such a pattern can best be described as “insecure”: so far, the students assigned to this subpopulation do not feel actually threatened, but they are highly alerted and react to possible threatening information with sensitive coping.

## Discussion

We found that typical motivational profiles can be identified in both samples: self-determined, strategic, pragmatic and negative. But we also identified specific motivational patterns for each program: In the sample of students of Business Economics we identified a subgroup of students with an anxious learning motivation (20% of the sample); in the sample of students of Educational Sciences we identified a subgroup of students with insecure learning motivation (25% of the sample).

Students of Economics are confronted with very different demands due to the variety of subjects they have to deal with. Besides, most of the subjects are quite unfamiliar as they are not taught at school, and several of them imply mathematical techniques which are rather frightening for many students. Not least, exams are often demanding (Heublein et al., 2010). Thus, studying economics is rather selective, especially compared to studying educational science, and more structured, too. Therefore, some economy students perceive the learning situation as threatening, and some freshman in education perceive the learning situation as not very well structured, they do not exactly know what they can expect.

The anxious learning motivation as well as the negative learning motivation are not very promising patterns of motivational regulation. Students with these kinds of motivation show lower grades and need more time for learning (Metzger et al., 2012). It can also be deduced that the pattern of negative learning motivation is associated with constant negative affects during learning which will reinforce procrastination tendencies to avoid exactly these feelings. It can be also be suspected that patterns of anxious learning motivation are especially dysfunctional when various learning strategies have to be applied, e.g. for comprehending complex knowledge.

So far, the presented results are based on cross-sectional data. Nevertheless, the used mixed distribution methods represent fixed-images of different regulation processes. Of course, this cross-

sectional approach has to be complemented by longitudinal data and more important by real time assessment of regulation processes.

## Consequences for Transition Processes

In view of high drop-out-rates – 28% of all bachelor students in Germany stop studying, with huge disparities between disciplines (Heublein, 2014) – the challenge for university teachers is to take the heterogeneity of learning motivation into account (see Metzger et al., 2012). Especially, didactical interventions have to be identified that foster student development and lead to overcoming dysfunctional patterns of motivational regulation.

It could be argued that patterns of motivational regulation might primarily be caused by personal traits. Thus, universities have no obligation to act on different motivational patterns. Two major counterarguments can be presented:

(1) Every student should be given the chance for a successful start at university – independently from his/her former pattern of motivational regulation. This is primarily a matter of universal justice (Rawls, 2009).

(2) We assume that patterns of motivation are not invariable. Rather, they depend on context factors and can be influenced by educational measures, e.g. feedback, structure of teaching, and transparency regarding relevance of topics for the field and of learning goals. Thus, optimising transition processes – especially from school to university – will most likely cause an improvement of motivational regulation for all types of learning motivation reported above.

We propose several basic educational principles and measures that can be deducted from the motivational processes postulated in the IMLA (Martens et al., 2013, Martens, 2012) and that become relevant especially in transition phases where students are confronted with new learning situations. Although, motivational, intentional, and volitional processes and strategies have to be

fulfilled and implemented by the students themselves the forming of a learning motivation, a learning intention and the implementation of a learning action can be supported by the institutional learning environment.

Motivation Phase

- Avoidance of threatening communication. Processes that induce fear will probably hinder self-regulation processes – at least for some subpopulations (e.g. learners with an insecure or a negative learning motivation). Teachers should describe discrepancies between the actual and in future desired learning state in such a way that students can relate to their prior knowledge or experiences. It is a common misunderstanding that threats – especially at the beginning of the study course – will foster motivational regulation in a positive way.
- Providing free choice of learning topics and approaches to learning – already at the beginning of the course. This will strengthen autonomy and ascription of responsibility.
- Making learning milestones and goals transparent supports the student in understanding what is required of him/her. Thereby, he/she is able to identify the discrepancy between the actual and an intended state and can develop a learning motivation.
- Providing a trustworthy learning atmosphere and relaxing breaks to help self-relaxation. These are prerequisites for activating the extension memory and subsequently stimulating the ascription of responsibility.
- Providing opportunities to tie in with one's own knowledge and experience as well as explaining the relevance of the learning topic might enhance the meaning of the topic to the student and thus increase interest and the acceptance of responsibility for the learning process.

Intention Phase

- Providing learning material that represents the same learning topics with different representations or in different contexts. This should support students to choose different actions or methods for learning.
- Provide formative assessment that allows students to rethink the effectiveness of their learning actions and reflect the self-compatibility of their learning actions.

Volition Phase

- Reduce distractions, e.g. by reorganising teaching modules, block scheduling (Metzger, Schulmeister & Martens 2012).
- Provide structures that help students to orient themselves in the learning process, e.g. giving feedback, providing meaningful deadlines.
- Provide options for students to plan and implement their learning processes individually.
- Providing opportunities for collaborative learning with peers.
- Set inducements for learning, e.g. providing feedback, working on a topic of relevance and interest.

Initially the "novelty" of a new learning situation is predominantly determined by external circumstances. The fading of this novelty can be supported by the institutions but depends largely on internal regulation processes. Successful adjustment to a new learning situation will result in a sufficient insight regarding the challenge (motivation phase) and the necessary response options (intention phase). Thus, a successful action regulation is exactly what will lead to a normal learning situation that is not new any longer.

## Further Research

The IMLA (Martens et al., 2013, Martens, 2012) presented here is a complex model. It will be difficult and maybe impossible to test all hypotheses that can be derived from this model simultaneously. Nevertheless, there are several options to expand empirical research and test the

IMLA in greater detail. One promising direction of research will examine motivational processes over a long period of time, e. g. several years, which might allow conclusions about factors and measures that influence motivation. It could be supposed that patterns of motivational regulation – especially if they are strongly connected to distinct self-schemata – might be persisting over time and difficult to change.

We also expect that future research on motivational regulation will improve using new technologies. For example, motivation regulation processes will be analysed with the help of sensory data from wearables exploring if sensory patterns can match motivational indicators. This will allow to detect motivational processes without disturbing the learning process and to adapt the learning environment accordingly (www.sensomot.de).

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