A longitudinal study of learning conceptions on the transition between primary and secondary education

A Longitudinal Study of Learning Conceptions on the Transition between Primary and Secondary Education

Abstract

Research shows that learning conceptions are susceptible to change during possible critical transitions in students' school careers: such as the transition from primary to secondary education and the transition from secondary to higher education. This study aims to determine whether students' learning conceptions developed during the four years of transition between primary and secondary education. The study consists of four measure moments in a longitudinal multilevel design and is based on a sample of 102 students. The results show that changes are present in students' learning conceptions during the last years of primary education and the first years of secondary education. Where change occurs, it is primarily a negative trend: avoidance orientation increases significantly when development orientation decreases. Boys develop a more negative conception towards school and learning than do girls. Deep processing activities, which focus on metacognitive skills, decrease from as early as one year before students leave primary education, when they are eleven years old, and continue to decrease until the end of the second school year of secondary education, when they are fourteen years old.

1. Introduction

Learning conceptions are students' individual views and thoughts about their learning and the way in which they interpret learning objectives and learning situations. Learning conceptions represent a cluster of individuals' ideas and views about what the nature of learning is and what demands are put on students by learning (Klatter, Lodewijks & Aarnoutse, 2001). In the area of learning conceptions, research has shown that conceptions of learning do not stand alone but relate specifically to the nature and quality of the learning activities undertaken during the learning process (Klatter et al., 2001). Most research on learning conceptions has, to date, focused on individual differences in learning conceptions, and less is known about the changeability. According to Richardson (2011) learning conceptions are relatively stable, but other research shows that throughout higher education (Marton, Dall'Alba & Beaty, 1993) and secondary education (Berry & Sahlberg, 1996; Cano & Cardelle-Elawar, 2004), learning conceptions are liable to change over the years. Learning conceptions were found to be liable to change during possible critical transitions in the school career, such as the transition from primary to secondary education (Klatter et al., 2001) and the transition from secondary to higher education (Donche, Coertjens & van Petegem, 2010; Vermunt &Vermetten, 2000).

Until now, it has mainly been the conceptions of students in higher education that have been studied (Entwistle, 1991; Marton et al., 1993; Säljö, 1979; Vermunt, 1998). There has been little research on young students' conceptions or which conceptions are relevant in the education of students on the transition between primary and secondary education.[1] The importance of gaining knowledge about learning conceptions, especially during critical transitions in young students' school careers, is substantial because in the current educational context, more emphasis is put on the development of awareness of students' methods of learning and the development of metacognitive skills and metacognitive knowledge. Previous research has shown that the way learning tasks were approached depended on students' learning conceptions (Klatter et al., 2001). There is a certain relationship between students' learning conceptions and how they interpret learning tasks (Klatter et al., 2001). Based on these interpretations, students perform the learning task according to the way they think the task should be performed. Previous research has shown that learning conceptions have had a significant relationship with the way in which students learn in higher education (Richardson, 2011; Vermetten, Lodewijks & Vermunt, 1999; Vermunt & Minnaert, 2003). Little research has been done regarding how learning conceptions develop through time. Cross-sectional studies have noted the similarity of the conceptions found in secondary- and higher-education students (Marton, et. al. 1993).

In light of the importance of the development of learning conceptions in diverse educational levels, it is important to study and portray the development of learning conceptions in young students during the transition between primary and secondary education. This longitudinal exploratory study focuses on the development of learning conceptions in the period from the second to last year of primary education, when students are eleven years old, until the end of the second year of secondary education, when students are fourteen years old. By means of longitudinal research, we aim to explore if and how learning conceptions develop during a period of four years, incorporating the transitional phase from primary to secondary education.

1 Primary education: students aged 4 to 12 years.
Secondary education: students aged 12 to 18 years.
Higher education: students aged 18 years and older.

2. Theoretical Framework

2.1 Learning Conceptions

In the last two decades, research has indicated the presence of individual differences in learning conceptions among students in different educational contexts (Entwisle, 1991; Marton et al., 1993; Peterson et al., 2010; Purdy & Hattie, 2002; Robbers, Van Petegem, Donche & De Maeyer, 2015; Saljö, 1979; Tynjälä, 1997; Van Rossum & Hamer, 2010; Vermunt, 1998). One of the first studies on the scope of learning conceptions in higher-education students was carried out by Säljö (1979), who distinguished five conceptions of learning: increasing knowledge; memorising and reproducing knowledge; applying and using knowledge; understanding what has been learned; and seeing things in a different way. In 1993, Marton and colleagues confirmed Säljö's findings and added a sixth learning conception: changing as a person. Purdie and Hattie (2002) used their learning conception list, the Conceptions of Learning Inventory (COLI), to compare learning conceptions in Australia, Malaysia and the United States of America. Similar to Marton et al. (1993), they also found six learning conceptions. Peterson, Brown and Earl Irving (2010) found the same six learning conceptions in fourteen-year-old secondary-education students in New Zealand. Learning conceptions have been more often identified in the literature, although different labels are often applied to each (Peterson et al., 2010).

Several studies (Säljö, 1979; Marton et al., 1993; Van Rossum & Hamer, 2010) mainly indicated the content and process aspects present in students' learning conceptions. However, other research (Purdie & Hattie, 2002; Tynjälä, 1997) suggests that learning conceptions can also be described from other perspectives. The content and process perspectives of learning conceptions, for example, could be extended to the inclusion of a social perspective: learning is an interactive process (Tynjälä, 1997) and learning is getting along with other students and knowing how to communicate (Purdie & Hattie, 2002). In addition, describing learning conceptions, other studies (Entwistle & Peterson, 2004; Klatter et al., 2001; Purdie & Hattie, 2002; Peterson et al., 2010; Robbers et al., 2015; Vermunt, 1998) also pointed to motivational perspectives: the reasons for learning, also known as goal-orientated learning. These social and motivational perspectives within the concept of learning conceptions increase the plausibility that learning conceptions can be described from a multidimensional perspective.

Table 1: *Learning conceptions from different perspectives (Robbers et al., 2015).*

	Säljö (1979); Marton, Dall'Alba & Beaty, (1993)	Van Rossum & Hamer (2010)	Tynjälä (1997)	Purdie and Hattie (2002); Peterson, Brown & Irving (2004)	Biggs (1987)	Klatter, Lodewijks & Aarnoutse (2001)
Perspective that points to the content and process of learning	increasing knowledge memorising and reproducing applying and using knowledge understanding what has been learned	learning as an externally determined event/process learning as strategies / styles/ approaches learning as information processing	learning as an externally determined event/process	gaining information remembering, using, understanding	surface learning approach deep learning approach Achieving approach	undirected learning surface learning demands and activities deep learning demands and activities
Perspective that points to the social aspects of learning	seeing things in a different way changing as a person	learning as a developmental process learning as a student / learner activity	learning as a developmental process learning as a student / learner activity learning as strategies / styles approaches learning as an information process learning as an interactive process learning as a creative process	developing social competence learning as a personal change learning as process (not bound by place or context)		teacher regulated learning peer regulated learning individual learning
Perspective that points to the motivational aspects of learning				learning as a duty	extrinsic approach intrinsic approach achieving approach	avoidance orientated development orientated

In the present study, learning conceptions are described from a multidimensional perspective consisting of three dimensions of learning conceptions: motivation, regulation and mental processing activities. The only conception-of-learning questionnaire, which was designed specifically from quantitative studies with young students that can be used on the transition between primary and secondary education in Dutch education, is the Learning Conceptions List originally developed by Klatter, Lodewijks & Aarnoutse (2001).

The questionnaire makes it possible to map individual differences in learning conceptions of young students and enables investigation of the changeability across time (to investigate their specific relationship with learning).

Table 2: *Overview of the three dimensions and the eight scales of the learning conception questionnaire and examples of items along with the number of items.*

Dimensions	Scales	Scale description	Number of items
Motivation	Development orientation	This scale reflects on learning as a personal importance for students. It measures pleasure in learning and aims towards personal growth and autonomy.	7
	Avoidance orientation	This scale indicates a negative attitude to school and learning. Students, with a high score on this scale, do not see the usefulness of school tasks.	8
Regulation of the learning process	External regulation	This scale maps in how far students prefer external direction and places a great deal of reliance of support from the teacher. Students, with a high score on this scale, believe that it is the teacher's job to give extensive explanations with regard to assignments and topics to be examined in any evaluation.	7
	Regulation by peers	This scale gives an insight on which level students prefer to obtain advice about learning and studying from their classmates. The scale also measures, the students' level of interest in how other students think and learn and compares this with their own habits of study.	5
	Individual regulation	The scale measures if students prefer to work and learn on their own	5
Mental processing activities	Surface learning and processing activities	This scale maps if students think that the use of a quantitative approach to learning is an appropriate approach. The scale also measures if students are devoted to their task and think that spending a lot of time and effort to a task is an important precondition to learning. Finally, the scale indicates if students think that repetition and memorization are relevant learning activities for them.	5
	Undirected learning and processing activities	This scale measures how far students find it difficult to carry out tasks because they are unsure where to start. The scale gives an insight into the fact if students regard their learning style as inefficient.	5
	Deep learning and processing activities	This scale indicates if students value learning activities, such as elaboration; understanding the learning content; and meta-cognitive activities.	6

2.2 Development of Learning Conceptions

A less investigated area in the field of learning conception research is related with examining the sources of, changes in and development of learning conceptions of young students over the course of time as part of students' individual school careers. Research on the development of learning conceptions showed that the conceptions of learning in secondary education students (e.g., Berry & Sahlberg, 1996; Cano & Cardelle-Elawar, 2004) and students in higher education (Busato, Prins, Elshout & Hamaker, 1998; Conley et al., 2004; Marton et al., 1993) developed throughout the school career due to educational experiences. Tynjälä (1997) found that, through the scope of their educational experiences, higher-education students who were educated in a constructive learning environment used more forms of critical thinking than students who received their education in a traditional learning environment. Vermetten, Lodewijks and Vermunt (1999) investigated the development of learning conceptions during the first two years of university study and found a high degree of stability during this period. However, for students in the first three years of higher education, Donche et al. (2010) and Vermunt (1998) found a development of learning conceptions, which shifted from reproductive, undirected learning, via more flexible learning, to meaningful directed learning.

Longitudinal research by Schommer, Calvert, Gariglietti and Bajaj (1997) on the development of learning conceptions in students aged fourteen to eighteen years showed that their

conceptions developed over the course of the four years in which the students were in school. Aside from existing research on the development of learning conceptions in secondary and higher education, Klatter et al. (2001) found in a longitudinal survey study that students in the period between the last year of primary education and the beginning of the second year of secondary education, showed a clear development of learning conceptions. Their learning conceptions were found to change over the course of time; however, most changes occurred during the transition from primary to secondary education. They also found a change from developmental orientation to avoidance orientation. The longitudinal design in the study of Klatter et al. (2001) was restricted, as it included only two years; the present study aims to go further by including the development of learning conceptions during the four years of the transition between primary and secondary education. The main aim in this study, therefore, is to examine whether learning conceptions are stable or whether they change over time and to what extent this possible variability could be associated with personal characteristics, such as gender.

2.3 Gender

Several studies have addressed the influence of gender on ideas and expectations and their translation into learning conceptions. However, despite various research, there is no conclusive view as to whether gender is consistently related to different conceptions of learning (Conley et al., 2004). Vermunt (2005) concluded that there is little to no consistent relationship between students' gender and their learning conceptions, with the exception that female students in higher education attached more value to cooperative learning than did male students. Research by Rozendaal and colleagues (2003) showed that female students in vocational secondary education used more surface-level processing, while male students used more deep-level processing. This is not in accordance with Edmunds and Richardson (2009), who found that female students in higher education held conceptions of learning that were more elaborated than those of male students. In the research of Klatter (2001; 2003) investigating learning conceptions in primary education and first year secondary education, no consistent relationships with gender were found. This study aims to further investigate whether significant differences in learning conceptions between boys and girls are present during the transition between primary and secondary education.

3. This study

This study aims to determine whether students' learning conceptions develop when making the transition from the second to last year of primary education (11-year-olds) until the second year of secondary education (13-year-olds). In contrast to the existing longitudinal research on learning conceptions, which often covered two or three years (Klatter et al., 2001) or occurred in higher education contexts (Richardson, 2011), this study is one of the first to examine learning conceptions across four years in relation to the transition between primary and secondary education. Given the inconclusive results with respect to gender, in this study, we also examine whether gender effects are present.

The following three research questions are central to this study:

(1) To what degree are learning conceptions variable during the four years surrounding the transition from primary to secondary education?

(2) How do learning conceptions change over time from the second to last year in primary education to the end of the second year of secondary education?

(3) Are the changes within learning conceptions on the four measure moments related to gender?

4. Methodology

4.1 Sample

The total research sample of the study consists of 102 students (45 boys and 57 girls) who were followed over four years with regard to their learning conceptions from the second to last year of primary education when they were eleven years old until the end of the second year in secondary education at the age of fourteen. The students were spread over 10 primary schools in the southeast of the Netherlands, with 9 to 30 students in each school. The study started with a total sample 551 students in their second to last year in primary education and ended at the end of the second year in secondary education. The sample is limited to students who have moved mainstream annually during four years of research. This has resulted in 102 participating students during four years in the total sample. Participation for schools and students at each wave was on a voluntary basis, and students could cease participation at any moment. There was no penalty for students who chose not to participate, nor were they rewarded for participation. Data were collected on four measurement moments yearly in May using the learning conception questionnaire in the last two years of primary education and the first two years of secondary education.

4.2 Instrument

Learning Conceptions

Students' learning conceptions were measured via four measurement moments in a longitudinal design using the learning conception questionnaire (Klatter et al., 2001). As stated by Klatter et al. (2001), three dimensions can be mapped and divided into eight scales. Table 3 gives an insight into the eight scales of the learning conception questionnaire.

Table 3: *Overview of the eight scales of the learning conception questionnaire and examples of items with Cronbach's alpha's, means and SD*

Scales	Items example	Number of items	Cronbach's alpha	Mean	SD
Development orientation	In Arithmetic I always want to find out exactly how everything works	7	.81	2.97	.74
Avoidance orientation	I mainly go to school because I have to	8	.76	3.28	.73
External regulation	I think that teachers have to explain everything very precisely as that's what he/she is there for.	7	.80	3.33	.71
Regulation by peers	I like to get tips from other students about the best way to learn.	5	.72	2.64	.75
Individual regulation	In Arithmetic I prefer to work on my own rather that in a team.	5	.70	2.74	.81
Surface learning and processing activities	If you spend a very long time studying for a test, you can actually get a good mark.	5	.72	3.55	.72
Undirected learning and processing activities	I often don't manage to learn the subject matter because I don't know how to deal with it.	5	.67	2.31	.72
Deep learning and processing activities	When I learn, I always try to think of examples that relate to the topic I'm studying.	6	.64	3.42	.57

On a five-point Likert scale, students could indicate how strongly they agree or disagree with the items in the learning conception questionnaire (1= totally disagree, 5= totally agree). This self-report questionnaire was, with the aid of confirmative factor analysis, validated prior to the study and measurement invariance results showed that the questionnaire can be used in longitudinal research in the transition phase between primary and secondary education (Robbers et al., 2015).

4.4 Analysis Method

In this exploratory longitudinal study, we measured students' learning conceptions at four different occasions. Given that we can assume that these four measurements are nested within students, we used multilevel analysis in order to analyse the data. Multilevel analysis is a methodology for the analysis of data with complex patterns of variability. In the analysis of such data, it is usually illuminating to take account of the fact that each level of nesting is

associated with variability that has a distinct interpretation. Given the data's hierarchical structure of the successive measured moments, it is less probable to pose that the observations in statistical terms are dependent on each other (Hox, 2002). The hypothesis was that the moment in which the students' learning conceptions were measured was relevant. These moments were unequal; for example, at one moment in their school career, a student could have a different conception regarding learning from other moments. Multilevel analysis fit the structure of the data and gave a perspective from which to measure the assumptions of variability. Because no linear relationship was expected and there was no prior indication as to how the change of younger students' learning conceptions could progress, we used the fixed occasions model (Singer & Willett, 2003).

To answer research question one, we first estimated a basic model without any explanatory variables (Model 1). Formally, the estimated model could be written as:

$$y_{it} = \beta_1 * Occ1 + \beta_2 * Occ2 + \beta_3 * Occ3 + \beta_4 * Occ4 + (\varepsilon_{1i} + \varepsilon_{2i} + \varepsilon_{3i} + \varepsilon_{4i})$$

where Occ1 through Occ4 are dummy variables, which have the value 1 if they concern an observation in the respective measured occasion and 0 if not. Therefore, β_1, up to and including β_4, could be interpreted as estimates for the average scores of the respective measurement occasions.

The four error terms ($\varepsilon_{1i} - \varepsilon_{4i}$) indicate that we assume that observed scores of individual students can deviate from these estimated average scores. In the analyses, estimates of the variances in these error terms express how large the differences are between students at each of the four measurement occasions. Therefore, to answer the first research question, we rely on these variance estimates.

The second research question concerns the evolution in learning conceptions. To answer this question we compare the estimates of average scores on each measurement occasion (β_1-β_4) on their statistical significance by making use of Chi^2 – tests on the contrasts between these estimates (see Rasbash, Steele, Browne, & Goldstein, 2016). Based on the estimates in the model, we can also derive Cohen's *d* values to express the differences between occasions in effect sizes. Cohen's *d* can be interpreted as follows: 0.2 - 0.5 small effect and 0.5 - 0.8 medium effect (Cohen, 1988).

To answer research question three, a second model (Model 2) was estimated by adding the dummy variable Gender to Model 1.

5. Results

Table 4 (Model 1) shows the change in students' learning conceptions (N = 102) over the four years surrounding the transition from primary to secondary education. In the "fixed part", there are eight scales of the learning conception questionnaire with estimations of average scores over the four years of the followed students. The *p*- values, calculated on the basis of Chi-square tests, indicate significant differences between the measured moments. In Table 5, the control variable gender is added to Model 1 to indicate the interaction effects between learning conceptions and gender.

In answering the first research question, it becomes clear that learning conceptions are subject to change in the transition period between primary and secondary education (Table 4). With regard to the second research question concerning how learning conceptions change over time from the second to last year in primary education to the end of the second year of secondary education, the motivational aspect of learning conceptions shows a significant increase in avoidance orientation, exactly on the transition between primary and secondary education (average scores of 3.034 and 3.355 on the two measuring moments; p = .000), where development orientation decreases. This means that students experience less pleasure in learning and less personal growth and autonomy. They seem to have a more negative attitude to school and learning and do not see the usefulness of school tasks. This decrease is significant only between the last two years of primary education (average scores of 3.241 and 2.962 on the two measuring moments; p = .000) and the first two years of secondary education (average scores of 2.863 and 2.675; p =.006) and not on the transition between primary and secondary education. Cohen's d was 0.44 on the scale avoidance orientation is nearly a medium effect. On the developmental orientation scale, the effects are small (Cohen's d = 0.40 and 0.26).

The results of the change within the regulation aspect of learning conceptions are variable. External regulation, where students prefer external direction and places a great deal of reliance of support from the teacher, decreased significantly in the period between end of the second-to-last year and the end of the last year of primary education (average scores of 3.408 and 3.168 on the two measuring moments; p<.003). However, external regulation increased significantly again on the transition between primary and secondary education (average scores of 3.186 and 3.324; p<.031), after which the level stabilized until the end of the second year in secondary education. In considering Cohen's d, the effects were rather small (0.31 and 0.20). Regulation by peers and individual regulation showed no consistent and significant picture over the period of study.

Regarding the processing component in learning conceptions, significant changes are only present in the scale for deep processing activities in the period between the second-to-last year and the last year of primary education (average scores of 3.540 and 3.346 on the two measuring moments; p = .000). Students value to learning activities, such as elaboration, understanding the learning content, and meta-cognitive activities decrease already by the age of eleven years. This is a small effect (Cohen's d = 0.36). Surface processing activities and undirected learning give no significant development when these scales are viewed from a longitudinal angle on the learning conception questionnaire.

Table 4: *Parameter estimates of Model 1, with corresponding standard errors and effect measurement for the differences in averages for measurement occasions. These indicate the significance (on the basis of Chi-square tests) and Cohen's d for each time the result of the equation between two successive measure moments (N=102).*

	Primary education						Secondary education			
Learning conception	2nd to last year	*d*	Sig.	last year	*d*	Sig.	year 1	*d*	Sig.	year 2
Avoidance orientation	3.043 (.079)	.01		3.034 (.073)	**.44**	*	3.355 (.072)	.07		3.406 (.071)
Development orientation	3.241 (.071)	**.40**	*	2.962 (.068)	.14		2.863 (.071)	**.26**	*	2.675 (.074)
External regulation	3.408 (.071)	**.31**	*	3.186 (.070)	**.20**	*	3.324 (.065)	.10		3.254 (.070)
Regulation by peers	2.873 (.075)	.18		2.962 (.068)	.02		2.722 (.082)	.14		2.608 (.075)
Individual regulation	2.882 (.075)	.05		2.924 (.079)	.08		2.855 (.089)	.07		2.791 (.075)
Surface learning	3.663 (.076)	.08		3.608 (.069)	.08		3.551 (.066)	.09		3.485 (.075)
Deep learning	3.578 (.051)	**.36**	*	3.384 (.056)	.04		3.409 (.062)	.09		3.409 (.062)
Undirected learning	2.302 (.072)	.12		2.226 (.059)	.08		2.177 (.064)	.13		2.261 (.063)

*= p< .05

Table 5: *Parameter estimates for boys (N=45) and deviation scores for girls (N=57) (Model 2) with corresponding standard errors. These indicate the significance (on the basis of Chi- square tests) for each time the result of the equation between two successive measure moments.*

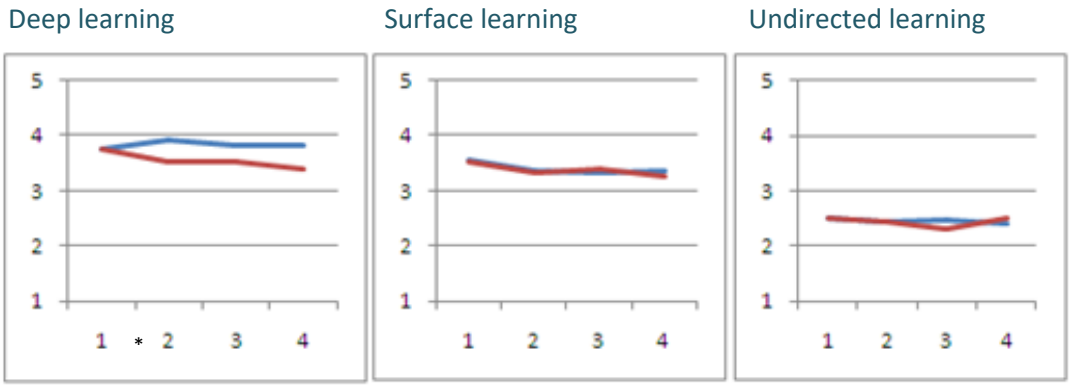
	Primary education						Secondary education					
	2nd to last year			last year			year 1			year 2		
Learning Conception	boys	girls	Sig.	boys	girls	Sig.	boys	girls	Sig.	boys	girls	Sig.
Avoidance orientation	3.217 (.116)	-.311 (.155)	*	3.422 (.096)	-.694 (.129)	*	3.453 (.107)	-.174 (.143)		3.651 (.101)	-.440 (.135)	*
Development orientation	3.362 (.105)	-.217 (.140)		3.000 (.102)	-.068 (.137)		3.076 (.102)	-.382 (.137)	*	2.721 (.110)	-.082 (.147)	
External regulation	3.562 (.105)	-.276 (.140)	*	3.270 (.104)	-.150 (.139)		3.470 (.095)	-.262 (.127)	*	3.422 (.103)	-.302 (.137)	*
Regulation by peers	2.813 (.113)	.106 (.151)		2.742 (.119)	-.012 (.159)		2.822 (.122)	-.180 (.163)		2.556 (.113)	.094 (.151)	
Individual regulation	2.791 (.129)	.163 (.172)		2.711 (.128)	.338 (.171)	*	2.924 (.133)	-.124 (.178)		2.787 (.123)	.007 (.165)	
Surface learning	3.658 (.114)	.009 (.152)		3.827 (.100)	-.392 (.133)	*	3.720 (.096)	-.302 (.129)	*	3.724 (.108)	-.429 (.144)	*
Deep learning	3.600 (.076)	-.039 (.102)		3.393 (.084)	-.015 (.112)		3.385 (.093)	.042 (.124)		3.411 (.096)	-.113 (.128)	
Undirected learning	2.311 (.108)	-.016 (.145)		2.240 (.088)	-.026 (.118)		2.771 (.095)	-.169 (.127)		2.222 (.095)	.069 (.127)	

*= p< .05

The third research question is whether the change of learning conceptions on the four measured moments during the transition from primary to secondary education changes in the same way in boys (N = 45) and girls (N = 57). Table 5 (Model 2) and Figure 2 make clear that the development of some learning conceptions of boys, based on interaction effects, changed differently from those of girls. On the avoidance orientation, a difference in development between boys and girls was visible in the period between the last year of primary education and the first year of secondary education. Boys showed a significant yearly increase in avoidance orientation, whereas girls in this period showed an increase as opposed to a decrease in the period between the first two years of secondary education. On development orientation, the

differences in development are also visible between the last year of primary education and the first year of secondary education. Here, it is shown that boys between the last year of primary education and the first year of secondary education were more developmentally orientated than girls. However, between the first and the second year of secondary education, a decreasing trend is present in the development orientation of boys, whereas a more balanced decrease is present among girls. Concerning the regulation component in learning conceptions, the results show that in the period between the last year of primary education and the first year of secondary education, girls make less use of individual regulation than boys. When examining processing activities, it is clear that in the last two years of primary education, the use of surface processing activities in girls decreases in comparison to that of boys.

Figure 1: *Differences in the change of learning conceptions over the four measurement moments between boys and girls based on interaction effects.*



Legend:

Horizontal: Four different measure moments whereby * the difference between two measured moments is indicated
Vertical: Scores on the learning conception questionnaire

Blue line: Boys
Red line: Girs

Conclusions and discussion

Until now, the principal research focus has been on the change in learning conceptions of students in higher education (Peterson et al., 2001). This study is one of the first empirical studies indicating if and how students' learning conceptions are subject to change in the transition phase between primary and secondary education. This study also aims to determine in a longitudinal design across four years how students' learning conceptions develop when students make the transition from the second-to-last year of primary education to the second year of secondary education.

The study provides evidence that not all learning conceptions change over time during the transition between primary and secondary education. Where change does occur, it is primarily a negative trend between the last years of primary education and the first years of secondary education. On one hand, avoidance orientation increases significantly, despite small effect sizes, in the period between the last year of primary education and the first school year in secondary education. On the other hand, yearly development orientated motivation (from the second to last year of primary education to the end of the second school year of secondary education) decreases. Klatter et al. (2001) also found a decrease in motivation during the transition from primary education to secondary education. Students in primary education were still motivated to gain knowledge and go to school. The moment that they were in secondary education, their learning conceptions changed from a development orientation to an avoidance orientation and students asked themselves about the purpose of school and learning (Klatter et al., 2001). In their longitudinal study, Anderman & Anderman (1999) found that personal mastery goals decreased as students made the transition from elementary to middle school.

However, this study shows that the negative development around motivation already starts in the period between the last two years of primary education. Possibly, during the last year of primary education, some students are already thinking about secondary education and find school and learning in primary education of inferior importance and are thus less motivated. This low quality of motivation can lead to disorientation (Klatter et al., 2001). What is striking in the regulation of learning activities is that external regulation decreases in the period between the last two years of primary education only to increase again between the last year of primary education and the second year of secondary education. With regard to the processing of subject matter, this study makes it clear that deep processing activities decrease significantly in the period between the last two years of primary education, although small effect sizes are present. During the last year of primary education students become less

convinced of learning activities as elaboration and are less prone to understand learning contents.

This present research indicates that developmental orientation and deep processing activities, which focus on metacognitive skills, decrease from as early as one year before students leave primary education and continue to decrease until the end of the second school year of secondary education. In contrast to developmental orientation, avoidance orientation increases on the transition between primary and secondary education.

Richardson's (2011) findings suggested that 'students' conceptions or mental models of learning were relatively stable" (p. 292). In contrast with Richardson's results in higher education, this study showed a trend in which learning conceptions developed in a negative direction on the transition between primary and secondary education from development orientation to avoidance orientation and in which deep processing activities decreased. Gender also seems to be relevant. The change in avoidance orientation and development orientation over the four years differed between boys and girls. Boys developed a more negative conception towards school and learning compared to girls, who expressed less personal interest in learning, experienced less pleasure in learning, and pursued less personal growth and independence. Concerning the regulation component in learning conceptions, it is clear that girls in the period between the last year of primary education and the first year of secondary education used more individual regulation than boys. This study shows that boys developed more surface processing activities in the last year of primary education. The results of this research concerning gender suggest that systematically girls' conceptions of learning are less surface, less avoiding, and less externally regulated compared to boys. This would suggest that greater self-regulation is present among girls, who are engaged in fewer maladaptive strategies.

It is possible that the conceptions that students in the last years of primary education use to regulate their learning processes are not in line with how teachers in secondary education exert control on the learning processes in secondary school learning environments. Vermunt and Vermetten (2000) and Meyer (2000) found in their studies a dissonance between students' learning strategies and the teachers' teaching strategies on the transition between secondary education and higher education. The present research indicates, in line with research done by Vermunt and Vermetten (2000) and Meyer (2000), that conceptions and strategies used by students are routinely put under pressure during the important school transition between primary and secondary education.

Although it is not often that 102 students can be tracked to collect longitudinal data during four years, a limitation of this study is that the sample was probably too small.

Further research should focus on larger samples in order to confirm the results of this study. Additional research is also needed to explain the variability in learning conceptions, with particular regard to the development of orientated motivation, deep processing activities and avoidance orientation. A second limitation of this study is that despite significant results, the effect sizes (Cohen's *d*) vary from small to approaching a moderate level. Future research in the last two years of primary education, where this study indicates significant results but small effect sizes, should confirm these results with larger effect sizes. A final limitation of this research is that the selective lack of students in the sample may not be representative. Additional qualitative research among students outside of the sample would reinforce the results of the current study. Future research should also focus on the possible relationship between learning conceptions and academic achievement during the four years during the transition between primary and secondary education, as well as the differences between boys and girls in this period. Given that learning conceptions are relevant to the learning achievements of students (Peterson et al., 2010; Robbers et al., 2015) and, as indicated in this study, there is a change in learning conceptions already in the last years of primary education when children are approximately eleven years old, it is important to ensure that students in the last years of primary education are already aware of their conceptions of learning. When teachers actively discuss learning conceptions with students and support students in the right way, it is possible to change their learning conceptions (Vosniadou, 2007) into conceptions focussed on developmental orientation and deep processing activities. However, not only should students be encouraged to change but also schools could consider their contexts of education. In the last years of primary education and in secondary education (Eccles & Midgley, 1989), these educational contexts should focus more on intrinsic involvement with tasks and less on grades and comparisons. A review study (Meece, Anderman, & Anderman, 2006) suggests that elementary and secondary students show the most positive motivation and learning patterns when their school settings emphasize mastery, understanding, improving skills and knowledge.

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