

# Reflection in Portfolios and Motivation for Composing a Portfolio

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## ABSTRACT

*Objective.* Purposes of this study were to find out amount and level of reflection in students' portfolios, their motivation for composing a portfolio, and the relationship between motivation and reflection. *Methods.* Participants were 156 fourth-grade pre-university students, whose motivation for composing a portfolio was measured by the motivation part of the Motivated Strategies for Learning Questionnaire (Pintrich, et al., 1993). Portfolios of 37 of the 156 students were examined on reflection occurrence. These portfolios were directed to fostering reflection in pre-university students during their development of cross-curricular research skills. The levels of students' reflection in the portfolios were measured by means of a coding scheme based on Mezirow's model of transformative learning (Mezirow, 1910; Wallman et al., 2008). *Results.* 19.5% of the portfolio paragraphs contained reflection, but reflection occurred more at surface than at deeper levels. Motivation for composing a portfolio ranged on average from undecided to somewhat at the motivational scales. Analysis of covariance did not show any relationship between the measured reflection in the portfolios and motivation results from the questionnaire. *Conclusion.* It was concluded that the portfolios contained one-fifth reflection, but the weak motivation for composing a portfolio did not influence the reflection amount or level.

## 1. INTRODUCTION

### 1.1 Research topic and objective

Cross-curricular skills are seen as prerequisites for successful learning (Organisation for Economic Co-operation and Development [OECD], 2003). An important goal of secondary education, in particular pre-university education and senior general secondary education, is a good transition to higher education or university. To make the gap between secondary education and higher education as small as possible, students are now required to act in a more self-regulated way and to develop cross-curricular skills (Ministry of Education, Culture and Science, 2008; OECD, 2003). Cross-curricular skills are needed in problem solving, which is seen as a basic activity in students' future learning and professional practice. So, the attention is changed from domain knowledge to domain specific skills or cross-curricular skills, such as cooperating, constructing an external representation, and evaluating solutions (Meijer, Elshout-Mohr & Hout-Wolters, 2001; OECD, 2003).

In particular, the development of the cross-curricular skill to reflect has been stimulated in educational practice increasingly (Kember et al., 1999; Mann, Gordon & MacLeod, 2009). Reflection

is active, persistent, and careful consideration of any belief or supposed form of knowledge in the lights of the grounds that support it, and the further conclusions to which it tends. This form of thinking is important for functioning in changing situations, for refreshing knowledge and skills, and for solving complex problems, because it can make parts of private understandings and feelings visible, makes new sense of indeterminate situations, and devises new strategies of action (Dewey, 1910; Moon, 1999; Schön, 1987). However, the role of reflection in learning may not be obvious to students and teachers, because of its implicit nature. To make reflection accessible for feedback and development, students should be invited to make their reflection explicit (Mann et al., 2009; Moon, 1999).

According to Bataineh and colleagues (2007), several scholars have pointed to the value of the (paper-based or electronic) portfolio as a learning tool for developing reflection. Portfolios differ dependent on their application and function, for instance documenting learning experiences or developing an individual learning plan. Under certain conditions, the portfolio structures and supports learning experiences in which reflection on undertaken activities could affect future experiences. Portfolios may support reflection by providing a systematic structure for understanding and evidencing what, how, and why the student learns or learned (Barrett, 2007). Reflection on learning and experience is most likely to appear in the portfolio parts with self-evaluation and journal writing (Boud, 2001; Cisero, 2006).

The amount of reflection in portfolios should be examined empirically, to avoid that promoting reflection by the means of portfolios is only a rhetoric idea. For this purpose existing models for measuring reflection and clustering reflective utterances in levels are useful (e.g., Mezirow, 1990, 1991). A considerable amount of research examined which levels of reflection occurred in for example interview data about teaching practice (e.g., Kreber 2005; Kreber & Castleden, 2009), students' reflective written work, or portfolios (e.g., Kember et al., 1999; Kember, McKay, Sinclair & Wong, 2008; Wallman, Lindblad, Hall, Lundmark & Ring, 2008).

Portfolios fit within the idea of acquiring skills and knowledge in a much more self-regulated way, because regarding composing a portfolio it is assumed that the learner is an owner of his own learning process (e.g., Wade & Yarbrough, 1996). Besides that, motivation is considered as the

initiator and activator of learning. It contributes to self-regulated learning and increases the feeling of responsibility for the task. However, the amount of motivation a student has for a task is assumed to be dependent on the perceived complexity of the task and ability beliefs (Eccles, 2005; Miller & Brickman, 2004; Pintrich, 1999; Vollmeyer & Rheinberg, 2006).

Previous research reported that students' motivation for composing a portfolio was diverse, and that students were reluctant to compose a portfolio and saw them as an extra time-consuming, administrative burden (Deketelaere et al., 2007). Possibly, a negative attitude to composing a portfolio may influence the occurrence of students' reflection. Some research investigated motivation for working with a portfolio (Chang, 2008; Deketelaere et al., 2007), but research into the relation between motivation for composing a portfolio and reflection occurrence in a portfolio is not known.

The present study has an exploratory design, because it researches into the relationship between motivation for composing a portfolio and reflection in students' portfolio. To stimulate reflection on the development of their research skills, the participating pre-university students had to compose a portfolio. Levels of reflection in the portfolios of the students are examined to know whether students reflected in the portfolios and if so, to which level. Besides that, the students completed a questionnaire about their motivation for composing a portfolio in their learning process. The results of the motivation questionnaire are described and eventually, the levels of reflection are examined in relation to motivation to find out the relationship between motivation for composing a portfolio and reflection occurrence in portfolios.

In summary, the objective of this exploratory study is to find out whether amount and level of reflection is related to motivation for composing a portfolio. In order to achieve the objective of this study the following research questions are answered: (1) *How much and at which levels does reflection occur in students' portfolios?* (2) *What is students' motivation for composing a portfolio?*, and (3) *What is the relationship between the measured amount and levels of reflection in portfolios and students' motivation for composing a portfolio?*

Conceptualisation of reflection can be found in the following subsection (1.2). A definition and explanation of reflection is given, since it is difficult to assess a skill that is not clearly defined. After that, motivation is outlined as well (1.3), because of the (expected) relationship with reflection. As a result, hypotheses are formulated to the research questions (1.4).

## **1.2 Reflection: the concept, practice and assessment**

The renowned philosopher of reflection, Dewey (1910), considered thought as the sole method to escape from purely impulsive or routine action. By thinking one systematises activities and that reminds of consequences and of ways of securing or avoiding them. Dewey (1910) distinguished the importance of *reflective* thinking among other forms of thinking. Reflective thinking goes beyond thinking by considering the basis and consequences of thoughts and beliefs. “Active, persistent, and careful consideration of any belief or supposed form of knowledge in the lights of the grounds that support it, and the further conclusions to which it tends, constitutes reflective thought” (Dewey, 1910, p. 6).

Dewey stressed the importance of training reflective thinking in education for students to meet the challenges of coping with change and lifelong learning (Kolb, 1984). Many researchers followed him and tried to define reflection and its role in learning (Moon, 1999). Now, reflection is widely used, but variously defined. The invisible nature of reflection tends to cause lack of clarity in research. Assumptions about the nature of reflection (*what*), reflection in practice (*when*), and assessing reflection (*how*) are described consecutively in the following paragraphs.

*What* – about the nature of reflection. The origination of reflective thinking is in a perceived problem, a to-be-answered question, or a to-be-resolved ambiguity, which causes the above mentioned active, persistent and careful consideration (Dewey, 1910). The steadying and guiding factor in the entire process of reflection is demand for the solution of problem: recapturing experiences, looking to future experiences and establishing a useful, new relationship between past and future experiences (Dewey, 1910; Tan & Goh, 2008). However, according to Moon (1999) this seems to be a somewhat narrow view, because the input seems to include knowledge that has been learnt as well, not only experiences.

Reflection addresses complex or unstructured ideas and experiences and then starts looking for a solution or an outcome, which causes mental processing with a problem solving purpose (Boud, 2001; Mann et al., 2009; Moon, 1999). The mental process of reflection is composed of “those intellectual and affective activities in which individuals engage to explore their experiences in order to lead to new understandings and appreciations” (Boud, Keogh, and Walker, 1985, as cited by Boud, 2001, p. 10). Oosterbaan, Van der Schaaf, Baartman, and Stokking (submitted) showed some specific cognitive and affective activities (e.g. analyzing, judging) that take place during reflection. From the description by Boud, reflection can be characterised as a learning strategy, involving mental activities to enhance learning by providing new understandings and continuing development of thought (Mann et al., 2009; Tan & Goh, 2008).

Moreover, when new understandings are generated transformative learning occurs (Mezirow, 1997). Transformative learning is the process of effecting change in a frame of reference. Reflection is necessary for this change in the structure of assumptions acquired in past experiences with which one interprets his present experiences, for example a change in a teacher’s thinking about guiding a child with a certain behavioural disorder. According to Moon (1999) this transformative view on reflection should not be associated with experiential learning per se. The role of reflection in the experiential learning cycle (as defined by Kolb, 1984) is only explained by the fact that further learning or action can be an intended purpose for reflection and an outcome of reflection.

*When* – about reflection in practice. Originally, a distinction has been made between reflection-in-action and reflection-on-action (Schön, 1987). According to Schön, who took the art and design disciplines as example, a student can educate himself only by beginning to do what he does not yet understand. Then, needs or disruption in practice activate reflection-in-action itself, looking back to past experiences and acting upon conclusions. Reflection-on-action occurs in considering the whole action afterwards and drawing conclusions for future actions.

One discipline often mentioned in relation to reflection in and on action is teaching (Hatton & Smith, 1994; Korthagen & Wubbels, 1991; Kreber, 2005). Another discipline is nurse or health education (Hulsman, Harmsen & Fabriek, 2009; Wallman et al., 2008, Wong, Kember, Chung & Yan, 1995). For both fields reflection is important, because practitioners are continuously dealing

with uncertainties and ill-structured problems and reflection can enhance relating theory to practice (Moon, 1999). It is assumed that prospective teachers or nurses should become capable of independent reflecting on their practical experiences and revising their thoughts and actions, for it is impossible to prepare the students for each situation they may be confronted with in their prospective professional career.

Reflection-on-action is a significant element in evaluating learners' growth with non-traditional methods, such as portfolios (Mezirow, 1997). According to Barrett (2007), paper-based or electronic educational portfolios contain work that a learner has collected, reflected upon, selected and presented to grow and change over time. Portfolios can help students to understand their learning outcomes or learning processes. So, by the means of portfolios students can be stimulated to make their reflection-on-action explicit for feedback and development (Mann et al., 2009; Wade & Yarbrough, 1992).

*How* – about assessing reflection. Reflection is a mainly invisible mental process. In order to discover whether reflection indeed occurs in for example portfolios, indicators of reflection are needed. Some models for measuring reflection by levels or dimensions have already been developed. For instance, Mann and colleagues (2009) distinguished two kinds of models into the already developed models. According to their review, reflection can be seen as iterative or as a model with vertical dimensions.

An iterative model emphasises that reflection is triggered by an experience, results in new understandings and different future actions, leading to new triggering experiences. A model with vertical dimensions shows that diverse levels can be distinguished in reflection, differing in quality or depth (Mann et al., 2009). Used models for measuring reflection can be seen as models with vertical dimensions, i.e. diverse levels of (non)reflection. For example, the model of Mezirow (1990, 1991) consists of six levels. The model represents both levels of reflection and non-reflection, whereby three levels specify non-reflective thinking and reflective thinking is also specified by three levels differing in depth. That is very worthwhile to note, because before levelling reflection one should first know the distinction between reflection and non-reflection (Wallman et al., 2008).

Different researchers attempted to assess the level of reflection in portfolios, but revealed that portfolios have still not contained much reflection. Furthermore, the deeper levels of reflection are more critical and difficult to reach than the surface levels, because the students have to prove that reflection changed the way they approach new problems and that they have internalised this understanding (Kember et al., 1999; Mann et al., 2009; Wallman et al., 2008).

### **1.3 Reflection: the role of motivation**

Some research indirectly related motivation to (effects of) using a portfolio. According to Mann and colleagues (2009) “failure to assess reflection and reflective thinking may imply to learners lack of real value for this activity” (p. 605). Deketelaere and colleagues (2007) mentioned diverse studies that documented students’ attitude towards portfolios and their use of portfolios, showing that “students are often reluctant to deeply engage in portfolio assignments, as they are considered to be a time-consuming administrative burden” (p. 798). Moon (1999) related motivation to reflection itself by suggesting that “reflection does not seem to necessitate external motivation, nor can external motivation coerce engagement in general reflective activity” (p. 96).

A possible explanation for (lack of) reflection in portfolios can be the (lack of) motivation for working with and composing a portfolio. Motivation is an important initiator of learning and contributes to self-regulatory processes, as expected in students who compose a portfolio. Possibly, motivation initiates the self-regulated process of reflection. In the following paragraphs the role of motivation in self-regulated learning (*motivation in self-regulation*) and the assumption of reflection as a self-regulative, meta-cognitive process (*reflection in self-regulation*) are described.

*Motivation in self-regulation* – As stated earlier, portfolios fit within the idea of acquiring skills and knowledge in a more self-regulated way, because concerning composing a portfolio it can be assumed that the learner is an active participant in his own learning process, i.e. a self-regulated learner. Critical factors in academic achievement are students’ perceptions of themselves and the task, and their use of meta-cognitive strategies to regulate their learning (Zimmerman, 2008). “A self-regulated learning perspective shifts the focus of educational analyses from student learning abilities and environments at school or home as fixed entities to students’ personally initiated strategies



designed to improve learning outcomes and environments” (Zimmerman, 1989, p. 1). These strategies are various cognitive and meta-cognitive strategies, for example elaboration as cognitive learning strategy or monitoring cognitive activities as meta-cognitive strategy (Pintrich, 1999).

Overall, self-regulation is considered as a meta-cognitive, motivational, and behavioural construct (Zimmerman, 1989, 2008). In a cyclical model by Zimmerman, developed for assessing self-regulation, motivational feelings and beliefs are considered as important initiators of self-regulated learning. According to Zimmerman (2008) motivation belongs to the before learning forethought phase of the model (the two other phases are during learning and after learning). This phase involves the well-known motives, such as self-efficacy beliefs, outcome expectations, task interest or value. In other words, these motives are considered as “factors of initial motivation” (Vollmeyer & Rheinberg, 2006, p. 240). Micro-analytical efforts to investigate the interaction have revealed a close relation between self-regulation processes and motivation (e.g., Vollmeyer & Rheinberg, 2006; Zimmerman, 2008).

Pintrich (1999) investigated the role of the motivation aspects self-efficacy beliefs, task value, and goal orientation and he concluded that these aspects of motivation help to promote and sustain self-regulated learning. For example, students who valued their school work as interesting and important were more likely to report self-regulation strategies. Another example, to have a mastery goal orientation, i.e. intrinsic motivation, was most adaptive to self-regulated learning. A self-regulation task involved a more demanding level of engagement than normal engagement in learning and students must be motivated to invest the extra time and effort for that kind of complex tasks (Pintrich, 1999; Utman, 1997).

Maehr and Meyer (1997) stressed the importance of motivation somewhat extra by pointing that motivation is personal investment that “not only initiates but shapes the acquisition of skills and the construction of knowledge” (p. 378). Motivation is not only a stimulating factor for self-regulation, it can also predict academic success and achievement. Self-efficacy, to feel competent in completing a task, is likely to give joy and willingness to spend time on the task. The greater the value of the task outcome and the feeling of being capable of performing the task, the more motivation occurs. Motivation plays a key-role in mediating engagement in learning and in

subsequent achievement (Linnenbrick & Pintrich, 2002; Miller & Brickman, 2004). For example, in research by Kuyper, Van der Werf and Lubbers (2000) achievement motivation and fear of failure turned out to be good predictors of the performance of Dutch fifth-graders from secondary schools.

Chang (2008) concluded that working with a (web-based) portfolio assessment system improved self-perceived performance on a computer task, especially for poorly-motivated students. It is probably that portfolios are stimulating and motivating learning tools, so that students' self-perceived performance on a task increases. Regardless, the question remains whether motivation of students for composing a portfolio stimulates reflection in a portfolio. Noteworthy, motivation is not a stable trait, but is domain specific, contextual, situated (Linnenbrick & Pintrich, 2002). Motivation for composing a portfolio is assumed to be not the same as motivation for some course, for example.

*Reflection in self-regulation* – To consider reflection as an academic outcome of composing a portfolio or as a self-regulatory learning process, in both cases motivation is assumed to play a part, according to the former paragraphs. Reflection is directed to noticing personal experiences, making sense and meaning of them, working with this new meaning and be transformed, as explained in 1.2 (Moon, 1999). So, reflection is more than just a self-regulation strategy, reflection integrates more self-regulatory strategies to a great extent, within a personally directed form of learning. Personally directed forms of learning are for example discovery learning, self-selected reading, seeking information, and social forms of learning such as seeking help from peers, parents, and teachers (Zimmerman, 2008). It is also possible to see (transformative) learning as a result of reflection within these forms of learning. So, reflection can be considered as educational means or as a form of academic achievement. Reflection is namely guided by composing a portfolio and expected to be a complex skill with lifelong prospects, increasingly developed during schooling (Moon, 1999).

Reflection can be considered as a self-regulated meta-cognitive process as well. Self-regulated learning is focused on meta-cognitive controlling learning processes whereby meta-cognitive strategies or activities are an important part of the self-regulation. These self-regulative meta-cognitive activities are aimed at improving learning processes or learning outcomes (Zimmerman, 1989, 2008). Meta-cognitive activities, also mentioned regulative learning activities, are for example: orienting, planning, adjusting and evaluating (Vermunt & Verloop, 1999).

Following section 1.2, the mental processes of reflection can be characterised as intellectual and affective activities in which individuals engage to explore their experiences to lead to new understandings and appreciations (Boud, Keogh, and Walker, 1985, as cited by Boud, 2001). Above mentioned meta-cognitive activities can be considered in line with the mental activities used within occurring reflection processes. The above mentioned descriptions by Moon (1999) also pointed out the meta-cognitive or controlling function of reflection, because they show that reflection is rethinking learning and learning processes. Reflection as meta-cognitive process is assumed to control activities that students use to process subject matter and that lead to learning outcomes in terms of changes in students' knowledge base and skills (Vermunt & Verloop, 1999).

#### **1.4 Research questions and hypotheses**

This exploratory study attempts to find out whether amount and level of reflection is related to motivation for composing a portfolio. Reflection was assessed in previous research, but within professional education or in portfolio-based conversations. This study could reveal reflection in portfolios of pre-university students doing research assignments. Furthermore, this study could (dis)confirm suggestions in previous research about motivation for composing a portfolio. Last, no research attempted to relate motivation to reflection, so this study might show that students' reflection in portfolios is related to amount of motivation for composing a portfolio. Hypotheses are formulated to the following research questions.

1. How much and at which levels does reflection occur in students' portfolios?
2. What is students' motivation for composing a portfolio?
3. What is the relationship between the measured amount and levels of reflection in portfolios and students' motivation for composing a portfolio?

First, it is expected that some reflection occurs in portfolios in any case, from more occurrence of surface reflection levels to less occurrence of deeper reflection levels. The deeper levels of reflection are more critical and difficult to reach than the surface levels, because the students have to prove that

reflection changed the way they approach new problems and that they have internalised this understanding (Kember et al., 1999; Mann et al., 2009; Wallman et al., 2008).

Second, the amount of students' motivation for composing a portfolio is difficult to expect, because of lack of research into motivation for portfolios and the domain-specificity of motivation measures for tasks. Some qualitative research showed that students' attitude to using a portfolio is diverse, and not seldom students are reluctant to keep portfolios and see them as a time-consuming burden (Deketelaere et al., 2007). However, composing a portfolio is a task that demands high level of self-regulation and self-regulation involves a more demanding level of engagement, i.e. motivation, than normal engagement in learning (Pintrich, 1999).

Third, motivation is seen as the initiator of learning and self-regulation, so it is expected that motivation has a positive relationship with reflection. Motivation contributes to self-regulated learning and increases the feeling of responsibility for the task (Eccles, 2005; Miller & Brickman, 2004; Pintrich, 1999) and it plays a key-role in engagement in learning and in subsequent achievement (Linnenbrick & Pintrich, 2002). Mediated by the portfolios as learning tools, more motivation for working with these tools could result in showing more or deeper reflection in the portfolios.

## **2. METHODS**

### **2.1 Participants**

Participants were pre-university students from a secondary school in the Netherlands. The secondary school was part of a purposive sample within the project called 'Prove-it' carried out from 2005 to 2008. The project was part of a larger study into teaching, learning and assessing cross-curricular skills and competences. Three schools which were using portfolios for checking the development of their students were selected to participate in Prove-it and one of these schools was selected for the current study.

The selected pre-university students in this study were 156 fourth-graders with mean age 16.4 years ( $SD = .52$ ,  $Min = 16$ ,  $Max = 18$ ) and 44.9 percent was male ( $n = 70$ ). They participated in the

project in course years 2005-2006, 2006-2007 and 2007-2008 and completed the questionnaire on motivation. See table 1 for the total numbers of students per course year.

The portfolios of 37 students were used, that is 23.7 percent of the 156 fourth graders. That was a purposive sample as well, because not all students in all years of the project completed both a portfolio and a questionnaire. The mean age of these 37 fourth-graders was 16.4 years ( $SD = .54$ ,  $Min = 16$ ,  $Max = 18$ ) and 40.5 percent was male ( $n = 15$ ). See table 1 for the numbers of students per course year with and without portfolio.

Table 1. *Numbers of participating students per course year with and without portfolio.*

Course year	Total N	N without portfolio	N with portfolio
2005-2006	53	39	14
2006-2007	61	46	15
2007-2008	42	34	8
Total	156	119	37

## 2.2 Instrumentation

The two instruments in this study, a portfolio and a questionnaire about motivation, will be described in the following subsections.

### 2.2.1 Portfolio

The first instrument was a portfolio that had to be composed digitally by the students. The portfolio used by the participating secondary school students is part of an educational tracking system called “Follow me” (Algemeen Pedagogisch Studiecentrum, n.d.). “Follow me” aims to make the progress of students visible for students and teachers and to help students to reflect on their progress. The reflections have to focus on a range of cross-curricular research skills that students can develop from beginners’ level to experts’ level. Students have the possibility to develop these skills during cross-curricular assignments, such as doing small research or solving complex problems. This kind of learning can be called a personally directed form of learning, see section 1.3 (Zimmerman, 2008).

Students map their learning progress and development themselves. In the digital portfolio students show who they are, what they have learnt and what they still have to learn. The students from the secondary school participating in this study had to use the portfolios for both formative and summative purposes. For formative purposes, the students presented their portfolios to two teachers in a portfolio-based conversation every course year. For summative purposes, the students' portfolio was graded at the end of every course year.

To answer the first research question, the expected useful parts of the "Follow me" portfolios are the personal description of the student, i.e. the self-image ("Zelfportret"), the collection of assignments and reflections ("Verzameling"), the description of learning progress ("Leerlijn") and personal development ("Ontwikkellingslijn"). In these parts the students are assumed to reflect on the development of their cross-curricular skills. Besides that, the portfolios contain grades ("Scores") and a guestbook ("Gastenboek").

### 2.2.2 Questionnaire

The second instrument was based on a questionnaire designed to assess students' motivational orientation and their use of different learning strategies for a course, called "Motivated Strategies and Learning Questionnaire" ([MSLQ], Pintrich, Smith, Garcia & McKeachie, 1993). Pintrich and colleagues reported that the MSLQ represents a coherent conceptual and empirically validated framework to assess students motivation and use of learning strategies. The MSLQ consists of two parts, namely a part about motivation and a part about self-regulation. In the current study only the part about motivation was used, to answer the second and third research question.

In the project Prove-it the items of the MSLQ were translated to Dutch and were adapted to the task level of composing a portfolio. The used motivation part consisted of 31 items with seven-point Likert scales ranging from 'not at all true of me' to 'very true of me'. The items were deducted from three general motivational constructs: expectancy, value, and affect. The expectancy construct referred to students' beliefs that they could accomplish a task: self-efficacy and control of learning beliefs (i.e. beliefs that outcomes are contingent on one's own effort). The value construct focussed on the reasons why students engaged in a task: because of the value of the task per se, because of

inner goals (e.g. personal development), or outer goals (e.g. peer approval). The affect construct tapped into students' worry and concern over taking exams. The three motivational constructs together were divided into six components, see table 2. These components were the scales of the motivation part of the MSLQ. They were designed to be modular and could be used to fit the needs of the researcher (Pintrich et al., 1993).

Table 2. *Motivational constructs, associated scales of the questionnaire and number of items* (see Pintrich et al., 1993).

Motivational construct	Associated scales	Number of items
Expectancy	Self-efficacy	8
	Control of learning beliefs	4
Value	Intrinsic goal orientation	4
	Extrinsic goal orientation	4
	Task value beliefs	6
Affect	Test anxiety	5

### 2.3 Design and procedure

The study was exploratory, with a non-experimental design and mixed methods. The study was *exploratory* because it was innovative in examining reflection in relation to motivation and because little was known about the amount of reflection in students' portfolios, pre-university students in particular. The *qualitative* method was measuring the reflection in portfolios with a coding scheme, because reflection is about dealing with mental processes and verbal data. The *quantitative* method was analysing the results of the completed questionnaires about motivation for composing a portfolio, the MSLQ is a structured and validated method for measuring motivation (Pintrich, et al., 1993). Eventually, statistical analysis was used to examine reflection in relation to motivation.

Before starting with composing their portfolio the students completed a questionnaire (based on MSLQ, as described in 2.2.2) about their motivation for working with a portfolio. From the fourth-graders in the project Prove-it, eight students did not fill in their student number and were excluded

from selection for analysis. Five students had not filled in a third of the items in the questionnaire. They were females and participated in 2007-2008. Because of their structurally missing values, they were also excluded from analysis and 156 students remained selected for this study. Of this total number of students, 37 students had an available composed portfolio, which was used for this study.

As mentioned earlier, data were gathered within the project Prove-it. To stimulate reflection on cross-curricular skills the students in this project composed the digital portfolio named “Follow me”. During the school year the students had to add descriptions of themselves, their learning progress, personal development and experiences about the assignments to the digital portfolio. During the process of composing the portfolio students did a portfolio-based conversation with teachers. The levels of reflection in the conversations have already been measured (Oosterbaan, et al., submitted). The graded portfolios at the end of the year were collected and used for this study.

## **2.4 Data analysis**

Data analysis was divided in three parts. First, the portfolios were analysed by means of a coding scheme, described in 2.4.1. Second, the validity and reliability measures of the motivation questionnaire are described in 2.4.2. Third, the statistical analysis of covariance for finding out the relationship between reflection en motivation is described in 2.4.3.

### *2.4.1 Qualitative analysis of portfolios*

The qualitative content of the portfolios was examined to find out how much and at which levels reflection occurs in students’ portfolios (first research question). For quantifying the qualitative analysis of the portfolios the practical guide for quantifying qualitative analyses of verbal data from Chi (1997) was used. The first following subsection describes the pre-coding steps deducted from the steps in Chi’s guide. The last two subsections describe the coding scheme and the process of coding and interrater reliability.

#### *Pre-coding steps*



Parts in the portfolio in which reflection could be expected are defined earlier, see 2.2.1. In these parts was searched for reflection. Portfolio parts about orientation on (study) career were eliminated from analysis, because not all students had written about their experiences on that subject. Tables about learning progress (“Leerlijnen”) and personal development (“Ontwikkelingslijnen”) prescribed behaviour from beginner to expert level for each cross-curricular skill. Below these tables were short comments starting with ‘I am here because...’ (“Ik sta hier omdat...”), describing what level of behaviour the students thought to have themselves. These comments were eliminated from analysis as well, because these comments were based on or similar to paragraphs in the portfolio part with collection of assignments and reflections (“Verzameling”).

Then, the portfolio parts were reduced by segmentation, as suggested in Chi’s guide (1995). One reflection moment is most often made up of more than one sentence (e.g. Wallman et al., 2008). So, the paragraphs as structured by the students themselves were chosen to be the portfolio analysis segments. Because it is typical for paragraphs to contain one idea, topic or argument chain, this segmentation can be characterised as based on semantic features (Chi, 1995). Therefore, during the coding process sometimes relatively long paragraphs containing more than one subject were divided into more paragraphs.

### *Coding scheme*

The coding scheme by Wallman et al. (2008) was used to analyse the occurrence of reflection in the portfolios. The scheme is based on the model of Mezirow (1990, 1991). According to Oosterbaan and colleagues (submitted) the model of Mezirow as used by Wallman and colleagues (2008) is a valid model for assessing reflection. Wallman and colleagues provided details of the coding procedure, reliability, and a description of reflection that provides the possibility to select segments in which reflection takes place. That basic description is the following: “The definition of reflection is that a situation is identified in relation to an actual experience. This problem must somehow be analysed in order for the task to be executable. Previous knowledge is used in the specific situation and is questioned and criticized when necessary” (p. 9).

Decisions about what utterances in the segments constitute evidence that the segments belong to a specific category from the coding scheme were based on existing descriptions by Wallman and colleagues (2008). The coding scheme by Wallman and colleagues consisted of six levels building on each other, the first three defined non reflective thinking and the last three defined reflective thinking. These last three levels of reflection from Wallman and colleagues were used in this study and these levels differed in depth. Content reflection pertained to *what* one perceives, thinks, feels, or acts when doing a task, process reflection referred to *how* one performs the functions of perceiving, thinking, feeling, or acting, and premise reflection focused on *why* one apprehends, thinks, feels, or acts the way one does and the consequences for how to act in different other future situations. These reflection levels were coded as follows: no reflection - coded 0, content reflection - coded 1, process reflection - coded 2, and premise reflection - coded 3.

#### *Process of coding and interrater reliability*

A fellow-student of the first rater was asked to be second rater and to do a second analysis of a sample of five portfolios. The first rater analysed the first portfolio to become confident with the coding scheme. Then, the first rater explained the coding scheme to the second rater. The coding scheme was a Dutch version of the coding explanation and examples by Wallman and colleagues (2008). The second rater analysed the first portfolio as well and differences between the two raters were discussed. Most discussion was about coding 1 or 2, the difference between content or process reflection was sometimes difficult to argue. Attention to reflection on *effect* of an action turned out to be a good aid to code content reflection. Attention to reflection on *effectiveness* of strategies turned out to be a good aid to distinguish process reflection from content reflection. Attention to description of *alternative strategies or perspectives on the future experiences* turned out to be a good aid to code premise reflection. After that, the two raters analysed four portfolios independently, that is ten percent of the total amount of portfolios. Calculated with Cohen's Kappa, agreement between the two raters appeared to be good,  $\kappa = 0.604$ . Besides that, no segmentation differences were found between the two raters.

The first rater subsequently coded reflection in the other thirty-two portfolios. That resulted in frequencies of reflection occurrence per level and a sum reflection occurrence per portfolio. These frequencies were calculated into percentages (reflection percentages per level and sum reflection percentage) because of the different number of paragraphs per portfolio. Then, the sum percentage of reflection was recalculated to a weighted sum reflection percentage to honour the students who reflected on deeper levels. Content reflection percentage was multiplied by 1, process reflection was multiplied by 2, and premise reflection was multiplied by 3, and these numbers were added up.

For each reflection level, two examples of coded segments were translated and these translated segments can be seen in table 3. As mentioned before, the reflection levels differed in depth, content reflection was the most surface and premise reflection the deepest level of reflection.

Table 3. *Two examples of coded segments per reflection level.*

Reflection level	Examples from the coded segments
Content reflection	<p>‘Before the lesson started, we did not meet and consider tasks, but if we had done that, we had better surveyed what we were doing actually.’</p> <p>‘Listening to others was very important. That’s not my strongest point. Usually, I like to take the lead, so I don’t feel easy listening to others.’</p>
Process reflection	<p>‘Although I didn’t know Tommy very well in the beginning, our cooperation went very well. We made good appointments together and respected them. We both tried to round off the things as good as possible and we both reviewed our work. Failures were improved by mutual, positive feedback. When you’re speaking about ‘cooperating’ I am sure I had some good progression.’</p> <p>‘The most important thing I learned by means of this assignment is that sometimes it is more practical to look in for example books and brochures than searching information on the internet for hours and hours. I would like to improve my information gathering by more looking in books and</p>

brochures and less by sitting at my computer. Most of the time, in a book or brochure you can find many data you can hardly find on the internet.'

Premise reflection

'When I look back, I can see that I learned a lot about cooperating. In the beginning I thought 'to cooperate is to divide the tasks and to have a bit of meeting before starting'. I learned that this doesn't work. Cooperating should happen more intensively than just dividing the assignment into tasks. I have dealt with situations in which other people did not respect the appointments with the consequence that I was victim because our assignment was not ready to hand in. Cooperating is more than asking for the parts made by others and just putting them together. That doesn't work. It is also important to make a whole good thing when the parts are ready. Still, I should learn a lot at the point of cooperating but I think that I have made a pretty good start by discovering this line of thoughts.'

'I've changed a lot in the last periods and I'm very grateful to Mrs. Bedeaux for that. Usually, I started to defend myself immediately when I received criticism from peers and especially teachers. But that isn't necessary, criticism is just directed at a point you can change. Mrs. Bedeaux showed me that very well, and the first times I continued doing it and I didn't listen, but after a talk it became very obvious to me! Now, I'm very quiet in a conversation, I wait and listen, and at the end I don't need to say very much, I just accept it and I will see whether I will use the feedback in the future! This hasn't had consequences only for my relations in school, but also in my daily social intercourse. I am very proud of it and I hope to hold it on.'

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#### 2.4.2 *Quantitative measures of motivation*

To know the students' motivation for using a portfolio (second research question), the results of the motivation part of the MSLQ were statistically described and interpreted. These descriptions defined the characteristics of the sample from which the students whose portfolio was examined were

selected. That concerned all the fourth-grade students from the course years 2005-2006, 2006-2007, and 2007-2008 who completed the questionnaire. First of all, it was found out that 0.21 percent of the values was missing at random and these values were imputed two-way.

As mentioned in 2.2.2, the motivation part of the MSLQ consists of six scales and in total 31 items. Exploratory factor analysis on these items did not show any consistent factor structures. This might sound surprising, because Pintrich and colleagues (1993) concluded that the questionnaire was a valid means of assessing motivation, as mentioned before in 2.2.2. However, there are more examples of the instability of factor structures across countries (for an example, see Clarebout, Elen, Luyten and Bamps, 2001). The overall reliability of the questionnaire was good, since Cronbach's alpha was .83.

Confirmatory factor analysis on the items of the separate scales showed that for four of the six scales just one item did not load over .4 (the scales Extrinsic goal orientation, Task value, Control of learning beliefs, and Test anxiety). Reliability analysis with Cronbach's alpha was done for each of the six scales as well. For four of the scales the alpha was reasonable, towards .6 or more, as can be seen in table 4. The scales Control of learning beliefs and Extrinsic goal orientation were not reliable.

Table 4. *Results of the reliability analysis of the six scales.*

Motivational construct	Associated scales	Cronbach's alpha
Expectancy	Self-efficacy	.85
	Control of learning beliefs	.29
Value	Intrinsic goal orientation	.70
	Extrinsic goal orientation	.44
	Task value beliefs	.58
Affect	Test anxiety	.57

As mentioned in 2.2.2 and as can be seen in table 4, the six scales were deducted from three motivational constructs. Although two scales were not reliable, factor analysis on the scale scores was done to see whether the scales measured the constructs (scale scores were made by taking the mean of

the items that made up a scale and the scale scores were normally distributed). The scales Intrinsic goal orientation, Extrinsic goal orientation, Task value beliefs, and Self-efficacy loaded over .4 on one component and the other scales did not load on one component. Besides that, the Cronbach's alpha for the two Expectancy scales together was .30; for the three Value scales together was .77, and for the Affect scale .57. So, the six scales could not be summarised in three scales based on the theoretical motivational constructs, because of the weak validity and reliability. It was decided to use the four reliable scales in the further analyses (see table 4). Because of their lack of internal consistency, the two scales Control of learning beliefs and Extrinsic goal orientation were removed from further analysis.

#### 2.4.3 *Analysis of covariance and non-parametric testing*

Reflection results and motivation results were integrated in an analysis of covariance with confidence interval of 95%. In terms of the analysis of covariance, the scores on the variables gender and course year were taken as independent factors that could have effect on the (weighted) sum percentage of reflection. The scores on the four motivation scales (but then only for the 37 students whose portfolio was analysed) were taken as covariates possibly influencing the (weighted) sum percentage of reflection in the portfolios. However, it was not allowed to speak about real effects (causal relations) in this study, because of the non-experimental design of this study.

Assumptions for analysis of variance have to be checked before running analysis of covariance (Field, 2005). The check of these assumptions is described in the following paragraphs. The additional assumption for analysis of covariance (testing for homogeneity of regression slopes) can be checked together with running the analysis of covariance. The results of checking this additional assumption are reported in the results section 3.3.3.

First, the variables sum reflection percentage and weighted sum reflection percentage were normally distributed. The variances of these variables were the same in the gender and course year groups, so the assumption of homogeneity of variance was assumed. Analysis of covariance could be done for sum reflection percentage and weighted sum reflection percentage.

Second, the reflection percentages per level were not normally distributed. The variances of these variables were the same in the gender and course year groups, so the assumption of homogeneity of variance was assumed. However, the analysis of covariance could not be done for the reflection percentages per level because of the non-normal distribution. It was decided to use the non-parametric two-tailed independent samples t-test (Mann-Whitney test) to test differences between males and females on reflection percentages per level. The non-parametric analysis of variance (Kruskall-Wallis test) was used to test differences among the three course years. Correlation analysis could be done with Spearman's correlation coefficient between the different reflection percentages per level and the four motivation scales.

### **3. RESULTS**

Description of results is divided in three sections. First, results of the analysis of the portfolios are given: the amount and levels of reflection in the portfolios (3.1). Second, analysis results of the outcome of the questionnaire about motivation are described, with attention to differences in gender and course year (3.2). Last, results of the statistical analysis of the relationship between reflection and motivation are given (3.3).

#### **3.1 Reflection**

The size of the 37 portfolios differed extensively. On average, the portfolios consisted of 33.8 segments, i.e. paragraphs ( $SD = 17.15$ ,  $Min = 7$ ,  $Max = 79$ ). As mentioned before, for each portfolio frequencies of reflection occurrence per level and sum reflection occurrence were calculated into percentages with respect to the total number of paragraphs in each portfolio. Mean percentage of sum reflection occurrence in the portfolios was 19.5 percent ( $SD = 9.21\%$ ,  $Min = 2.1\%$ ,  $Max = 44.9\%$ ).

The most surface level of reflection, content reflection, occurred most often in the portfolio segments. The deepest level of reflection, premise reflection, occurred least often. Four-fifth of the portfolios segments did not contain any reflection. See table 5 for amount of reflection occurrence in

percentages per level and the sum percentage of reflection occurrence (content, process, and premise reflection added up).

Table 5. Average amount of reflection occurrence in percentages per level.

Reflection level	M	SD	Min	Max
No reflection	80.5 %	9.21 %	55.1 %	97.9 %
Content reflection	12.1 %	7.18 %	0.0 %	38.5 %
Process reflection	6.5 %	5.20 %	0.0 %	22.2 %
Premise reflection	0.8 %	1.78 %	0.0 %	6.7 %
Sum reflection	19.5 %	9.21 %	2.1 %	44.9 %

The reflection levels differed in the depth they show, and not all students showed the same amount of the deeper (process reflection) or deepest level of reflection (premise reflection). Recalculating sum reflection percentage in a weighted sum reflection percentage resulted in a normally distributed value ( $M = 27.68\%$ ,  $SD = 14.27\%$ ,  $Min = 2.13\%$ ,  $Max = 69.39\%$ ). The weighted sum reflection percentage, the sum reflection percentage, and the reflection percentages per level were used in further analysis, see 3.3.

### 3.2 Motivation

Descriptive statistics of the scores of the 156 students at the four motivation scales (as described in 2.4.2) can be seen in table 6.

Table 6. Descriptive statistics of the motivation scale scores for the total number of participants.

Motivation scale	M	SD	Min	Max
Self-efficacy	4.80	.80	2.25	6.62
Intrinsic goal orientation	4.55	.89	2.00	6.75
Task value beliefs	4.43	.73	2.00	6.50



Test anxiety	3.33	.88	1.40	5.60
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The scores at the four scales were normally distributed. Two-tailed independent samples t-tests with confidence interval of 95% were done to test whether gender made difference in motivation. Three significant differences were found. First, males ( $M = 4.25$ ,  $SD = .78$ ) scored significantly lower than females ( $M = 4.58$ ,  $SD = .67$ ) at Task value beliefs,  $t(154) = -2.87$ ,  $p = .005$ . Second, males ( $M = 4.33$ ,  $SD = .98$ ) scored significantly lower than females ( $M = 4.73$ ,  $SD = .77$ ) at Intrinsic orientation,  $t(154) = -2.87$ ,  $p = .005$ . Third, males ( $M = 3.13$ ,  $SD = .83$ ) scored significantly lower than females ( $M = 3.50$ ,  $SD = .89$ ) at Test anxiety,  $t(156) = -2.66$ ,  $p = .009$ .

Analysis of variance with confidence interval of 95% was done to test whether course year made difference in motivation. The assumption of equal variances was assumed. Students from the course year 2005-2006 ( $M = 3$ ,  $SD = .76$ ) scored significantly lower than students from the other years 2006-2007 and 2007-2008 ( $M = 3.47$ ,  $SD = .93$ , and  $M = 3.55$ ,  $SD = .83$ , respectively) at Test anxiety,  $F(2, 153) = 6.29$ ,  $p = .002$ .

### 3.3 Relationship between reflection and motivation

Reflection results and motivation results were integrated in an analysis of covariance with confidence interval of 95% to find out the relationship between the measured reflection in portfolios and the students' motivation for composing a portfolio.

There was no significant relationship between gender and sum reflection percentage,  $F(1, 25) = .17$ ,  $p = .686$ , and no significant relationship between course year and sum reflection percentage,  $F(2, 25) = .20$ ,  $p = .816$ . The covariates, motivation measured by four scales, did not correlate significantly to sum reflection percentage: Self-efficacy  $F(1, 25) = .03$ ,  $p = .868$ ; Intrinsic goal orientation  $F(1, 25) = .00$ ,  $p = .971$ ; Task value beliefs  $F(1, 25) = .32$ ,  $p = .578$ ; and Test anxiety  $F(1, 25) = .00$ ,  $p = .976$ . The extra assumption for analysis of covariance, testing for homogeneity of regression slopes, was tenable.

Repetition of the analysis of variance with the weighted sum reflection percentage instead of the un-weighted value did not show significances either. There was no significant relationship between gender and the weighted sum reflection percentage,  $F(1, 25) = .03, p = .872$ , and no significant relationship between course year and the sum reflection percentage,  $F(2, 25) = .60, p = .558$ . The covariates did not correlate significantly to the weighted sum reflection percentage: Self-efficacy  $F(1, 27) = .14, p = .710$ ; Intrinsic goal orientation  $F(1, 25) = .19, p = .666$ ; Task value beliefs  $F(1, 25) = .30, p = .590$ ; Test anxiety  $F(1, 25) = .01, p = .909$ . The extra assumption for analysis of covariance, testing for homogeneity of regression slopes, was tenable.

The Mann-Whitney test did not show significant difference between males and females on reflection percentages per level. The Kruskal-Wallis test did not show significant difference between the course years on the reflection percentages level. Correlation analysis with Spearman's correlation coefficient showed no significant relationship between the different reflection percentages per level and the four motivation scales.

## **4. DISCUSSION**

### **4.1 Conclusions**

The objective of this study was to find out whether amount and level of reflection is related to motivation for composing a portfolio. Firstly, 37 portfolios of fourth-grade pre-university students were analysed; secondly, 156 questionnaire results were analysed; and lastly, these two analyses were integrated to find out the possible relationship between motivation and reflection.

The first research question was '*How much and at which levels does reflection occur in students' portfolios?*' The analysis of the qualitative data of portfolio paragraphs was done with a coding scheme for reflection. As expected, this analysis showed that the portfolios contained some reflection: on average 19.5% of the paragraphs of a portfolio contained reflection. This is in line with previous studies that also showed that reflection is not self-evident (e.g. Mann et al., 2009). In particular, this result of one-fifth reflection is in line with research by Oosterbaan and colleagues

(submitted), who analysed the conversations that were based on the portfolios used in this study. They found that 19.8% of the conversation segments were made up of reflection.

Content reflection (12.1%) occurred the most in comparison with the other levels. Almost all students reached the content reflection level, but not all students reached the other levels. On average, process reflection (6.5%) was coded less by a half than content reflection, and the amount of premise reflection (0.8%) was very small. It was expected that the deeper levels (process and premise reflection) occurred less than the surface level of reflection (content reflection). These findings are in line with previous studies (Deketelaere et al., 2007; Kember et al., 1999; Kreber, 2005; Wallman et al., 2008). However, the previous studies assessed reflective work rather holistically than divided in text segments. The differences in occurrence of reflection levels indicate that students are focused on *what* and *how* and less on *why* they apprehended, felt, thought, or acted during the research assignments meant to develop their cross-curricular skills.

Regarding the reflection occurrence in student's portfolios, it is noteworthy that the analysis of covariance did not show any relationship between gender and reflection and course year and reflection. Also, the non-parametric tests for the reflection levels did not find any differences within the gender and course year variables. That indicates that males and females and students from different course years do not appear to differ on the amount and level of reflection occurrence.

The second research question was '*What is students' motivation for composing a portfolio?*' To answer this question, the results of the MSLQ part of motivation among 156 fourth-grade pre-university students were analysed. The students expressed that they had somewhat self-efficacy for composing a portfolio and that they were somewhat intrinsic oriented. They were undecided about the value of composing a portfolio. Moreover, the students were somewhat worried about the task of composing a portfolio. It is good to realise that these fourth-graders had no experience with composing a portfolio when they filled in the questionnaire, so they could not base their motivation on own experiences and had a blank attitude that could have made them sceptic.

These results indicate that the fourth-grade pre-university students were not really motivated for composing portfolios. It is the first time that motivation for composing a portfolio was measured with a validated questionnaire. Amount of motivation for composing a portfolio was difficult to

expect in this study because motivation is dependent on task and ability beliefs, but the results in this study can give quantitative support to previous studies that suggested that students are reluctant to compose a portfolio (e.g., Deketelaere, 2007). For composing a portfolio the students needed self-regulation strategies and a self-regulation task demands more engagement in learning than normal (Pintrich, 1999; Utman, 1997). Probably, the students perceived composing a portfolio as a complex self-regulation task and they did not know whether they were able to do it, although they had somewhat self-efficacy for composing a portfolio. Moreover, the students were undecided about the value of composing a portfolio, so they probably did not see the relevance of composing a portfolio for reflection on their development of cross-curricular skills.

Motivation is indeed contextually bound and can change per educational task or student group (Garcia Duncan & McKeachie, 2005). Also, with respect to the significant differences between males and females it can be said that motivation for composing a portfolio has also to do with gender traits of the learners. Males in this study were less intrinsic motivated, valued the task lower, and were less worried about composing a portfolio. The significant difference at Test anxiety among the course years indicated that students of the latter two course years were significantly less worried about composing a portfolio. That can direct to an increasingly positive climate (maybe familiarity with portfolios or better guidance by teachers) in school about composing a portfolio.

The third research question was *'What is the relationship between the measured amount and levels of reflection in portfolios and students' motivation for composing a portfolio?'* No previous research studied the influence of motivation on reflection, as it was done in this study with a questionnaire for motivation for composing a portfolio and a coding scheme for reflection in portfolio segments. However, it was expected that more motivation for composing portfolios would result in more reflection occurrence in portfolios, because of the interface between motivation and (meta-) cognition. Motivation has a close relationship with self-regulation, and for reflecting in a portfolio students need to be self-regulated. Besides that, motivation increases the feeling of responsibility for the task, and plays a key role in learning and subsequent achievement. For example, Pintrich and colleagues (1993) reported significant correlations between the motivational scales and the final course grade of the students in that study.

Nevertheless, no significant relation between motivation and reflection was found in this exploratory study, be the sum percentage of reflection weighted or un-weighted. The students lacked real value for composing a portfolio and their weak motivation did not make difference in reflection outcome in the portfolios. A possible explanation is that there was a specification error, so that some other unknown variable than motivation, gender, or course year correlated with reflection (for example teacher's guidance, or time spent on composing a portfolio).

#### **4.2 Methodological issues and implications**

This section discusses methodological issues about the analyses of motivation and reflection in this study. When necessary, an elaboration of implications for further research and practical implications are added.

The analysis of the 37 portfolios was partly done by two raters with a good interrater reliability. However, the discussion about the levels content reflection and process reflection in particular showed that the difference between these two levels is not self-evident. Especially in the case that the students expressed *what* research assignments they did, they find themselves often obliged to express *how* they acted then. However, the students not always reflected on how they acted, so expressions of how one acted could not always be coded as process reflection. Attention to effect or effectiveness was a good solution for the two raters in this study to distinguish content and process reflection (see 2.4.1).

Besides that, this study showed that the students were mainly describing tasks or actions, without expressing *why* they felt, thought or acted with the associated consequences, whereas this is the deep kind of reflection leading to transformative learning. In further research students should have a short course about what good reflection is and how they could express that process in a portfolio, although social desirability bias could increase then (students faking reflection). Overall, it must be said that students who are more verbose could have had advantages in expressing their reflection. Maybe incorrectly, they could have showed to be a better reflective thinker than not-verbose others, since the analysis of the portfolios was about written, verbal data (Chi, 1997).

The analysis of the students' motivation for composing a portfolio was based on a validated questionnaire (MSLQ, Pintrich et al., 1993). However, in this study the reliability of the motivation scales did not appear to be good for all six scales, indicating a low internal consistency in two of the concerning scales in particular. Probably, the translation of the questionnaire in Dutch made the questionnaire weaker. Validating the translated questionnaire was not the purpose of this study, but for further research it is recommended to validate the Dutch translation of the MSLQ at first.

As mentioned before, the 156 fourth-grade students had no previous experience with composing a portfolio, so they turned out to have a somewhat undecided attitude towards composing a portfolio. Further research should compare motivation of fourth-grade students with for example fifth-grade students, who have actual experience with composing a portfolio. The same can be done for measuring reflection in portfolios. Possibly, there is an increase in motivation and reflection throughout the grades.

The present study was exploratory, the first that analysed reflection levels in portfolios of pre-university students and attempted to find correlation between motivation and reflection. It showed the small amount of (deep) reflection in portfolios, but it can not be said that the amount of reflection occurrence was relatively low or influenced by weak motivation. Practical implications for pre-university education are to rethink the balance between the costs of composing a portfolio by the students and the reflective thinking outcome measured. As mentioned earlier, students should have a short course about reflection in and on action. When portfolios remain tools for learning to reflect during learning and development, students must apprehend clearly that reflection is more than just recording what happened and which research skills one developed during an assignment. It is still not known whether reflection demands motivation, but reflection calls attention to problems and new understandings and that always demands a critical and conscious mind.

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