A problem is your chance to do your best. — Duke Ellington

Doctors are expected to reflect both scientifically and personally in order to become an excellent doctor. The core subject of this thesis is personal reflection in medical practice and medical education. The aim of personal reflection is to make the individual experience of doctors meaningful for the benefit of ‘good practice’. However, what is needed is more precise knowledge about the construct of personal reflection and educational strategies for its encouragement. This resulted in the following research issues in this thesis:

1. Is it possible to make the rather abstract construct of personal reflection more concrete for medical educators?
2. Is it possible to measure the personal reflection ability of medical students?
3. What is the validity of an instrument to measure personal reflection?
4. Is experiential learning an effective educational method to foster personal reflection?
5. Is it possible to describe a conceptual framework for a more precise understanding of the nature and function of personal reflection in practice, in order to identify, use, and encourage personal reflection?

Chapter 1
Today, reflection is regarded as a key quality of the self-critical doctor and other healthcare professionals. Therefore reflection is increasingly promoted in healthcare education. The predominant mode of reflection in medicine, in the last decade, used to be ‘scientific reflection’. Its aim is the improvement of evidence-based clinical judgment, i.e. evidence-based medicine (EBM). This mode of scientific reflection fitted quite well with the professional identity of the doctor as a science-based rational practitioner. However, the misconception and ill-reflected expectation of EBM, at least in the beginning, was that it would replace the personal experience and knowledge of the doctor. This one-dimensional view is now replaced by a more multi-dimensional conceptualisation of professionalism in which ‘evidence’ is seen as one of the components of ‘good practice’ jointly with other key components, such as the personal ‘experience’ and ‘knowledge’ of the professional as well as the ‘situation’
and ‘expectations’ of the patient - as noticed and weighted by the professional. Obviously, just enunciating this more balanced view is not sufficient and can easily be illusory when it is not clarified how to recognize and use these experience-based key components of ‘good practice’ appropriately. It is here that the value of personal reflection and the need for more precise understanding of its nature and function in healthcare practice, becomes apparent. We define personal reflection as: the careful exploration and appraisal of experience, thus clarifying and creating meaning, for the benefit of balanced functioning, learning and development of doctors. Reflection is not an aim in itself. The modes of scientific and personal reflection are equally needed, i.e. a reflective equilibrium is needed, to acquire and maintain balanced conduct of medical students and doctors, which means: the augmentation of ‘evidence’ through scientific reflection and the augmentation of ‘relevance’ through personal reflection. Balanced conduct of doctors is primarily for the benefit of integral patient care, but also for the development of expertise and inter-professional cooperation, as well as the doctor’s self-care and well-being. Medical educators have therefore distinct responsibilities for the effective encouragement of the personal reflective ability of medical students and doctors. This thesis is intended to contribute to improved recognition, use and encouragement of personal reflection.

**Chapter 2**

This chapter tries to make the rather abstract construct of reflection more concrete for practical doctors and medical educators who play a central role in the support of reflection by students. An obstacle is that the appeal for reflection easily remains normative and rhetorical. Consequently its impact on medical education is likely to be small and sometimes boring or even misleading. In order to prevent this, we distinguished ‘behaviour’, ‘clinical reasoning’, ‘scientific reflection’, ‘personal reflection’ and ‘unconscious thinking’ and put these parts into an educational model, using the angler’s float as a metaphor (see figure). The Float Model symbolizes the doctor as reflective professional-in-action. It can prevent some misinterpretations such as
seeing the person and the professional as entire separated parts; mixing up scientific reflection and personal reflection; taking reflection as a goal in itself instead of a means to an end, namely balanced professional behaviour; and denying the importance of unconscious and irrational thoughts, feelings and reactions. The water represents the clinical context and culture. Without water a float does not function and has no meaning, i.e. individual professional / personal habits of mind and behaviour are always cultural embedded. Examples are given to reveal blends of balanced and unbalanced reflection underneath the water, shaping professional behaviour at the surface. The limitations of the use of metaphors are discussed.

Chapter 3
This chapter describes the development of a new scale: the Groningen Reflection Ability Scale (GRAS). The research question was: is it possible to measure the personal reflection ability of medical students in a practical way?
Item selection took place using literature and screening of an initial item-pool (81 items) by medical teachers and experts. Large samples of medical students (N 350 and N 583) and teachers (N 38) were used to investigate the psychometric characteristics of the items. Explorative factor analysis was used to investigate the structure of the scale.
The psychometric quality and content validity of the GRAS are satisfactory. The 23-item scale proved to be easy to complete and to administer.
The GRAS is, on conceptual and psychometric grounds, a one-dimensional scale. The three factors (self-reflection, empathetic reflection and reflective communication), being a result of explorative factor analysis, must therefore be interpreted primarily as facets of one dimension. This means that in practice a one-GRAS-score is leading. The content validity of the scale is satisfactory because the items are grounded in reflection literature and are covering three substantial aspects of personal reflection in the context of medical practice and education. The GRAS can be used for program evaluation concerning the reflection ability of medical students and doctors. A possible limited and paradoxical aspect of the GRAS is its self-rated character. Although the content validity of the GRAS is satisfactory, further research is needed to explore the external validity.
We can conclude that the GRAS is a practical measurement instrument that yields reliable data that contribute to valid inferences about the personal reflection ability of medical students and doctors, both at individual and group level. The 23 items on a 5-point Likert scale are
easy to complete, resulting in a one-GRAS-score. Scores can be calculated without time-consuming coding procedures.

Chapter 4
In this chapter, in two studies, the conceptual relationship (concurrent validity) between the GRAS and existing reflection scaled is explored. The aim was to test to which extent the Groningen Reflection Ability Scale (GRAS) covers the construct of personal reflection.

Study 1.
The correlations between the GRAS and 4 Korthagen reflection scales (1993) were analysed: (1) the Self-Internal orientation (SI) and (2) the Self-External orientation (SE) on ‘learning’, and (3) the Fellow-students Internal orientation (FI) and (4) the Fellow-students External (FE) orientation on ‘communication and cooperation’. We expected the SI scale to represent the GRAS concept of personal reflection the most, followed in decreasing order by the SE, FI and the FE scales. Hypothesis 1 therefore was: The correlation levels of the GRAS with Korthagen will decrease from SI on learning to FE on communication and cooperation.
The study showed significant decreasing correlations with the Korthagen scales, ranging from .67 with the most reflective scale to .32 with the least reflective scale; the GRAS Self-Reflection items explained most of the variance. The first hypothesis has been confirmed.
The results indicate that the GRAS and the Korthagen scales measure, to a certain extent, related aspects of reflection. However, the correlations are not high enough to conclude that an identical construct is measured. In our opinion this difference is a result of a differentiation in conceptual focus: the GRAS covers more the concept of self-reflection and the Korthagen scales more the concept of communication. Exploration indicates that this difference between the GRAS and Korthagen is based mainly on the GRAS items of Empathetic Reflection. We may therefore conclude that the GRAS covers the empathetic aspect of personal reflection more than Korthagen. The GRAS is a self-rating test of reflection ability, more than an external assessment of reflective performance such as assessment by medical teachers or peers.

Study 2.
The correlations of the GRAS with three related cognitive-emotional scales were analysed: the Need For Cognition (NFC) scale (Petty & Jarvis 1996), the Personal Need For Structure (PNFS) scale (Neuberg et al. 1997), and the Open-Mindedness scale (Webster & Kruglanski 1994). We expected the NFC and Open-Mindedness scales to measure valid attitudinal aspects of personal reflection, leading to hypothesis 2: The
**GRAS is positively correlated with the NFC and Open-Mindedness scales.**

The expected relationship between the GRAS and the Personal Need For Structure (PNFS) scale is more complex. An overall strong need for structure and decisiveness (Webster & Kruglanski 1994), which is needed for diagnosing and treating medical problems, may be a potential block to reflection because it obstructs the necessary tolerance towards uncertainty, openness towards reflection on experience and meta-reasoning (Mamede & Schmidt 2004). This leads to hypothesis 3: *The GRAS is not or negatively correlated with the PNFS scale.*

The study showed significant positive correlations with the NFC scale (.56) and the Open-Mindedness scale (.56), and a low negative correlation with the PNFS scale (-.14). *The second hypothesis was confirmed.* This relationship is primarily based on the GRAS Self-Reflection items. This indicates that personal reflection, as measured by the GRAS, is associated positively with a need for complex thinking and an open-minded attitude. *The third hypothesis was confirmed too (-.14).* To a small degree GRAS Reflective Communication is related negatively (-.25) to a need for personal structure. This indicates that personal reflection, as measured by the GRAS, is to a small extent associated positively with a tolerance for lack of structure and uncertainty.

Further research is needed to test a possible self-rating effect, for example by using the GRAS in a 360-degree assessment setting. We can conclude that both studies support the claim that the GRAS is a measure that contributes to valid inferences about the personal reflection ability of medical students.

**Chapter 5**

The aim of this study was to test the expectation that enhanced experiential learning is an effective educational method that encourages personal reflection in medical students. The hypothesis was: the growth of the personal reflection ability of students in an *enhanced* experiential learning programme is stronger than that of students in a standard educational programme.

Experiential learning is widely used as an educational method for stimulating the growth of students’ reflective abilities and attitudes required to become all-round professional practitioners. Recommended principles for strengthening its effectiveness are: authentic experience, a clear portfolio structure, a supportive mentor system, and appropriate assessment. These enhancements were adopted in an experiential learning programme that was part of new competence-based curriculum program at our medical faculty.
The level of personal reflection of an exposure group of 394 first-year medical students participating in the new enhanced experiential learning programme was compared to that of a control group of 250 second and 243 third-year medical students participating in the standard problem-based learning programme. A pre-post-test follow-up design was used. Personal reflection was assessed using the Groningen Reflection Ability Scale (GRAS) (see Chapter 3). We controlled for the variables that presumably influence the GRAS score: Gender and Time. Not every student responded at every measurement moment, therefore the data called for a multilevel analysis.

The study resulted in the following GRAS scores. The first-year medical students in the exposure group: at the first measurement 50.2 and at the second 55.1. In the control group, the second year students at the first measurement 52.9 and at the second 55.6; the third year students at the first measurement 56 and at the second 55.9. After one year, first-year medical students in the exposure group achieved a level of personal reflection comparable to that reached by students of the control group in their third year. The reflection growth curve of the control group declined slightly in the third year as a function of study time. The difference in growth of reflection was significant (p < .001), with a small to average effect size (ES = .18).

This study supports the suggestions that the ability of personal reflection on experience is enhanced by the mentioned supportive educational principles. The exposure programme combined the existing PBL elements of the standard program with the new elements of enhanced experiential learning. A possible bias in the estimation of the effect could be that measurements are not always of the same students.

We can conclude that enhanced experiential learning has a positive effect on the development of personal reflection. Undergraduate medical students acquired a higher level of personal reflection which, according to modern insights of competence-based education, is needed to become a professional medical doctor.

Chapter 6. Conceptual framework

This chapter offers a conceptual framework for more precise recognition, use and encouragement of personal reflection. At a meta-level ‘personal reflection’ is distinguished from ‘scientific reflection’, and at an operational level ‘information processing’ is distinguished from ‘sense making’:

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<th>Meta-level:</th>
<th>Scientific reflection</th>
<th>Personal reflection</th>
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These distinctions offer an analytical model that is used to make clear that scientific reflection is mainly focused on the critical (evidence-based) appraisal of information processing, and personal reflection on clarifying sense making. The properties of sense making and reflection on sense making are described plus the implications for a definition of reflection as a competence. A profound reflective competence contains a mindful attitude; the modes of ‘scientific reflection’ and ‘personal reflection’; purposeful attention for equally ‘information processing’ and ‘sense making’; and an internal oriented self-reflective application and an external oriented reflective communicative application (patients, family, colleagues).

Chapter 7
In this thesis, the urgency of personal reflection of doctors and other healthcare practitioners for the benefit of integrative patient care, professional development and cooperation, and own self-care and well-being is substantiated. For that reason the encouragement of personal reflection is increasingly promoted in healthcare education. This thesis has shown that personal reflection is a valid, comprehensible and to certain extent a measurable and trainable professional quality. The following critical reactions on this substantiated viewpoint and conclusions are discussed: (1) Personal reflection is not necessary and desirable in medical practice and education, (2) It is difficult or almost impossible to combine personal reflection with critical scientific reflection, (3) Personal reflection is not teachable and learnable, because it is a matter of personality (state-trait discussion). At the end some perspectives on further research and medical education are discussed.