

University of Groningen

Personal reflection in medical education

Aukes, Lense Cornelis

IMPORTANT NOTE: You are advised to consult the publisher's version (publisher's PDF) if you wish to cite from it. Please check the document version below.

Document Version

Publisher's PDF, also known as Version of record

Publication date:

2008

[Link to publication in University of Groningen/UMCG research database](#)

Citation for published version (APA):

Aukes, L. C. (2008). *Personal reflection in medical education*. s.n.

Copyright

Other than for strictly personal use, it is not permitted to download or to forward/distribute the text or part of it without the consent of the author(s) and/or copyright holder(s), unless the work is under an open content license (like Creative Commons).

The publication may also be distributed here under the terms of Article 25fa of the Dutch Copyright Act, indicated by the "Taverne" license. More information can be found on the University of Groningen website: <https://www.rug.nl/library/open-access/self-archiving-pure/taverne-amendment>.

Take-down policy

If you believe that this document breaches copyright please contact us providing details, and we will remove access to the work immediately and investigate your claim.

Downloaded from the University of Groningen/UMCG research database (Pure): <http://www.rug.nl/research/portal>. For technical reasons the number of authors shown on this cover page is limited to 10 maximum.

Chapter 4. Validation of the Groningen Reflection Ability Scale (GRAS)

The quest for certainty blocks the search for meaning. Uncertainty is the very condition to impel man to unfold his powers. – Erich Fromm

Abstract

Purpose: Encouraging personal reflection by medical students is important. This study examines the validity of a recently developed instrument for measuring personal reflection in medical education, the Groningen Reflection Ability Scale (GRAS).

Method: In two studies, medical students completed the GRAS and related validated scales: 4 Korthagen reflection scales, the Need For Cognition (NFC) scale, the Open-Mindedness scale, and the Personal Need For Structure (PNFS) scale. The correlations between the scales were analysed.

Results: Study 1 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. Study 2 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) (both studies $p < .01$, 2-tailed, all correlations with attenuation correction).

Conclusions: The study supports the claim that the GRAS is a measure that contributes to valid inferences about the personal reflection ability of medical students.

Introduction

Today, best medical practice is seen as ‘reflective practice’ and a good doctor as a ‘reflective practitioner’ (Epstein 1999; CanMEDS 2005; Coulehan 2005). Therefore, reflection is considered as a key issue in medical education (ABIM, ACP-ASIM & EFIM 2002). An empirical study by Mamede and Schmidt on the nature of reflective practice in medicine revealed five factors of reflection. The first three factors (deliberate induction, deliberate deduction, and testing and synthesizing) resemble the more cognitive, logical dimension of medical expertise,

such as clinical reasoning and scientific reflection. The last two factors are openness for reflection and meta-reasoning, which they describe as the more affective, attitudinal and meta-level dimension of reflection (Mamede and Schmidt 2004).

This article focuses on this last dimension of reflection, which we call personal reflection. The Groningen Reflection Ability Scale (GRAS) was developed to measure the personal reflection ability of medical students and doctors (Aukes et al. 2007). The aim of this validity study is to investigate to what extent the GRAS covers the construct of personal reflection in medicine. This was done by matching the GRAS with several related previously validated scales, taken at the same time. The ultimate purpose, obviously, is to ensure that the inferences based on GRAS scores are correct, suitable, interpretable and practically useful.

Among the problems in fostering and assessing reflection in medical education (Coulehan 2005; Arnold 2002), there are two co-dependent obstacles in particular that are relevant when examining the validity of the GRAS. These are a lack of conceptual clarity (Atkins & Murphy 1993; Procee 2006) and a lack of instruments to measure reflection (Kember & Leung 2000; Arnold 2002). These are serious problems because what is not conceptualized well cannot be measured adequately (Shumway & Harden 2003). A third obstacle is the fact that the systematic development of measurement scales is difficult and time-consuming.

The available instruments for measuring reflection are mainly focused on critical thinking regarding well-defined problems (King & Kitchener 1994). However, critical thinking is not identical to reflection (Polanyi 1974; Mezirow 1998; Mamede & Schmidt 2004). Quite a lot of problems arising in patient care, inter-collegial cooperation and lifelong personal and professional learning are multifaceted and complex. For example, if a doctor, despite feedback from colleagues, does not recognize the influence of the multicultural background of the patient on his/her process of diagnosing, therapy and communication. These problems require not just cognitive modes of critical reflection, but also supplementary affective personal modes of reflection in order to improve the quality of medical care and the medical profession (Epstein 1999; Coulehan 2005).

In the literature, there is informal consensus that one of the main functions of reflection is the acquisition of knowledge and understanding by using one's own experience as a supplementary source to theory and handbooks, and that therefore reflection is interconnected with the

subjective and affective dimension of the person of the professional (Schön 1983; Atkins & Murphy 1993; Mamede & Schmidt 2004; Procee 2006). In line with these findings, 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’ (Aukes et al. 2007).

Hypotheses

The test construction of the GRAS was grounded firmly in the theoretical domain, based on literature research, systematic construction of theoretical items, appraisal of items by experts and explorative study of the structure (Aukes et al. 2007). Therefore, on theoretical grounds, the construct validity was satisfactory (Cronbach & Meehl 1955; Cronbach 1971). Nonetheless, the question to what extent the GRAS covers the different aspects of this important construct of personal reflection in medicine remained. Thus, the validity of the GRAS was tested by examining the correlations of the GRAS with previously validated scales expected to measure related aspects of the same construct (Cronbach & Meehl 1955; APA et al. 1954; AERA, APA & NCMI 1999). Two studies were performed, with hypotheses about the empirical relationships between the GRAS and the related scales, built on the following expectations.

Study 1

In the first study, the correlations between the GRAS and the 4 Korthagen reflection scales (1993) were analysed. Korthagen’s vision of reflection resembles Donald Schön’s (1987) idea of ‘reflection-on-action’. His vision approaches our definition of personal reflection-on-experience. We prefer ‘experience’ because this term emphasizes the more affective focus on the personal thoughts, feelings and values related to ‘action’ rather than the cognitive focus on testing the degree of evidence of one’s clinical reasoning (Epstein 1999). In his scale construction, Korthagen (1993) distinguishes two learning orientations on which students differ in the degree to which their learning relies on reflection: an Internal Orientation and an External Orientation. Students with an Internal Orientation predominantly use personal thoughts and experience as a source. An External Orientation is based on support and guidance from outside and predominantly using the knowledge, experience or authority of others as a source. Korthagen (1993) applies each of these orientations to the domains of ‘learning’ and ‘communication & cooperation’, resulting in 4 reflection scales:

- the Self-Internal orientation on learning (SI) (‘I reflect on myself’)

- the Self-External orientation on learning (SE) ('I like it when others comment on my conduct')
- the Fellow-students Internal orientation on communication and cooperation (FI) ('I am interested in my fellow students')
- the Fellow-students External orientation on communication and cooperation (FE) ('I consider it important to receive information from a supervisor about my way of dealing with my fellow students').

Because medical students, as young professionals, are expected to learn how to act and think autonomously, personal reflection is primarily associated with SI rather than with SE, and primarily with a commitment to personal thinking and learning rather than with communication and cooperation with fellows. In our opinion, however, most of the items in the Korthagen scales, even the reflective FI items, are more focused on communication than on reflection – except the SI items on learning. Hence, we expected the SI scale to represent the GRAS concept of personal reflection most, followed in decreasing order by the SE, FI and the FE scales. This expectation was articulated in hypothesis 1: *The correlation levels of the GRAS with Korthagen will decrease from SI on learning to FE on communication and cooperation.*

Study 2

In the second study, the correlations of the GRAS with three related cognitive-emotional scales were analysed: the Need For Cognition (NFC) scale (Petty & Jarvis 1996) ('I prefer to be responsible for situations which need much thinking'), the Personal Need For Structure (PNFS) scale (Neuberg et al. 1997) ('I don't like situations that are uncertain'), and the Open-Mindedness scale (Webster & Kruglanski 1994) ('I always see so many possible solutions to problems I face').

Personal reflection on experience has an encompassing focus on subjective thoughts, feelings and values. It is associated with attention for and active structuring of experience, which are characteristics of a deep approach to functioning and learning (Vermunt 1992; Mezirow 1998; Entwistle & McCune 2004). Personal reflection requires an open attitude towards reflection on experience and a tolerance of uncertainty and ambiguity (Mamede & Schmidt 2004). Therefore, the NFC and Open-Mindedness scales are expected 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. Professional functioning of

doctors is generally speaking based on two sources: explicit and implicit (tacit) knowledge and structuring of experience (Polanyi 1974). On the one hand, when doctors are testing the degree of evidence of their clinical judgements, through critical scientific reflection, they are mainly focused on the appraisal of their own explicit expert information processing and literature. This requires a logical meta-cognitive ability, in combination with pragmatic clinical structuring and decisiveness. This combination possibly correlates positively with their personal need for structure, order and decisiveness. On the other hand, when doctors use personal reflection in order to learn from their experience, they are mainly focused on tacit knowledge and sense-making, mostly concerning ill-defined problems. Thus, the mode of personal reflection requires an open mind for structuring tacit knowledge and experience. However, an overall strong need for structure and preference for order and decisiveness (Webster & Kruglanski 1994) may be seen as a potential block to reflection because it obstructs the necessary tolerance towards uncertainty, openness towards reflection and meta-reasoning (Mamede & Schmidt 2004). Consequently, hypothesis 3 was formulated as: *The GRAS is neutral or negatively correlated with the PNFS scale.*

Method

Participants and procedure

In study 1, 285 first-year medical students completed the GRAS and the 4 Korthagen scales. The whole cohort of 350 students was invited, in a letter from the programme coordinator, to complete the scales as part of the programme evaluation of a new curriculum. In study 2 a sample of 583 medical students (first through to sixth year) completed the GRAS and the three social-psychological scales discussed in the introduction. The first to fourth-year students were invited to complete the scales at the end of their mandatory progress knowledge test; the fifth and sixth-year students were invited by email during their clerkships.

Instruments

The GRAS uses a 5-point Likert scale containing 23 items, with a satisfactory Cronbach's alpha, which reliably and feasibly measures the personal reflection ability of medical students (Aukes et al. 2007). The GRAS was developed as a one-dimensional scale, resulting in one GRAS personal reflection score. Principle component analysis showed three groups of items or factors, indicating three aspects of that one dimension. These factors cannot be interpreted as three subscales, but should be seen as preliminary gradations of the construct of personal reflection. Consequently, they cannot be used as separate scores for assessing and

ranking individuals, but they can be used for scientific validity studies. The three factors are ‘Self-Reflection’ (10 items), which assesses the exploration of own experience, thoughts and feelings, ‘Empathetic Reflection’ (6 items), aimed at understanding the experiences of others, and ‘Reflective Communication’ (7 items), measuring openness and responsiveness to feedback. See Table 1 for some representative items.

In study 1 the students completed the GRAS and the 4 Korthagen reflection scales (5-point Likert scales, short version), namely (1) the Self-Internal (SI) scale (11 items), representing the internal orientation on learning, (2) the Self-External (SE) scale (10 items), representing the external orientation on learning, (3) the Fellow-students Internal (FI) scale (10 items), representing the

Table 1. Three representative items from each of the GRAS factors (translated from Dutch)

<p><i>Self-Reflection (10 items)</i></p> <p>I take a close look at my own habits of thinking I am aware of the emotions that influence my thinking I want to know why I do what I do</p> <p><i>Empathetic Reflection (6 items)</i></p> <p>I am aware of the possible emotional impact of information on others I can empathize with someone else’s situation I reject different ways of thinking (reversed item)</p> <p><i>Reflective Communication (7 items)</i></p> <p>I take responsibility for what I say I am open to discussion about my opinions I sometimes find myself having difficulty in illustrating an ethical standpoint (reversed item)</p>

internal orientation on communication and cooperation, and (4) the Fellow-students External (FE) scale (10 items), representing the external orientation on communication and cooperation (Korthagen 1993).

In study 2 the students completed the GRAS and three social-psychological scales. The first of these, the Need For Cognition scale (NFC) (Petty & Jarvis 1996), measures the personal need for deeper thinking and interest in exploring multifaceted problems. Its short version (15 items) was used. Second, the Close-Mindedness scale (CM), a

subscale of the Need for Closure scale (Webster & Kruglanski 1994), measures intolerance of experience, uncertainty and diversity. Its short version (8 items) was used and scores were computed using its reversed version, measuring Open-Mindedness. Third is the Personal Need For Structure (PNFS) scale (Neuberg et al. 1997). The PNFS measures the need for structured tasks, instructions and situations; its short version (11 items) was used. The Dutch translations of all these scales were used (Pieters et al. 1987).

Analyses

In study 1 the Pearson's correlations with attenuation correction were computed between the GRAS and the Korthagen scales. The differences between the correlation levels were tested with a t-test for the differences between dependent correlations. The contribution of the GRAS item groups to the variance with the Korthagen scales was explored using correlation analysis. In study 2 the correlations (Pearson's r) were computed between the GRAS item groups and the three social-psychological scales (NFC, CM, PNFS).

Results

Study 1: the relationship GRAS ~ Korthagen

The first study obtained responses from 285 first-year students (62%). Table 2 shows the correlations between the GRAS and the successive Korthagen scales. All the correlations are significant at $p < .01$, 2-tailed, except the two correlations between FE and Empathetic Reflection (.19, $p < .05$ 2-tailed) and Reflective Communication (.15 n.s.). The highest correlation of GRAS with Korthagen is with the most reflective SI scale (.67), and the lowest correlation of GRAS is with the least reflective FE scale (.32). T-tests of the differences between the GRAS correlations show that most of the differences are significant, except those between SI (.67) and SE (.62), and between SE (.62) and FI (.56).

Additional explorative study of the contribution of the GRAS item groups shows the following correlations. The maximum correlations are between GRAS Self-Reflection and the most reflective Korthagen SI scale (.75), and between GRAS Reflective Communication and the next reflective SE scale (.65). This suggests that GRAS Self-Reflection is associated mostly with an internal orientation on learning and functioning. GRAS Reflective Communication is associated mostly with an external orientation on learning and functioning. The exploration of the contributions of the GRAS item groups to the variance with the Korthagen scales resulted in the following contributions: Self-Reflection

56%, Reflective Communication 42% and Empathetic Reflection 27%. This means that the GRAS Self-Reflection items explain most of the variance in the Korthagen scales. In short, the results in Table 2 imply that the first hypothesis is supported.

Table 2. Correlations between the GRAS and Korthagen reflection scales, with attenuation correction

KORTHAGEN scales	GRAS 23 items	Self-Reflection 10 items	Empathetic Reflection 6 items	Reflective Communication 7 items
1. Self-Internal (SI) 11 items	.67**	.75**	.47**	.32**
2. Self-External (SE) 10 items	.62**	.53**	.34**	.65**
3. Fellow-students Internal (FI) 10 items	.56**	.56**	.52**	.32**
4. Fellow-students External (FE) 10 items	.32**	.38**	.19*	.15

** p < .01 (2-tailed)

* p < .05 (2-tailed)

All the differences between the correlation levels of the GRAS (23 items) are significant, except

between .67 and .62, and between .62 and .56.

The negative items of the GRAS are reversed.

Study 2: the relationship GRAS ~ NFC, Close-Mindedness and PNFS scales

The second study obtained responses from 583 first to sixth-year medical students (31%). As Table 3 shows, this study resulted in positive correlations between the GRAS and the NFC scale (.56) and the Open-Mindedness scale (.56), and a low negative correlation with the PNFS scale (-.14) (all p < .01, 2-tailed with attenuation correction). Explorative study of the relationships with the item groups shows the highest correlations between GRAS Self-Reflection and the NFC scale(.54) and the Open-Mindedness scale(.50), and a low negative correlation between GRAS Reflective Communication and the PNFS scale (-.25) (all p < .01, 2-tailed with attenuation correction). This means that GRAS Self-Reflection is associated predominantly with the NFC and Open-Mindedness scales, and that GRAS Reflective Communication is negatively related to the PNFS scale to a small degree. In short, the

results in Table 3 imply that the second and third hypotheses are confirmed.

Discussion

The aim of this study was to test to what extent the GRAS covers the construct of personal reflection in medicine, by analysing the correlations of the GRAS with several related and validated scales concerning reflection. All the hypotheses could be confirmed.

Table 3. Correlations between the GRAS and the three familiar reflection scales

	GRAS 23 items	Self- Reflection 10 items	Empathetic Reflection 6 items	Reflective Communication 7 items
Need For Cognition (NFC) 15 items	.56**	.54**	.38**	.49**
Open-Mindedness (reversed Close-Mindedness) 8 items	.56**	.50**	.38**	.47**
Personal Need For Structure (PNFS) 11 items	-.14**	-.03	-.09*	-.25**

** p < .01 (2-tailed) * p < .05 (2-tailed)

The first hypothesis – a decreasing relationship between the GRAS and 4 Korthagen reflection scales – has been confirmed. This relationship was expected because personal reflection was associated primarily with self-reflection concerning own thoughts, feelings, and experience. GRAS Self-Reflection turns out to be associated mostly with SI (.75) and explains most of the variance (56%). GRAS Reflective Communication is associated to a lesser extent with SE (.65) and explains 42% of the variance. These results indicate that the GRAS and the Korthagen scales to a certain extent measure 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. This difference can be interpreted as the GRAS covering more the concept of self-reflection, and the Korthagen scales more the concept of communication. In exploring this difference, the results show that the highest correlation between the GRAS and Korthagen is found between Empathetic Reflection and FI (.52). This correlation is, however, lower than the highest correlations of the GRAS with Korthagen, namely GRAS Self-Reflection .75 and GRAS Reflective

Communication .65. This indicates that the 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 second hypothesis – a positive correlation between GRAS and the Need For Cognition (NFC) and Open-Mindedness scales – has been confirmed (.56 and .56). This relationship is based primarily 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 – neutral or a negative correlation between the GRAS and the Personal Need For Structure (PNFS) scale – has been confirmed (-.14). To a small degree GRAS Reflective Communication is related negatively (-.25) to a need for personal structure. This indicates that personal reflection is to a small extent associated positively with a tolerance for lack of structure and uncertainty.

Both studies contribute to the validity of the GRAS as an instrument for measuring personal reflection. The GRAS score is associated with an internal orientation on personal learning and functioning, open-mindedness, a need for complex thinking, and to a small degree with a tolerance for lack of structure and certainty.

A possible limitation of this study may be the non-response rate of 38% in the first study and 69% in the second. An explanation of the latter is the fact that the students' participation in the second study was probably experienced as more voluntary than the first. In the second study, filling in the scales was the last voluntary task of a compulsory and important progress test, and the fifth and sixth-year students busy with their clerkships were more difficult to stimulate by email. It is difficult to interpret what this means with regard to a possible bias in this study. The size of both studies in these quite homogeneous groups was large enough to evaluate the concurrent validity.

Conflicting interpretations are possible – the extra task to complete the scales (about 15 minutes) could have been done by only the most intrinsically motivated and thus reflective students (Sobral 2001), or by the students with the highest need for authority, thus externally less reflective, orientated students (Korthagen 1993), or by the high achievers and probably more reflective students (Sobral 2001) who finished their progress test more quickly.

Further empirical research is needed in this domain of reflection in medicine. Reflection is undoubtedly a multidimensional construct that reflects the complexity of cognitive-emotional and meta-cognitive processes. The GRAS, focusing on personal reflection on experience, is a one-dimensional scale with three aspects – self-reflection, empathetic reflection and reflective communication. The relationship with other modes of reflection in medicine must be explored, such as the related dimension of mindful attention awareness (Brown & Ryan 2003).

The question to which degree personal reflection is a stable trait or a changeable state, and its implications for fostering and measuring reflection, is part of a theoretical debate and further research (Rees 2005). In the vision of Hilton and Slotnick (2005), reflection and reflective professionalism is more a state than a trait. The cognitive logical dimension of reflection (Mamede & Schmidt 2004) is usually taken as trainable dimension, although intelligence is also seen as an aspect of personality (Furnham & Heaven 1999). The more affective, attitudinal and personal dimension of reflection (Mamede & Schmidt 2004) is more internally oriented, and probably more closely linked to the doctor's personality (Atkins & Murphy 1993; Epstein 1999). The personal traits of the doctor and the environment play an influential role in shaping the reflection ability and reflective behaviour.

Furthermore, the question is how stable traits in fact are – as well as the question whether stability is rather an artefact of the chosen personality model or practice model. Modern variants of the Five Factor personality theory take the interaction between person and environment more into account, and the way in which this interaction is shaped by the actor as characteristic for personality (De Raad & Doddema-Winsemius 2006). Taking reflective professionalism as a state, our hypothesis in further research is that the personal reflection ability, which can be practised and developed over time, is a significant cognitive-emotional moderator variable between reflection as a personal trait and reflective behaviour.

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. Further research is needed to test a possible self-rating effect, for example by using the GRAS in a 360-degree assessment setting. Further research is also needed to test the predictive validity of the GRAS on the criterion of reflective behaviour in actual practice.

Conclusion

This validation study contributes to the required conceptual clarification of the construct of personal reflection in medicine. The study supports the claim that the GRAS is a measure that yields reliable data that contribute to valid inferences about the personal reflection ability of medical students.

References

- ABIM (American Board of Internal Medicine), ACP-ASIM (American College of Physicians-American Society of Internal Medicine) & EFIM (the European Federation of Internal Medicine) (2002). Medical professionalism in the new millennium: A physician's charter. *Annals of Internal Medicine*, 136, 243–246.
- American Educational Research Association, American Psychological Association, National Council on Measurement in Education. 1999. *The Standards for Educational and Psychological Testing*, [Rev. ed.] (Washington, DC, American Educational Research Association).
- American Psychological Association, American Educational Research Association, National Council on Measurements Used in Education, Joint Committee on Test Standards. 1954. Technical recommendations for psychological tests and diagnostic techniques. *Psychol Bull (Suppl.)* 51:1–38.
- Arnold L. 2002. Assessing professional behaviour: yesterday, today and tomorrow. *Acad Med* 77: 502–515.
- Atkins S, Murphy K. 1993. Reflection: a review of the literature. *J Adv Nurs* 18: 1188–1192.
- Aukes LC, Geertsma J, Cohen-Schotanus J, Zwierstra RP, Slaets JPJ. 2007. The development of a scale to measure personal reflection in medical practice and education. *Med Teach* 29:177–182.
- Brown KW, Ryan RM. 2003. The benefits of being present: mindfulness and its role in psychological well-being. *J Pers Soc Psychol* 84:822–848.
- CanMEDS 2000 Project. 2005. *Skills for the New Millennium: Report of the Societal Needs Working Group*, [improved version] (Ottawa, Royal College of Physicians and Surgeons of Canada).
- Coulehan J. 2005. Viewpoint: today's professionalism: engaging the mind but not the heart. *Acad Med* 80:892–898.
- Cronbach LJ, Meehl PE. 1955. Construct validity in psychological tests. *Psychol Bull* 52:281–302.
- Cronbach LJ. 1971. Test validation, in: RL Thorndike (Ed.), *Educational Measurement*, 2nd edn (Washington, DC, American Council on Education).
- De Raad B, Doddema-Winsemius M. 2006. *De Big 5 Persoonlijkheidsfactoren: een Methode voor het Beschrijven van Persoonlijkheidseigenschappen*, [in Dutch] (Amsterdam, Uitgeverij Nieuwezijds).
- Entwistle N, McCune V. 2004. The conceptual bases of study strategy inventories. *Educ Psychol Rev* 16:325–345.
- Epstein RM. (1999) Mindful practice. *JAMA* 282:833–839.
- Furnham A, Heaven P. 1999. *Personality and Social Behaviour* (London, Arnold).
- Hilton SR, Slotnick HB. 2005. Proto-professionalism: how professionalisation occurs across the continuum of medical education. *Med Educ* 39:58–65.
- Kember D, Leung DYP, Jones A, Loke AY, McKay J., Sinclair K, Tse H, et al. 2000. Development of a questionnaire to measure the level of reflective thinking. *Assess Eval Higher Educ* 25:381–395.

- King PM, Kitchener KS. 1994. *Developing Reflective Judgment: Understanding and Promoting Intellectual Growth and Critical Thinking in Adolescents and Adults* (San Francisco, Jossey-Bass).
- Korthagen F. 1993. Measuring the reflective attitude of prospective mathematics teachers in the Netherlands. *Eur J Teach Educ* 16:225–236.
- Mamede S, Schmidt HG. 2004. The structure of reflective practice in medicine. *Med Educ* 38:1302–1308.
- Mezirow J. 1998. On critical reflection. *Adult Educ Quart* 48:185–198.
- Neuberg SL, Judice TN, West SG. 1997. What the Need for Closure scale measures and what it does not: toward differentiating among related epistemic motives. *J Pers Soc Psychol* 72:1396–1412. Dutch version of the Need for Closure scale: CRATYLUS (1995) Een Nederlandse Need for Closure vragenlijst. *Ned Tijdschr Psychol* 50:231–232.
- Petty RE, Jarvis WBG. 1996. An individual differences perspective on assessing cognitive processes, in: N Schwarz, S Sudman (Eds), *Answering Questions: Methodology for Determining Cognitive and Communicative Processes in Survey Research* (San Francisco, Jossey-Bass).
- Pieters RGM, Verplanken B, Modde JM. 1987. Neiging tot nadenken: samenhang met beredeneerd gedrag (Need for cognition: association with deliberative action), [in Dutch]. *Ned Tijdschr Psychol* 42:62–70.
- Polanyi M. 1974. *Personal Knowledge: Towards a Post-critical Philosophy* (Chicago, University of Chicago Press).
- Procee H. 2006. Reflection in education: a Kantian epistemology. *Educ Theory* 56:237–253.
- Rees C. 2005. Proto-professionalism and the three questions about development. *Med Educ* 39:7–11.
- Schön DA. 1983. *The Reflective Practitioner* (London, Temple Smith).
- Schön DA. 1987. *Educating the Reflective Practitioner: Towards a New Design for Teaching and Learning in the Profession* (San Francisco, Jossey-Bass).
- Shumway JM, Harden RM. 2003. AMEE GUIDE No 25: The assessment of learning outcomes for the competent and reflective physician. *Med Teach* 25:569–584.
- Sobral D. 2001. Medical students' reflection in learning in relation to approaches to study and academic achievement. *Med Teach* 23:508–513.
- Vermunt JDHM. 1992. *Leerstijlen en het Sturen van Leerprocessen in het Hoger Onderwijs: Naar Procesgerichte Instructie in Zelfstandig Denken* (Learning styles and regulation of learning processes in higher education: towards process directed instruction in independent thinking), [Dissertation in Dutch] (Amsterdam/Lisse, Swets & Zeitlinger).
- Webster DM, Kruglanski AW. 1994. Individual differences in need for cognitive closure. *J Pers Soc Psychol* 67:1049–1062

