

Graduateness: an empirical examination of the formative function of university education

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Abstract The formative merits of university education are at risk of being reduced from graduateness in the sense of broad academic cultivation to professional training with a strong emphasis on employability. The difficulty in opposing this trend is the absence of a clear framework for academic cultivation. The aim of this study is to construct a model that uses the formative function of university education as a starting point, that distinguishes graduateness from employability, and that integrates theories on reflective thinking, scholarship, moral reasoning and lifelong learning. This approach offers the possibility of making use of insights from established theoretical traditions in the study of the intellectual development of students. For this study, a questionnaire was developed to investigate graduateness, or intellectual cultivation, among students in a research university. Structural equation modelling revealed that the expected structure was confirmed by the data. Reflective thinking has the strongest influence on lifelong learning; however, scholarship and moral citizenship are also important elements.

Keywords Graduateness · Generic competences · Intellectual development · Reflective thinking · University students

Introduction

Ask ten randomly chosen people what they expect from university graduates, and you are likely to receive at least ten different answers. Some will stress the importance of disciplinary knowledge and research skills, whereas others will expect university graduates to primarily function as professional experts. A few people even might view the graduates in relation to their responsibility in society, culture and the arts. You will probably hear such notions as problem solving, professional expertise, lifelong learning, research skills, (multidisciplinary) team work, contributing to the public debate, and creativity. Maybe someone will point out to you that it is difficult to answer such a general question, given

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the diversity among disciplines, institutes and students. Nevertheless, there is some common understanding that university graduates, regardless of their field of study, share something that could be recognised as *graduateness*. In other words, university education, regardless of the discipline, does something to its students that distinguishes university graduates who have completed an entire degree programme from non-university graduates or even from university graduates who received exemptions (Wheelahlan 2003).

Although university education is believed to have an essence that is shared by all disciplines, it appears to be difficult to reach consensus on what this essential shared communality of university disciplines is. Different expressions are used to address this shared experience, such as *graduateness*, generic graduate attributes, generic skills, core skills, key skills, transferable skills, and cultivation. Each expression has its own interpretation and, sometimes, even more than one. The concept of generic skills, for example, is used in the US to identify a broad set of general skills ranging from basic skills to personal skills to values and ethics, whereas in the UK and Australia, this expression is mainly used to identify employability skills, i.e., those skills that are considered necessary in the labour market (Kearns 2001). Consequently, little theoretical foundation for *graduateness*, the expression of our choice, exists (Barrie 2006; Bennett et al. 1999; Clancy and Ballard 1995).

This lack of consensus is not only confusing but also limits the opportunities for both researchers and educational policy makers to address *graduateness* adequately. Glover et al. (2002) highlighted that the difference between employability and ‘the wholeness of the university experience’ (p 303) is rarely acknowledged when investigating *graduateness*. More recently, Booth et al. (2009) observed that universities emphasise short-term economic indicators, such as employability, at the expense of personal and intellectual growth. With an increasing focus on economic indicators to determine educational quality (Barnett 2003) and financial resources that depend heavily on scores of these indicators, it is only rational that universities focus on economic indicators. This focus is enhanced by applying *graduateness* models that make no distinction between employability and intellectual development. It is our concern that in this way, universities as institutions are selling themselves short.

The objective of our study is to take the discussion on *graduateness* a step further by introducing an integrated model that distinguishes *graduateness* from other generic attributes that are not typically considered intellectual development, such as team working skills, literacy and presentation skills. According to Stevenson (2003), the major difference between experts and novices lies not in the amount of skills they master but rather in their ability to make connections, for example, between conceptual understanding and skills. Moreover, there is a difference between skill development and intellectual development in the sense that the first does not imply transformation within the student (Stevenson 2003). Mastering presentation or teamwork skills does not lead to a transformation of beliefs and attitudes. These statements about *graduateness* are still rather abstract; however, they reflect the basic idea of *graduateness*: transformation. In order to provide a more prominent place for *graduateness* in university education, the definition of *graduateness* needs to be made clear.

In the following section, we explore *graduateness* using insights from different (developmental) theories. This section will provide a theoretical model of *graduateness* that will be tested empirically. The outline of the article is as follows. First, we will restrict the interpretation of *graduateness* by explaining what *graduateness* is and what it is not. Subsequently, we will determine the domains of *graduateness* using common elements from comparable concepts. This section concludes with the introduction of the theoretical

model of graduateness. In the third section, the different elements of the model are operationalised, and the testing procedure is explained. In section four, the results are presented, and, in the final section, we draw conclusions from the results and discuss them.

Graduateness

The search for the meaning of graduateness is as ancient as university education itself. Every era has its own, sometimes conflicting, views on university education and what makes someone a graduate. Inevitably, these different views contain a normative element, which complicates the construction of a theoretical framework. In an attempt to construct a theoretical foundation, certain authors (e.g. Barrie 2006; Oost et al. 1998) have attempted to determine what graduates have in common regardless of the discipline they studied. Such an approach results in a wide range of different generic domains that are not necessarily typical for university education. Nevertheless, these lists have value in themselves as a representation of what is currently valued in university education. However, the models built on these lists are less appropriate for discriminating between generic skills, employability and intellectual development, as those models regard them as elements of the same construct.

The necessity of discriminating graduateness from employability skills is emphasised by both Booth et al. (2009) and Glover et al. (2002). Therefore, we advocate a different approach to determining graduateness. When looking at what common results graduates have within such generic and varied lists, how should we interpret graduateness such that it discriminates better between the different domains? Pascarella and Terenzini (2005) show that higher education affects students in a wide range of domains, such as verbal and quantitative competences, cognitive skills, identity, attitudes and values, moral development, career choices and development, and educational attainment. Regarding all this as graduateness would reduce graduateness to an empty construct, as discriminating between domains would be impossible. If graduateness is not all that students learn during their university years, then what is the essence of graduateness?

The essence of graduateness is closely related to the formative function of university: cultivating students, that is, contributing to their personal growth. Besides research and the professional preparation of students, universities have this formative function (UNESCO 1998; Dutch Higher Education and Scientific Research Act 1992). What are the characteristics of this personal growth, or graduateness, as we prefer to address it? First, and foremost, graduateness implies a transformation in students (e.g. Jansen 2009; Perry 1970; Stevenson 2003; Van Rossum and Hamer 2010). This transformation means that freshmen and graduates are in different stages of their intellectual development (Perry 1970; Van Rossum and Hamer 2010). We consider graduateness to be a specific stage in students' intellectual development that is most likely to be achieved by the time the students graduate. This timing, however, is not ironclad; a portion of students might not have achieved graduateness upon graduation (Van Rossum and Hamer 2010). This approach allows us to build a theoretical framework for graduateness on existing research traditions.

The idea of transformation through university education forms the essence of Perry's (1970) theory of academic development. He noted that students transform in the way that they deal with knowledge during their years in university. In his model, Perry distinguishes nine developmental positions distributed among three clusters. All of these positions represent different views of knowledge starting from a dualistic position (in which something is held to be either true or untrue, and certain authorities are held to know the

answer) to the relativism position (in which one commits to certain ideas, values and responsibilities). These positions are by no means static; rather, they are the subject of continuous re-evaluation, reorganisation and repositioning. These developmental positions comprise a complex process during which students gain new facts, insights and knowledge and use them to restate their commitments.

It is in the relativism cluster of positions where the stadium of gradueness should be placed. How knowledge is viewed is an important element of gradueness, but gradueness is not limited to knowledge. From a cognitive learning point of view, Stevenson (2003) highlights the importance of linking different types of knowledge, for example, theoretical knowledge and functional knowledge. This linking of different types of knowledge means that gradueness is not merely about expanding knowledge but that it also enables the practical application of theoretical knowledge. According to Schön (1983), the application of theoretical knowledge is facilitated by a complex process that mainly revolves around reflection (upon the situation, one's interpretation and one's theoretical knowledge). Experienced professionals will find it hard to explain the exact steps of this process, as it has become part of their tacit knowledge (Schön 1983).

Let us summarise the characteristics of gradueness. We interpreted gradueness in the context of the essence of university education instead of in the context of the generic element in university education. Gradueness refers to a stage in the intellectual development of students. This stage is situated in the highest cluster of Perry's (1970) model of intellectual development and is characterised by what Van Rossum and Hamer (2010) interpret as 'widening horizons' and 'growing self-awareness'. We identified reflective thinking as a key element of gradueness. The university needs to cultivate this reflective ability, especially in an era in which most students will become professionals; furthermore, the students need to be receptive toward developing a reflective attitude.

Domains of gradueness

How can universities cultivate gradueness in students? Is there only one way, or do numerous roads lead to Rome? Jones (2009) found generic graduate attributes, which have some similarities to gradueness, to be interpreted and valued differently among disciplines despite the 'generic' label. This difference in interpretation and value will also be the case for gradueness. We illustrate this difference by highlighting two different approaches that contribute to a student's intellectual development. First, Von Humboldt (1809–10) emphasised that self-cultivation takes place through research and inquiry and by reading philosophy and arts. The discipline studied takes a prominent place; personal growth and scholarship need to be developed together. Most universities in continental—Europe are founded in this tradition. Second, in liberal education, university education has a formative function. However, this formative study takes place in a separate curriculum and is mainly focused on creating democratic world citizens (Mulcahy 2009; Nussbaum 1997) by introducing them to different (sub)cultures in the world (Nussbaum 1997). This tradition has flourished mainly in the US, however, the emergence of University Colleges in Europe shows that it ideals become more popular in Europe as well.

What these two ideals have in common is that students' development in one area (scholarship or world citizenship) is expected to have an overspill to a more general area: students' intellectual development. This fits our basic idea of gradueness: development in one area contributes to a higher-order level of development: reflective thinking. Gradueness occurs where development in these two areas reinforce intellectual development,

reflective thinking. Given the increasing importance of lifelong learning in current society (Commission of the European Communities 2002; Dearing 1997) and its generic character (it is important in all academic disciplines) we decided to include it in our model to assure the contemporary character of the model. All of these elements of graduateness (reflective thinking, scholarship, citizenship and lifelong learning) are elaborated below.

Reflective thinking

We have already emphasised that reflective thinking is at the essence of graduateness. In the same tradition that Perry developed his model of intellectual development, Kitchener and King (1981) developed a theory of reflective judgment, distinguishing seven stages in three clustered groups: pre-reflective thinking, quasi-reflective thinking and reflective thinking. Comparable to Perry's model (1970), graduateness is situated in the third cluster of reflective thinking. At this stage, students should recognise that knowledge is uncertain and that they must translate and integrate information from different angles in order to reach a conclusion (King and Kitchener 2004). The academic process is not only about learning how to apply certain skills and knowledge in particular situations, but it is also about acting in a situation in which it is unclear what the situation is and what knowledge, skills and attitudes are necessary to tackle the situation (Schön 1983). In other words, reflective thinking is about reflection on the situation and reflection on the required instruments, such as theoretical knowledge and various skills, and it is about the application of such knowledge and skills based on one's own judgement.

Scholarship

Scholarship is not merely reserved for students who aspire to an academic career. A scholarly attitude is also appreciated outside academia, as the situations professionals face have become more complex and require more of the cognitive and inquiry skills of professionals and citizens (Boyer 1990; Schneider 2004; Schön 1983). One example is the scholarship of application (Boyer 1990), which is explicitly concerned with complex problems within organisations and society. This subject requires the ability to link theoretical and functional knowledge in order to solve complex problems conscientiously. In most cases, the problem at hand requires analytical investigation before an appropriate solution is proposed, and, after implementation, the solution needs to be evaluated as to whether it was appropriate. Scholarship is not merely about basic research skills, which, again, will differ between disciplines (because research in the natural sciences requires different skills than research in the humanities), but it is also about a scholarly attitude (Byrne and Johnstone 1987). The transformative character of scholarship is not merely about mastering research skills; it is also about developing a scholarly stance towards the world.

Moral citizenship

The use of the term moral citizenship requires explanation because it is not commonly used. By using this expression, we want to highlight a domain in graduateness that is concerned with students' moral development and their responsibilities toward society. In liberal education, these elements are closely related. Nussbaum (1997:294), while describing students in liberal education, writes '[t]hey (...) want to learn a good deal about

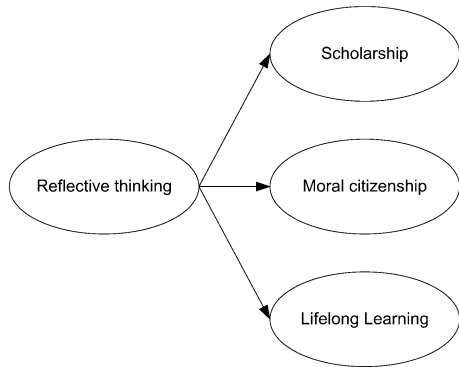
other ways and people—both in order to establish respectful communication about matters of importance and in order to continue rethinking their own views about what is best.’ In an attempt to adjust liberal education to contemporary requirements, Schneider (2004) refers to this desire as ‘social responsibility and civic engagement’. The emphasis is not on what are considered ‘good’ decisions; instead, students are educated to question their own beliefs. This does not necessarily mean that students need to change their beliefs and opinions. However, they need to know from where their beliefs stem, and they need to know that other people might hold different beliefs. The similarities with Kohlberg’s (1973) theory on the development of moral reasoning are evident. This theory in which individuals become less dependent on authority with respect to their moral judgements originates from the same line of thinking as Perry’s model of intellectual development and King and Kitchener’s model of reflective judgement. To emphasize both elements (social responsibility and moral judgment), we choose ‘moral citizenship’ to address this domain.

Lifelong learning

The last element that is added to the theoretical framework of gradueness is lifelong learning. According to Biggs (1999), academic learning is one of the objectives of university education. In this interpretation, academic learning is not only a means to acquire required knowledge, skills or attributes, but it also represents a certain attitude towards knowledge, skills and attributes. This attitude consists of higher-level cognitive activities, such as connecting new knowledge to what is learned previously and reflecting upon its value and consequences. Furthermore, lifelong learning represents the ability to guide one’s own learning process and the willingness to learn (Pintrich 2000). Academic learning includes the ability to recognise flaws in one’s knowledge base or competences and the ability to overcome these flaws by studying or training. Moreover, academic learning includes the desire to change, to direct one’s personal development, and to become a professional or an academic (Jansen 2009). We use the expression ‘lifelong learning’ to emphasise that it is a continuing process. These learning skills are not only means to ensure graduation, but they also enable the graduate to adapt when future situations require knowledge and skills that are not yet known. Consequently, the graduate is expected to provide his or her own study or training by acquiring the knowledge and skills that are necessary to adequately deal with any given situation.

The model

The aim of this study is to present a theoretical model of gradueness. We have already explored the domains of gradueness: reflective thinking, scholarship, moral citizenship and lifelong learning. These domains have in common that they all refer to some kind of transformation in students or what we consider to be the essence of gradueness. We now need to define the relationships between the aforementioned domains. Our model revolves around the idea that reflective thinking underlies the other three domains. In other words, development in either one of the other three areas is expected to reinforce development in reflective thinking. Figure 1 represents the model of gradueness in its most elementary shape; only the relationships with reflective thinking are specified. We are aware that this model is an oversimplification of the complex reality of such a construct as gradueness; however, we want to investigate the model in its purest form to test our hypothesis that reflective thinking is indeed the element that ties together the other domains. We argue that gradueness appears where reflective thinking is linked to any of the domains of

Fig. 1 Model of graduateness

scholarship, moral citizenship, lifelong learning or a combination of these. In other words, reflective thinking can be achieved in (at least) three different ways, but for it to be considered as graduateness, it requires high-level functioning in both reflective thinking and at least one of the other domains.

Methods

Participants

This study was performed in a research-oriented university among students of study programmes with a social orientation. These students were selected because of the similarity between the study programmes, and all domains (reflective thinking, scholarship, moral citizenship and lifelong learning) were most likely to occur jointly in these programmes. Both bachelor's- and master's-degree students were asked to complete an online questionnaire in order to ensure sufficient variation in the different domains. One of the departments imposed restrictions on e-mailing their students; therefore, an invitation to participate was posted at the electronic learning environment. Of the 79 students who clicked on this invitation, 27 decided to participate (34 %). All students (340) in the other department received a personal invitation by e-mail and a reminder after 2 weeks. For these students, the response rate was 22 % (N = 76). A total of 103 students completed the entire questionnaire.

Instruments

The instruments were selected from the same theoretical traditions that build the theoretical model. Furthermore, only instruments which had been proven reliable in other studies were selected. Finally, these instruments were proven reliable in the context of a Dutch university (Steur et al. 2011). The reflective thinking questionnaire (Kember et al. 2000) was used to measure reflective thinking. This instrument is derived from the transformative learning theory of Mezirow (1991). Transformative learning addresses the capabilities to 'become critically reflective of assumptions and to participate more fully and freely in critical-dialectical discourse' (Mezirow 2003:62). The reflective thinking questionnaire consists of four subscales: habitual action ('When I am working on some activities, I can do them without thinking about what I am doing'); understanding ('To pass

in this study programme you need to understand the content’); reflection (‘I like to think over what I have been doing and consider alternative ways of doing it’) and critical reflection (‘During this study programme I discovered faults in what I had previously believed to be right’). The 16 items are formulated for the educational learning context. A confirmative factor analysis showed that the habitual subscale did not fit the latent concept of reflective thinking; therefore, this subscale was not included in further analyses. Confirmative factor analysis also showed that in the reflection subscale, a non-significant coefficient for the first item occurred; therefore, the first item was subsequently excluded from further analyses.

The research self-efficacy scale (RSES) of Bieschke (1993) serves as an indicator of scholarship. The original instrument consists of 52 items. In an earlier study, the items were designed with a research-intensive university context in mind (Steur et al. 2011). For this study, the number of items is reduced to six; these six items, taken together, form a Mokken Scale, representing advanced levels of scholarship. An example of one of these six items that represents advanced scholarship is the following: ‘Organise your proposed research ideas in writing’. This Mokken scale has an H-value of 0.43, which means that this selection of RSES items forms a usable scale. For comparison, the Cronbach’s alpha for this instrument is 0.77.

Moral citizenship was measured with Shelton and McAdams’s (1990) Visions of morality scale (VMS). This instrument provides the respondent with 45 short everyday dilemma descriptions, for example, ‘In order to make people aware of world hunger, students at my university are requested to restrict their food intake at lunch during the month of March and donate the money they save to a world hunger drive. I take the pledge to be part of this drive and donate my lunch money.’ For each dilemma, a behavioural response is specified. The respondent is asked to state to what extent he or she would react in the described manner. This instrument required adjustments for appropriate use. Finally, a single factor solution of 12 items was obtained with a reasonable reliability estimate (Cronbach’s Alpha = 0.75).

The learning strategies subscales of the motivated strategies for learning questionnaire MSLQ (Pintrich et al. 1991) were used to measure lifelong learning. These subscales measure different aspects of learning: rehearsal (‘When I study for this class, I practice saying the material to myself over and over’), elaboration (‘I try to relate ideas in this subject to other courses whenever possible’), organisation (‘When I study the readings for this course, I outline the material to help me organise my thoughts’), critical thinking (‘I treat the course material as a starting point and try to develop my own ideas about it’) and metacognitive self-regulation (‘When reading for this course, I make up questions to help focus my reading’). The original subscales consist of 31 items. Certain items were excluded from the elaboration and the metacognitive self-regulation subscales (Steur et al. 2011). A confirmative factor analysis revealed that the critical thinking subscale did not fit the latent concept lifelong learning as measured by the MSLQ. For this reason, this subscale is left out of further analyses.

All of the instruments were measured on a 5-point Likert-like scale with answer options ranging from strongly disagree to strongly agree. For the analyses, the scale scores were standardised by dividing the original scale scores by the number of items in the scale. This standardisation makes it easier to compare scale scores across scales with different numbers of items and this way, possible effects due to scale length are prevented from occurring. Table 1 presents the reliability estimates for all of the (sub)scales as they were used in this study. In Table 2, the correlation coefficients for all the subscales are

Table 1 Reliability estimates

Instrument	Subscales	Reliability
Reflective thinking questionnaire	Understanding	0.81
	Reflection	0.78
	Critical reflection	0.78
Research self-efficacy scale	–	0.77
Visions of morality scale	–	0.75
Motivated strategies for learning questionnaire	Rehearsal	0.67
	Elaboration	0.67
	Organization	0.73
	Metacognitive self-regulation	0.70

presented, including the subscales that were excluded as a result of the confirmative factor analyses for the individual instruments.

Analysis

The data were analysed with the LISREL programme (Jöreskog and Sörbom 1985). The analyses were performed on covariance matrices. Only standardised results are reported in the Figures. The missing values were removed listwise, which resulted in 102 valid cases. In cases in which only one observed variable loaded on a latent variable, the programme required that the error variance of this observed variable be fixed (Hayduk 1996). The number to which the error variance was fixed was based on the Cronbach's alpha for that particular scale. In the present model, the error variances of two observed variables (scholarship and moral citizenship) are fixed.

Results

The theoretical model, which suggests relationships between reflective thinking and the three remaining domains (scholarship, moral citizenship and lifelong learning), is translated into a structural equation model in which the four domains are represented as latent variables. The use of multiple subscales to operationalise reflective thinking and lifelong learning make structural equation modelling the appropriate analysis technique. The results are shown in Fig. 2; only the standardised results are presented.

The goodness of fit is determined by a number of measures, which are compared to accepted cut-off values. The cut-off values are derived from the overview provided by Schermelleh-Engel et al. (2003). For this model, the Standardised RMR is 0.079, which falls within the range of acceptable values (0.05–0.10). The RMSEA for this model is 0.091, which is considered a mediocre model fit. Finally, the model has an acceptable fit according to the GFI, which is 0.91. In conclusion, combining the goodness-of-fit measures with the careful procedure by which the instruments were selected to fit the theoretical model (Steur et al. 2011) the model is considered an acceptable representation of the data.

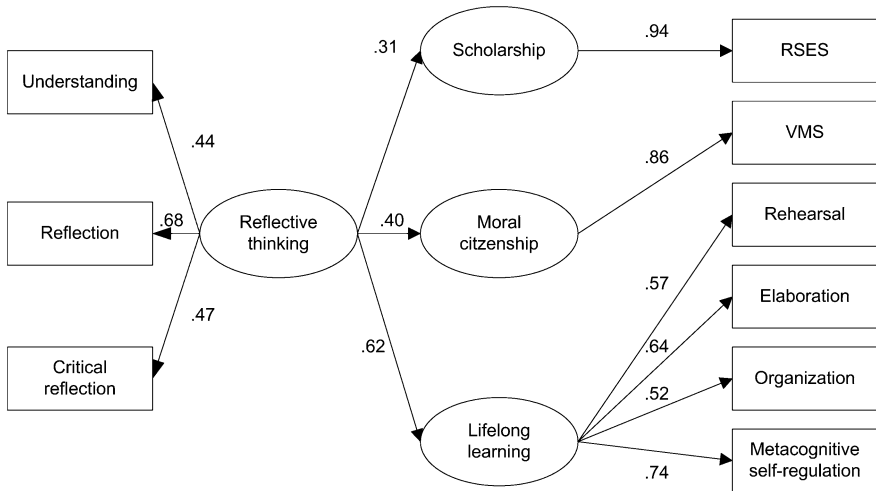
All coefficients are observed to be significant by the standard $t > 2.00$ for each coefficient. The measurement model consists of two variables, scholarship and moral citizenship, that are determined by one observed variable, and the model consists of two latent

Table 2 Correlations

	1	2	3	4	5	6	7	8	9	10
1. Habitual action	1.000									
2. Understanding	-0.323**	1.000								
3. Reflection	0.042	0.312**	1.000							
4. Critical reflection	-0.100	0.303**	0.325**	1.000						
5. Visions of morality	0.046	0.060	0.167	0.257**	1.000					
6. Rehearsal	0.019	0.166	0.179	0.045	0.070	1.000				
7. Elaboration	0.097	0.192	0.320**	0.274**	0.360**	0.302**	1.000			
8. Organization	-0.095	0.173	0.140	0.036	0.095	0.562**	0.230*	1.000		
9. Critical thinking	0.096	0.022	0.448**	0.241*	0.154	-0.140	0.243*	-0.149	1.000	
10. Metacognitive self-regulation	-0.067	0.189	0.390**	0.115	0.182	0.397**	0.508**	0.354**	0.076	1.000
11. Scholarship	0.119	0.126	0.144	0.112	0.162	-0.120	0.201*	-0.030	0.299**	0.093

* Correlation is significant at the 0.05 level (2-tailed)

** Correlation is significant at the 0.01 level (2-tailed)



Goodness of fit: Standardized RMR = .079

Fig. 2 Structural model of graduateness

variables, reflective thinking and lifelong learning, that are determined by more than one observed variable. The observed variable reflection is, with a coefficient of 0.68, the largest contributor to the latent variable reflective thinking. The observed variables of understanding and critical reflection are comparable in their contribution to the latent variable (resp. 0.44 and 0.47). For the latent variable Lifelong Learning, four observed variables are included in the measurement model. The largest contribution to this latent variable comes from the subscales of metacognitive self-regulation (0.74), and Elaboration (0.64). Rehearsal (0.57) and Organisation (0.52) contribute the least.

The structural model is determined by the relationships between the latent variables. The expectation that reflective thinking underlies the three domains of scholarship, moral citizenship and lifelong learning is confirmed by observed significant relationships between reflective thinking and the remaining three latent variables. In this structural model, lifelong learning appears to have the highest loading (0.62). This finding means that reflective thinking has the strongest association with lifelong learning. For scholarship and moral citizenship, the association with reflective thinking is less strong (resp. 0.31 and 0.40). However, following Kline (1998), these loadings might be considered to be medium effects, whereas the effect on Lifelong Learning is considered a large effect.

Conclusion and discussion

The aim of the current study was to examine the theoretical foundations and empirical evidence for our model of graduateness. A model like this could help explaining why some students from pre-master programmes are more successful than other students when entering master programmes. Providing more insight in what it is that university graduates share opposed to non-university graduates would help to design more appropriate university master preparation programmes, for students who completed a non-university bachelor degree and want to enter a university master programme. Previous attempts of

providing a theoretical model for gradueness began with determining what graduates from different disciplines have in common (Barrie 2006; Oost et al. 1998). This process resulted in models that included both employability skills and reflective thinking. Glover et al. (2002) and Booth et al. (2009) showed that emphasis on employability overshadows gradueness, when no explicit distinction is made between the two. Furthermore, this approach of detecting similarities suggests that gradueness has the same meaning across all disciplines. Jones (2009) found that this claim does not hold; generic elements of university education can have different interpretations in different disciplines, despite uses of the same vocabulary. Our approach is innovative in the sense that it makes the formative function of university education a starting point instead of searching for what graduates from different disciplines resemble. Transformation appeared to be the key essence of this formative function, which explains why freshmen differ from graduate students. This resulted in a much more restricted interpretation of gradueness. Moreover, it allowed us to use valuable insights from established research traditions regarding the intellectual development of students (e.g. Perry 1970; King and Kitchener 2004; Kohlberg 1973).

We know of one other study concerning gradueness that is founded in the intellectual development of students. Van Rossum and Hamer (2010) performed an epistemological study regarding the intellectual growth of students. These researchers regularly asked students to answer general questions concerning what they learned and how they view knowledge. The students would respond to these questions in their own words. We wanted to develop a less time-consuming instrument that could be easily administrated among larger groups of students. A short questionnaire that allows fully computerised processing is preferred. We examined in another article whether the instruments can be used in the Dutch university education context (Steur et al. 2011). Although the original questionnaire consisted of over a hundred items, we have already showed (Steur et al. 2011) that these items can be reduced to a more manageable number.

Our key hypothesis, that reflective thinking underlies the other three domains of scholarship, moral citizenship and lifelong learning, was confirmed by the data. Nevertheless, several limitations should be mentioned regarding this study. First, the data for the study were collected at one time period. Therefore, no conclusion can be drawn regarding causality. In order to address causality and thereby refine the relationships among the four domains, a longitudinal design is necessary. Second, the model could be made more sophisticated by the way moral citizenship is operationalised. Currently, we operationalised it by considering everyday morality; however, other aspects of moral citizenship, such as political awareness (Ahier et al. 2003) or ethical reasoning (Dearing 1997) would be appropriate additions. At the time the questionnaire was constructed, we knew of no instrument that was appropriate for fully computerised processing of these elements at levels comparable to reflective thinking. Third, the measurements in our study were based on self-reports. Consequently, we do not know the extent to which these self-reports accurately reflect students' gradueness. Naturally, the results should be interpreted with caution, but there are no indications that they solely reflect biased respondent reporting. Combining self-report data with data obtained in a more objective manner, such as grades, is recommended for future research so that powerful statistical techniques can be applied for hypothesis testing. The findings of the present study can be used to generate hypotheses for future research. Finally, the model should be tested across different disciplines.

In spite of its limitations, our study has several important strengths. First, the current study ventured into a novel domain of gradueness, by building a model using the formative function of education instead of looking for similarities between graduates in various disciplines. Second, measurement error was contained, because the study

employed established instruments with known psychometric properties. Reliability analysis shows that the measurements satisfy psychometric standards. Third, we adopted a theoretical framework that may help to organise research findings across a variety of investigations. Finally, the observed associations between reflective thinking and scholarship as well as moral citizenship and lifelong learning, respectively, were not only statistically significant but also interesting and meaningful. Although, this work is only a first step, and future studies are needed to reach a better understanding of gradueness, we believe that awareness of gradueness and how the different areas of students' development reinforce reflective thinking will be useful in redesigning academic degree (-preparation) programmes that address the students intellectual development, beside knowledge and (professional) skills. It can help universities shape their formative function in a contemporary way.

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