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Self-assessment in university assessment of prior learning procedures

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Competency-based university education, in which lifelong learning and flexible learning are key elements, demands a renewed vision on assessment. Within this vision, Assessment of Prior Learning (APL), in which learners have to show their prior learning in order for their goals to be recognised, becomes an important element. This article focuses on a first step in APL, namely students' self-assessment of their prior learning before entering university education. The main aim of the presented study is to examine the suitability of the use of self-assessment in APL. First, in an explorative study, the main sources for self-assessment are derived and the relation between sources and domain of study is investigated. Second, in a pre-test post-test research design, the hypothesis that students' self-assessment of prior learning related to a course changes after studying a domain-specific course is tested. Pre-test results reveal that students indicate that they have prior knowledge related to the chosen university programme. In general, this prior learning is obtained from study experience, work experience, books, newspapers, magazines, the Internet, TV, radio, film or video. A relation is found between the type of source and the university programme. The hypothesis that students change their self-assessment after a study period could not be confirmed. Based on these results, it is concluded that self-assessment in APL might be a suitable tool. Implications for further research are discussed.

Self-assessment in university assessment of prior learning procedures

University education still aims at the individual achievement of learning objectives with related certificates. In this intentional goal-oriented learning, students conduct organised educational activities to achieve the learning objectives. Different assessment methods are used to measure students' performance and certificates are granted when this performance meets the standards of the learning objectives. However, learning goes far beyond this formal learning. Non-formal and informal learning are two other important categories of learning that deserve more attention within the formal education system (Centre Européen pour le Développement de

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la Formation Professionnelle [CEDEFOP] 1996, Bjørnavold 2001, Cretchley and Castle 2001, Colardyn and Bjørnavold 2004). Non-formal learning is similar to formal learning, characterised by an intentional learning objective in a structured context such as schools or classes, but there is no legally or socially recorded certification involved. An example is typing lessons. Informal learning is not intentional, not structured and does not lead to certifications. An example is being a chairperson of a sports club. Marsick and Watkins (2001) emphasise that informal learning is at the heart of adult education because of the lessons that can be learned from life experiences. In its most generic sense, learning involves the acquisition of competencies, understanding, knowledge, or skills, anytime and anywhere (Livingstone 2001).

Because university education has been focusing for many years on knowledge construction rather than on competency development, the value of informal and non-formal learning was not recognised. In the context of life long learning however, it should not matter *how* something is learned exclusively, but it matters *what* is learned in relation to further personal development (Spencer, Briton and Gereluk 2000). The importance of establishing systems for the recognition and accreditation of various forms of prior learning, and in particular informal and non-formal learning, has been recognised as a key issue in lifelong learning policy within Europe in recent years (European Commission 2000). In this article, we therefore focus on the use of non-formal and informal learning for students who want to attend university education. This is defined as the 'credit exchange model', in which achieved and proven competencies are exchanged for course credits by giving exemption from part of the educational programme (Butterworth 1992). In this model, it is assumed that there is a knowledge equivalence between formal and informal learning environments and therefore credit exchange is possible.

The admittance of students based on formal, non-formal and informal prior learning experiences is referred to as Assessment of Prior Learning (APL). APL is 'the process of identifying, assessing and recognising skills, knowledge, or competencies that have been acquired through work experience, unrecognised training, independent study, volunteer activities and hobbies. APL may be applied towards academic credit, towards requirement of a training programme, or for occupational certification' (Human Resource Development 1995: 1). In APL, prospective students provide evidence of prior learning that relates to the learning objectives of the formal academic programme and they have to present this evidence to the academic institute. APL acknowledges that adults learn in a variety of contexts outside educational institutions and that this learning may be broadly equivalent to that gained in formal education (Cretchley and Castle 2001). In general, APL consists of four phases (New Zealand Qualification Authority 2001, Wilcox and Brown, 2003): (1) identification and initiation; (2) gathering and presenting the evidence; (3) assessing the evidence; and (4) recognition and accreditation.

The first phase is rather general; the institute communicates what is expected from the learner. In the second phase, the student collects evidence about previous qualifications and experiences to support a claim for credit with respect to the new qualification students are seeking. In phase three, the students' prior learning is assessed. If the prior learning is suitable for the educational programme, it will be recognised in phase four.

This article addresses the second phase of gathering and presenting evidence of prior learning. A common tool in this phase is a portfolio (Clarke and Warr 1997,

Bjørnavold 2001). In general, a key component of a portfolio is students' self-assessment of their learning experiences in relation to the educational programme they want to attend (Evans 2003). This self-assessment, however, is delicate and complicated for two reasons.

First, adult students appear to deliver evidence from formal prior learning easily, but their experiences from informal and non-formal learning environments are more difficult to indicate for them (Colley, Hodkinson and Malcolm 2002). A list of sources may help students to illustrate prior learning experiences (Spencer, Briton and Gereluk, 2000). For example, Shapiro (2003) explored the informal learning experiences in the domain of teacher education and distinguished five sources, of which the first two are domain-specific: (1) learning through non-teaching jobs; (2) emulating one's past teachers; (3) learning in museums, science centres, and similar institutions; (4) learning through community or volunteer work; and (5) learning through reading, Internet use and television. In the domain of non-profit organisations, Sousa and Quartier (2003) found sources such as meetings, reading, the Internet, correspondence, fundraising, telephone calls, workshops, attending conferences, study or sabbatical leave and certification. Livingstone (2000b) related informal learning to community work, household work, and other, general interests such as sports or recreation, leisure or hobby skills, community activities or housework and others. Learning in the workplace has emerged as an important source for adults' informal and non-formal learning (Beckett and Hager 2000). The sources mentioned previously are especially applicable for adult students, who in general have a broad life and working experience.

A second reason that the self-assessment of prior learning is complicated is the requirement to have the skill to self-assess. In APL, students should ask themselves such questions as: 'Is what I have learned enough?', 'Is my prior learning meeting the criteria?' or 'What have I really learned in the past?'. Shapiro (2003) confirms that it is difficult for students to give good descriptions of former learning experiences based on memories. Students may not realise the extent of what they know, or miss the language to articulate that. Besides this, the perception of informal learning is subjective and it is difficult to self-assess whether past job experiences actually involved learning. In general, research on self-assessment of adult students is ambiguous with respect to the reliability of self-assessment. While some research reveals that the reliability of the students' self-assessment is acceptable (e.g. Galson and Olikier (1976); Gentle (1994)) which implies that students are able to self-assess accurately, other research findings reveal that there is little or no relationship between actual performance or ability and self-rated performance or ability (Boud and Falchikov 1989; Ward, Gruppen and Regehr 2002). In particular, low-expertise students tend to overrate themselves, while the reverse is the case for high-expertise students. Koriat and Bjork (2005) argue that learners are susceptible to bias in predicting what they will know in the future based on their actual knowledge. Koriat and Bjork conclude that overconfidence in self-assessment is higher if the correct answer is available. Regehr and Eva (2006) conclude that self-assessment skill is tied to expertise in specific domains. These findings on self-assessment lead to the question whether overconfidence, domain specificity and differences between low-expertise and high-expertise students apply to APL. In APL, for example, no correct answer is available beforehand. Therefore, the overconfidence might be less than expected in other testing situations. Based on the literature, it is expected that (1) students' self-assessment changes over time if they have to self-assess their basic

knowledge before and after an intervention; and (2) the self-assessment will be biased by the expertise of the students.

The main question in the present study is whether self-assessment as a key component of the portfolio is a suitable tool to support students in gathering evidence in university APL procedures. This question is investigated a two-step approach. In the first step, it is explored which sources are interesting for demonstrating. Specific research questions are:

1. Do students indicate prior learning experiences related to a particular university programme?
2. If so, through which sources is this prior learning obtained?
3. Is there a difference in the sources mentioned between students with a low knowledge-level and students with a high knowledge-level?
4. Are the sources students use to indicate prior learning related to the chosen university programme they start with?
5. Do university programme, study motivation, gender, age and fulfilled education influence the self-assessment of prior learning?

In the second part of the study, it is empirically investigated how students self-assess their prior learning before and after a domain-specific course. Specific research questions are:

1. Is the self-assessment of students stable over time?
2. Does the result of the self-assessment differ between low-expertise students and high-expertise students?

Method

Participants

1,105 adult students who subscribed for a university starting course (200 hours study load) at the Open University of the Netherlands were sent a web-based questionnaire before the start of the programme (pre-test) and after one and a half years (post-test). Between the two measurements, participants took a domain-specific starting course that they could study independent of time and place. The adult student at the Open University is characterised as a mature person, with the minimum age of 19, with work and life experiences and who wants to develop themselves at a lifelong learners' university. The university is an open and flexible institute in which education is offered not only to certificate, but also to have the possibility for recognition of relevant prior learning. Prior learning obtained by formal learning is recognised with prescribed exemptions, and prior learning obtained by informal and non-formal means might be recognised by an APL procedure. The admissions policy in theory allows every adult to start studying at the Open University. There are no entrance requirements for the bachelor programmes. The starting courses are designed from the principle that students have to learn how to study and to learn the basics of the educational domain.

In total 503 students participated. The mode age of this group was 36–45 years. This participation is divided into students who took the pre-test ($N = 428$; mode

= 36–45 year; response rate of 38.7%) and students who took the post-test ($N = 167$; mode = 36–45 year; response rate of 15.1%). 92 of these students participated in both measurements. The distribution of the students across the six university domains is given in table 1 for each measurement. In addition, the tables also show the numbers and percentages of students who passed the starting course and participated in both measurements.

Questionnaires and procedure

For the pre- and post-test, a self-assessment online questionnaire on prior learning consisting of 33 questions was developed. This questionnaire was pre-tested by educational developers and researchers and people that represented the sample of this study.

This final questionnaire included instructions on how to fill in the questionnaire and some background questions regarding age, gender, prior fulfilled education, motivation to start the university programme, and acquired knowledge related to the concept of assessment of prior learning. The questionnaire included both closed- and open-ended questions regarding participants' prior learning in relation to the learning objectives of the academic programme they intended to start and the sources they brought forward for this learning. These questions were derived from the questionnaire of Shapiro (2003) who investigated the informal learning of teachers. Participants had to indicate on a four-point scale if they had prior knowledge about the learning objectives (0 = I know nothing about 'learning objective x'; 1 = I know a little about 'learning objective x'; 2 = I know relatively a lot about 'learning objective x'; 3 = I know a lot about 'learning objective x'). For the twelve learning objectives, the students could indicate if they had learned something about the learning objective from relevant sources in informal and non-formal learning (Livingstone (2000a), Shapiro (2003), Sousa and Quarter (2003)). Students could also insert a new source that was not included in the list. Students could only indicate the use of a source when they previously had indicated that they had learned more than nothing according to a learning objective. An example of a question is in table 2.

Because of the retrospective character of the post-test, one of the questions in this text was changed to 'Did you at the moment of the start of the course really have that knowledge'. For example, the first question in table 2 was 'Did you at the moment of the start of the course really have knowledge of consumer behaviour, producer behaviour and the market?'

Data-analyses

To investigate the research questions one to five, only the data of the pre-test are used. To investigate the sixth and seventh research question, the post-test data are included.

To answer the first research question ('Do students indicate prior learning experiences that are related to a particular university programme?'), frequencies were calculated for the questions that focused on the obtained knowledge and skills of the student in relation to the learning objectives.

Table 1. Distribution of the students across the six university domains, numbers of exam participation and exam passes at the pre-test (start of the course), at the post-test (after one and a half year) and the responses on both measurements

Domain	n	Pre-test						Post-test						Pre-test and post-test					
		Male			Female			Male			Female			Male			Female		
		n	Exam participation	Exam passes	n	Exam participation	Exam passes	n	Exam participation	Exam passes	n	Exam participation	Exam passes	n	Exam participation	Exam passes	n	Exam participation	Exam passes
Cultural science	63	23	40	33	31	31	31	14	16	24	24	24	24	16	7	9	16	16	16
Management science	34	19	14	7	6	10	10	4	6	5	5	5	5	5	3	2	4	4	4
Natural science	23	16	7	11	10	10	10	8	2	7	7	7	7	7	6	1	6	6	6
Dutch law	83	35	47	31	23	36	36	14	22	24	24	21	21	16	6	10	13	11	11
Psychology	196	42	151	61	51	71	71	17	53	37	37	35	35	42	12	29	26	25	25
Computer science	29	21	7	14	13	9	9	4	3	6	6	6	6	6	2	3	5	5	5
Total	428	156	266	157	134	167	167	61	102	103	98	98	92	36	54	70	67	67	67

Table 2. Example of a question in the domain of management science

q.3. Do you have knowledge of consumer behaviour, producer behaviour and the market?
 I know nothing about consumer behaviour, producer behaviour and the market.
 I know a little about consumer behaviour, producer behaviour and the market.
 I know relatively a lot about consumer behaviour, producer behaviour and the market.
 I know a lot about consumer behaviour, producer behaviour and the market.
 I do not know.

If the students gave b, c, or d as an answer, they got the following question:

q.3.1. Here you see a list of sources out of which you could have learned about consumer behaviour, producer behaviour and the market. Which of the following sources did you use (you can mark more than one)?

- 'Work experience or on-the-job training'
- 'Symposia or workshops'
- 'Museum visit'
- 'Internet, TV, radio, film or video'
- 'Household and family'
- 'Hobbies'
- 'Study experience'
- 'Social activities or clubs'
- 'Sabbatical leave'
- 'Voluntary work'
- 'Correspondence (mail, letters)'
- 'Books, newspapers, magazines'
- 'Executive functions'

q.3.2. Give extra information to these sources if you want to.

q.3.3. Did you use another source that is not mentioned in the list? If so, which source is this?

To analyse the second research question ('Through which sources is this prior learning obtained?'), the questions in which students could mark all the sources that contributed to the learning objectives were used for analysis. For these sources, sum scores were calculated to indicate how often sources were mentioned. Analyses of variance with post-hoc tests for the university programmes were used to indicate significant differences between the university programmes.

To compare the used sources with the knowledge base of the students (third research question: 'Is there a difference in the sources between high level knowledge and low level knowledge students?'), first correlations were calculated between the number of sources and knowledge level. For this, a median split was used to define a high knowledge group and a low knowledge group. If the students marked 'I know nothing about learning objective x' they scored zero points. If they marked 'I know a little about learning objective x', they scored one point. If they marked 'I know relatively a lot about learning objective x', they scored two points, and if they marked 'I know a lot about learning objective x', they scored three points. Sum scores were calculated for these 12 items. The median sum score was 14. The students with a sum score equal to 14 or less were labelled as the 'low knowledge group', and the students with a sum score higher than 14 as the 'high knowledge group'. After testing the correlation between knowledge-level and number of sources it is investigated if the sources depend on the knowledge level of the students, by an independent-samples *t*-test was conducted.

To answer the fourth question ('Are the sources students use to indicate prior learning, related with the university programme they start with?') a univariate anal-

ysis of variance is used with post-hoc tests to compare the group means of the sources in the pre-test for the university programmes.

To answer the fifth research question ('Which variables (university programme, study motivation, gender, age and fulfilled education) influence the self-assessment of prior learning?'), univariate analyses of variance in the pre-test were used with post-hoc tests with the university programme as the between subject factor, the sources as the dependent variable and the background variables as the factors.

To answer the sixth question ('Is the self-assessment stable over time?'), the mean scores on items on the learning objectives in the pre-test were compared with the mean scores on the items on the learning objectives in the post-test. The data of the participants who passed the starting course and filled in both questionnaires were selected for this analysis. The domain-generic learning objectives were analysed with a t-test. Because the number of observations per domain were low, a Wilcoxon signed ranks tests was used.

The data-analyses of the seventh question ('Does the result of the self-assessment differ between the low-expertise students and high-expertise students?'), was based on the selective sample of students who filled in both questionnaires. For this sample, correlational analyses were conducted between the self-assessment on both measurements and the marks on the starting course.

Results

Student characteristics

Before the start of the study, 3.8% of the students expected to complete the starting course within two months, 65.3% within six months, 27.6% within a year and 3.1% within one year and half. After one year and a half, 44.3% of the students had taken the exam, and 38.4% achieved a positive result. The motivation of the students to start the university programme mainly was to develop their (intellectual) capabilities (38.4%), and to increase their chance on the labour market (28.8%). The daily activities of the participants consisted full-time jobs (64.6%), part-time jobs (fewer than 36 hours per week) (31.5%), retirement activities (2.3%), household activities (31.7%), childcare (24.1%), being full-time students (13.2%), or being part-time students (25.0%). The highest fulfilled educational programme of the students was higher vocational education (bachelor's degree) 24.9%, secondary vocational education 14.3%, or university education (master's degree) 13.2%.

The majority of the students (76.5%) were acquainted with the exemption policy of the institute; only 4.4% were acquainted with APL procedures, although 17.5% had heard about them without knowing the meaning of APL.

The reasons mentioned for attending APL were 'to save time' (51.8%), 'it is a good chance to receive study points' (33.3%), 'to save money' (31.0%), 'to combine work and study better' (27.4%), 'I like to follow less courses' (11.9%), 'to change my career' (9.5%), and 'to satisfy the requirements of my employer' (3.0%).

Research question 1

The first research question related to whether students indicate prior learning experiences related to a particular university programme. From the total group 97.2%

indicated that they know a little to a lot about the learning objectives. Therefore, the first question can be answered positively. 35.9% of the students felt that they could be considered for exemptions based on their prior informal learning. Only 32.3% of the students indicated that they thought that their prior learning was at the required academic level.

Research question 2

The second research question focused on the sources that students indicated as relevant for their prior learning. In figure 1, sources and frequencies are presented. The source that the students mentioned most frequently was study experience ($M = 4.8$; $SD = 3.91$), followed by work experience or on-the-job training ($M = 4.5$; $SD = 3.58$), books, newspapers, magazines ($M = 4.5$; $SD = 3.75$), and the Internet, TV, radio, film or video ($M = 3.6$; $SD = 3.39$). Sources that were mentioned less frequently were

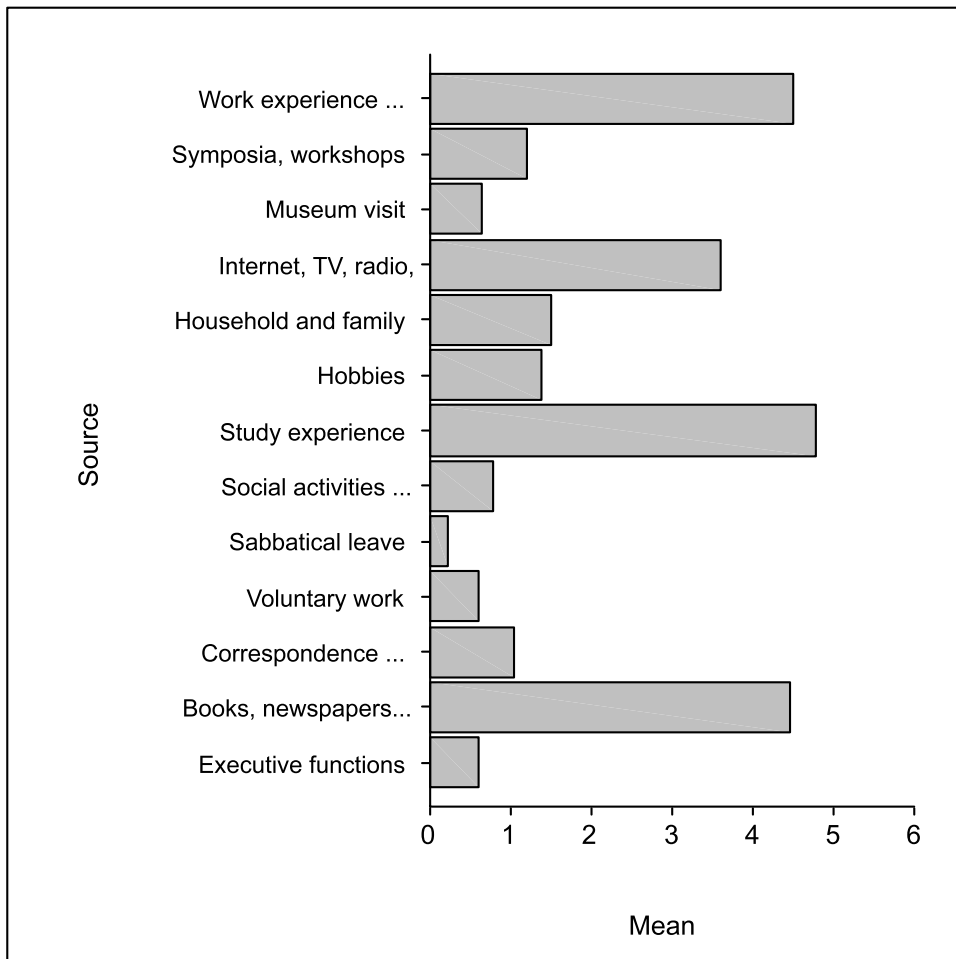


Figure 1. The means of the sources indicated by the students

sabbatical leave ($M = 0.2$; $SD = 1.03$), voluntary work ($M = 0.6$; $SD = 1.74$), executive functions ($M = 0.6$; $SD = 1.68$), and museum visits ($M = 0.7$; $SD = 1.48$).

Research question 3

A significant correlation was found between students' knowledge levels and the number of sources that they indicated ($r = 0.632$, $p < 0.001$). Subsequently, the differences between the high-knowledge group and low-knowledge group were compared. By scoring the answers of the students with three or fewer points for their knowledge level, it was possible to evaluate the knowledge-level of the students for the two groups. The maximum score was 36 ($M = 14.05$, $SD = 7.12$). The skewness value (0.028) indicates a normal, symmetric distribution. Results of the independent-samples *t*-test showed no significant differences for 'sabbatical leave', 'voluntary function' and 'museum visit'. For all the other sources a significant differences between high knowledge group and the low knowledge group students were found: 'work experience or on-the-job training' $t(336) = -11.54$, $p < .01$, 'symposia, workshops' $t(282) = -5.69$, $p < .01$, 'Internet, TV, radio, film or video' $t(344) = -7.33$, $p < .01$, 'household and family' $t(356) = -2.15$, $p < .05$, 'hobbies' $t(286) = -4.14$, $p < .01$, 'study experience' $t(331) = -10.69$, $p < .01$, 'social activities, clubs' $t(312) = -3.53$, $p < .01$, 'correspondence' $t(307) = -2.50$, $p < .05$, 'books, newspapers, magazines' $t(360) = -8.72$, $p < .01$ and 'executive functions' $t(248) = -3.45$, $p < .01$. Figure 2 shows these significant differences.

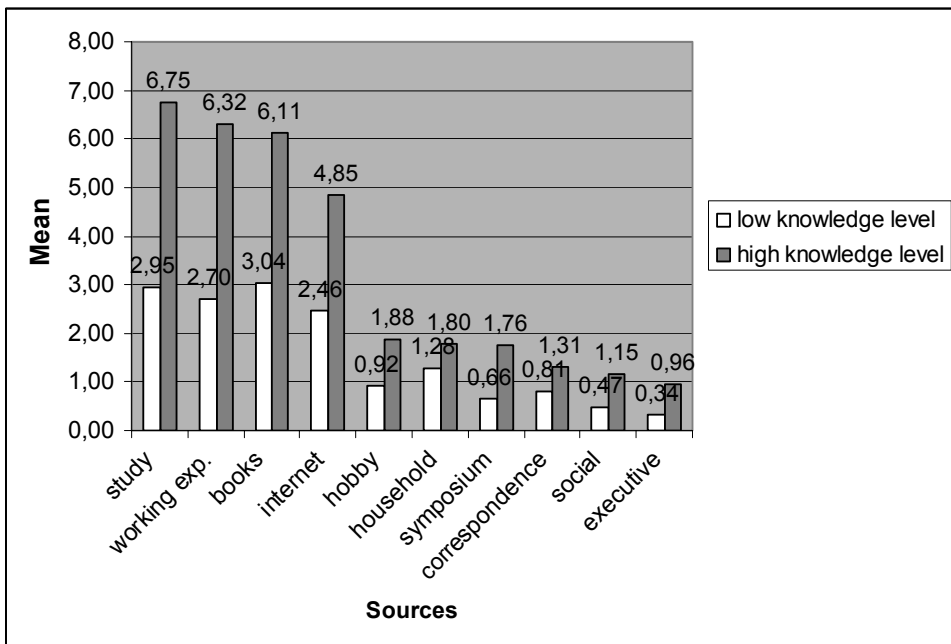


Figure 2. Significant differences in the use of the different sources between the 'low knowledge-level group' and the 'high knowledge-level group'

Research question 4

The fourth research question related to whether the sources students used to indicate prior learning were related to the university programme they start with. The results show that there is a significant difference between the university programmes for use of the following reasons: 'work experience or on-the-job training' $F(5) = 15.71, p < .01$, 'symposia or workshops' $F(5) = 7.29, p < .01$, 'museum visit' $F(5) = 48.84, p < .01$, 'Internet, TV, radio, film or video' $F(5) = 6.37, p < .01$, 'household and family' $F(5) = 9.87, p < .01$, 'hobbies' $F(5) = 8.10, p < .01$, 'study experiences' $F(5) = 2.54, p < .05$, 'sabbatical leave' $F(5) = 3.05, p = 0.01$, 'books, news papers and magazines' $F(5) = 3.64, p < .01$. Table 3 shows the identified homogeneous subsets of the means that are not different from each other for each of the significant sources. This means, for example, that for 'work experience or on-the-job-training' the university programmes of cultural science and natural science do not differ significantly, similarly to the university programmes of natural science, Dutch law, and psychology, and the university programmes of Dutch law, psychology and management science. This means that these clusters tend to use the same sources.

Research question 5

The fifth research question related to whether university domain, age, gender, fulfilled education and motivation were related to the students' self-assessment. Fewer significant relations were found.

Table 3. Summary of the results of univariate analysis of variances on the sources. Homogeneous subsets are sets of the university programmes that do not differ significantly

	<i>Cult</i>	<i>Comp</i>	<i>Nat</i>	<i>Man</i>	<i>Psy</i>	<i>Law</i>	<i>Homogeneous subsets</i>
Work experience	1.84	7.52	3.09	5.35	5.09	4.13	Comp > (Man + Psy + Law) > (Psy + Law + Nat) > (Nat + Cult)
Symposia	.67	1.66	.87	.74	1.73	.49	(Psy + Comp + Nat + Man + Cult) > (Comp + Nat + Man + Cult + Law)
Museum	2.71	.03	1.22	.06	.28	.23	Cult > Nat > (Psy + Law + Man + Comp)
Internet	4.00	3.62	6.57	2.97	3.73	2.41	Nat > (Cult + Psy + Comp + Man + Law)
Household	.84	1.31	1.22	1.18	2.28	.48	(Psy + Comp + Nat + Man) > (Comp + Nat + Man + Cult + Law)
Hobbies	1.94	2.93	2.17	.56	1.41	.46	(Comp + Nat + Cult) > (Nat + Cult + Psy) > (Psy + Man + Law)
Study experience	4.17	5.10	5.70	3.21	5.26	4.34	(Nat + Psy + Comp + Law + Cult) > (Psy + Comp + Law + Cult + Man)
Sabbatical	.16	.14	.91	.00	.27	.06	Nat > (Psy + Cult + Comp + Law + Man)
Books, ...	4.75	3.72	6.30	4.06	4.85	3.28	(Nat + Psy + Cult + Man) > (Psy + Cult + Man + Comp + Law)

Note: In the cells, the mean scores of the sources per university programme are mentioned. Subsets are made for programmes that do not differ significant from each other. Comp = Computer science, Man = Management science, Psy = Psychology, Law = Dutch law, Cult = Cultural science, Nat = Natural science.

Table 4. Significant relations between the sources and background variables

<i>Source</i>	<i>Variable</i>	<i>F</i>	<i>df</i>
'Work experience ...'*	motivation	4.32	7
'Symposia ...'*	education	8.30	20
'Household and family'*	education	1.96	20
'Hobbies'*	education	2.67	20
'Study experience'*	age	4.44	5
'Voluntary work'*	education	2.29	20
'Correspondence ...'*	education	3.70	20
'Executive functions'*	age	3.80	5

* $p < .01$

Table 4 shows that motivation is associated with the number of the times the source 'work experience' is mentioned. Education as background variable is related with the number of the sources 'symposium', 'household and family', 'hobbies' and 'voluntary work'. Age is related with the number of the source 'study experience'.

Research question 6

The sixth question related to whether students differed in their self-assessment after following a domain-specific course. Only for one domain-specific learning objective (Psychology, 'knowledge on personality, pathology and therapy') was a significant difference found by the Wilcoxon signed ranks test between the pre-test ($M = 2.55$; $SD = 0.83$) and the post-test ($M = 2.10$; $SD = 0.82$): $Z = -2.555$, $p = 0.011$. All the other analyses showed no significant difference between the two measurements.

Research question 7

The next question focused on the relation between the self-assessment of knowledge and the expertise of the student. Correlations between the pre-test and the marks on the starting course were not significant. This is also the case for the correlation between the post-test and the marks. One significant correlation was found between the post-test and the marks for Natural science ($r = 0.823$, $p < 0.1$). The hypothesis is that students with low expertise (low marks on the test) have a low self-assessment score of their prior knowledge. The data confirm this hypothesis. Students with a low mark, did have a low self-assessment score.

Conclusion and discussion

The main aim of this study was to explore the role of self-assessment as a suitable tool to support students in gathering evidence in university APL procedures. A first conclusion is that although almost every student claims to have prior learning experiences related to the subject of the university programme, only one third of

the students was confident that this prior learning was sufficient to gain exemptions for the university programme. This gap may be explained by students' awareness of the educational worth of their learning experiences; only 32.3% had indicated that the prior learning was at an academic level.

Another explanation is that students underestimated their knowledge. This seems to be in line with the conclusion of Wheelahan, Miller and Newton (2002), who state that students need time and support to translate their prior learning into the educational discourse. However, this research shows that students do not change in their self-assessment before and after a domain-specific starting course. This means that their self-assessment was stable over time. Even in the case that students were more aware of the content of the course, the self-assessment did not change. This result is crucial for the use of self-assessment in APL. If the self-assessment of prior learning before the start of the university programme differed significantly with the self-assessment after the start of the university programme (one and a half years later), then the use of self-assessment in APL would be questionable. Now, we are positive about the value of self-assessment in APL. The conclusion of Dunlosky and Nelson (1992)—that the prediction of knowledge is far more accurate if the self-assessment is made after a delay following learning than if the self-assessment is made immediately after the learning—is not important in the context of APL, because the self-assessment of the prior learning in APL is not directly after the learning takes place.

Our research does not confirm the result of Boud and Falchikov (1989) who showed that high-expertise students tend to underestimate themselves and low-expertise students tend to overestimate themselves. In the underlying research, no differences were found in the pre-test and post-test between the high-expertise group and the low-expertise group. However, the gap between the general finding that 96.9% of the students expected to complete the course within one and a half year and the observation of only 38.4% of the students who really completed the course assumes some overestimating. Although the drop out rate was comparable with the normal dropout rate of distance universities (students mention the following reasons for drop out: lack of time, personal and work-related circumstances (Joosten 2003)), the power of the conclusions is reduced.

In this research, students were asked about their prior learning experiences. Although students were asked to indicate their own prior learning, it is questionable whether the students used the same criteria to give a specific score on the four-point scale.

A second conclusion of this research is that students used different sources to demonstrate prior learning and that the sources students used in their prior learning are related to the university programme they start. The homogeneous subsets define which programmes are comparable by the sources used and which are not comparable. For example, a comparable source for five of the educational domains was 'study experience'. 'Museum visit' is an example of a source in which the programmes were not comparable. Students of cultural science use museum visits significantly more as a source than students of natural science and they used this source significantly more often than the other students. This is not surprising because of the nature of cultural science and the existence of many science centres that try to make young children interested in this domain. The high use of the Internet, TV, radio, video or films of the natural sciences can be attributed to the many documentaries about the domain of natural science (e.g. the popularity of the

Discovery Channel). The high use of work experience for students of computer science might be explained by today's society, in which ICT is common in the workplace. The level of comparison can be used to structure the portfolio's students have to make in an APL procedure. University programmes within the same subset can use a comparable structure. The structure of the portfolio should suit the student's prior formal, informal and non-formal learning and the competencies required by the institute (Bjørnavold 2001, Wilcox and Brown 2002, Baume and Yorke 2002, Nieweg 2002, McMullan *et al.* 2003). Therefore, an institute must be aware of the possible prior learning experiences a student will use and the evidence the student will present of this prior learning. In line with the conclusion of Livingstone (2001) that the kind of sources are broad but related to the study a student wants to start, we recommend to inform students in the details of the portfolio about the relevant sources. This is especially important for low-expertise students, because they mention fewer sources.

A practical advantage of this study is that if a university wants to support students in their recognition of prior learning, they should refer them to the relevant sources for their domain. This could be done by giving worked out examples of sources that deliver evidence for a specific domain. A portfolio for cultural sciences might contain more detailed information about museum visits, while a portfolio for computer science might contain a more detailed structure for work experience. More information research on the relation between the sources and the portfolio structure is necessary, because being too prescriptive will have a negative impact for the APL candidates. The results of this study can be used to develop online tools for students—higher education students in particular—that can be used in to help them maintain freedom of place, time and pace.

For future use, some improvements to the questionnaire are needed. The questionnaire could be improved by splitting up the sources. For example, one source was 'Internet, TV, radio, film or video'; analyses that are more specific are possible if this source is split up in five separate sources. This would mean that a conclusion could be drawn as to if it was the Internet, the TV, the radio, film or video that distinguishes natural science from the other university programmes. A last improvement of the questionnaire is that it should define what is meant by prior learning. Does it cover all the prior learning, or only the prior learning of the last few years? Are students capable of knowing if their prior learning is outdated?

Further research should focus on the other assessment instruments that are used in APL, especially the portfolio. Can we consider a structure for the portfolio that supports the students and is efficient in use? Furthermore, it would be interesting to investigate participants' perception of APL. How do the assessors, the tutors, the students and others perceive the quality of the procedure and the instruments used?

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