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ABSTRACT

Data from 211 adult students (ages 20 to 75) at the Open University, The Netherlands, were used to construct and test an instrument to measure learning styles and regulation processes. Test development was guided by a three-tiered model of self-regulation encompassing: (1) cognitive learning processes (deep, surface, elaborative); (2) regulation processes (planning, monitoring, self-testing, etc.); and (3) conceptual processes (metacognitive knowledge and beliefs about learning). A pilot interview study with 24 students (phenomenographic method) yielded three styles: self-regulation, external regulation, or lack of regulation. In the main study, 211 students (out of 700 contacted) completed 50 regulation and 50 learning approach items. Principal components analysis identified items most indicative of self-regulation, external regulation, or lack of regulation (these items are included). Similar analyses yielded scales for deep, surface, and elaborative learning style (items not presented). Higher education background was associated with lower scores for external regulation and lack of regulation. Students just beginning at the Open University reported greater lack of regulation and elaborative learning style. These scales are part of a larger projected Inventory of Learning Styles, Conceptions, and Orientations. (LPG)

LEARNING STYLES AND SELF-REGULATION

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Introduction

The research project 'Learning Styles and the Open university' is concerned with the different ways in which adult students learn in higher distance education. The main objective of the project is the development of a valid, reliable and usable diagnostic learning style instrument. To promote validity, the instrument construction was based on extensive interviews with a small group of Open university (Ou) students. These interviews were meant to identify basic differences and similarities in their ways of studying, thinking about studying and orientation toward studying. To promote reliability, an experimental version of the instrument was completed by a larger group of Ou-students. Item, factor and reliability analyses enabled the construction of an improved version. To promote usability, possible user contexts within the Ou were analyzed and manuals for use of the instrument were composed, field-tested and adjusted according to the results of this evaluation. One manual was meant for use by students with the main purposes of selfdiagnosis and encouragement of reflection on different possible ways of learning. Another was meant for use by members of the Ou-staff with as main purpose the promotion of students' skill in selfregulation, by varying educational measures as counselling, guidance, learning-to-learn sessions, cooperation with other students, regulation aids in the study materials, etc. on the basis of learning style differences. The here reported research is mainly directed at the validity and reliability aspects of the instrument development.

The newly started dutch Open university is an open higher distance education institution for adults. 'Open' means that students donot need any formal entry qualifications. They can study at their own pace, whenever and whenever they want. The kind of education the Ou offers to persons of 18 years and older can be labeled 'guided self-study'. Most of their study-time students learn on their own from coursebooks. Besides the actual study content these course materials also contain a variety of adjunct aids to make those materials suited for self-study. Examples of these in-text guidance devices are: introductions, learning objectives, questions, exercises, directions for studying, summaries, selftests with feedback, etc. Students also have the opportunity to attend some meetings at the regional study centres under the guidance of a teacher. Other guidance students can get are individual or small-group meetings with study-counsellors or teachers to discuss general topics or problems related to their study.

The Ou offers courses in a modular system. Students can register themselves for any course they want to study and once they have paid, they receive all course materials. From that date onward they have a period of 2 years in which they stay registered for that course and have the opportunity to participate in examinations. A successful result is rewarded with a certificate. If in this period they take part in an examination that they donot pass, they get an extra year of registration and study time for that course. One course is equivalent to 100, 200 or 300 estimated hours of study-time. The course materials are organised into course blocks that contain a number of learning units. One learning unit needs about 4 hours of study-time. Courses from 7 subject areas can be studied at the Ou: social, cultural, management, law, economy, natural and technical sciences.

A model of regulation of learning

To regulate their learning activities, students may let themselves be directed by external sources or they may direct themselves. In the latter case one may speak of selfregulated learning. As any goal-directed human

activity selfregulated learning can be conceptualised as an activity in which three interrelated levels of functioning are involved: an executive, a regulation and a conceptual level (Hettema, 1979; Lawson, 1984). At the executive level a student tries to attain learning outcomes by using cognitive learning processes with certain learning contents. At the regulation level a student directs and controls these cognitive learning activities by making use of regulation processes. This regulation is influenced by a student's orientation or motivation toward studying. It also is influenced by a student's conception of what learning in education essentially means and what he views as his own and as the education's tasks in learning and studying: the conceptual level. These three levels correspond to the distinction between cognition, metacognitive regulation and metacognitive knowledge, respectively. The educational environment may stimulate the development of, activate or take over cognitive learning and regulation processes and may influence students' conceptions of and orientations toward studying (see figure 1).

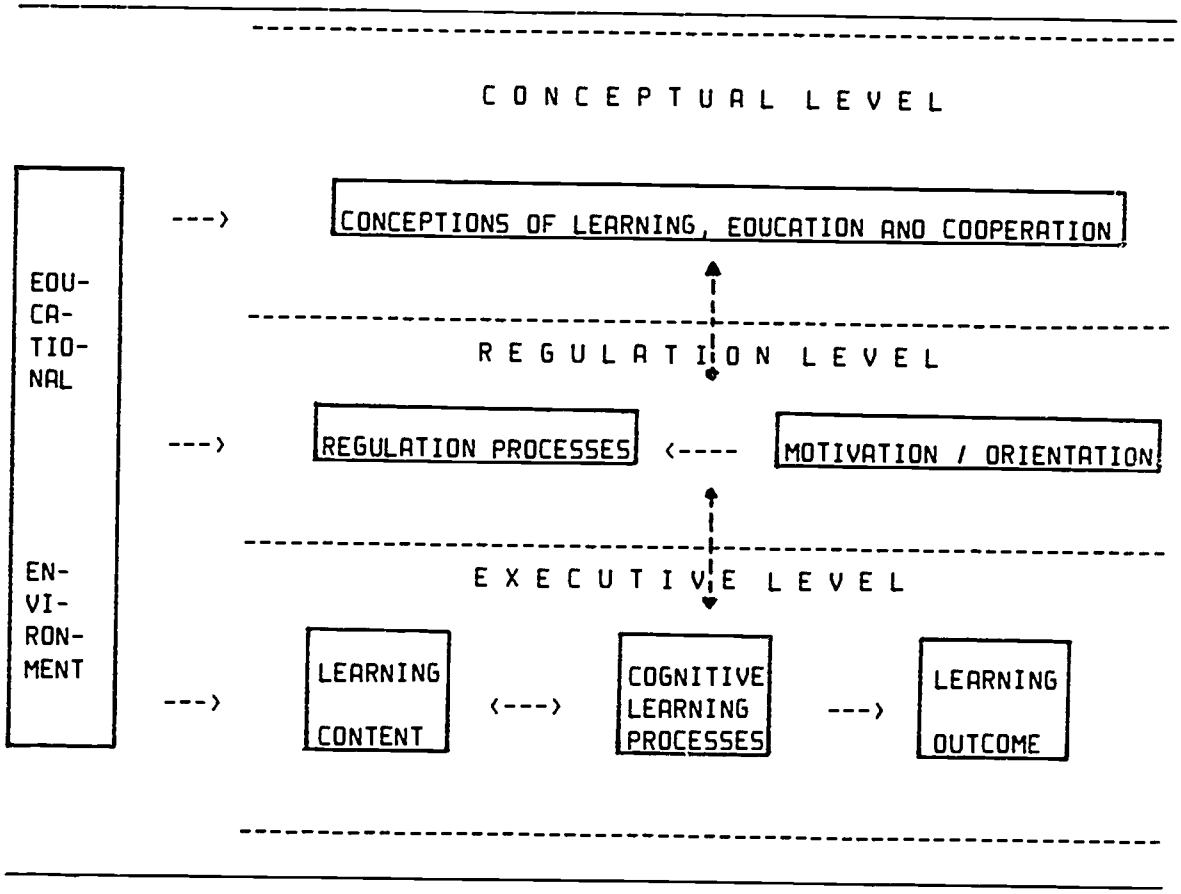

Figure 1: a model of regulation of learning

Cognitive learning processes. Many learning styles, strategies and approaches are described in terms of the cognitive learning processes (such as relating, elaborating, structuring, personalising, memorising, etc.) that students use out of themselves when studying. A well-known distinction in the way students go about studying is that between a deep and a surface approach (Marton, 1983; Marton & Säljö, 1984). A deep approach is characterised by attention for what study materials are about (the

signified) and by learning activities like relating the parts to each other and to the whole, relating learning contents to own experiences and to knowledge one already has, restructuring parts of the study materials in an own organised whole, forming own conclusions and personalising knowledge. A surface approach is characterised by attention for the study materials themselves (the sign) and by learning activities like memorising unrelated facts, processing mainly details, studying the parts of the study materials in isolation and trying to reproduce study contents unalteredly. Schmeck (1983) makes a distinction between the learning styles and strategies deep and elaborative processing and fact retention. The first two are variations within Marton & Säljö's (1984) deep approach. A deep processing student tries to come to understanding mainly by searching for internal relations within the study materials, an elaborative processing student tries to do so mainly by searching for relations between the study materials and own personal experiences (a concretising and personalising strategy/style). Fact retention concerns the extent to which students process and remember factual, detailled information. Other learning styles and strategies that are described in terms of cognitive learning processes are Pask's (1976) serials and holist learning strategies and improvidence and globetrotting learning pathologies and Janssen's (1987) analysing, synthesising, structuring and functioning study strategies.

Regulation processes. To learn in a selfregulated way a student must not only be skilled in the use of cognitive learning activities, but also in the coordination and control of these own activities. This concerns the flexible adjustment of one's way of learning to different learning objectives, learning tasks, own characteristics like preknowledge and contextfactors like available time, and the use of regulation processes to exert control over one'e own learning. Examples of these regulation or metacognitive processes are planning learning activities, monitoring ongoing actions, testing one's learning outcomes, repair activities and evaluating the learning process (Brown, 1980; Fischer & Mandl, 1984). Simons & Vermunt (1986) define selfregulation as the number and kind of regulation processes students take over from teachers. They distinguish eight of these processes: orientation, planning, monitoring, testing, diagnosing, on-line regulation (or repair activities), evaluation and reflection. On the basis of a review of dutch research on selfregulation they conclude that students differ in the extent to which they handle these processes themselves or expect from teachers to handle these processes to regulate their learning (internal vs external regulation). And although the attention for metacognitive processes is relatively recent, in 1970 Parlett already described a similar distinction between syllabus-free and syllabus-bound students. According to him, syllabus-bound students are in need of very clearly described exam requirements and obligatory subject-matter and are very exam-directed in their studying. When the course-structure is more ambiguous and they have to decide themselves what, how and with what objective to learn, they are less effective. Syllabus-free students on the other hand are restricted by a tight course structure. They are most effective when they can choose themselves what, how and with what objective to learn, are more directed by personal interests and also read non-obligatory literature about the subject-matter.

Conceptions of learning, education and cooperation. What a student does when learning is influenced by his knowledge and beliefs about learning (e.g. Flavell, 1979). This metacognitive knowledge is often conceptualised as knowledge of rather specific facts about learning, such as the duration of short-term memory. In our research metacognitive knowledge is conceptualised as the more general view on or conception of learning and education. Säljö

(1979) interviewed students about what learning actually meant to them and he identified 5 qualitatively different of these learning conceptions. Learning was seen as: (1) a quantitative increase in knowledge, (2) memorising, (3) the acquisition of facts, methods, etc. which can be retained and used when necessary, (4) the abstraction of meaning and (5) an interpretative process aimed at understanding reality (see also Marton & Säljö, 1984). Van Rossum, Deijkers & Hamer (1985) showed that students' conceptions of learning are closely related to their conceptions of good education. In our own reseach we factoranalysed responses of students on conception-items of a Likert type. Three main dimensions appeared: learning seen as the intake of knowledge, the construction of knowledge and the use of knowledge (Vermunt, 1986). These conceptions differed mainly in students' views of student and educational tasks in the learning process. For example, students who see learning as the intake of knowledge donot consider activities like relating, structuring, diagnosing, testing etc. as learning activities but as educational tasks. Students also differed in their conceptions of cooperation with other students. Some students considered cooperation very important and expected a variety of functions in their own learning to be performed by other students, for others cooperation was unimportant and they expected no benefits at all from working with other students.

Orientations toward studying. In much research significant correlations are found between a student's way of learning and his motivation or orientation toward studying. Often a distinction is made between an intrinsic, extrinsic and achievement motivation. Intrinsic motivation is often associated with a deep approach to learning, extrinsic motivation with a surface approach. Achievement motivation is often reported to be related to a strategic approach, characterised by the tendency to choose that approach from which a student expects the highest exam results (e.g. Entwistle & Ramsden, 1983; Biggs, 1984). Gibbs, Morgan & Taylor (1984) use the term educational orientation to indicate the whole complex of student aims, values and purposes for study. In their interviews they identified four main types of these orientations: vocational, academic, personal and social. In our factoranalytic research we found five main dimensions that were labeled certificate-directed, vocation-directed, selftest-directed, personal interested and ambivalent orientations toward the study (Vermunt, 1986).

Educational environment, learning content and learning outcome. Of course, also aspects of the educational environment and the learning task and content influence the way students learn. Education can for example stimulate, take over or try to develop cognitive learning and regulation processes (see Simons & Vermunt, 1986). Influencing factors on the way students learn are for example exam requirements (Thomas & Bain, 1984), the kind of learning tasks (Laurillard, 1979), subject areas and ways of teaching (Entwistle & Ramsden, 1983) and adjunct aids in study materials (Hamaker, 1983). Relations between learning activities and learning outcomes are often studied. Generally, a deep approach to and self-regulation of learning are associated with better learning outcomes than a surface approach and external regulation (e.g. Marton & Säljö, 1984; Friedrich & Mandl, 1986).

Pilot Study

The model of selfregulated learning described above served as theoretical background for the development of the learning style instrument that is the main aim of our research project (see introduction). This instrument, labeled the 'Inventory of Learning Styles, Conceptions and

Orientations (ILSCO), contains 4 parts: (1) learning styles or approaches in terms of cognitive learning processes; (2) regulation styles; (3) conceptions of learning, education and cooperation and (4) study-orientations. Here the emphasis will be on the regulation component, but also some attention will be paid to the first mentioned part.

Method. As a first empirical step in the development of the learning activities components of the ILSCO (part 1 and 2 above), 24 Open university students were extensively interviewed on their way of studying. The students were randomly selected within 3 subject areas: cultural, law and natural/technical sciences. All students were in their first year of study. In the interviews special attention was given to the way they interacted with the regulation devices that are interwoven into the Ou study materials. The interviews were tape-recorded and later transcribed as completely as possible. These transcripts were analysed in a phenomenographic way (see Marton & Säljö, 1984) to identify basic differences and similarities in these adult students' studying and regulation of studying. The main aim of this interview-study was the development of a limited number of categories of description that reflect these differences and similarities.

Results and discussion. Originally the analysis of the interview transcripts resulted in four categories of description of different regulation styles: selfregulation, restricted selfregulation, external regulation and lack of regulation. Later on we decided to combine the first two in a more general descriptive category, since they differed only in minor points. The remaining three regulation styles differ mainly in the extent to which students out of themselves use regulation processes to control their own learning, or let themselves be directed by the regulation aids in the study materials.

Five students gave evidence of a great degree of **selfregulation** in their studying, seven of a limited degree. Of the regulation aids in the study materials the first mentioned group mainly used the learning objectives, selftests and literature-references, the other aids (such as directions for studying) they used much less. Besides the learning objectives that are given in the course materials they also set objectives of their own. They also read other literature about the subject-matter and when they had trouble understanding some parts of the course materials, they often diagnosed extensively why these problems occured. During studying they thought of own questions, problems etc. and tried to formulate the learning content in their own words to check their learning progress. The other seven students also exhibited these activities, although in a lesser degree.

Eight students let themselves strongly be directed by the **external regulation** in the course materials. They followed exactly the offered route through the study materials and did what was suggested by means of questions, directions, exercises, but little more. Their study activities were mainly caused by activation by the regulation aids. Out of themselves they hardly monitored and checked their learning progress and they relied in great extent on the selftests and questions with feedback in the course materials to estimate their degree of understanding. Diagnostic, repair and reflective activities, regulation processes that can difficultly be taken over by the course, were almost absent in their studying.

Four students showed to have difficulties with the regulation of their studying (**lack of regulation**). Out of themselves they hardly used regulation processes but they also hardly used the external regulation aids because they didnot understand them well. Generally the learning objectives,

directions for studying, selftests and feedback etc. were judged to be too global to have a good grip on them. They wanted more specific guidelines about what they had to know and more explanation of the learning content and of relations between its parts.

The development of the regulation component of the ILSCO can be based on the results of this study. The differences in regulation among adult students found in this study can be operationalised into items of a Likert type. Formulation of items in terms of selected interview statements has the advantage that the items closely correspond to the way Ou-students themselves experience their studying.

Main study

The aim of the main study was the development of a reliable, valid and usable learning style instrument. Since the usability is researched in a separate study, here the reliability and validity will be discussed. The emphasis will be on the regulation component of the ILSCO.

Method

Subjects. By the Open university a random sample of 700 students was taken from the 24378 students who had a least received the study materials of one Ou-course. Of this whole sample the following background information was available: sexe, age, highest level of completed prior education, the Ou-courses they studied and the dates they received the course-materials, exam participation dates, exam results in terms of passed/failed and some other background data. One-third of the sample was female, two-third male. The age varied from 20 to 75 years and 50% of the sample was between 25 and 34 years of age. 43% of the sample had as highest level of completed prior education higher education. The biggest group (31%) studied mainly courses in the subject area law sciences, followed by students cultural sciences (19%), management sciences (11%), technical sciences (11%), economy (9%), social sciences (8%) and natural sciences (4%). The other students studied an even amount of courses from different subject areas. Of the sample subjects 30% had participated at least once in a exam. 33% of the sample students received their most recent course more than a year ago and hadnot participated in any exam yet. 46% of the exam participants passed every exam they took part in (max. about 5).

Inventory. In line of the conclusions of the pilot study, an inventory was constructed based on the categories of description that were the result of that study. From the interviews statements were selected that were judged to be characteristic for the 3 regulation styles. When necessary these student utterances were slightly reworded. The same procedure was followed with the selection of items for the learning approaches in terms of cognitive processes. At last 50 regulation items were selected for inclusion in the inventory and also 50 learning approach items. In the introduction to the inventory students were asked to rate on a 5-point scale the extent to which they used the listed activities. The scale varied from (1) I seldom or never do this to (5) I (almost) always do this. At the end of the inventory one question was added about the amount of Ou-study materials the student had already studied.

Procedure. Together with an covering letter and a post-paid return envelope on february 6, 1987 the inventory (ILSCO) was sent to all 700 Ou-students from the sample. Two weeks later a reminder was sent to all those who hadnot reacted until then. Participation was voluntary and the students were in no

way rewarded for their participation.

Data analysis. Data were analyzed via item, principal component and reliability analyses using the SPSSX statistical package. Analyses of variance were conducted to test differences in regulation among different subgroups based on the background information. Crosstabulations were conducted to test differences in composition between responding and non-responding groups of students.

Results and discussion

Respons and non-respons. From 211 students completed inventories were received. Five envelopes came back unopened; these students were moved into another house. Another 14 partly completed inventories were received. So the total respons was 32%, the effective respons was 30%. There were no significant differences in composition between respons and sample group on the following variables: sexe, age, highest level of completed prior education, subject area, motives for studying, motives for choosing the Ou, study plans, the amount of hours students worked in a paid job, kind of prior education and recent educational experience outside the Ou. On two other variables, however, there were significant differences. These are shown in tables 1 and 2. Table 1 shows that respons is a function of the time that elapsed since students received their most recent Ou-course. Table 2 shows that students who passed all their exams were more likely to respond than students who didnot pass all their exams.

Table 1: Distribution of respons - non-respons on the basis of exam-participation and date of reception of the most recent Ou-course: frequencies and row percentages (() = percentages)

Exam-participation/ reception date most recent Ou-course [1])	Respons	Non-respons	Row total (Sample)
(1)	100 (47.8)	109 (52.2)	209 (30.3)
(2)	47 (44.3)	59 (55.7)	106 (15.4)
(3)	36 (24.5)	111 (75.5)	147 (21.3)
(4)	14 (17.1)	68 (82.9)	82 (11.9)
(5)	11 (7.5)	135 (92.5)	146 (21.2)
Column total	208 (30.1)	482 (69.9)	690 (100)

X^2 = 85.58; Df = 4; p = .000

[1]) (1) = exam participants.
Other 4 groups: students who didnot yet participate in any exam and who received their most recent Ou-course:
(2) = less than half a year ago;
(3) = between half a year and 1 year ago;
(4) = between 1 and one and a half year ago;
(5) = more than one and a half year ago.

Table 2: Distribution of respons - non-respons on the basis of exam results.

Exam result [1]	Respons	Non-respons	Row total (Sample)
(1)	47 (57.3)	35 (42.7)	82 (45.6)
(2)	36 (36.7)	62 (63.3)	98 (54.4)
Column total	83 (46.1)	97 (53.9)	180 (100)

X^2 = 6.80; Df = 1; p = .009.

[1]) (1) = students who passed every exam they took part in.
(2) = students who didnot pass every exam they took part in.
Since there is a time period between registration of exam participation and exam results, the row total is smaller here than in the previous table.

Construction of the ILSCO-activity scales. In table 3 the results are shown of a principal component analysis with Varimax-rotation on 30 items that were included in the final learning regulation scales. The other 20 items were removed either because of extreme means and/or standard deviations, or highest loadings of below .30 on the factors, or item-scale total correlations below .30 or because there were enough items in a scale. In table 3 also the reliability (Cronbach α) of and the number of items in the scales are shown that were constructed corresponding to the factorsolution, as well as the item-scale total correlations of separate items. Factor 1 in table 3 represents the external regulation style, factor 2 the self-regulation style and factor 3 the lack of regulation style. The reliabilities of the first 2 scales are good, of the third one reasonable. In a similar way 3 scales were constructed for the cognitive learning approaches: deep, surface and elaborative approach. The scale deep approach groups items that represent structuring, internally relating and critical learning activities (n = 12; α = .82). The scale surface approach represents memorising, isolating and fact- and detail-oriented activities (n = 12; α = .79). The third scale, elaborative approach, groups 6 items that represent personalising and concretisising activities (α = .70). In table 4 intercorrelations among the 3 regulation and 3 learning approach scales are shown. The regulation scales do not correlate with each other, of the learning approach scales only deep and elaborative approach correlate mildly. Selfregulation and deep approach correlate about .50 with each other and so do external regulation and surface approach.

Relations between ILSCO-activity scores and background data. Various subgroups of students were compared in their main activity scale scores. Only on one scale, elaborative approach, a significant difference showed up between men and women. Males scores higher on this scale ($F(1,204) = 7.42$, $p = .007$). Correlations between age and scale scores yielded no significant relation for 4 scales. Only mild correlations were found between age and external regulation ($r = .16$) and age and surface approach ($r = .14$). In table 5 students with different educational background are compared in their mean scale scores.

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Table 3: Factor loadings of ILSCD-regulation items in a three-factor Varimax-solution (principal component analysis), reliabil 'y (Cronbach α) of the correspondingly composed scales and ~orrected item-scale total correlations (r_{it}) of separate items (n = 211; decimals and factor loadings below .30 omitted)

FACTOR LOADING F1	F2	F3	r_{it}	SCALES AND ITEMS
				SCALE EXTERNAL REGULATION (n = 12; α = .80)
70			58	I study according to the directions that are given in the course materials.
65			56	I check my learning progress exclusively by doing the questions, exercises and selftests in the study materials.
64			49	I experience the introductions, learning objectives, directions, exercises and selftests as an indispensable grip for my studying.
63			47	I use the introductions and learning objectives to know exactly where I have to go to.
58			46	When doing questions and exercises I check whether I do them correctly.
58			50	I learn everything exactly as its written in the course materials.
53			45	The questions and exercises in the course materials I work out completely at the moment I meet them during studying.
53			45	I study the subject-matter in the sequence in which it appears in a course.
48			36	When I don't understand a part of a study text quite well, I try to come to understanding by rereading it again and again.
47			40	I study all learning units in the same way.
44			38	With the exercises I practise myself thoroughly in applying the methods that are described in a course.
40			33	When I can answer the questions of the selftest correctly, I decide that I master the learning unit well.

FACTOR LOADING F1	F2	F3	r-ait	SCALES AND ITEMS
				SCALE SELF-REGULATION (n = 12; α = .81)
	68		51	Besides the course materials I also study other literature that has to do with the course content.
	65		51	When I d t understand a part of a study text quite well, I try to find other literature about that subject.
	63		51	From other sources I add something to the study materials.
	61		52	To check my learning progress I try to formulate an answer to questions about the study-matter that I think of myself.
	58		50	To check whether I master the study-matter, I try to think of other examples and problems than those in the course materials.
	58		48	To check my learning progress, I try to formulate the main points of a course block in my own words after I studied it.
	54		45	I study in different ways, depending on the learning objectives I have in mind.
	51		40	When I begin at a new learning unit, I first think about the way in which I can best study it.
	50		40	To check my learning progress, I try to express the content of a paragraph in my own words after I read it.
	49		38	When I have problems with a part of the subject-matter, I try to think of what I can do to solve them.
-39	49		42	When studying I also direct myself toward learning objectives that are not in the course, but that I set myself.
	48		36	When I have problems with a part of the course-matter, I try to analyse why it is difficult for me.

FACTOR LOADING F1	F2	F3	r-it	SCALES AND ITEMS
				SCALE LACK OF REGULATION (n = 6; α = .71)
	72	52		I notice that I find it difficult to ascertain whether I master the course-matter enough.
	70	54		I realize that it is not clear to me what I have to remember and what I have not.
	65	46		I notice that I have trouble to go about with a big amount of study material.
	59	43		I realize that the study directions in the course are not very clear to me.
	57	37		I perceive that I miss somebody to help me with difficulties.
	52	35		I notice that the learning objectives are too global for me to have a good grip on them.

Table 4: Intercorrelations (Pearson r) between ILSCD activity scales [1])

SCALE	1	2	3	4	5
REGULATION OF LEARNING					
1. Self-regulation					
2. External regulation	-11				
3. Lack of regulation	-03	-07			
LEARNING APPROACH					
4. Deep approach	52	-15	-14		
5. Surface approach	17	51	-05	09	
6. Elaborative approach	34	-08	12	30	00

[1]): N=211; decimals omitted; correlations statistically significant with r > 0.11 (p < 0.05).

Table 5: Mean ILSCO-scale scores for students with different educational background: highest level of completed prior education and length of Ou-experience.

ILSCO Scale	Contrast Groups	Mean Scale Score	SD	F	p
HIGHEST LEVEL OF COMPLETED PRIOR EDUCATION [1] (Df = 1, 195)					
Self-regulation	(1)	31.56	8.74	2.78	.097
	(2)	29.51	8.47		
External regulation	(1)	40.53	8.36	4.62	.033
	(2)	43.12	8.52		
Lack of regulation	(1)	12.29	4.22	3.91	.049
	(2)	13.57	4.76		
Deep approach	(1)	41.77	9.03	3.15	.077
	(2)	39.63	7.87		
Surface approach	(1)	30.65	7.62	3.05	.082
	(2)	32.77	9.21		
LENGTH OF OU-EXPERIENCE [2] (Df = 1, 86)					
External regulation	little	39.70	8.52	9.32	.003
	much	45.30	8.45		
Lack of regulation	little	14.04	4.94	6.38	.013
	much	11.59	3.75		
Surface approach	little	30.95	7.42	3.39	.069
	much	34.06	8.36		
Elaborative approach	little	20.02	4.87	4.51	.037
	much	17.86	4.32		

[1]: (1) = higher education: university or higher vocational education (n = 94);
(2) = secondary education: lower and middle vocational education, general secondary education or preparatory higher education (n = 103);
Students with another than the dutch nationality were removed from the comparison groups because of a different coding of their prior education in the Ou-files.

[2]: 'little' (n=51): studied between 1 and 12 learning units of Ou-courses (= max. about 50 hours of study);
'much' (n=37): studied more than 2 Ou-courses.

Students who have higher education as highest completed prior education are less externally regulated in their studying and score lower on the lack of regulation scale than students with secundary education as highest prior education. Differences approaching significance manifested themselves on the deep and surface approach and the selfregulation scales. In table 5 also groups of students with different lengths of Ou-experience are compared in their scale scores. Beginning students score lower on the external regulation scales and higher on the lack of regulation and elaborative approach scales than students who have studied more than 2 Ou-courses. The difference on the surface approach scale approaches significance. In table 6 differences in learning activities among groups of students from different subject areas are shown. Students in the humanities score lower than other student on external regulation and on surface approach. On this last scale law and economy students score relatively high. The difference on the lack of regulation scale approaches significance here. Relations between learning activities and indices of study results are reported in table 7. Students who could reasonably have participated in an exam but who didnot yet do so (received their most recent Ou-course a year or more ago) show much more signs of lack of regulation than exam participants. One the elaborative approach scale these first group of students scores higher than the second. In comparison with students who passed every exam they took part in, less successful students in terms of passing exams exhibited more signs of lack of regulation and, approaching significance, external regulation.

Table 6: Mean ILSCO-scale scores for students of different subject areas

ILSCO Scale	Contrast Groups	Mean Scale Score	SD	F	p
External regulation	(1)	40.11	8.84	4.52	.012
	(2)	43.88	8.23		
	(3)	43.68	7.60		
Lack of regulation	(1)	12.62	4.43	2.79	.064
	(2)	13.22	4.60		
	(3)	14.87	4.68		
Surface approach	(1)	30.28	8.83	3.97	.021
	(2)	34.17	8.39		
	(3)	32.19	7.72		

1): (1) = social, cultural and management sciences (n = 93);
(2) = law and economy sciences (n = 64);
(3) = natural and technical sciences (n = 31).
Students who studied an even amount of courses from different subject areas where not included in the comparison groups.

Table 7: Mean ILSCO-scale scores for students with different study results: exam participation and exam results.

ILSCO Scale	Contrast Groups	Mean Scale Score	SD	F	p
EXAM PARTICIPATION [1]) (Df = 1, 123)					
Lack of regulation	(1)	12.30	4.16	11.83	.001
	(2)	15.76	5.65		
Elaborative approach	(1)	18.01	4.66	4.27	.041
	(2)	20.16	4.58		
EXAM RESULTS [2]) (Df = 1, 81)					
External regulation	(3)	40.89	8.11	3.20	.077
	(4)	44.31	9.24		
Lack of regulation	(3)	11.11	3.45	5.89	.017
	(4)	13.31	4.74		

[1]) (1) = students who participated in at least 1 exam (n = 100);
(2) = students who didnot yet participate in any exam and who received their most recent Ou-course a year or more ago (n = 25);
[2]) (3) = students who passed every exam they took part in (n = 47);
(4) = students who didnot pass every exam they took part in (n = 36).
The maximum number of times individual students took part in examinations is 5.

General discussion

The 6 ILSCO-activity scales discussed in this paper all have acceptable reliabilities in terms of internal consistency. No scale has an α below .70 and 3 scales have α's of .80 or higher. A study into the test-retest reliability will be conducted within a couple of weeks (interval 3 months). To promote validity the instrument construction was based on categories of description derived from interviews with students from the population that the instrument is meant for. By formulating items in terms of students' statements we tried to connect the items as closely as possible to their study-experiences, with the aim of developing recognizable items. On the other hand the instrument development was based on a model of regulation of learning, derived from research and theory on student learning. The results of this development-procedure are, however, difficult to calculate in terms of validity-figures. More hard measures of validity are the relations between activity scale scores and indices of study results. Concerning this, especially the lack of regulation scale turned out to be related to both measures of study results. The elaborative approach and external regulation scales each proved to be related to one of these measures. The lack of regulation scale furthermore showed relations with students' level of prior education, length of Ou-experience and subject area. External regulation furthermore turned out to be connected to age, prior education, length of

Ou-experience and subject area. The selfregulation scale showed almost no relations with background variables, just as the deep approach scale. Of the other two learning approach scales elaborative approach turned out to be related to sexe and Ou-experience, surface approach to age and subject area.

Since we used a rather broad definition of 'Ou-student' (everyone who is registered for at least one course of which he/she received the materials), the non-respons rate became quite high. This same effect we found in a previous study (Vermunt, 1986). A more narrow definition would have excluded the students in the high non-responding groups from sampling. On the other hand, the few students from these groups who did respond showed a high degree of lack of regulation. And since this group forms one-third of the sample, this may be a significant finding. Another significant finding may be that on the one hand experienced Ou-students show a much higher degree of external regulation than beginning Ou-students, and on the other hand external regulation is negatively related to passing exams. Probably it would be useful to try to make students less externally regulated in their studying.

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