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**Measuring Perceptions of the Learning Environment and Approaches to
Learning: Validation of the Learn Questionnaire**

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Measuring Perceptions of the Learning Environment and Approaches to Learning: Validation of the Learn Questionnaire

While focus on quality in Danish higher education has been growing in recent years, limited attention has been devoted to developing and thoroughly validating instruments that allow collecting data about university students' perceptions of the teaching-learning environment. Based on data from a large sample of Danish university students, a Danish version of the Learn questionnaire was validated using confirmatory and exploratory factor analysis. Analyses confirmed the existence of three scales reflecting students' approaches to learning and six scales reflecting students' perception of the teaching-learning environment. The results suggest that the Danish version of Learn is a valid instrument to be used for evaluation of the teaching-learning environment as well as for research into Danish university students' learning strategies.

Keywords: student feedback surveys, teaching-learning environment, approaches to learning, academic achievement

Introduction

Surveys for obtaining student feedback are well-established across higher education systems in English-speaking countries (Richardson, 2005). A similar trend could be witnessed across European higher education systems after the Bologna Declaration (1999), in which European universities were called to develop quality assurance systems with compatible criteria (Amaral & Rosa, 2010). Within recent years, there has been a similar interest in systematically monitoring the quality of higher education in Denmark (Kvalitetsudvalget, 2014). According to the 2015–17 contract between Danish higher education institutions and the Danish Ministry of Higher Education and Science (2014),

universities are obligated to promote and monitor quality in education by means of locally defined indicators.

One way of assuring quality in university education is obtaining feedback from students, and many university programmes evaluate their courses regularly. While feedback from students is an important source of information, it is, in fact, a very difficult and complex task to develop survey items that are truly indicative of high quality learning and high quality teaching. If conducted poorly, such survey instruments risk becoming ritual or even detrimental to quality. As Richardson (2005) argued, surveys focusing narrowly on students' satisfaction risk promoting an unfortunate consumer-supplier relationship between students and teachers. Kember, Jenkins and Ng (2004) found that surveys of teaching in some instances were detrimental to learning because university teachers were afraid that instructional innovation would provoke student conservatism and thus result in negative evaluations of them as teachers. To avoid the problem that student evaluations measure students' satisfaction with the teaching and assess teacher competence instead of focusing on learning experiences and learning outcomes, it has been suggested that the relationship between students' learning and their experiences of the teaching-learning environment should be emphasised in the student surveys (Harvey, 2003; Richardson, 2005). There is evidence that students' learning is related to their perceptions of the teaching-learning environment (Kreber, 2003; Lawless & Richardson, 2002; Parpala, Lindblom-Ylänne, Komulainen, & Entwistle, 2013; Richardson, 2005, Richardson & Price, 2003; Sadlo & Richardson, 2003). Therefore, an instrument focusing on both experiences of the teaching-learning environment and approaches to learning would be less vulnerable to the problems described above.

If student surveys as tools of quality assurance policies are in fact to promote quality in higher education, Richardson (2005) argued, they need to (i) be grounded in a solid theoretical framework about teaching and learning in higher education, (ii) undergo empirical testing to establish their validity, and (iii) focus on a study programme rather than on a single course. Since 2005, the Learn questionnaire has been developed in these respects at the University of Helsinki (Parpala & Lindblom-Ylänne, 2012). The main aim of the University of Helsinki was to develop a survey that could act also as a base for the feedback system. After careful consideration and comparison between the existing student feedback instruments, researchers at the University of Helsinki chose the Experiences of Teaching-Learning Environment Questionnaire (ETLQ, see Entwistle, McCune, & Hounsell, 2003; Teaching & Learning Research Programme, 2007). The strength of the ETLQ was that it combined the theories behind good teaching and approaches to learning and could be used at a single course unit or even at a course module level, making it suitable to measure students' experiences also at a more general level. Furthermore, the ETLQ has recently been tested in different cultural contexts (Parpala et al., 2013) and in different disciplines (Entwistle et al., 2003; Parpala, Lindblom-Ylänne, Komulainen, Litmanen, & Hirsto, 2010). The Learn questionnaire is a modification of the ETLQ and research done at the University of Helsinki showed that the Learn was robust enough to be used in a large, multidisciplinary, Scandinavian university (Parpala, 2010). Thus, there was an interest to also use this instrument in a Danish university context.

Aim of study

The use of a survey instrument in a new context requires revalidation of the instrument (Richardson, 2014) and thus the aim of the current study was to test the validity of the Learn in the context of Danish Higher Education. The validity of a measurement instrument is a description of how well the instrument measures what it is supposed to measure and several types of evidence should be considered to assess the overall validity. Abell, Springer, and Katama (2009) suggested addressing the following questions: Does the scale appear to measure what it claims to measure (face validity) and does the item content reflect the construct definition (content validity)? Is the factor structure as would be expected (factorial validity) and does the scale correlate with an external criterion not measured by the instrument (criterion validity)? Does the scale correlate with variables as expected (convergent validity) and do variables that should not correlate with the scale score not do so (discriminant validity)? An alternative interpretation of discriminant validity is the extent to which scale scores differ between groups of individuals who would be expected to differ (Richardson, 2009).

The study's main research question (RQ) was this: What is the validity of the Learn questionnaire in Danish higher education? To address this question, we asked the following sub-questions:

- RQ₁: What is the factor structure of the Danish version of Learn (i.e. an indication of factorial validity)?
- RQ₂: Are perceptions of the teaching-learning environment positively related to a deep approach to learning and organised study and negatively related to a surface approach to learning (i.e. an indication of convergent validity)?

- RQ₃: Do approaches to learning and organised effort correlate with students' academic achievement (i.e. an indication of criterion validity)?
- RQ₄: Do distinct educational programmes score differently on scales related to the students' perception of the teaching-learning environment (i.e. an indication of discriminant validity)?

In the following paragraphs, the Learn questionnaire will be presented in more detail, followed by a description of the study's sample and methods. The results will be discussed in the light of the existing research and the different criteria of validity.

Scales Measuring Teaching and Learning in the Survey

Learn consists of items measuring both students' approaches to learning (SAL) and their perceptions of the teaching-learning environment (TLE). The section measuring approaches to learning includes items from different measurement instruments. Seven items were modified from the Approaches to Learning and Studying Inventory which is included in the ETLQ (see Entwistle & McCune, 2004). Three items originate from the Learning and Studying Questionnaire (LSQ, see Entwistle et al., 2003) and two items from the Revised Learning Process Questionnaire (R-LPQ, see Kember, Biggs, & Leung, 2004). Together these 12 items in the Learn measure three broad approaches to learning; deep approach to learning, surface approach to learning, and organised studying, each with four items. The items measuring the deep approach focus on how students concentrate on understanding the bigger picture, focus on underlying meanings, and integrate new information into their previous knowledge, whereas items measuring the surface approach assess struggling with fragmented knowledge and focusing on

memorization (Entwistle, 2009). Items measuring organised studying reflect effort and time management and can be considered more as an approach to studying than learning (Entwistle & McCune, 2004). The Learn instrument appears to be fairly robust when focusing on student approaches to learning and studying (Hailikari & Parpala, 2014; Karagiannopoulou, Naka, Kamtsios, Savvidou, & Michalis, in press; Parpala & Lindblom-Ylänne, 2012; Postareff, Vanthournout, Coertjens, & Lindblom-Ylänne, in press; Sakurai, Parpala, Pyhälto, & Lindblom-Ylänne, 2014).

The other section of the Learn measures students' perceptions of the teaching-learning environment and it originates from the ETLQ (Entwistle et al., 2003). This section covers students' experiences of the teaching-learning environment provided; it was based on a literature review but also on an analysis of existing inventories measuring students' experiences of teaching-learning environments or academic quality (Entwistle et al., 2003; Parpala et al., 2013). All the scales are based on theories of good teaching, more precisely; they are measuring dimensions that support students' deep approach to learning. They have their origin in the curriculum development, which suggests ideas of how curriculum could help students to develop their understanding, for example, by putting teaching and assessment methods in line with each other (Biggs, 1999). Some of the scales were drawn from the theory of how teaching methods can provoke students' interest and help them to enhance learning (De Corte, 1995, 2000) and some of them emphasise the balance of teachers' and students' roles in supporting learning (Vermunt, 1998). In the Finnish data, six factors emerged from the 22 items measuring different aspects of quality teaching: *Teaching for understanding*, *Alignment*, *Staff enthusiasm and support*, *Interest and relevance*, *Constructive feedback*, and *Support from other students* (Parpala et al., 2013). This factor structure has been identified also among Greek students

(Karagiannopoulou & Milienos, 2014). In line with the previous research, Parpala and her colleagues (2013) found that the deep approach to learning scale was positively related to positive perceptions of the teaching-learning environment whereas surface approach was negatively related to perception of the teaching-learning environment.

Methods

Participants

Data was collected in the spring of 2014 at the School of Business and Social Sciences at Aarhus University, which is a research intensive, Scandinavian university. The school encompasses seven major departments covering 38 programmes within business and social sciences (e.g., law, political science, psychology, and economics). All 12,721 full-time students were invited to respond to an electronic questionnaire. Thirty-four percent responded to the survey, resulting in 4,377 valid cases. The sample consisted of 46% men and 54% women aged 18 to 57 ($M = 23.9$, $SD = 3.76$). Sixty-one percent were bachelor's students, and 39% were master's students. Compared to non-responders, female and young students were slightly overrepresented in the sample. An independent-samples t-test indicated that the mean high school grade point average (HSGPA) was higher in the sample ($M = 8.97$, $SD = 2.03$) than in the group of non-responders ($M = 8.36$, $SD = 2.14$), $t(7,116) = 13.5$, $p < .001$. Likewise, the university grade point average (GPA) was higher among students in the sample ($M = 7.18$, $SD = 1.93$) compared to students that were not part of the sample ($M = 6.62$, $SD = 2.27$), $t(10,146) = 14.6$, $p < .001$.

Instrument

Analyses were carried out on two sections from the Learn-questionnaire (Parpala & Lindblom-Ylänne, 2012); students' perceptions of the teaching-learning environment (22 items) and students' approaches to learning (12 items). The English version of the Learn-questionnaire was first translated into Danish by a professional translator independent of the study and then back-translated by a fellow researcher. Furthermore, the questions were discussed among fellow educational researchers and tested on a focus group. Without altering the fundamental meaning, minor adjustments in the wording were undertaken on some items to adjust them to idiosyncrasies in the Danish language and the context of Danish higher education. For example, the question "Courses have given me a sense of what goes on 'behind the scenes' in this subject area" was changed to "The courses have given me a good sense of the development and newest research in this subject area." For the final version of the questionnaire, see Table 5. Students responded to items using a 5-point Likert scale (1 = Disagree to 5 = Agree).

Data about HSGPA and GPA was collected directly from the university's study administrative system. Assessment formats at the institution vary between courses; however, written examinations (both take-home and on-site) are the most common. Some examinations are oral while multiple choice exams are rare. Grades are based on the extent to which the student meets the course's intended learning outcomes. In this respect, the Danish grading system corresponds with ECTS guidelines (Danish Ministry of Education and Science, 2015).

Statistical Analyses

To answer the first research question we conducted both confirmatory (CFA) and exploratory factor analyses (EFA). Bowen and Guo (2012) recommend randomly

splitting data in two if the dataset is sufficiently large; one dataset for *calibration* and another for *validation*. Thus, we first performed CFA on the calibration dataset to evaluate how well the hypothesized models fitted the data. This resulted in adjustments of the hypothesised model. For one of the models, however, CFA was supplemented with EFA because inspection of the modifications indices suggested major revisions of the model. After revision, both models were tested on the validation dataset. The following rules of thumb were used to guide the analyses. When evaluating model fit, Hu and Bentler (1999) recommend values close to or above .95 for CFI (the comparative fit index) and TLI (Tucker-Lewis index), a value close to or below .08 for SRMR (the standardised root mean squared residual) and a value around .06 and below for the RMSEA (the root mean square error of approximation). Hu and Bentler (1999) furthermore proposed that practitioners apply a combinational rule (e.g., a cut-off value close to .95 for CFI in combination with a cut-off value close to .09 for SRMR). Others have suggested more liberal decision rules regarding model fit. According to Kline (2005), CFI greater than roughly .90 still indicates reasonably good fit while RMSEA values between .05 and .08 suggest reasonable error of approximation. Finally, it is common to include the model chi-square statistic (χ^2) even though it is difficult to meet the criterion of non-significance when the sample is large. Hence, according to Bowen and Guo (2012), it is still possible to claim that the model fits the data well if other fit indices meet their criteria. Regarding the interpretation of factor loadings, Tabachnick and Fidell (2007) suggest that only variables with loadings of .32 and above be interpreted in factor analyses. Finally, Cronbach's alpha statistics were computed to test the scales' internal reliability. Values above .70 are generally considered acceptable

although it should be noted that the statistic is, in part, dependent on the number of items (Abell et al., 2009).

Regarding the second and third research questions, correlation analyses were performed. As a rule of thumb, Cohen (1988) suggested that Pearson's r correlation coefficients greater than .1 but less than .3 be interpreted as weak correlation, correlation greater than .3 but less than .5 be interpreted as moderate correlation, and correlation greater than .5 as strong correlation. Bonferroni correction of the significance level was applied to reduce the risk of Type-I error. Finally, an analysis of variance (ANOVA) was performed to answer the fourth research question. Statistical analyses were conducted in SPSS version 21 and its AMOS module.

Results

Prior to the main analyses, data was screened for outliers, missing values, and normality. Thirty-eight cases were deleted because the students' answers were missing on more than 25% of the items. Data was randomly split into a calibration dataset ($n = 2,170$) and a validation dataset ($n = 2,169$).

Approaches to Learning

As a first step, CFA with maximum likelihood estimation was performed on 12 SAL items from the calibration dataset using a hypothesized model with three factors labelled *deep approach*, *surface approach* and *organised effort* (see Figure 1). The chi-test ($\chi^2 = 521.5$, $df = 51$, $p < .001$) indicated poor fit; however, this was expected due to the very large sample. The fit indices (CFI = .930, TLI = .909, RMSEA = .065, SRMR = .047) were reasonable, and standardized regression weights were between .57 and .74. This suggested that the hypothesized model fitted the data reasonably well.

Figure 1 about here

Inspection of the modification indices suggested that allowing covariance between e11 and e12, that is, allowing covariance between the error terms for items SAL11 and SAL12, could significantly improve the fit of the model. Therefore, we added a covariance term between e11 and e12, which improved the model’s fit indices (CFI = .959, TLI = .946, RMSEA = .051, SRMR = .041). A comparison of AIC and BIC values also indicated that the revised model (AIC = 383.0, BIC = 542.1) was an improvement of the originally proposed model (AIC = 575.5, BIC = 728.9). Finally, the revised model was tested on an independent sample, that is, the *validation* dataset. While the chi-test ($\chi^2 = 300.1$, $df = 50$, $p < .001$) still indicated poor fit, other fit indices (CFI = .965, TLI = .953, RMSEA = .048, SRMR = .042) indicated very good fit.

Table 1 about here

Still using the validation dataset, three scales were constructed and Table 1 shows the main descriptive statistics. Measures of internal reliability were satisfactory ($\alpha > .70$) as were measures of normality.

Perceptions of the Teaching-Learning Environment

In a similar way, we examined the factor structure of items measuring students’ perception of the teaching-learning environment. Based on previous research by Parpala and Lindblom-Ylänne (2012), a six-factor model was hypothesized (see Figure 2) and tested using CFA on the calibration dataset and the 22 items measuring students’

perceptions of the teaching-learning environment. The six factors were labelled *Teaching for understanding*, *Alignment*, *Staff enthusiasm and support*, *Interest and relevance*, *Constructive feedback*, and *Support from other students*. Both the chi-test and the other fit indices (CFI = .867, TLI = .842, RMSEA = .073, SRMR = .057) suggested poor fit. Standardized regression weights were between .52 and .78 with one being .40 (between TLE02 and *Teaching for understanding*).

Figure 2 about here

Due to the lack of fit and due to modification indices that strongly indicated that several items correlated with more than one latent variable, EFA was performed on the 22 TLE items. Maximum likelihood factoring was applied since it estimates factor loadings for population that maximize the likelihood of sampling the observed correlation matrix (Tabachnick & Fidell, 2007). Six components showed eigenvalues larger than 1 (Kaiser's criterion), explaining a total of 49.2% of variance after rotation. The scree plot was slightly ambiguous and showed inflexions that would justify either four or six factors. Based on the scree plot, prior research, and the number of factors meeting Kaiser's criterion, we decided to retain six factors. Strong correlation among factors warranted oblique rotation, and promax rotation was chosen in order to maximize simple structure. In many respects, the resulting factor solution resembled the hypothesized model; however, two items drew attention. TLE14 ("The teachers help us to see how we are supposed to think and reach conclusions on this subject")

unexpectedly loaded together with items representing *staff enthusiasm and support* rather than items representing *teaching for understanding*. A communality statistic of only .177 and loadings below .32 suggested that TLE02 (“We are allowed some choice over what aspects of the subject to concentrate on in courses”) was an outlier among variables. We decided to remove TLE02 and repeated the exploratory factor analysis. This time, the eigenvalue for the sixth factor was .982 while the scree plot still supported retention of either four or six factors. We retained six factors, which produced a clear factor solution (see Table 1). TLE14 still loaded with items representing *staff enthusiasm and support*, which makes sense because TLE14 addresses perceptions of teachers.

Table 2 about here

Exploratory factor analysis, thus, suggested a revision of the originally hypothesized model in which TLE02 was removed and TLE14 was allowed to represent the factor reflecting *staff enthusiasm and support*. This revised model (see Figure 2) was subjected to CFA using the validation dataset (n = 2,169). The chi statistic ($\chi^2 = 1588.5$, df = 174, $p < .001$) still indicated poor fit; however, other fit indices (CFI = .912, TLI = .893, RMSEA = .061, SRMR = .050) overall suggested that the revised model fitted the data reasonably well.

Six scales were computed using the validation dataset and the scales’ properties were examined (see Table 3). Overall, measures of internal reliability were acceptable.

For the *peer support* scale, however, $\alpha < .70$ and skewness close to 1 indicated potential problems concerning internal reliability and non-normality.

Table 3 about here

Scale Intercorrelations

Based on the computed scales, a series of correlation analyses were conducted to examine the second research question concerning the instrument’s convergent validity. Table 4 shows the bivariate correlations between the three scales measuring approaches to learning and the six scales measuring perceptions of the teaching-learning environment. Strong correlation between the six teaching-learning environment scales could be observed, and these scales correlated positively with the deep approach and organised effort scales and negatively with the surface approach scale. Also, the surface approach scale was negatively correlated with the organised effort and deep approach scales.

Table 4 about here

Approaches to learning and academic achievement

To answer the third research question concerning criterion validity, three bivariate correlation analyses were conducted. These showed that the GPA was positively correlated with the *deep approach* ($r[2143] = .106, p < .001$) and *organised effort*

($r[2143] = .142, p < .001$) scales and negatively correlated with the *surface approach* scale ($r[2143] = -.272, p < .001$).

Differentiation between Educational Programmes

Finally, to examine the instrument's discriminatory validity we examined to which extent distinct educational programmes would score differently on the six scales measuring the students' experiences of the teaching-learning environment. Analysis of variance showed that programmes differed on the following scales: *interest and relevance* ($F[38, 2121] = 3.64, p < .001, \eta^2 = .061$), *peer support* ($F[38, 2121] = 3.02, p < .001, \eta^2 = .051$), *staff enthusiasm* ($F[38, 2120] = 4.43, p < .001, \eta^2 = .074$), *teaching for understanding* ($F[38, 2016] = 6.55, p < .001, \eta^2 = .105$), *alignment* ($F[38, 2121] = 3.82, p < .001, \eta^2 = .064$), and *constructive feedback* ($F[38, 2113] = 7.18, p < .001, \eta^2 = .114$).

Discussion

In this study, two sections of the Learn questionnaire measuring students' perceptions of the teaching-learning environment and their approaches to learning were used in a sample of Danish university students. The purpose was to examine the validity of the Danish translation of Learn as an instrument to measure key aspects of the teaching-learning environment as well as qualitative aspects of students' approaches to learning.

The analyses of items reflecting approaches to learning showed that the hypothesized model with three dimensions (deep, surface and organised studying) seemed to fit the Danish data well; especially, when allowing covariance between the error terms for two items (SAL11 and SAL12). Both items are part of the *deep approach*

scale and measure students' intention to relate new material with already known information. The reason for these two items acting a bit differently than the other two items measuring deep approach to learning can be found from previous research, which suggested the division of the deep approach to learning into intentional and strategy components respectively (Parpala et al., 2013; Rytönen, Parpala, Lindblom-Ylänne, Virtanen, & Postareff, 2012; Vanthournout, Coertjens, Gijbels, Donche, & Van Petegem, 2013). In their research, Parpala et al. (2013) found that the *intention* to understand and the *process* of deep approach appeared to be separate factors. Parpala (2010) suggests that because Finnish university students are a selected group and aim to understand the subject matter, they do not easily disagree with the statements asking about their intention to understand. Thus, the *intention to understand* forms a separate factor in the data concerning Finnish students. The Learn questionnaire has been revised according to the research by Parpala (2010) and Parpala and her colleagues (2013) and the *intention to understand* scale has been removed. However, the intention is still explicitly included in the items measuring students' intention to relate prior knowledge in the new learning material by using the formulation of "I try". The present study indicates that asking about Danish students' intention to relate new material and course contents into each other might still be a problematic task as it may be very difficult for a university student to disagree with the statements asking about their intentions. Thus, the items measuring deep approach might form a more coherent scale if they would not measure explicitly intentions but students' actual processes without using the word "try". The deep approach, after all, refers to students' intention to analyse and understand information through relating ideas and using evidence, so the intention is implicit in the items. The

present study suggests the deletion of the word “try” (Danish: “forsøger”) in the items measuring deep approach to learning.

With respect to the students’ experiences, analyses showed that two items measuring students’ experiences of the teaching-learning environment were potentially problematic. Item TLE02 (“We are allowed some choice over what aspects of the subjects to concentrate on in courses”) did poorly fit the hypothesized model and the exploratory factor analysis suggested TLE02 to be an outlier among variables. This might be due to the fact that students’ freedom in choosing what aspects to study within a course is fairly limited, especially at the undergraduate level. Item TLE14 (“The teachers help us to see how we are supposed to think and reach conclusions in this subject”) was expected to load with the *teaching for understanding* scale. However, we found that model fit indices improved significantly if TLE14 was instead allowed to load with *staff enthusiasm and support*. Interestingly, the same finding appeared in the sample of British students but not in the context of Finnish higher education (Parpala et al., 2013).

Bearing these modifications in mind, the Danish version of Learn fared quite well concerning evidence of validity (Abell et al., 2009). Satisfactory Cronbach’s alpha values suggest that the scales are internally consistent and that the instrument is reliable. Analyses showing reasonable fit between the expected models and data in the validation sample support factorial validity. Convergent validity is supported by the finding that positive experiences of the teaching-learning environment were positively related with deep approaches to learning and negatively with surface approaches to learning as would be expected from previous research. Results showing systematic differences between educational programmes regarding mean scores on scales measuring students’ perceptions of the teaching-learning environment support discriminatory validity.

Criterion validity is supported by the result that students' academic achievement (evaluated by external data) correlated with students' self-reported approaches to learning, although not very strongly. This finding is convergent with meta-analyses showing weak but positive correlation between academic achievement and deep approaches to learning and organised study respectively and negative correlation between academic achievement and surface approach to learning (Watkins, 2001; Richardson, Abraham, & Bond, 2012). Moreover, face validity was taken into account by using focus groups to critically evaluate the translations of the Danish version.

Still, limitations that invite further development of the Danish version of Learn should be noted. The number of items has been kept at a minimum to ease administration of the survey; however, this might be at the price of content validity. For example, compared to the ETLQ and similar surveys of approaches to learning, items reflecting the intentions underlying students' approaches to learning have been omitted. Furthermore, the questionnaire has only been tested within disciplines relating to business and social sciences, and although these encompass a large variety of disciplines, the questionnaire should be tested in the natural and health sciences also. Finally, as noted in the methods section, high-achieving, female and young students were overrepresented in the sample. Thus, further research could examine measurement-invariance (Abell et al., 2009) concerning age, gender, and level of achievement, that is, examine whether Learn and its items are interpreted in a conceptually similar manner by respondents representing specific groups of students.

Conclusion

Taken together, the results suggest that the Danish version of Learn with minor revisions can be used as a valid instrument for evaluation of the teaching-learning environment as well as for research into Danish university students' approaches to learning and perceptions of the teaching-learning environment. As the instrument has been used already in many different countries, there is a chance that the information gathered with the Learn instrument is comparable, which enables the comparison of the teaching-learning environments across different countries. Moreover, the different faculties at the University of Helsinki have used the instrument not only for research purposes but in their quality work and in student counselling (Parpala & Lindblom-Ylänne, 2012). Based on their answers, students receive personal feedback on their approaches to learning as well as guidance for enhancing their learning skills. Thus, Learn can also be used as a practical quality tool at the universities.

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Appendix

Table 5 here

Table 1

Descriptive Statistics for Scales reflecting Students' Approaches to Learning

	Items	<i>M</i>	<i>SD</i>	Skewn.	Kurtosis	α
Deep approach	SAL(5, 6, 11, 12)	3.59	0.70	-0.41	0.41	.733
Surface approach	SAL(1, 3, 7, 9)	2.57	0.78	0.42	-0.25	.771
Organised effort	SAL(2, 4, 8, 10)	3.52	0.83	-0.44	-0.24	.773

Note. Range for all scales is 1-5. N (validation dataset) = 2,169

Table 2

Pattern Matrix of the Loadings for the Six-Factor Solution for the 21 Items describing Students' Perceptions of the Teaching-Learning Environment (Maximum Likelihood Extraction, Promax Rotation)

Item (short label)	F1	F2	F3	F4	F5	F6
TLE20 Feedback improves learning	.905					
TLE22 Feedback clarifies difficulty	.877					
TLE17 Feedback is sufficient	.542					
TLE21 Set work helps connecting	.463					
TLE01 Clear what is expected		.715				
TLE03 Teaching matches goals		.710				
TLE19 Set work matches goals		.663				
TLE18 Clear what is assessed		.658				
TLE09 Most is interesting			.825			
TLE04 Can see relevance			.685			
TLE13 Enjoy courses			.446			
TLE06 Think about evidence				.920		
TLE05 Sense of research area				.715		
TLE07 Encourages to relate				.398		
TLE12 Teachers patient					.839	
TLE14 Teachers model thinking					.609	
TLE10 Teachers share enthusiasm					.583	
TLE16 Opportunity to discuss					.466	
TLE15 Comfortable with peers						.766
TLE11 Collaboration is productive						.572
TLE08 Can get help and support						.505
Rotation SSL	4.295	4.928	3.915	3.227	4.999	2.649

Note. Loadings below .32 have been omitted for ease of interpretation.

Table 3

Descriptive Statistics for Scales reflecting Perceptions of the Teaching-Learning Environment

	Items	<i>M</i>	<i>SD</i>	Skewn.	Kurtosis	α
Interest and relevance	TLE(4, 9, 13)	3.95	0.64	-0.88	1.45	.718
Peer support	TLE(8, 11, 15)	4.17	0.64	-0.99	1.52	.655
Staff enthusiasm and support	TLE(10, 12, 14, 16)	3.66	0.71	-0.60	0.48	.753
Teaching for understanding	TLE(5, 6, 7)	3.72	0.74	-0.52	0.26	.701
Alignment	TLE(1, 3, 18, 19)	3.63	0.70	-0.76	0.58	.768
Constructive feedback	TLE(17, 20, 21, 22)	3.33	0.86	-0.50	0.02	.812

Note. Range for all scales is 1-5. N (validation dataset) varies between 2,161 and 2,169 due to missing values.

Table 4

Bivariate Correlation Coefficients (Pearson's r) between Scales

	1	2	3	4	5	6	7	8	9
1. Deep app.									
2. Surface app.	-.273*								
3 Organised eff.	.265*	0.020							
4. Interest and rel.	.326*	-.368*	.238*						
5. Peer support	.097*	-.134*	.170*	.362*					
6. Staff enthusiasm	.269*	-.312*	.082*	.523*	.357*				
7. Teaching f. und.	.317*	-.247*	.136*	.448*	.268*	.494*			
8. Alignment	.220*	-.293*	.102*	.429*	.292*	.536*	.367*		
9. Constr. feedback	.187*	-.142*	.095*	.318*	.267*	.493*	.312*	.531*	

Note. The level of significance (* $p < .001$) was obtained after Bonferroni adjustment ($.050 / 81 = .0006$). N (validation dataset) varies between 2,161 and 2,169 due to missing values.

Table 5

Questionnaire items in the Danish version of Learn

Item	English	Danish
TLE01	It is clear to me what I am expected to learn in courses.	Jeg er klar over, hvad jeg forventes at lære i fagene.
TLE02	We are allowed some choice over what aspects of the subject to concentrate on in courses.	Vi har medindflydelse på, hvilke aspekter af emnet der skal lægges vægt på i fagene.
TLE03	What we are taught seems to match what we are supposed to learn.	Der er sammenhæng mellem det, vi undervises i, og det, vi forventes at lære.
TLE04	I can see the relevance of most of what we are taught.	Jeg synes, at det vi lærer, er relevant.
TLE05	The courses have given me a good sense of the development and newest research in this subject area.	Fagene har givet mig en fornemmelse af, hvordan forskere på dette fagområde arbejder.
TLE06	The teaching helps me to think about the evidence underpinning different scientific views.	Undervisningen hjælper mig til at kunne vurdere hvad der ligger bag forskellige videnskabelige synspunkter.
TLE07	The teaching encourages me to relate what I learned to issues in a wider context.	Undervisningen tilskynder mig til at sætte det, jeg har lært, ind i en større sammenhæng.
TLE08	I can receive help and support from my fellow students when I need it.	Jeg kan få hjælp og støtte fra mine medstuderende, når jeg har brug for det.
TLE09	I find most of what I have learned in courses really interesting.	Jeg syntes, at det meste af det, jeg har lært i fagene, er meget interessant.
TLE10	Teachers try to share their enthusiasm about the subject with us.	Underviserne forsøger at dele deres entusiasme for faget med os.
TLE11	Discussions with fellow students helps me to better my understanding.	Det fremmer min forståelse at tale med andre studerende.
TLE12	The teachers patiently explain subjects that the students find difficult to grasp.	Underviserne bruger tid på at forklare os de ting, vi har svært ved at forstå.
TLE13	I enjoy participating in courses.	Jeg kan lide at deltage i fagene.
TLE14	The teachers help us to see how we are supposed to think and reach conclusions in this subject.	Underviserne hjælper os med at forstå, hvordan man skal tænke og drage konklusioner inden for faget.
TLE15	I can generally work comfortably with other students.	Jeg har det generelt godt med at arbejde sammen med andre studerende.
TLE16	Courses provide plenty of opportunities for me to discuss important ideas and topics.	I undervisningen er der god plads til at diskutere vigtige begreber og emner.
TLE17	I receive a sufficient amount of feedback regarding my effort during the semester.	Jeg modtager tilstrækkelig feedback på mine faglige bidrag i løbet af semesteret.
TLE18	It is clear to me what is expected in the assessed work (i.e. final exam,	Det er tydeligt, hvad der forventes af det arbejde, der skal bedømmes (dvs.

Item	English	Danish
	exercises).	afsluttende eksamener, prøver).
TLE19	It is easy to see a connection between the assignments and what we are supposed to learn.	Jeg kan se sammenhængen mellem det vi bliver bedt om at lave mellem timerne og det, vi skal lære.
TLE20	The feedback I get regarding my work helps me to improve my ways of learning and studying.	Den feedback, jeg får på mine faglige bidrag i løbet af semesteret, forbedrer den måde, jeg lærer og arbejder på.
TLE21	The assignments given during the semester helps me to draw connections between what I am supposed to learn and my existing knowledge or experience.	De aktiviteter vi bliver bedt om at lave hjælper mig til at skabe sammenhæng mellem det jeg skal lære og min forhåndsviden og erfaringer
TLE22	The feedback I get regarding my assignments/work clarifies things I had not fully comprehended.	Den feedback jeg får på mine arbejdsopgaver er med til at gøre det tydeligt, hvad jeg ikke helt har forstået.
SAL01	It is often hard for me to make sense of things I need to learn.	Jeg har tit svært ved at forstå det, jeg skal lære.
SAL02	I put a lot of effort into my studying.	Jeg bruger mange kræfter på mine studier.
SAL03	Much of what I learn is incoherent which means that I cannot connect it to a greater picture.	Jeg synes, at mange af de ting, jeg har lært, er tilfældige og usammenhængende.
SAL04	I am generally systematic and organized in my studies.	Generelt studerer jeg systematisk og velorganiseret.
SAL05	I consider ideas and perspectives presented in different texts (ie. academic articles and teaching material).	Jeg bliver tit grebet af ideer, der præsenteres i undervisningsmaterialet og går og tænker videre over det i min fritid.
SAL06	I look at evidence carefully to reach my own conclusion about what I'm studying.	Jeg sætter mig grundigt ind i argumenterne, så jeg kan drage mine egne konklusioner om det, jeg læser.
SAL07	Topics are presented in such complicated ways I often can't see what is meant.	Emnerne i undervisningen bliver tit præsenteret på en så kompliceret måde, at jeg ikke kan følge med.
SAL08	I organise my study time carefully to make the best use of it.	Jeg planlægger min studiehverdag omhyggeligt for at kunne udnytte tiden bedst muligt.
SAL09	Even though I study some things over and over again to remember them, they do not make sense to me.	Jeg oplever, at ting ikke giver mening for mig, selvom jeg har repeteret dem igen og igen for at huske dem.
SAL10	I have made a plan to ensure that I get through the entire curriculum during the semester.	Jeg har en klar plan, der sikrer, at jeg når hele pensum igennem i løbet af semesteret.
SAL11	I try to relate new material, as I am reading it, to what I already know on that topic.	Jeg forsøger at sammenholde nyt materiale med det, jeg allerede ved om emnet.
SAL12	I try to relate what I have learned in one course to what I learn in other	Jeg forsøger at se sammenhænge mellem det jeg lærer på tværs af

Item	English	Danish
	courses.	fagene.

Figure 2. Perceived academic quality (teaching-learning environment), six-factor model.

→ Final model - - - → Original model

Figure 1. Approaches to learning, three-factor model.