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- Lassesen B. & Jensen T.K. Demographic and Contextual predictors of student approaches to learn and in a large sample of Danish university students. (PAPER 2)
- Lassesen B. & Jensen T.K. Motivational factors as predictors of student approach to learning (PAPER 3)
- Study questionnaire-package

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English summary

Background

Knowledge of how students go about their studies can be valuable for teachers, study counselors, and researchers, and with an increasing societal demand towards effectiveness and competence in higher education, there has been an increased interest in investigating and assessing student learning and study strategies.

Historically, several theoretical positions have dominated the landscape of learning theories: The behaviourist position, cognitive approaches, the information processing position (IP), and the Student Approach to Learning (SAL). SAL, the most recent approach, was developed in attempts to amend various limitations of the previous positions, e.g. the low ecological validity of stimulus-response- and memory-focused cognitive laboratory research, and focuses on academic learning research as the study of the student's construction of meaning carried out in the natural educational settings.

The SAL perspective on students draws upon the Presage, Process, and Product (3P) model suggested by Dunkin and Biddle (1974) and the pioneering studies by Marton and colleagues (Marton and Säljö, 1976a; b). This model focuses on the interrelationship between personal characteristics of the students, the situational constraints in which they find themselves, their approach to learning, and the outcome of learning. Students' perceptions of teaching and learning context are seen as a result of the interaction between their previous experiences of teaching and learning and the context itself.

Marton & Säljö (1976a; b) identified two basic levels of processing: a *surface* and a *deep level*, and subsequent research in the area has consistently confirmed these two broad approaches to learning.

Deep level processing is generally characterized by a “*a genuine preference, and ability, for*

working conceptually rather than with unrelated detail” (Biggs, 2003), and is likely to be promoted by teaching methods promoting critical thinking and meaningful interaction, where students are given the opportunity to challenge and question, and when the learning task is perceived to be relevant to student’s interests. In contrast, *surface level processing* seems more determined by non-academic priorities, insufficient time, high anxiety levels of the students, by an instructional environment unable to bring out the intrinsic structure of the learning material, and by assessment methods rewarding reproduction of information.

Studies of learning approaches and learning outcomes have found Deep Approach to be most consistent with the goals of higher education and to be related to higher quality learning outcomes, while a Surface Approach is usually found associated with lower quality outcomes. Given that learning approaches appear to be highly susceptible to outside influences, especially the learning environment, knowledge about the factors influencing learning approach can assist teachers in developing and implementing teaching strategies that encourage appropriate learning strategies.

Aim of the PhD-project

Factors, which can explain the variance in learning approach of students in Higher Education, have been extensively studied in the international context. The available studies, however, have often been based on relatively small samples and have generally focused on few selected variables. Furthermore, only very little is known about student learning in the Danish University context. The aims of the present PhD-project were therefore: 1) to translate into Danish one of the most widely used instrument assessing students’ approach to learn, the Study Process Questionnaire (SPQ) (Biggs 1987; 2001), and to provide a preliminary test of its reliability and validity in a sample of Danish university students, and 2) to use the instrument to explore the learning approaches of

Danish university students and – following the 3-P model – to identify the major a) *presage factors*, i.e. student background characteristics and institutional and teaching context variables, and b) *motivational factors*, i.e. perception of the teaching environment, self-efficacy, and test-anxiety, which could explain the variance in *Deep* and *Surface learning approach* of Danish university students. Based on a review of the existing, international SAL research, a number of specific hypotheses concerning the associations between various presage and process factors and Deep and Surface Approach were stated and tested.

The methods and results have been described in the three papers included in the present thesis:

- Lassen B. Learning Strategies in a Danish university context - Testing the reliability and validity of the Revised Two-Factor Study Process Questionnaire. (PAPER 1)
- Lassen B, Jensen T.K. Demographic and Contextual predictors of student approaches to learn and in a large sample of Danish university students. (PAPER 2)
- Lassen B, Jensen T.K. Motivational factors as predictors of student approach to learning (PAPER 3)

Summary of methods

A total of 1350 questionnaires were handed out at lectures and seminars to undergraduate (3rd semester) and graduate students (7th and 9th semester) recruited from four major faculties at Aarhus University: Arts, Social Science, Health Science, and Science. A total of 1192 questionnaires were returned (response rate: 88.3%). The 1083 students who had completed all items of the Revised Two-Factor Study Process Questionnaire (R-SPQ-2F) (80.2%) were included in the validation study of the questionnaire (PAPER 1). The 1181 students who had responded to all questionnaires in the questionnaire package (response rate: 87.5 %), but had not necessarily completed all items of

the R-SPQ-2F, were included in the subsequent analyses of the potential presage- and process predictors of Deep and Surface approaches to learn (PAPER 2 and 3).

The *dependent* variables were *Deep* and *Surface* levels of approach to learn (R-SPQ-2F). The *independent* variables explored were student background characteristics and institutional and teaching context variables. The *background* variables included age, gender, socio-economic background measured through parental educational background, High School GPA, their secondary education, current study level, and current GPA. The *context* variables were faculty, the teaching method used in the course they were taking and the assessment methods to be used at the end of the course. In addition, the following *motivational* factors were assessed: Intrinsic and extrinsic motivation to study, academic self-efficacy, test-anxiety, the perception of the current learning environment, and the importance they placed on the learning environment characteristics.

Analyses

The preliminary reliability and validity of the R-SPQ-2F-DA was analyzed with descriptive and reliability statistics (internal consistencies; Cronbach's alpha) and confirmatory factor analyses (CFA), following the analytical steps described by Biggs et al. (2001) for the English-language version of the R-SPQ-2F (PAPER 1). In subsequent studies (PAPER 2 and 3), the predictors of learning approach were analyzed with both unadjusted bivariate and multiple regression analyses with Deep and Surface Approach as dependent variables, adjusting for the other independent variables investigated. In each analysis, the selection of predictor variables and the order in which they were entered in the multiple regression models were based on theoretical grounds, i.e. the 3P model (Biggs, 1987).

Summary of results

PAPER 1: Internal consistencies of the subscales of the Danish R-SPQ-2F were higher or comparable to those reported for the English-language original. CFA suggested moderately acceptable fit at the item-level (CFI= 0.815; SRMR= 0.07; GFI= 0.874) with further analyses indicating the lesser fit to be primarily related to one the subscales: Surface Strategy (SS). A model treating the subscales as indicators of the two latent factors, Deep (DA) and Surface Approach (SA), showed better fit (CFI= 0.927; SRMR=0.05; GFI= 0.952). The results indicated that a 19-item Danish version of the R-SPQ-2F could be used for further analyses with the aim of providing preliminary data for Danish university students.

PAPER 2: Further analyses showed that the main independent presage (background and contextual) predictors of higher scores on Deep Approach to learn were: older age, female gender, higher High School Grades, intrinsic motivation to study, studying at the faculties of Arts and Social Sciences, and small-group seminar as the teaching method. Among the independent predictors of higher Surface Approach scores were: younger age, lower high school grades, studying at the faculties of Health Sciences and Science, lower current GPA, and lectures as teaching method. The final models, however, explained no more than 7% of the variance of Deep Approach and 10% of the variance in Surface Approach.

PAPER 3: In the third study the associations of psychological motivational factors of academic self-efficacy, test-anxiety, and the perception of the teaching environment and the perceived importance of the teaching environment with Deep and Surface Approach were explored while controlling for the previously investigated were examined, where the results showed that each of the student motivational factors of self-efficacy, test-anxiety, and perception and importance of the teaching

environment were strong independent predictors of students approach to learning, even when taking other motivational, background, and institutional factors into consideration. When adding the motivational factors to the models, the explanatory power was increased considerably to 28% of the variance in Deep and 21% of Surface Approach.

Discussion and conclusions

First, the results indicated that the Danish version of the R-SPQ-2F could be used for further analyses, and the results of the subsequent analyses supported the validity of the instrument in a Danish context. However, the results also suggested that further adjustments, primarily of the Surface Strategy (SS) subscale, are needed to establish a suitable version of the SPQ for Danish university students.

Second, several of the results were consistent with reported findings in the international literature on SAL; mainly that Deep Approach was associated with older age, higher HSGAP, current GPA, intrinsic motivation to study, and studying subjects associated with “soft” sciences such as the Arts. Furthermore, the results confirmed that the contextual factor of small-group teaching methods, e.g. seminars or lectures in combination with seminars, was associated with greater tendencies to use Deep approaches to learning. Somewhat surprisingly, assessment methods did not emerge as an independent significant predictor when adjusting for the remaining factors, which could be due to shared variance or interactions with some of the other factors, e.g. faculty and teaching method. Likewise, results previously found for Surface Approach were also generally confirmed. Taken together, the results indicated that the background and contextual factors only explained a relatively modest proportion of the variance in students approach to learn, suggesting that other factors, e.g. more direct motivational factors, could be relevant to explore.

Third, that motivational factors could add to our understanding of SAL was confirmed by the findings that academic self-efficacy, test anxiety, and the perception and importance of the learning environment were important predictors of approach to learn, adding considerably to the explanatory power of the models. Although successful learning largely depends on knowledge and skills, motivational factors such as self efficacy and test anxiety also play an important role as predictors of students' learning approaches, and subsequent learning outcomes. The results also indicated that perceiving the learning environment as stimulating problem solving, scientific thinking, and exam preparation in concordance with a Deep Approach to learning was an equally important predictor as self-efficacy.

Strengths and limitations

To this author's knowledge, SAL has not previously been explored in the Danish university context, and the results thus add to the cross-cultural validation of both SAL as a model of learning and the SPQ as an instrument to assess SAL. The present study has several *strengths*. First, the majority of previous studies have used relatively small samples of convenience and have frequently only included relatively few predictors in each study, which means that the associations between the predictors and SAL have rarely been adjusted for other - potentially confounding - factors. In the present study it was attempted to amend these weaknesses by including one of the largest samples in this area of research with students at different study levels from several faculties representing both "soft" and "hard" disciplines, thereby increasing the representativity of the sample. Second, the large sample allowed for statistical adjustment for several relevant factors using a multivariate approach, enabling comparison of unadjusted bivariate associations with results adjusting for the remaining factors investigated. Our results thus support several previous findings, which mainly

have been explored in studies based on relatively small samples and focusing on a few selected variables. Third, the empirical evidence concerning the influence of expectancy and affective motivational components on study behavior is so far very limited, and the model of learning was therefore expanded in the present study to include these motivational variables while adjusting for other factors known to influence student approaches to learning. Finally, attempts were made to ascertain that the main instrument to measure the dependent variable, the R-SPQ-2F, was translated following the general recommendations for cross-cultural adaptation, tested in a pilot study, and its psychometric properties explored with the appropriate methods, e.g. confirmatory factor analysis prior to the analyses of the final dataset.

In spite of the strengths described above, a number of potential challenges and limitations of the present study should also be noted. First, while the number of participants is large, we cannot be certain that the sample is sufficiently representative, as all students were from Aarhus University. Second, while the overall response rate of 88.3% can indeed be considered highly satisfactory, the total number of students at the master level included was somewhat smaller than originally intended, which could affect the statistical power to detect differences associated with study level. Third, a potential limitation of the present study is the quantitative questionnaire-based methodology used. Quantitative methods imply reductionism, and the explanatory power could of course be challenged if the suggested model, as it is operationalized in the SPQ, does not sufficiently capture the fundamental nature of the factors related to SAL. Finally, while the SPQ has been used in a large number of international studies, it had not previously been used in a Danish context, and evidence for the reliability and validity of the Danish adaptation is still not fully available, as indicated by the less than satisfactory results for the Surface subscales, in particular the SS-subscale.

Conclusion and perspectives

Students' approaches to learning (SAL) vary. Deep Approach, i.e. studying to develop personal understanding, has been found to correspond more to the requirements in higher education than Surface Approach, i.e. studying with the purpose of reproducing knowledge at a later time. Similar teaching and learning environments are not experienced in a similar way by the students attending, and teachers as well as administrators in higher education should be aware of factors that may either promote or hinder students in actively engagement and development of their own individual understanding of what is being learned.

While being significant independent predictors, factors that can be influenced through recruitment, e.g. age, gender, HSGPA, study choice motivation, and previous educational experience, were only relatively weak predictors of SAL. The results indicate that although there seems to be good reason to continue the current admission requirements, it is also important that students have a genuine interest for the subject they have chosen.

Among the more salient predictors were teaching methods and – most prominently – motivational factors such as academic self-efficacy, test anxiety, and perception of the teaching environment as promoting deep approaches to learn. The results thus indicate that the learning environment and learning objectives, the student's perception of these, and the perceived capacity to succeed at the task in question are potential important variables through their effects on student motivation and learning, regardless of the remaining demographic, institutional, and contextual variables. Therefore it is essential to facilitate active student collaborating, problem solving learning activities in which students are given the opportunity to regulate their own learning activities and form their own

opinion of what is being learned. Learning practices should as far as possible go beyond trivia and simple memorizing for examinations.

Although it could benefit from adjustments, the availability of an instrument such as a Danish version of the R-SPQ-2F creates opportunity for 1) further examination of the quality of the learning activities in the university context, 2) raising students' awareness of their own approach to learning and 3) investigating the impact of training and of changes in the teaching-learning system.

Dansk sammenfatning

Baggrund

Universiteterne står aktuelt overfor en pædagogisk udfordring. De studerende på de videregående uddannelser udgør en stadig mere uensartet gruppe. Heterogeniteten skyldes flere forhold. Dels har de studerende meget forskelligartede sociale baggrunde, og dels møder de op med meget forskellige faglige forudsætninger på grund af den brede vifte af adgangskriterier. Udviklingen medfører store krav til institutionerne og de universitetspædagogiske udviklingsenheder i form af at kunne bidrage med evalueringer af undervisningens kvalitet og årsager til frafald. Ligeledes vil viden om hvilke forhold der har betydning for og stimulerer og motiverer de studerende til hensigtsmæssig læringsadfærd, herunder forventninger til uddannelse, undervisning og undervisere på universiteterne, således være værdifuld for såvel undervisere, som studievejledere og forskere.

Det læringsteoretiske landskab været domineret af flere positioner: Fra behavioristiske over kognitionspsykologiske til konstruktivisme hvoraf den seneste udvikling - den såkaldte Student Approach to Learn (SAL) tilgang udspringer. På baggrund af begrænsninger ved de tidligere positioner, fx den begrænsede økologiske validitet som karakteriserer stimulus-respons-teorier og hukommelses-fokuserede kognitive laboratorieundersøgelser fokuserer SAL i modsætning til de førnævnte tilgange på akademisk læring og kompleksiteten i de kognitive læringsprocesser og de studerendes konstruktion af mening, således som den foregår i de faktiske undervisningsmiljøer. SAL bygger på de banebrydende undersøgelser af Marton og kolleger (Marton og Säljö, 1976a, b; Svensson, 1977; Fransson, 1977) og den såkaldte 3-P-model (Presage, Process and Product) (Biggs, 1985; 1987; 1989; 1999), foreslået af Dunkin og Biddle (1974). Modellen fokuserer på sammenhænge mellem de studerendes personlige karakteristika og

tidligere erfaringer med undervisning og læring, de situationsbestemte forhold som karakteriserer læringssituationen (f.eks. undervisnings- og eksamensform), de studerendes valg af læringsstrategi i relation til oplevede læringskrav og resultatet af læringsprocessen.

Marton & Säljö (1976a; b) identificerede to grundlæggende processerings-niveauer for læring: et overflade- og et dybdelæringsniveau, og den efterfølgende forskning på området har gennemgående bekræftet disse to tilgange til læring. Dybdelæring er generelt karakteriseret ved en "en ægte præference for, og evne til, at arbejde konceptuelt snarere end med isoleret detail-viden" (Biggs, 2003), og antages at fremmes af undervisningsmetoder, der fokuserer på involverende undervisning, der opfordrer til - og stimulerer kritisk tænkning, hvor de studerende får mulighed for at udfordre den præsenterede viden og stille spørgsmål, og af læringsopgaver der opleves som relevante og vedkommende for de studerende. I modsætning hertil synes overfladelæring i højere grad at være bestemt af ikke-akademiske prioriteringer, et undervisningsmiljø der er ude af stand til at fremstille den indre struktur i det anvendte undervisningsmateriale, tidspres i undervisningen og eksamensformer, der belønner reproduktion og fremmer et højt angstniveau hos den studerende. Forskning i sammenhængen mellem læringsstrategier og læringsudbyttet i de videregående uddannelser viser, at resultatet af de studerendes læring hænger sammen med *hvordan* de lærer. Dybdelærings-strategier er forbundet med læringsresultater af højere kvalitet, mens overfladelærings-strategier ofte er forbundet med læringsresultater af lavere kvalitet. Læringsstrategier er reaktioner på det undervisningsmiljø, de studerende lærer i; dette ligger i begrebets relationelle natur (Ramsden, 1992). For at kunne støtte undervisere i at udvikle og gennemføre undervisningsformer, der tilskynder og stimulerer de ønskede lærings aktiviteter, er det nødvendigt at opnå viden om de faktorer, der påvirker de studerendes læringsstrategier.

Formålet med PhD-projektet

Faktorer, som kan forklare variationen i læringsstrategier blandt studerende på de videregående uddannelser, er velundersøgt i international sammenhæng. De foreliggende undersøgelser har dog ofte været baseret på relativt små stikprøver og har generelt fokuseret på nogle få udvalgte variable. I den danske universitetskontekst har man derimod relativt begrænset viden om hvilke faktorer, der har betydning for de studerendes læring. Formålet med herværende PhD-projekt var derfor: 1) at oversætte et af de mest udbredte instrumenter til vurdering af de studerendes læringsstrategi, the Study Process Questionnaire (SPQ) (Biggs 1987; 2001), til dansk og at gennemføre en foreløbig vurdering af instrumentets pålidelighed og validitet i en større gruppe af danske universitetsstuderende, og 2) at anvende dette instrument til at udforske læringsstrategier blandt danske universitetsstuderende og i denne forbindelse, med udgangspunkt i 3-P-modellen, at identificere de væsentligste prædiktorer for de studerendes valg af læringsstrategi, herunder: a) de studerendes baggrundskarakteristika samt de institutionelle og undervisningskontekstuelle baggrundvariable, og b) centrale motivationelle faktorer, herunder de studerendes oplevelse af undervisningsmiljøet, akademisk self-efficacy, og eksamens-angst (test anxiety). Baseret på en gennemgang af resultater fra den eksisterende internationale SAL-forskning opstilledes en række specifikke hypoteser vedrørende sammenhænge mellem forskellige faktorer i 3-P-modellen og de studerendes tendens til hhv. dybde- og overfladelæring.

De anvendte metoder og opnåede resultater er beskrevet i de tre artikler, som indgår i nærværende afhandling:

- Lassesen B. Learning Strategies in a Danish university context - Testing the reliability and validity of the Revised Two-Factor Study Process Questionnaire. (PAPER 1)
- Lassesen B, Jensen T.K. Demographic and Contextual predictors of student approaches to learn and in a large sample of Danish university students. (PAPER 2)
- Lassesen B, Jensen T.K. Motivational factors as predictors of student approach to learning (PAPER 3)

Sammenfatning af de anvendte metoder

I alt 1350 spørgeskemaer blev uddelt ved forelæsninger og seminarer til bachelorstuderende (3. semester) og kandidatstuderende (7. og 9. semester) rekrutteret fra fire fakulteter ved Aarhus Universitet: Humaniora (Arts), Samfundsvidenskab (Business and Social Sciences), Sundhedsvidenskab (Health) og Naturvidenskab (Science and Technology). I alt 1192 spørgeskemaer blev returneret (svarprocent: 88,3 %). De 1083 studerende, der havde besvaret alle spørgsmål i den oversatte reviderede SPQ (R-SPQ-2F) (80,2 %), blev inkluderet i valideringsundersøgelsen af spørgeskemaet (PAPER 1). I alt 1181 studerende, som havde besvaret alle spørgeskemaer i spørgeskemapakken (svarprocent: 87,5 %), men som ikke nødvendigvis havde besvaret alle spørgsmål i de enkelte spørgeskemaer, herunder R-SPQ-2F, blev inkluderet i den efterfølgende analyse af de potentielle prædiktorer af dybde- og overfladelæringsstrategier (PAPER 2 og 3).

De afhængige variable var hhv. dybde- og overfladelæring (R-SPQ-2F). De uafhængige variable var de studerendes baggrundsfaktorer samt institutionelle og undervisningsrelaterede kontekstvariable. De undersøgte baggrundsvariable omfattede bl.a.: 1) alder, 2) køn, 3) social baggrund (målt ved forældrenes uddannelsesmæssige baggrund), 4) den selvrapporterede adgangsgivende

studentereksamenskarakter, 5) deres adgangsgivende uddannelse (f.eks. gymnasium, HF, HTX etc.), 6) deres aktuelle studietrin (Bachelor vs. Kandidat) og 7) selvrapporterede nuværende karaktergennemsnit på studiet. De undersøgte kontekstvariable var: 1) fakultet, 2) studietrin 3) undervisningsmetode (seminar, forelæsning m.v.) der blev anvendt på det fag, de blev anmodet om at udfylde R-SPQ-2F på baggrund af og 4) den eksamensform, som ville blive anvendt ved afslutningen af det pågældende fag (f.eks. kort skriftlig eksamen (f.eks. 3, 6, 27 timer), skriftlig hjemmeopgave, mundtlig eksamen etc.). Derudover blev følgende motivationsfaktorer undersøgt: Indre og ydre motivation for deres studievalg, akademisk self-efficacy, eksamens-angst, oplevelsen af de aktuelle undervisningsaktiviteter på det pågældende fag var for dem og betydningen af dette.

Analyser

Den foreløbige reliabilitet og validitet af den danske oversættelse af R-SPQ-2F blev undersøgt med deskriptiv statistik, reliabilitetsanalyser (intern reliabilitet: Cronbach's Alpha) og konfirmatorisk faktor-analyse (CFA) under anvendelse af de analytiske trin, som er beskrevet af Biggs et al. (2001) for den oprindelige engelsksprogede version af R-SPQ-2F (PAPER 1). I de efterfølgende undersøgelser (PAPER 2 og 3), blev prædiktorer for dybde- og overfladelæring analyseret med ikke-korrigerede bivariate regressionsanalyser samt multiple hierarkiske regressionsanalyser med dybde- og overfladelæring som afhængige variable - justeret for de øvrige uafhængige undersøgte variable. I hver analyse blev udvælgelsen af prædiktorvariable og den rækkefølge hvori de blev optaget i de multiple hierarkiske regressionsmodeller foretaget på baggrund af teorien, dvs. 3P-modellen (Biggs, 1987).

Sammenfatning af resultater

PAPER 1: Den interne reliabilitet for den danske version af R-SPQ-2F var højere eller sammenlignelig med resultaterne for den engelsksprogede originalversion. Den konfirmatoriske faktoranalyse (CFA) indikerede et moderat acceptabelt fit på item-niveau (Fit-indices: CFI = 0,815; SRMR = 0,07; GFI = 0,874). Efterfølgende analyser pegede på, at det mindre tilfredsstillende fit var primært relateret til den ene af to subskalaer for overfladelæring: Surface Strategy (SS). En model, der anvendte de enkelte subskalaer som indikatorer for de to latente faktorer (Deep og Surface Approach), viste et bedre fit (CFI = 0,927; SRMR = 0,05; GFI = 0,952). Samlet pegede resultaterne på, at en modificeret 19-item dansk version af R-SPQ-2F kunne anvendes til yderligere undersøgelse af validiteten og mhp. at frembringe præliminære data vedrørende de to overordnede læringsstrategier (dybde- og overfladelæring) for danske universitetsstuderende.

PAPER 2: De efterfølgende analyser viste, at de vigtigste uafhængige baggrunds- og kontekstuelle prædiktorer for højere grad af dybdelæring var følgende: 1) at den studerende var ældre, 2) var kvinde, 3) havde højere studentereksamenskarakter, 4) havde indre-styret motivation for valg af studium, 5) studerede på det humanistiske (Arts) eller det samfundsvidenskabelige (Business and Social Science) fakultet, og 6) at undervisningsformen foregik i mindre grupper (seminarundervisning). Blandt de uafhængige prædiktorer for højere grad af overfladelæring var: 1) yngre alder, 2) lavere studentereksamenskarakter, 3) at studere på den sundhedsvidenskabelige (Health) eller naturvidenskabelige (Science) fakultet, 4) at have lavere selvrapporteret gennemsnitskarakter på studiet, og 5) forelæsning som undervisningsmetode. De samlede statistiske modeller forklarede dog ikke mere end ca. 7 % af variationen af dybdelæring og 10 % af variationen i overfladelæring.

PAPER 3: I det tredje sæt analyser undersøgtes betydningen for dybde- og overfladelæring af en række psykologiske motivationsfaktorer: akademisk self-efficacy, eksamens-angst, og oplevelsen og betydning af undervisningsmiljøet. Der blev samtidig taget højde for de baggrunds- og kontekstfaktorer, som de tidligere analyser havde vist som potentielle prædiktorer for læringsstrategi. Resultaterne viste, at hver af de motivationelle faktorer (self-efficacy, eksamens-angst, og oplevelse og betydning af undervisningsmiljøet) var stærke uafhængige prædiktorer af de studerendes læringsstrategi, selv når der blev taget højde for andre motivationelle, baggrunds- og institutionelle faktorer. Når de motivationelle faktorer blev inddraget i de statistiske modeller, øgedes forklaringsgraden til hhv. 28 % af variationen i dybdelæring og 21 % af variationen i overfladelæring.

Diskussion og konklusion

For det første pegede resultaterne på, at den foreløbige reliabilitet og validitet af den danske version af R-SPQ-2F var acceptabel således, at instrumentet kunne anvendes til yderligere undersøgelser af læringsstrategi blandt danske universitetsstuderende, og resultaterne af de efterfølgende analyser understøttede yderligere validiteten af instrumentet i en dansk kontekst. Dog antydede resultaterne også, at yderligere justeringer, primært af Surface-Strategy (SS) underskalaen, er ønskelige for at etablere en endelig dansk version af SPQ.

For det andet viste flere af resultaterne sig at være i overensstemmelse med en række tidligere rapporterede resultater i den internationale litteratur om SAL, herunder at dybdelæring var forbundet med højere alder, højere adgangskvotient, deres nuværende karaktergennemsnit på studiet, indre- motiveret studievalg, og at være indskrevet på fakulteter, der er forbundet med de

såkaldt "tørre" områder, f.eks. humaniora. Desuden bekræftede resultaterne, at en række kontekstuelle faktorer, herunder undervisning i mindre grupper, f.eks. seminarer eller forelæsninger kombineret med holdundervisning, var forbundet med øget tendens til at anvende dybdelæringsstrategier. Noget overraskende fremstod eksamensformer ikke som en selvstændig signifikant prædiktør af læringsstrategi, når der tages højde for de øvrige faktorer i modellen. Dette kan tænkes at skyldes delt varians eller interaktioner med nogle af de øvrige faktorer, f.eks. fakultet og undervisningsmetode. Tilsvarende blev tidligere fund vedrørende brugen af overfladelæringsstrategier generelt bekræftet. Sammenfattet viste resultaterne, at baggrunds- og kontekstuelle faktorer forklarede en forholdsvis beskeden andel af variationen i de studerendes valg af læringsstrategi, hvilket kunne tyde på, at andre faktorer, fx mere direkte motivationelle faktorer, er af betydning.

For det tredje bekræftede resultaterne denne antagelse. Inddragelse af motivationelle faktorer bidrog væsentlig til modellernes evne til at forklare variationen i SAL, idet akademisk self-efficacy, eksamensangst og oplevelsen af, og betydningen af undervisningsmiljøet var vigtige prædiktører for de studerendes læringsstrategier. Selvom resultatet af læring i høj grad afhænger af viden og evnen til at anvende denne, spiller motivationsfaktorer som self-efficacy og eksamensangst en vigtig rolle som prædiktører for de studerendes læringsstrategier. Resultaterne pegede endvidere på, at oplevelsen af et læringsmiljø, som stimulerer til problemløsning, videnskabelig tænkning, og eksamensforberedelse i overensstemmelse med en dybdelærings-baseret tilgang til læring, var en selvstændig prædiktør på lige fod med self-efficacy.

Styrker og svagheder

Så vidt vides er SAL ikke tidligere blevet udforsket i en dansk universitetskontekst, og de fundne resultater i herværende PhD-projekt bidrager således til en tværkulturel validering af SAL som læringsmodel og til SPQ som et pålideligt og validt instrument til at undersøge SAL. Nærværende undersøgelse har flere styrker. For det første har størstedelen af de tidligere studier af SAL anvendt relativt små stikprøver af studerende og har i mange tilfælde inkluderet relativt få prædiktorer i det enkelte studie, hvilket betyder, at de fundne sammenhænge mellem de undersøgte prædiktorer og SAL sjældent er korrigeret for andre, potentielt konfunderende, faktorer. I den nærværende undersøgelse blev der taget højde for disse metodiske svagheder ved at inddrage et stort antal studerende på forskellige studietrin fra flere fakulteter, der repræsenterer både "tørre" og "våde" fag, for derved at øge repræsentativiteten af stikprøven. For det andet muliggjorde den store stikprøve, at der kunne justeres for betydningen af en række relevante faktorer ved hjælp af multivariate statistiske modeller, der muliggjorde sammenligning af ikke-justerede bivariate sammenhænge med resultater justeret for de øvrige undersøgte faktorer. Vores resultater støtter således flere tidligere fund, som primært er blevet udforsket i undersøgelser baseret på relativt små stikprøver med fokus på få udvalgte variable. For det tredje foreligger der hidtil kun få empiriske undersøgelser af sammenhængen mellem motivationelle faktorer, som self-efficacy og test anxiety og valg af læringsstrategi. I herværende projekt blev modellen udvidet ved at inddrage disse motiverende variable, idet der samtidig blev justeret for andre faktorer, der vides at påvirke studerendes læringsstrategi. Endelig blev det tilstræbt at R-SPQ-2F, som er et af de hyppigst anvendte i international forskning til at måle den afhængige variabel, forud for analyserne af det endelige datasæt blev oversat under hensyn til de generelle anbefalinger for tværkulturel oversættelse, vurderet i en pilotundersøgelse og udforsket mht. dets psykometriske egenskaber ved hjælp af relevante metoder, herunder konfirmatorisk faktoranalyse.

På trods af de ovenfor beskrevne styrker bør en række potentielle udfordringer og begrænsninger i nærværende undersøgelse også bemærkes. For det første: til trods for at antallet af undersøgelsesdeltagere er stort, kan vi ikke være sikre på, at stikprøven er tilstrækkeligt repræsentativ, da alle studerende blev rekrutteret fra Aarhus Universitet. For det andet: selvom den samlede svarprocent på 88,3 % kan betragtes som særdeles tilfredsstillende, var det samlede antal studerende på kandidatniveau noget mindre end oprindeligt planlagt, hvilket kan tænkes at påvirke den statistiske mulighed for at finde eventuelle forskelle relateret til studietrin. For det tredje: en potentiel begrænsning ved den nærværende undersøgelse er den anvendte kvantitative spørgeskema-baserede metode. Kvantitative metoder indebærer uundgåeligt en vis reduktionisme, og forklaringsværdien kan blive svækket, hvis den foreslåede model, således som den er operationaliseret i SPQ, ikke i tilstrækkelig grad indfanger de grundlæggende karakteristika ved SAL. Endelig, mens SPQ har været anvendt i en lang række internationale undersøgelser, har det ikke tidligere været brugt i dansk sammenhæng, og der mangler endnu tilstrækkelig dokumentation for reliabilitet og validitet af den danske version.

Endelig konklusion og perspektiver

De studerendes tilgange til læring (SAL) varierer. *Dybdelæring*, dvs. at studere for at udvikle personlige indsigt og forståelse, har vist sig i højere grad at svare til de krav, der stilles til studerende på de videregående uddannelser, end *overfladelæring*, dvs. at studere med henblik på reproduktion på et senere tidspunkt. Undervisnings- og læringsmiljøer opleves ikke ens af de studerende, og undervisere såvel som administratorer på de videregående uddannelser bør være opmærksom på faktorer, der enten fremmer eller hindrer de studerende i aktivt at engagere sig og i at udvikle deres forståelse af, hvad der undervises i.

Faktorer, der kan påvirkes gennem rekrutteringen, f.eks. de studerendes alder, køn, adgangskvotienter, motivation for valg af studie, og øvrige tidligere uddannelsesmæssige kvalifikationer, var - til trods for at de viste sig at være statistisk signifikante uafhængige prædiktorer - kun relativt svage prædiktorer for SAL. Resultaterne peger på, at selvom der synes at være grund til at fastholde eksamenskarakterer som et adgangskrav, er det også vigtigt, at de studerende har en ægte interesse for faget, de har valgt.

Blandt de mere fremtrædende, men fortsat moderate, prædiktorer for læringsstrategi var de anvendte undervisningsmetoder, først og fremmest undervisning i mindre grupper. De mest fremtrædende prædiktive faktorer var motivationelle: akademisk self-efficacy, eksamensangst og oplevelsen af et undervisningsmiljø som stimulerer dybdelæring. Resultaterne peger således på, at læringsmiljø, læringsmål og den studerendes opfattelse af disse, samt den studerendes oplevede evne til at kunne håndtere den pågældende læringsopgave på en succesfuld måde er potentielle vigtige faktorer via deres betydning for de studerendes motivation og læring, uafhængig af de øvrige undersøgte sociodemografiske, institutionelle og kontekstuelle faktorer. Det fremstår derfor som en vigtig opgave at fremme de studerendes aktive samarbejde og at udvikle problemløsningsorienterede læringsaktiviteter, hvor de studerende får mulighed for at regulere deres egen læringsaktiviteter og danne deres egne opfattelser af, hvad der bliver undervist i. Den universitære læringspraksis bør i videst muligt omfang gå videre end blot at skulle indlære fakta og afprøve disse til eksamen.

STUDENT APPROACH TO LEARNING

An empirical investigation of factors associated with student approach to learning

Berit Lassesen, 2011

1. Foreword

Universities put great effort into helping their students develop their knowledge, skills and competencies. However, the associations between teaching and learning are complex, and understanding the nature of and influencing the process of academic learning present considerable challenges.

The fundamental question of “*how do students learn?*” has been the subject of considerable research. The key processes are different forms of thinking, e.g. searching for understanding, problem solving, creativity, and evaluative learning, and various forms of remembering, including rote learning, identifying patterns, and learning through understanding. Teaching is essentially about helping students to become competent learners in their chosen field of interest. However, because students are not always internally motivated, they sometimes need the *situated motivation* provided by the environmental conditions that the institution represents. Although successful learning largely depends on knowledge and skills, it is obvious that motivational factors such as intrinsic/extrinsic motivation, perception of the learning environment, and the feeling of competence are important factors in determining what is learned and how it is learned. Some wish to pursue an interest while for others the main concern is to progress towards a desired career – others are affected by outside pressures from, for example, family. By improving our understanding of the role of these factors in relation to specific learning tasks, we may improve our ability to create learning environments that provide opportunities for students to experience progress in their learning.

As in many other countries, Danish higher education is currently undergoing many changes, including changes in recruitment, institutional organization, and – even more importantly – in

teaching and assessment methods, with the politically explicit aim of improving standards of university teaching and outcomes. Demands on students are high in relation to their study efficiency and their competencies in showing a good grasp of study requirements. To help students meet these demands, many higher educational institutions in Denmark have in recent years established resources to help departments to develop curricula, course designs, teaching, and assessment methods and to provide teacher training in student learning theory with the aim of improving students' personal involvement in the learning task.

To ensure the success of such interventions, there is a need for evidence-based approaches. While a large number of potential predictors of learning approaches among university students have been extensively studied in the international context, only very little is yet known about student learning in the Danish University context. It is therefore of acute interest to explore factors influencing learning of Danish university students. This was the aim of the research project described in the present thesis.

2. Psychological aspects of learning

The concern about developing “the one grand theory of learning” has been the subject of research by psychologists in the larger part of the last century. While, prior to the 1970’s, remarkably little of this endeavor had spread to university teaching activities (Biggs & Tang, 2007), from the 1970’s and on, the complexity of the interrelationships affecting student learning became more clear (Biggs & Tang, 2007). Several theories and concepts have since been proposed in attempts to explain the process of learning and the ways people acquire skills, and over the years, models of learning have changed radically, with a progression from functionalism and behaviorism, through cognitive theories, to different variations of constructivism (Phillips, 2000 cited by Entwistle & Smith, 2002), situated cognition (Brown, Collins, & Duguid, 1989 cited by Entwistle & Smith, 2002), and cognitive apprenticeship (Lave & Wenger, 1991 cited by Entwistle & Smith, 2002). The early attempts to explain learning were primarily based on laboratory studies, while later ideas to a larger degree depended on empirical data collected in varying natural learning contexts. As it will be argued below, the aims of these concepts were to establish assumptions with high levels of generalizability, and many theories have been developed with the aim to suggest ways of improving the effectiveness of learning within education. They are thus, to some extent, products of their time and influenced both by social and political conditions (Entwistle & Smith, 2002). The following description is by no means exhaustive. First, a brief outline of the development in some central theoretical perspectives of learning will be presented, followed by an overview of the Student Approach to Learn (SAL) theory, which is the focus of the present thesis.

2.1. The behaviorist perspective

The empirical research on learning dates back to 1885 with Ebbinghaus’ pioneering research on memory (Kvale, 1975), and to Wundt and James (Berliner, 2009). Their work had an enormous

impact, because until then, the “mind” had primarily been the domain of philosophy, and their influence inspired the use of scientific research methods in the study of learning, teaching, and curriculum (Berliner, 2009).

In the 20th Century, two paradigms dominated the field of educational psychology: The behaviorist and the cognitive. The *behaviorist* paradigm originated from the work of Pavlov and Thorndike and is perhaps best represented by scientists such as Watson and Skinner. Behaviorism focuses on designing the environment in order to influence behavior, in case learning (Shuell, 1986). The theoretical goal was the prediction and control of the behavior, and it was attempted to describe ‘learning’ in purely environmental terms without attempting to understand the structure of the organism (Entwistle & Smith, 2002). Learning is seen as promoted through various stimuli and the responses to these stimuli - a conditioning process in which feedback (reinforcement) is used to modify behavior in the desired direction (Ertmer & Newby, 1993). Until the 1960’s, almost all research on learning was conducted within a behaviorist framework involving a relatively simple form of understanding learning as embedded in stimuli-response patterns. Most of the research was carried out with animals in the laboratory, and as a result, *comprehension* was rarely studied, even when examining human learning (Shuell, 1986). Behaviorist theories imply that teachers must organize the instructive framework with the purpose of making students respond properly to presented stimuli, and this approach has generally been shown reliable in certain learning situations, e.g. those involving recalling of facts, applying explanations, and performance of specified procedures (Ertmer & Newby, 1993). As a consequence of the behavioral research, learning was viewed as “programmed learning”, which emphasizes the importance of reinforcement (through knowledge of results) and increasing knowledge in small sequential steps. Today, however, it is generally agreed that behaviorist principles are insufficient when it comes to explaining the

acquisition of higher level skills or learning processes that require a greater depth of processing, e.g. language development, problem solving, and critical thinking (Ertmer & Newby, 1993).

2.2. The cognitive perspective

Later decades have therefore been dominated by the *cognitive* paradigm, which encompasses several scenarios ranging from computer-based information-processing to the later socio-constructivist models (Calfee, 2009). The move from behaviorist to cognitive theories indicates a shift from the study of the individual's behavioral responses to environmental stimuli - to the study of the individual's cognitive processes (memory, perception, and problem solving) (Berliner, 2009). Although cognitive psychology was present in the 1930's, the impact of conceptions of learning was limited until the 1960's, when educational psychology began to show an interest for the internal, non-directly observable mental processes such as perception, reasoning, problem solving, conceptualization, planning, and applications (Shuell, 1986). The cognitive conceptions of learning differed from the traditional behaviorist conception of learning in ways that enriched the understanding of how humans acquire new knowledge and how they differ in their ways of doing this. However, the cognitive perspective is comprehensive and the focus in this introduction will be on *information processing* theory and constructivist approaches to learning, as they have both played an important role in the attempts to explain complexity of learning in the academic setting.

From a constructivist perspective, *the individual is no longer viewed as a passive information storage system, but as a self-determining agent who actively selects information from the perceived environment, and who constructs new knowledge in the light of what the learner already knows* (Biggs, 1989, p. 8). Learning is perceived as an active, constructive, and self-directed process in which learners build up internal knowledge representations that are personal interpretations of their

learning experiences. The cognitive orientation emphasized the effects of the structure of the organism and has been evident in research on topics such as meaningful verbal learning (Ausubel, 1962, 1963, cited in Shuell, 1986) and discovery learning (e.g., Bruner, 1957, 1961, cited in Shuell, 1986). Cognitive approaches were considered more appropriate than behaviorist learning theories, especially when it came to explain complex forms of learning, e.g. problem solving or information-processing. Research in human memory attempts to describe how information is processed, coded, and stored, and while these aspects remain important aspects of problem solving, the information processing approach was insufficient to understand a central aspect of problem solving, that is, *how* people understand and represent problems. Although researchers studying cognition recognized that people learn in different ways, relatively little research had attempted to describe *what* students understand (Gibbs, Morgan & Taylor, 1982). As a result, the discipline of educational psychology developed a much wider range of cognitive perspectives, where the pre-dominate focus was upon answering the questions: ‘*how individuals learn?*’ and ‘*what are the implications of this?*’ (Haggis, 2009).

2.3. Development of approaches to learning

A number of the concepts developed by cognitive psychology had implications for the evolution of the Student Approach to Learn perspective. Research on student learning was for many years primarily carried out by experimental psychologists making use of university students as research participants. Although the research was often advanced in its experimental designs, it was often trivial in content, e.g. by the use of “*nonsense syllables or simple prose passages*” (Entwistle & Hounsell, 1979 p. 359). The experimenter’s concern was mainly with such aspects as verbatim recall and evidence of memory decay over time (Entwistle, 1979). The outcome of learning was generally observed in quantitative terms, e.g. measured by the numbers of units remembered when

required. The research presented in the following represents not only a change in research methods, but also in the underlying theoretical assumptions.

2.4. Levels of Processing in student learning

In the field of complex learning, e.g. at university level, educational researchers have generally referred to two fundamentally different ways in how learning may be approached. The distinction reflects the difference suggested by Ausubel (1968) between *meaningful* and *rote learning*, and despite the many differences in theoretical as well as methodological frameworks used by different researchers, the concepts are often described in quite similar terms, for example the concept of *deep* and *shallow* levels of learning suggested by Craik & Lockhart (1972), the terms *serialistic* and *holistic* learning coined by Pask and Scott (1976), the *deep* and *surface* level suggested by Marton and Säljö (1976a), *internalizing* and *utilizing* dimensions conceived by Biggs (1978a; 1984), and the *understanding* and *reproductive* learning suggested by Entwistle, Hanley & Hounsell (1979).

2.4.1. Craik and Lockhart

From an information processing perspective, Craik and Lockhart (1972) proposed the concept of *deep* level processing, which requires access to semantic attributes and is hypothesized to generate a more efficient memory trace, and – in comparison - *shallow* level processing involving analysis of physical attributes of stimuli to explain memory retention (Tickle, 2001). The information processing approach focused on the mechanism of the problem solving process, e.g. the procedures people adopt when handling a task (Laurillard, 1984), and the theory was largely developed on the basis of research of humans in artificial laboratory settings. Newell and Simon (1972, cited in Mayer, 1997) thus developed a characterization of the information processing model based on their

analysis of human problem solving in a study in which they asked people to think out loud while solving specified problems. Four assumptions underlie the levels of processing model (Dyke, Taylor and Boulton-Lewis, 1994 p. 360):

1. *Qualitative different memory traces result from different types of processing – that is, memory is determined by the way which we perceive and process the stimulus*
2. *Increased levels of processing involves longer processing times*
3. *Deeper perceptual processing produces more accessible memory traces. Superficial or sensory processing of stimulus results in a fragile trace with rapid decay rate, whereas deeper, semantic processing results in a more robust memory trace with a slower decay rate.*
4. *Type 1 and Type 2 rehearsal characterize differences in the depth of encoding processes*

Two well-documented findings emerged from this Levels of Processing model. First, rote rehearsal is not an effective learning strategy when recall is required. Second, memory may be facilitated by changing the nature of the encoding process (Dyke et al., 1994). Deeper processing requires access to more semantic aspects, whereas superficial processing involves more physical (e.g. phonetic) aspects of stimuli (Dyke et al., 1994; Tickle, 2001). By showing that encoding was not a simple, straightforward process, the levels of processing model changed the direction of memory research. It explains why some individuals memorize things in a more appropriate manner than others. However, according to McCleod (2007), the model failed to provide a sufficiently detailed account of why deep processing is so effective.

Research methodology as well as the underlying theoretical assumptions regarding student learning changed significantly in the 1970's, and research in learning in higher education evolved with focus

on: a) building a knowledge base about individual student learning (cognitive psychology), and b) development of a particular extension of this approach (approaches to learning) (Haggis, 2009). As pointed out by Tickle (2001), the development of student learning as a distinct research area was a reaction to the finding that the general concepts of learning appeared insufficient to explain learning behavior within an academic environment. In contrast to the previous laboratory-based research, learning research now became a study of the individual construction of meaning in the students themselves carried out in natural settings.

2.5. Conceptions of deep and surface learning

2.5.1. The Gothenburg group

With an acknowledged link to Craik and Lockhart, a similar dichotomy was developed by a group of researchers from Gothenburg (Säljö, 1975; Marton & Säljö, 1976a; b; Svensson, 1977; Fransson, 1977), who applied Craik and Lockhart's (1972) levels of processing theory to a specific learning situation (Duff & McKinstry, 2007). Their focal point was on students' experiences and semantic processing of information in a natural setting at the university level. The development of this "phenomenographic" approach took place some years after the initial work on the epistemological level, but has had an even stronger influence on thinking about student learning, and research from the Gothenburg group signifies not only a shift in research methods but also a change in the assumptions about the nature of learning (Entwistle & Hounsell, 1979). The aim was not merely to describe qualitative differences among individual students in terms of different levels of learning outcome, but also to derive a commensurable description of the levels of processing utilized in student learning (Richardson, 1999). As in Pask and Scott's research (see below), students were involved in active learning by paraphrasing a text, but instead of anticipating the dimensions of

study processes from experimental work in cognitive psychology, qualitative levels of learning were derived from qualitative analysis of students' reports of their own study processes (Biggs, 1979; Entwistle & Waterston, 1988). In a laboratory-type environment, students were instructed to read academic texts and, subsequently, asked to reflect about their experience of handling the task. Two different levels of processing were identified: a *surface* and a *deep* level. What (we) found was that *the students who did not get "the point" failed to do so simply because they were not looking for it (Marton and Säljö, 2005, p. 41)*. In the case of surface level processing, the students directed their attention towards learning the text in itself, i.e. a reproductive type of learning, which forced them to use a rote-learning strategy. In the case of deep-level processing, the student was focused on the intentional content of the learning material. By looking for associations between the text and phenomena in the real world or by looking for relations between the text and its underlying structure, the students tried to understand the meaning. The latter type of learners seemed capable of using their capabilities to make critical judgments, logical conclusions and come up with their own ideas (Marton & Säljö, 1976a; Entwistle, 2005).

As anticipated, a clear association was found between the students' levels of processing and the levels of outcome evident in their recall of the text. Svensson (1976 cited by Marton & Säljö, 2005) combined these two sources of information in making an independent and simultaneous analysis of the same set of data with the same intention: to explain the differences in outcome (Marton & Säljö, 2005). Those exhibiting deep levels of processing achieved the highest levels of outcome, while those demonstrating lower levels of processing reached lower levels of outcome (Richardson, 1999). Marton points out that the student's intention is essential, i.e. what the student intends to accomplish from the task determines the student's approach (deep or surface), which in return affects the level of outcome (Biggs & Rihn, 1984). Furthermore, the distinction between the levels

of processing seemed to be correlated with different conceptions of learning itself. Those who adopted deep level processing indicated that learning “*is something they do*”, whereas those adopting surface level processing indicated that learning “*is something that happens to them*” (Ibid., p. 55).

What distinguished the work of the Gothenburg group was not the subject matter of their research, but the research perspective from which they viewed the topic. By embedding their research in practical activities, the theoretical principles that were developed had a greater ecological validity than those developed primarily in laboratory studies. The research helped clarifying the distinction between the different forms of learning, and as a consequence of this they were able to describe learning in ways, which gave new insights into what learning consists of (Gibbs, Morgan & Taylor, 1982. p. 126). The nature of this relationship was investigated more fully in other research programs, albeit by the use of a different research methodology. Despite the differences in methods and aims, they all had in common the dichotomy between a deep and a surface level of processing (Prosser & Trigwell, 1999).

2.5.2. Pask

At the same time, Pask (1976) also identified a distinction between style and strategy. Using a selection and questioning technique, students were asked to work out the taxonomies of imaginary characters and required to explain the reasons for their inquiring progress. In order to achieve a more detailed understanding of what they have learned, subjects were asked to teach back to the researcher. Errors were pointed out and the subjects were asked to repeat the procedure until a faultless performance was carried out (Tickle, 2001). Using these methods, two general categories of learning strategies were identified: a) a *serialistic* “working-one-step-at-the-time” strategy, that

is, learning, remembering, and recapitulating information in terms of string-like cognitive structures, where items are related by simple data links, and b) a *holistic* strategy, which is driven by an intention to put together a broad picture of understanding. During the teach-back exercise, the “serialists” showed a tendency to test simple predictions in their attempts to identify the categories, while the “holists” demonstrated a capability to test complex hypotheses. In this study, all students were required to reach a form of conceptual understanding, but they still went about it in very different ways. The attempt to obtain both ecological validity by the use of naturalistic learning condition - *and* high internal validity through scientific control - made this contribution unique. The relevance of the findings of a serialist/holist distinction between student learning strategies was demonstrated by the results showing that academic performance was improved when students were taught in manners that reflected their own chosen approach (Tickle, 2001).

2.5.3. Biggs

Working from a cognitive psychology perspective, Biggs criticized the information processing framework for being too narrow and for ignoring the role of contextual factors and student characteristics. The work of Biggs was primarily concerned with the development of an inventory to identify and measure the most important dimensions underlying study behavior and attitudes (Entwistle et al. 1979b p. 369). Despite the differences in methods used, Biggs (1970a; 1976), on the basis of a detailed research of the literature available, identified similar categories of learning. Initially, he characterized these as *internalizing* and *utilizing* approaches to learning, but in the development of these constructs, and in the light of their very close relationship with the concepts proposed by the Swedish group, Biggs (1987) suggested a similar terminology of processing distinguishing between a *surface* level involving ‘*repetition of analyses already carried out*’, and a *deep* level signified by using ‘*a greater semantic or cognitive analysis*’ (Biggs, 1987). However,

according to Biggs, approaches to learning consisted not only of a learning *strategy*, but also of a learning *motive*, with the two in combination constituting the learning *approach*. Motive signifies the reasons why students undertake the study, while strategy refers to the methods employed by the students to obtain their goal or fulfill their motivation for studying. Each motive-and-strategy-combination characterizes a distinct approach to learning (ibid). In addition, Biggs (1987) also identified a third approach, which was characterized by the desire to “*publicly manifest one’s excellence*” (Ibid. p. 12), as some students appeared to be particularly motivated by *achieving* high grades and therefore organized their work in a way they believe to best accommodate the assessment criteria. The surface strategy is expected to “*lead to accurate but un-integrated recall of details*”; the deep strategy to the “*greatest structural complexity*”, while the use of flexible strategy is expected to “*lead to whatever goals the student sees as most pertinent to high grades*” (Ibid. p. 12). It is important to notice that the achieving approach differs in a significant way from Deep and Surface Approach in that it refers to the way students organize their work, while the two other approaches describe ways in which the student engage the context of the task itself (Biggs, 1987).

2.5.4. Entwistle

Another important contribution came from the Lancaster group in UK. Also drawing upon the work of Marton and Säljö and the psychology of individual student differences, Entwistle and colleagues (E.g. 1988; 1991; 1997; Entwistle & Entwistle 1991; Entwistle, Hanley & Hounsell, 1979; Entwistle & Waterstone, 1988; Entwistle & Tait, 1990 cited by Jones 2001) by the use of interviews developed a questionnaire and found corresponding levels of processing. Like Biggs (Jones, 2002), they considered the intention of learning (motive) and the process of learning (strategy) as central factors (Jones, 2001). However, according to Entwistle and colleagues (1979 b), Marton’s term “processing” lead to some confusion, as it covered differences in the learning related both to the

learner's intention and the learning process in itself. The coexistence of intention and process suggested that the categories might better be described as *approaches to learning* implying different ways of interpreting the requirements of the task (Entwistle & McCune, 2004). Based on interviews focusing on the experience of studying, they found deep and surface approaches were apparent across differing tasks, suggesting that these approaches had developed into relatively consistent study habits. Yet, students indicated that their approaches varied, depending on the course and the lecturer. In everyday contexts, assessment strongly affects studying, and so an additional category was introduced, namely a *strategic approach to studying* (as opposed to learning) (ibid. p 329).

The Student Approach to Learning (SAL) position is distinct from earlier concepts of learning by drawing attention to the *context* in which learning occurs. The research was motivated by the need to understand the students' perspectives, which distinguishes it from other forms of educational research. Furthermore, instead of signifying a pre-determined theoretical stand on approaches to learning and examine whether these are confirmed, researchers initially gathered information from students in order to understand the *process* of learning (the qualitative differences in levels of processing and reasons for these differences). The distinction in the ways students handled the learning task was captured in the terms *deep* and *surface* approaches to learning, and has since proven valuable in building models of teaching and learning. Entwistle and Biggs both considered the process of learning (strategy) as well as the intention of learning (motive) to be important, whereas Marton and Säljö (1976 a; b) were more concentrated on the learning strategies (Jones, 2002). The question of variability versus consistency came very much to the forefront in the 1970's (Entwistle et al. 1979). While Marton (1976) argued for task specificity, Svensson (1977) found evidence of consistency. Laurillard (1978 cited in Entwistle et al. 1979 b) showed differences in approaches to tasks drawn from the same subject area. Later research, however, has confirmed that

students' approaches to learning are changeable in response to the learning situation, and as a reflection of variations in students' motives for learning (Entwistle & Tait 1990; Ramsden, 1984; Trigwell & Prosser, 1991a; Biggs, 2003).

The research described above gave rise to many new research questions about the possible interaction between students' approaches to learn, disciplinary differences, teaching methods and teachers approach to educate, assessment types, student characteristics, and the influence of motivational factors. The following section will present a broader context of learning.

2.6. The 3-P model - A model of learning

The 3-P model (Presage, Process, and Product) suggested by Dunkin and Biddle (1974) and Biggs (Biggs, 1985; 1987; 1989; 1999) offers a useful framework for understanding approaches to learning. The model summarizes Michel's (1973, cited in Biggs, 1987a) description of how people behave in situations in terms of their encoding strategies and self-regulatory systems. A student's encoding strategy of the learning context, or the institution as a whole, is represented by his or her motives to gain a qualification, to pursue academic interest, to gain high grades, or a combination of these. Similarly, the student's self-regulatory system is represented by the strategies adopted (Biggs, 1987 a, p. 10). Biggs' 3-P model encapsulates the complex nature of student learning by describing this as a result of the interaction between the student and teacher behaviours by focusing on the interrelationships between: 1) Presage factors, referring to what exists prior to the engagement, including the individual characteristics of the students and the situational constraints in which they find themselves, and 2) the process component described in terms of deep and surface approaches to learning. Whether a student adopts a deep or surface learning approach in a particular learning situation is seen as depending on a complex array of factors, including his or her conception of

learning, cultural factors, the nature of schooling, his or her upbringing, department characteristics and the teaching methods to which the student is exposed, learning orientation, and perception of the task requirements. A Deep Approach often involves an intrinsic curiosity and an intention to understand the underlying ideas of the course content and transforming these by relating to previous knowledge and experience, whereas a Surface Approach to learning often involves non-academic priorities, misunderstanding of course requirements and ideas presented, or requirements to take a course perceived as irrelevant to the student's program (Biggs & Tang, 2007). 3) The product of learning is mainly determined by the students' approaches to learning (Biggs, et al., 2001, p 136; Biggs, 2003). Outcomes leading to the awarding of grades may be viewed quantitatively, e.g. how much is learned, or qualitatively, that is how well it is learned. As Deep approaches – in contrast to surface approaches - have generally been found associated with higher quality learning outcomes, deep learning has been identified as being more consistent with the goals of higher education (Marton and Säljö 1984; Prosser and Millar 1989; Trigwell & Prosser, 1991; Duff et al., 2004). And, as noted by several modern educational researchers (e.g. Biggs 1985, 1987a; Watkins and Hattie 1981), the distinction between rote learning of facts and concepts and achieving a deeper understanding of the subject has been present in discussions about the quality of education for several centuries, with general agreement among theorist that rote learning is a limited, and limiting, process. However, it should be noted that surface knowledge is not always inappropriate, as critical interpretation requires prior existence of basic knowledge.

However, just as Biggs has criticized the information-processing position for ignoring the role of personal and situational factors (Jones 2002), educational researchers favoring a more relational perspective regarded the context-specific perspective as incomplete in that the academic environment per se was not the defining feature. In a later version (Biggs, 1984), this perspective

was integrated in the model. The central idea was that the students' perceptions of the teaching and learning context should be seen as a result of the interaction between their previous experiences of teaching and learning and the present context, in particular the students' reactions to perceived situational demands (Biggs 2001). Study methods have also been found related to the *perceived value* of the course in question and the personal development gained as perceived by the students. Some students may be *extrinsically* motivated by specific career options or family pressure, while others are more motivated by the opportunity of personal or existential growth provided by a higher education. The complexity is further increased by the possibility of students holding multiple goals, and interactions between these can be heightened if the design of the course is being perceived as relevant to their ideas of a future career. Being *intrinsically* motivated in an academic task, on the other hand, suggests that participation in the process is experienced as an end to itself, and intrinsically motivated students may be more likely to employ self-initiated exploratory strategies. Extrinsic goal-oriented students, on the other hand, appear to be more focused on external approval and external circumstances, e.g. acquiring the skills necessary to obtain a good job, and would therefore be expected to be likely to engage in the task in a more procedural way (Bye et. al. 2007). While the 3-P model has gone through many changes during the past three decades (e.g. Biggs, 1978; 1984; 1985; 1987; 1989; 1990; 1992; 1993a; 1999 cited by Jones, 2001), it is important to notice that the basic components: presage, process and product, have remained constant. According to Jones (ibid.), the most significant change in Biggs' model (1990) is the transition from a *linear* model (as displayed in Model 1 in [Figure 1](#)) describing how personal and situational factors (presage) affect the approach adopted by the learner (process), which in turn influence the learning

results (product), to an *interactive* model.

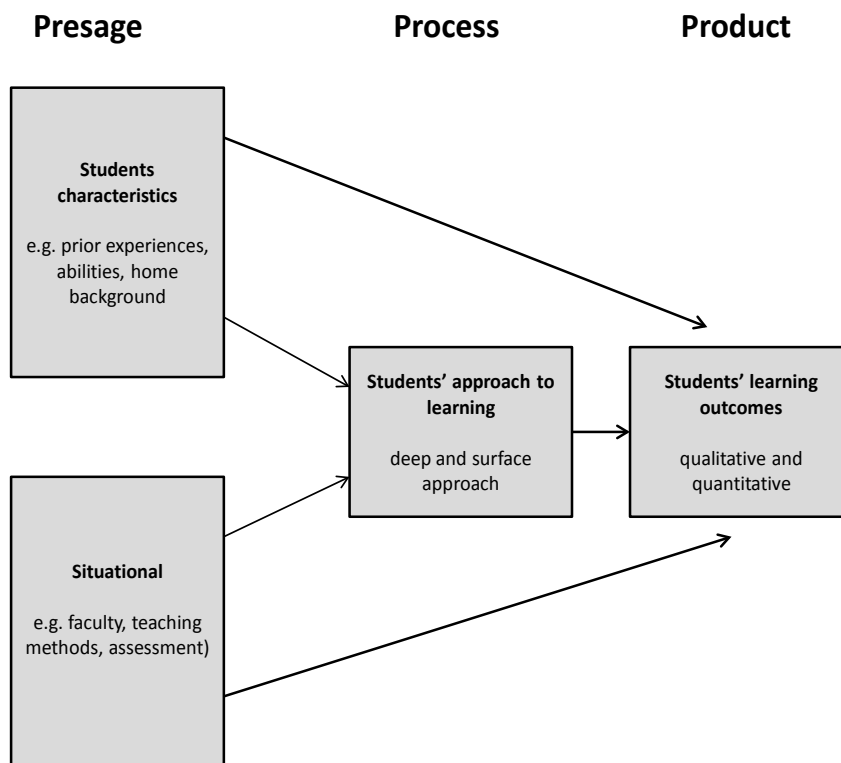


Figure 1. Model 1: General model of study processes (Source: Biggs, 1987a)

The *interactive* model (shown in Model 2 in [Figure 2](#)) suggests that, in addition to the linear progression, there are also *feedback* loops between the components of the model, e.g. between outcomes of learning and future learning, which means that the learner would reflect upon their learning experience leading to changes in motivation and the way they approach future learning tasks. Change in one component may thus lead to changes in all the other components (Biggs, 2001).

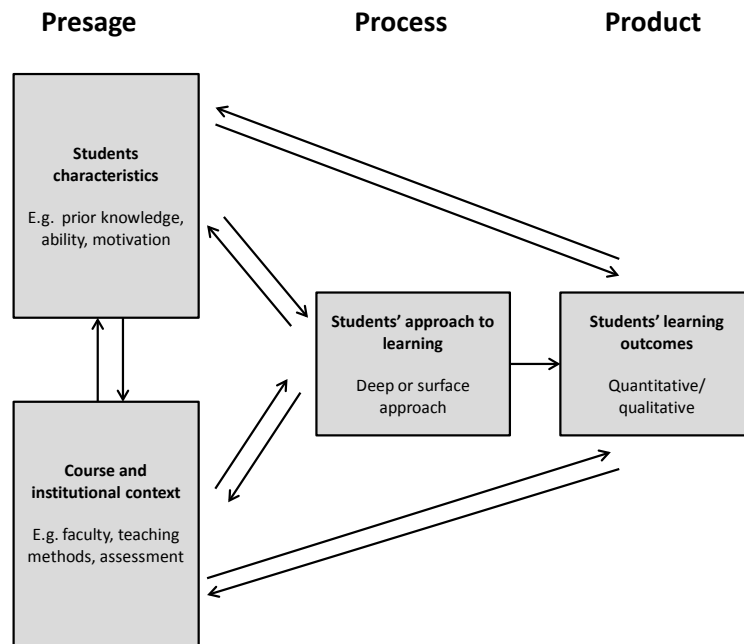


Figure 2. Model 2: Systems model of study processes (Source: Biggs, 1999)

According to Entwistle (Entwistle and McCune, 2004), there is a surprising lack of emphasis on emotion in learning, and only concepts of negative emotions (anxiety or fear of failure) have been developed explicitly in educational psychology (ibid.). The relative absence of emotional components in the learning models shown above has been criticized, as they may provide an essential addition to the assessment of preferences for information-processing modes and to the evaluation of meta-cognitive awareness and skills (Pintrich, 2004). Learners' use of strategies may not be fully grasped without understanding the nature of their motivation for learning, e.g. which features of a task give rise to intrinsic rather than extrinsic motivation and heighten curiosity instead of instilling a sense of self-efficacy (Gurtner et al., 2001). Research has documented that positive motivational beliefs such as self-efficacy and intrinsic motivation and the absence of negative emotions such as test anxiety are associated with greater use of cognitive and meta-cognitive strategies and improved learning results (Garcia & Pintrich, 1994). While there is considerable

research indicating that both self-efficacy (the expectancy aspect), and test anxiety (the affective component) may influence student performance (e.g. Pintrich and De Groot, 1990; Pintrich 2000), only a few recent studies (Prat-Sala et al. 2010; Diseth, 2011) have included motivational components in the SAL model, indicating a need for further investigation in future research.

Taken together, later research into student learning has been based on two main theoretical sources: information processing (IP), and contextually based research into students' approaches to learning (SAL). Both quantitative and qualitative methods have confirmed the existence of deep and surface learning to approaches. The basic tenet in the SAL tradition is that student learning should be viewed as taking place within the teaching/learning-context. Over the years, various instruments have been designed with the aim of predicting student performance and produce student learning profiles.

2.7. Measurement of Approaches to Learning

At least three questionnaires have been developed from the SAL perspective (Jones, 2002). Only two of them will be described in the following in brief detail: 1) The Study Process Questionnaire (Biggs, 1987), which in addition to focusing on the process of learning included a motivational dimension defined as intrinsic, extrinsic, and achieving orientation, and 2) The Approaches to Study Inventory (Entwistle et al. 1979), which focuses on the level of engagement during learning (Entwistle & Ramsden, 1983). Both were later revised into shorter forms: *the Revised Two-Factor Study Process Questionnaire* (R-SPQ-2F) still retaining the motive/strategy distinction, although now just on two scales: deep and surface (Biggs, Kember & Leung, 2001), and the *Revised Approaches to Study Inventory* (RASI) (Entwistle & Tait, 1995). Although the *SPQ* and the *ASI* both acknowledge links to the psychological literature, their development was primarily guided by

the conceptualizations drawn from educational research (Entwistle & McCune, 2004). While agreeing on the definitions on deep and surface approaches to learning, Biggs and Entwistle independently developed questionnaires to measure approaches to learning by the use of different methods. The ASI was based on student interviews focusing on study approaches, motivation and intentions, while the SPQ was constructed on the basis of former research on student learning. Both approaches agree on the influence of contextual factors mediated by students' tendency to favor one over the other, and both consider the process of learning and the intention of learning to be important (Jones 2001). Both the SPQ and the ASI have been extensively used in educational Psychology. The reason for selecting the SPQ (and later the revised version) in the present research project on Danish students' approaches to learn was that the constructs of this questionnaire were considered as the most central to this model.

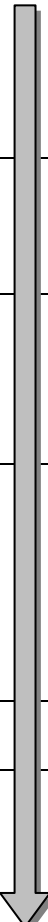
2.8. Summary

Research that examines students' approaches to learning has evolved through several stages of development. A summary of the theoretical development is shown in Table 1 below. The "approach to learning" perspective originates primarily from the work of the Gothenburg group in Sweden (Marton and Säljö, 1976a; b), the research of Biggs (1978; 1987; 2001), and the work of Entwistle and colleagues (e.g. Entwistle, 1981; Entwistle and Ramsden, 1983). Regardless of the diversity in methods used, the different Deep and Surface Approach constructs of learning developed seem to be largely interchangeable, and the stability of the concept strengthens the argument for the validity of these constructs. Initially, research was conducted using qualitative methods and few subjects (Marton and Säljö, 1976a; b). Later, researchers developed and refined "student approach to learning"-inventories making it possible for researchers to draw conclusions concerning students' approaches to learning based on larger populations. The findings have subsequently contributed to

improving the quality of learning and teaching through the recognition of the influence of contextual variables upon approaches to learning. Exploring students' approaches to learning within the framework of SAL and the 3-P-model directs our attention to several potential factors, which may influence their choice of learning approach in the current institutional and teaching context. These include: 1) the individual background characteristics of the students, e.g. age, gender, socioeconomic background, grades the student has achieved so far, and various motivational factors viewed as existing more or less prior to the learning process, 2) institutional factors, e.g. faculty, and contextual factors, e.g. teaching methods and assessment type, and 3) the outcomes of learning. The main findings concerning these potential predictors published so far will be summarized in the following section.

Table 1. Student learning: Summary of theoretical developments

Theoretical paradigm	Explanatory focus	Research methodologies	Main theorists
Behaviorist	Stimulus-response and reinforcement theory. Changes in the environment influence learning by providing reinforcement when the appropriate response is made.	Experimental Laboratory settings.	E.G. Thorndike, 1913; Watson, 1924; Skinner, 1957.
Cognitive	Mental activities and the acquisition of knowledge. Knowledge structures, e.g. perception, representation, and memory.	Experimental. Laboratory settings.	E.g. Bruner, 1957; Ausubel, 1962.
Levels of processing	Identification of stages and processes involved in human information processing (How knowledge is represented in memory rather than how changes in knowledge takes place)	Experimental. Laboratory/ natural settings.	E.g. Craik & Lockhart, 1972.
Phenomenography	Relations between the individual and various aspects of the world around them. The learner's perspective determines what is learned.	Qualitative. Structured interviews. Laboratory/ natural settings.	E.g. Marton & Säljö, 1976 ; Marton, 1981.
Students Approach to	The learner's perspective determines what learning approach is chosen, what is learned,	Quantitative/ Qualitative.	E. g. Entwistle et al. 1979; Biggs, 1978,



Learn (SAL)	and how learning is conceived. Dynamic interactions between presage, process, and product (3P).	Questionnaires/ interviews Natural settings: Teaching/ learning context.	1987.
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3. Predictors of SAL - Empirical findings

As described in the previous sections, SAL draws upon the Presage, Process, and Product (3-P) model (Dunkin and Biddle, 1974; Biggs, 1978; 1985; 1987a; 1988; 1989; 1990; 1999), which views learning as a result of the interaction between: 1) the individual background characteristics of the students, including age, gender, socioeconomic background, grades the student has achieved so far, and various motivational factors viewed as existing more or less prior to the time of the learning process, 2) situational factors, including the institutional and teaching context, including the teaching methods used and type of assessment, and how this perceived by the student, and 3) the outcomes of learning. The influence on SAL of one or more of these factors has been explored in several previous studies over the years. The main findings in the literature published so far will be summarized briefly in the following.

3.1. Student background characteristics

The associations between SAL and basic demographic characteristics such as age and gender have been investigated in several studies. Generally, one would expect that as students get older, mature, and accumulate knowledge, they would be more likely to use deep learning approaches and to be more able and willing to commit themselves to the use of learning strategies which require a greater effort. We would therefore expect *older age* to be associated with a greater tendency towards Deep

Approach to learning and *younger age* to be associated with a greater tendency towards using a Surface Approach. The majority of studies considering the relationship between age and learning approach have found age to be positively related to scores on Deep Approach and negatively correlated with Surface Approach scores (e.g. Sadler-Smith, 1996; Sadler-Smith & Tsang, 1998; Zeegers, 2001). In contrast, the results concerning the role of *gender* differences are generally inconclusive (Wilson, Smart, and Watson, 1996), which could be due to methodological limitations of the existing studies, including small samples and failure to control for other possible gender-related factors, including choice of study, previous grades, etc.

Socioeconomic background, including the educational background of parents, is another factor which could be expected to influence SAL. It is generally accepted that inequality exists in the recruitment to the higher-education system (Nordli & Mastekaasa, 2006), and it is generally assumed that students tend to act in congruence with their social background and education thereby being likely to reproduce the existent social structures (Bourdieu and Passeron, 1992). The role of socioeconomic background for SAL has, however, received limited attention so far (Cano, 2007). The results of the few existing studies indicate a positive association between higher parental educational level and students' use of Deep Approach and, likewise, between lower educational level of the parents and Surface Approach (Biggs, 1987a; Zhang, 2000).

In most, if not all countries, students applying to higher educational institutions are selected on the basis of their academic achievement, usually their *high school grade* performance. While most studies of the role of previous academic achievement conclude that high school grade point average (HSGPA) is a strong predictor of academic success (e.g. Zheng, Saunders, Shelley, & Whalen, 2002), the associations between HSGPA and SAL, however, are still unclear. On the one hand, if

academic achievement is positively related to deep approaches, and negatively related to surface approaches (Sadler-Smith, 1996; Biggs, 2003; Diseth & Martinsen, 2003), we may assume that students who have developed effective approaches to study in high school are also capable of doing the same in the future, i.e. tend to adopt a deep approach. On the other, what is an effective approach in high school may not necessarily be so at the university level. The student's *secondary educational background* may be another relevant presage factor. Previous work by Richardson (1995) has, for example, shown that students who do not enter higher education directly from high school, seem to be more motivated, even after a relatively short break of one or two years after secondary schooling, towards the use of a deep or meaning orientated approach to learning.

3.2. Student motivational factors

Results from previous studies have indicated that the most predictive motivational factors are aspects of the three main components: Intrinsic value (the value component), self-efficacy (the expectancy aspect), and test anxiety (the affective component) (e.g. Pintrich and De Groot, 1990; Pintrich 2000).

With respect to the value component, the students' *motivation to study* at the university is a factor that could affect their approach to learn. While some students' choice of tertiary education may be motivated by specific career options, i.e. extrinsic motivation, others may be more motivated by the opportunity of personal or existential growth provided by a higher education, i.e. intrinsic motivation. Intrinsic motivation has fairly consistently been found associated with the interest facet (Kember et al, 2008; Lassesen, 2007; Pintrich, 2003; Pintrich & Schunk, 2002), and should therefore be expected to be associated with Deep Approach. Extrinsic goal-oriented students, on the other hand, appear to be more focused on external approval and external circumstances, e.g.

acquiring the skills necessary to obtain a good job, and are therefore expected to be more likely to engage in the task in a more procedural way, i.e. a Surface Approach to learn (Bye et. al. 2007; Lassesen, 2007). One could theorize that students' motivations to study may not be stable over time, as one could expect that they, at least to some degree, will be affected by their learning experiences and thus change over the course of their university education. Furthermore, their motivation to study could be influenced by the individual teachers and the specific courses they are taking and thus show varying associations with SAL over the course of their university education. However, not much is known about the changes in motivation to study over time and the possible influences on SAL.

The *expectancy aspect* is concerned with how students perceive their ability to be effective in specific contexts and how this perception of "self-efficacy" may affect their learning. Self-efficacy in the academic context refers to the students' beliefs in their cognitive capability to learn or to perform actions to achieve intended results (Bandura, 1997). Several studies have examined the role of student self-efficacy on motivation and learning (e.g. Bouffard-Bouchard, 1990; Bouffard-Bouchard, Parent, and Larivé, 1991; Pintrich & DeGroot, 1990) and have found that self-efficacy influences both motivation and cognition by affecting the students' task interest, task persistence, the goals they set, the choices they make, as well as their use of various cognitive, meta-cognitive, and self-regulatory strategies. With respect to the possible associations between self-efficacy and performance, research conducted at various levels of education generally show self-efficacy to be an important predictor and mediator of student achievement, motivation, and learning (Dinther et al., 2010). While self-efficacy thus seems important to academic performance, studies exploring the possible associations between self-efficacy and SAL are so far very limited. Two recent studies (Prat-Sala & Redford, 2010; Diseth, 2011) have, however, found evidence to suggest that students

classified as high in academic self-efficacy are more likely to adopt deep learning strategies, while students low in self-efficacy are likely to engage in a Surface Approach to learning.

Test anxiety represents an important *affective* factor in the academic context, and refers to anxiety experienced by students in an assessment context (Rosenfeld, 1978). Most students experience some level of anxiety during exams, and some level of heightened apprehension may even improve performance. A high level of test anxiety, however, becomes problematic when it impairs academic performance and learning behavior. Test anxiety is believed to consist of two components: a worry - or cognitive component – representing negative thoughts that disrupt performance, and an emotional component, which refers to the affective and physiological arousal aspects of anxiety. Cognitive concerns and preoccupation with performance have been found to be among the greatest sources of performance impairment (Garcia et al., 1991). A meta-analysis of 562 studies published before 1988 investigating the associations between test anxiety and academic achievement concluded that 5-10 % of the variation in students' achievement scores could be explained by self-reported anxiety, with higher correlations for test-anxiety than general anxiety (Hembree, 1988; Zeidner, 1998). One reason that high anxiety is expected to impair the learning process is that it is believed to promote a surface rather than a Deep Approach to learning (Fransson 1977; Tooth et al. 1989; Marton & Säljö, 2005; Spada et al., 2006; Birenbaum, 2007). This has been confirmed in a small number of studies showing that highly anxious students tend to encode information at a more superficial level resulting in poorer knowledge of the relevant material (Benjamin et al., 1981; 1987; Spada et al. 2006).

Research suggests that the expectancy and affective motivational components are closely interrelated, with students who have a low sense of academic self-efficacy being especially

vulnerable to achievement-related anxiety (Shelton & Mallinckrodt, 1991). People rely in part on emotional states when assessing their capacity by perceiving and interpreting the affective and physiological feedback (Dinther et al., 2010). Experiencing a positive mood state generally strengthens self-efficacy, while depressed and anxious mood states tend to weaken it. Furthermore, as people have the capacity to modify their own thinking and feeling, students with a high sense of self-efficacy may interpret a state of tension as energizing in the face of a performance task; whereas those who have self-doubts are more likely to interpret their tension as weakness.

3.3. Institutional and teaching context

As described earlier, SAL is primarily seen as a context-dependent phenomenon, with students responding to teaching context factors, rather than being a trait-like student characteristic.

Therefore, in addition to the individual background characteristics the students bring to the learning situation, the 3-P model emphasizes the role of the general institutional and specific teaching context, including the subject matter, teaching and assessment methods.

Research confirms that the students' perception of the learning environment plays a strong role in their approaches to learning, and studies have shown that students from different faculties differ with respect to what they perceive as important in their studies, how they view their learning environment, and how they approach their studies (Becker et al., 1968; Entwistle & Tait 1990; Richardson, 1995; Vermetten, Lodewijks & Vermunt, 1999). Science students have, for example, been described as differing from students from the arts by being substantially more prone to use a Surface Approach (Biggs, 1987). Students learn the demands of the institution and what it takes to evolve into the kind of learner the specific academic context demands. Generally, "soft" or "dry" discipline faculties are seen as more likely than "hard" or "wet" discipline faculties to emphasize

deep approaches to learning, and teachers from soft discipline faculties are more likely to encourage analysis and synthesis, while hard discipline faculties appear more focused on solving logically structured problems and require more memorization (e.g. Braxton & Nordvall, 1985; Biggs, 1987; Smart & Ethington, 1995; Entwistle 2005; Laird et al., 2008).

The different disciplines may therefore also differ in their use of different teaching methods, further strengthening the inter-disciplinary variation in their students' approaches to learning. The role of teaching method in the promotion of specific approaches to learning has been explored by several researchers. The setup of a class, i.e. the course structure, its content, the methods of teaching, and the assessment methods used at the end of the course can have a profound effect on the quality of learning (Biggs, 1978; Entwistle & Ramsden, 1983; Biggs & Rihn, 1984; Laurillard 1984; Newble & Clark, 1986; Biggs, 1987; Biggs, 1989; De Volder & De Grave, 1989; Entwistle & Tait, 1990; Eley, 1992; Biggs & More, 1993; Gow et al., 1994; Beattie et al. 1997; Vermetten et al., 1999; Zeegers, 2001; Jones 2002; Ramsden, 2003). Furthermore, students differ in their learning environment preferences, with those tending to adopt deep approaches being more likely to prefer courses they find intellectually stimulating and allow them to express their own ideas. In contrast, students using surface learning approaches prefer courses that provide a ready link between the material taught and fact-based assessment procedures (Entwistle & Tait, 1990). Generally, lectures are relatively effective for passing on information, but a rather passive experience for the student, and would therefore be expected, all things being equal, to promote a Surface Approach, whereas seminars focusing on small group discussions, with students being asked to prepare and participate in discussions would, again all things equal, be expected to promote a Deep Approach to learning.

The available research generally indicates a negative association between Surface Approach and academic performance and positive associations between deep learning approach and performance (Biggs 1985, 1987a; Watkins and Hattie 1981). However, the associations between learning approach and academic performance may be more complex. Assessment is an integral part of the teaching and learning process, and several studies have documented an influence of assessment on students' approaches to their learning (Entwistle & Entwistle, 1991; Ramsden, 1997; Scouller & Prosser 1994; Watkins & Hattie, 1985; Ramsden, 1988; Brown et al., 2005). Some forms of evaluation appear to encourage deep approaches while others are more likely to promote surface approaches to learning, even though students may have a preferred approach to their study (Newble and Jaeger, 1983; Biggs 1987; Boud, 1990; Scouller and Prosser 1994; Prosser & Webb 1994; Scouller, 1996; Ramsden, 1997; Watering et al. 2008). Some studies have found that students perceive essay-type exams as assessing higher levels of intellectual processing based on the understanding of the curriculum, and that they therefore are more likely to adopt deep approaches when preparing for this type of exam. Short-answer assessments, e.g. multiple choice exams, on the other hand, are often perceived by students as assessing lower knowledge-based levels of intellectual processing, with students therefore being more likely to adopt a Surface Approach when preparing for these tests (Entwistle & Entwistle, 1991; Tang, 1998; Scouller, 1996). Despite such findings, it is far from clear how different assessment types influence learning approach (Säljö, 1975). While it appears relatively easy to influence the approach to learn when it comes to surface learning, trying to induce a Deep Approach is a different matter. For example, to some students, the format may not matter much if they have intrinsic reasons for valuing the topic and therefore are more likely to immerse in it. Taken together, however, the available research suggests that students' perceptions of the upcoming assessment method and their learning approach are strongly

associated, with assessment formats based on longer written exams tending to encourage a deep learning approach while shorter written exams will tend to encourage a Surface Approach.

Other presage factors present prior to the specific learning context, but indirectly related to the present institutional and teaching context, are previous learning experiences. The study level of the student represents the level of experience he or she has with the institution, its teaching methods, and the curriculum. Another aspect is represented by the results of the assessments experienced by the individual.

With respect to study level, student learning approaches in a time perspective has not received much attention in the available literature (Severiens et.al. 2001; Jones 2002), and it is not clear whether attending higher educational institutions actually promotes the qualities of independent learning to which they aspire. Some cross-sectional studies (Watkins and Hattie, 1981 (cited in Severiens et al., 2001); Biggs, 1987) have found that, when compared to first-year students, third-year students exhibit *fewer* meaning-orientated approaches to learning, findings which have found further support in longitudinal studies (Watkins and Hattie, 1985 cited by Zeegers, 2001; Gow & Kember, 1990). In contrast, other cross-sectional as well as longitudinal studies have either found no differences or results in the opposite direction (Richardson, 1998; Vermetten et al. 1999). While one would generally expect that students, as they move to higher study levels and achieve a better understanding of the curriculum, will have developed higher levels of intellectual processing, more intrinsic reasons for valuing the topic and therefore be more likely to immerse in it, learning does not take place in a vacuum. There are thus several contextual factors that simultaneously may influence the students to move towards the greater use of surface approaches, including work pressure, assessment procedures, and their perceptions of the teaching and learning environment.

Biggs (1994) describes learning as the way in which students are influenced to go about their academic tasks, thereby affecting the nature of the learning outcome. According to Ramsden (1992), these ways are also likely to be influenced by their prior educational experiences, e.g. the grades obtained. One study (Svensson, 1977), for example, found that 12 out of 19 students who reported frequent use of surface approaches failed some of their examinations, while only 1 out of 11 students who normally made use of deep approaches failed their exams. According to the author, this suggests that learning approach may not only influence the knowledge acquired during the learning process, but also how it is used in the test situation. Significant positive associations between annual GPA and Deep Approach and negative associations with Surface Approach have also been found in several other studies (Eley, 1992; Zeegers, 2001; Duff et al., 2004; Snelgrove, 2004). Other studies have, however, only found weak associations between SPQ and ASI scores and learning outcomes (Jones and Jones, 1996; Watkins & Hattie, 1985; Sadler-Smith & Tsang, 1998). While, in general, research on the association between approaches to learning and quantitative outcomes suggests a positive association between GPA and deep approaches and a negative association with Surface Approach, the inconsistent results in the literature suggest that other factors may be equally important in determining academic success. For example, students have different backgrounds, strengths and weaknesses, and levels of motivation, and some students may be genuinely incapable of adopting structurally complex understandings in situations where it is required, underscoring the need to control for other potentially influential factors when exploring the associations between various predictors and SAL.

3.4. Student perception of context

As reviewed above, there is evidence to suggest that SAL is influenced by institutional and contextual factors (Newble and Clarke 1986; Entwistle and Tait 1990; Lizzio et al. 2002; Diseth et al., 2006). However, it has been emphasized that it is in particular the student's *perception* of the learning context, which influences SAL most directly, rather than the context in an objective sense (Laurillard 1979; Biggs, 1984; 2001; Entwistle 1987; Richardson 2005; Diseth et.al., 2006).

University students bring to their courses a baggage of previous learning experiences, which may influence their perception of the current learning situation (Marton et al., 1993), and students taking the same courses can vary considerably in their perceptions of the course, which in turn may influence their approaches to studying. For example, students who rely on a Surface Approach have been found to actively prefer and rate more highly a more teacher-regulated learning environment with lecturers providing easy to grasp pre-digested information, while students relying on a Deep Approach are found to appreciate teachers who challenge and inspire by using activating student-focused methods (Entwistle & Tait 1990; Trigwell & Prosser, 1991; Vermunt & Verloop, 1999; Lonka et al., 2008). Such findings underscore the need to go beyond the objective teaching context factors when exploring the predictors of SAL and consider how students perceive the teaching context. For example, to what degree do students perceive the teaching and assessment methods to stimulate a Deep Approach to learn, and – furthermore – how do they value these aspects, i.e. how important is this to them?

3.5. Student learning outcomes

Generally, previous research on the more direct relationships between approaches to learning and academic performance indicate that deep learning approach is positively associated and Surface Approach negatively associated with performance (Svensson, 1977; Biggs 1985, 1987a; 1999; Watkins and Hattie 1981; Crawford et al., 1999; Trigwell et al. 2000). Learning outcomes may be

assessed quantitatively, e.g. how much is learned, or qualitatively, e.g. how well it is learned. Deep approaches have been identified as being more consistent with the goals of higher education as they generally appear to be related to higher quality learning outcomes, while a Surface Approach is usually found associated with lower quality outcomes (Marton and Säljö 1984; Prosser and Millar 1989; Trigwell & Prosser, 1991; Duff et al., 2004). Although the distinction between ‘learning by heart’ and achieving an understanding has been a central aspect in the continuing discussion about the quality of education, it is generally agreed that rote learning is a limited, and limiting, process (Biggs 1985, 1987a; Watkins and Hattie 1981). However, it is necessary to note that surface knowledge is not automatically inappropriate, as basic knowledge is fundamental prior to interpretation. Likewise, there may also be differences in the appropriateness of different learning approaches between different scientific traditions. Ramsden (2003), for example, describes that the Lancaster study suggested that a deep oriented learning approach was more appropriate while a reproducing orientation was more “heavily penalized” in arts than in science.

3.6. Summary of the evidence

As described above, there is a broad international research literature describing associations between 1) various presage factors, 2) students’ approach to learning, and 3) the outcomes in terms of academic achievement. The factors explored in the literature are summarized in the revised 3-P model shown in Figure 3 below.

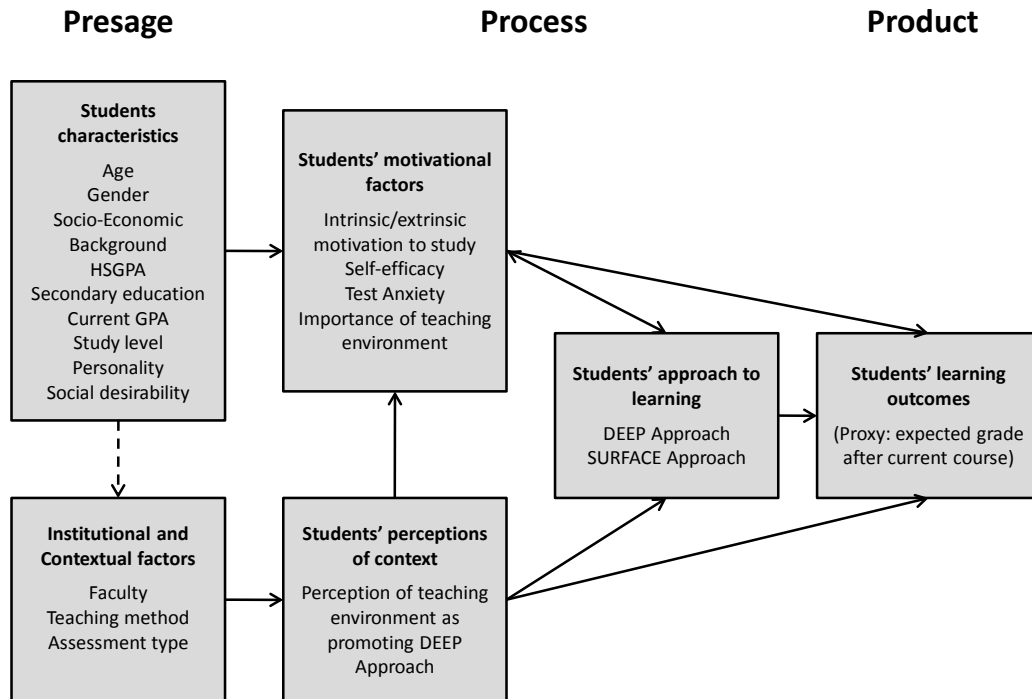


Figure 3. The revised 3-P model

Taken together, the available studies have provided evidence suggesting that SAL is influenced by several factors, including student background characteristics such as age, socioeconomic background, and student motivational factors, and institutional and teaching contextual factors such as faculty, teaching methods, and assessment factors, as well as the students' perceptions of and the value they place on the teaching context. For other factors, including gender, secondary education prior to entering university, and study level, the available evidence is less clear-cut or even contradictory. This may be due to the available studies being characterized by a number of methodological limitations. First, several of the previous studies have been based on relatively small samples of convenience, which may limit the generalizability of the results. Second, most of

the available studies have focused on relatively few selected variables. Third, the methods have primarily presented unadjusted bivariate associations between students' approach to learn and the selected predictors and failed to control for the possible confounding influence of other relevant variables. Finally, as no studies of students' approach to learn so far, to the best of the author's knowledge, have been conducted in Denmark, not much is known about student learning in the Danish University context.

4. Aims and hypotheses

As described in the previous section, learning approach of students in Higher Education and factors which can explain the variance in learning approach have been extensively studied in the international context. The results found for several of the factors explored are, however, conflicting or unclear, which may, in part, be due to the methodological limitations of the available studies. Furthermore, as no studies of students' approach to learning have been conducted in Denmark, only little is known about student learning in the Danish University context. The aim of the present PhD-research project was therefore two-fold:

- 1) to translate into Danish the most widely used instrument assessing students' approach to learn, the Study Process Questionnaire (Biggs 1987; 2001), and to provide a preliminary test of its reliability and validity in Danish University Students, and
- 2) To use the Danish adaptation of the SPQ to explore the learning approaches of Danish university students and – following the 3-P model – to identify the major a) presage factors, i.e. student background characteristics and institutional and teaching context variables, and b) process-related factors, e.g. perception of the teaching environment and other motivational factors, which contribute to the variance in Deep and Surface learning approach of Danish university students by studying the independent contributions of these factors in a large sample of Danish university students from different faculties and at different study levels.

Based on the theory of Students' Approach to Learn (SAL) and the findings of previous studies in the international context, a number of hypotheses concerning the expected associations between the

studied presage -and process-related factors and Deep and Surface Approach in the Danish context were formulated. The hypotheses are summarized in [Table 2](#) below:

Table 2. Predictors of Student's Approach to Learn (SAL): Expected results based on theory and results of previous studies

Predictors	Deep Approach	Surface Approach
Older age	↑	↓
Gender (female)	↔	↔
Higher Socio-Economic Background (Proxy: Parents' education)	↑	↓
Higher HSGPA	↑	↓
High school as secondary education	↔	↔
Father had same education	↑	↓
Mother had same education	↑	↓
High Intrinsic motivation to study	↑	↓
High external motivation to study	↓	↑
Study level (Master)	↔	↔
Faculty ("Hard"/"Wet" disciplines)	↓	↑
Faculty ("Soft"/"Dry" disciplines)	↑	↓
Higher current GPA	↑	↓
Teaching method (seminar or lecture + seminar)	↑	↓
Teaching method (lecture)	↓	↑
Assessment (Longer, written)	↑	↓
Assessment (Short, structured)	↓	↑
Perception of teaching environment as promoting Deep Approach	↑	↓
Importance of teaching environment as promoting Deep Approach	↑	↓
Self-efficacy	↑	↓
Test Anxiety	↓	↑

Notes: ↑: The predictor expected to be associated with higher scores on SAL; ↓: The predictor expected to be associated with lower scores on SAL; ↔: No clear expectation; — : The predictor is not expected to show any association.

With a few exceptions, i.e. for gender, high school as secondary education, and university study level, where the available results from the literature were generally inconsistent, it was possible to form specific hypotheses concerning the direction of the associations between the assessed factors and scores on Deep and Surface Approach, respectively.

5. A summary of methods

The study was conducted in five phases: 1) First, a pilot study was conducted with the aim of conducting a preliminary testing of the translation of the questionnaire intended to be used in the final study, the original 42-item Study Process Questionnaire (Biggs, 1987). 2) In the second phase, based on the results of the pilot study, the revised two-factor version of the SPQ (R-SPQ-2F) (Biggs et al. 2001) was explored qualitatively, after which a final version was developed and administered to a large sample of Danish University students with the aim of assessing the internal consistency and testing the factor structure of a Danish version of the R-SPQ-2F (R-SPQ-2F-DA). 3) In the third phase of the study, additional data collected in phase 2 were further analyzed with the aim of investigating students' approach to learn and its associations with a number of predictors, primarily presage factors such as student characteristics and institutional/contextual factors. 4) In the fourth phase, the associations between students' approach to learn and motivational factors such as self-efficacy, test anxiety, perception of and perceived importance of the teaching environment were explored. 5) In the fifth and final phase, exploratory analyses of the associations between students' approach to learn and a number of additional factors of potential importance, but not included in phase 3 and 4, were conducted. The methods and results of phase 1 and 2 are reported in detail in PAPER 1. The methods and results of phase 3 and 4 are reported in detail in PAPER 2 and 3 respectively. The methods and results of phase 5 are reported in the summary of results section of the present overview.

5.1. Phase 1

In the first pilot phase, the original six-subscale, 42-item Study Process Questionnaire (Biggs, 1987) was translated into Danish using a translation-back translation procedure and tested in a sample of students. Participants were 110 first and fourth-year students (Mean age: 26.8 (SD: 7.7), 80.7% women) at the Department of Psychology, Aarhus University. Internal consistencies (Cronbach's Alpha) for the six subscales ranged from poor (0.35, Deep motive) to moderate (0.70; Surface strategy), and comments from the respondents revealed that they had experienced difficulties understanding several of the items, and that they considered the questionnaire too long with a high degree of redundancy. Several respondents were unsure, which aspects of their university experience they should refer to when answering the questions. Furthermore, many respondents indicated that they experienced the large number of items to be a burden. In addition to the SPQ, the participants had completed the Revised NEO Personality Inventory (NEO-PI-R) (Costa McCrae, 1992).

5.2. Phase 2

Based on the findings of the pilot phase, the original SPQ was replaced with the R-SPQ-2F (Biggs et. al., 2001). The R-SPQ-2F consists of only four subscales: Deep Strategy, Deep Motivation, Surface Strategy, and Surface Motivation, which are combined into two approach scales: Deep Approach and Surface Approach. The translation was conducted in the same manner as for the original 42-item version with further adjustments based on comments from an expert panel of 6 colleagues from the Department of Educational Psychology (*See PAPER 1 for further details*). The first Danish version of the R-SPQ-2F (hereafter R-SPQ-2F-DA) was then presented to a focus group of 8 students (Mean age 29.1, 75% women), who were informed about the aim of the study

and asked to complete the R-SPQ-2F-DA. Based on their comments, further adjustments were made, including the omission of an item, which seemed irrelevant to them in the Danish context. The Danish version of the R-SPQ-2F is shown in Appendix 1.

Participants: A total of 1350 questionnaires were handed out at lectures and seminars to undergraduate (3rd semester) and graduate students (7th and 9th semester) recruited from four major faculties at the University of Aarhus: Arts, Social Science, Health Science, and Science. A total of 1192 questionnaires were returned (response rate: 88.3%), and the 1083 students who had completed all items of the R-SPQ-2F (80.2%) were included in phase 2 (*See PAPER 1*). The main sample of participants investigated in the third to fifth phase of the study consisted of the 1181 students who had responded to all questionnaires in the questionnaire package (response rate: 87.5%), but had not necessarily completed all items (*See PAPER 2 and 3*) (*See Figure 4* for sample and response rates). University teachers were contacted by e-mail and asked permission to distribute the questionnaire to students during their classes. In all, 37 classes ranging in size from 3 to approximately 170 participants were approached. The author and two research assistants, all unknown to the students, collected all data. The teachers who provided class time introduced the researcher and stressed to the students that participation was voluntarily but encouraged the students to participate in the project. The author and research assistants then briefly described the aim of the study, handed out the questionnaires, and informed the students that their response would be anonymous. It was stressed that they should respond to each item with reference to the specific course they were taking at the time of filling out the questionnaire. The questionnaires were collected after approx. 20 min. or after all participants had completed the questionnaire. (*See PAPER 1-3* for further detailed descriptions of the sample, the data collection procedure, and analytical strategy).

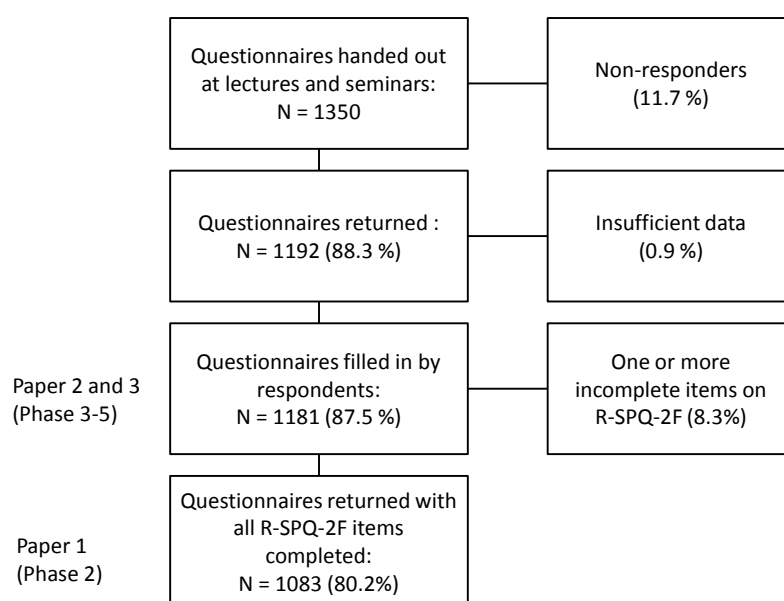


Figure 4. Flowchart of response rates

Analytical strategy: Based on the data collected from the large sample, the preliminary reliability and validity of the R-SPQ-2F-DA was analyzed. In addition to descriptive and reliability statistics (internal consistencies; Cronbach's alpha), confirmatory factor analyses were conducted to test the uni-dimensionality of the SPQ subscales, following the analytical steps described by Biggs et al. (2001) for the English-language version of the R-SPQ-2F. (See PAPER 1 for further details).

Phase 3

The aim in phase three was to examine the Deep and Surface Approach among the students and the possible influences of the presage factors: student background characteristics and institutional and contextual variables. The background variables included age, gender, socio-economic background measured through parental educational background, High School GPA, their secondary education, current study level, and current GPA. The context variables were faculty, the teaching method used in the course they were taking and to which their responses to the R-SPQ-2F referred to, and the

assessment methods to be used at the end of the course. In addition, the associations with intrinsic and extrinsic motivation to study were examined (for further details, see PAPER 2). The variables included in the analyses are shown in **bold face** in Figure 5 below.

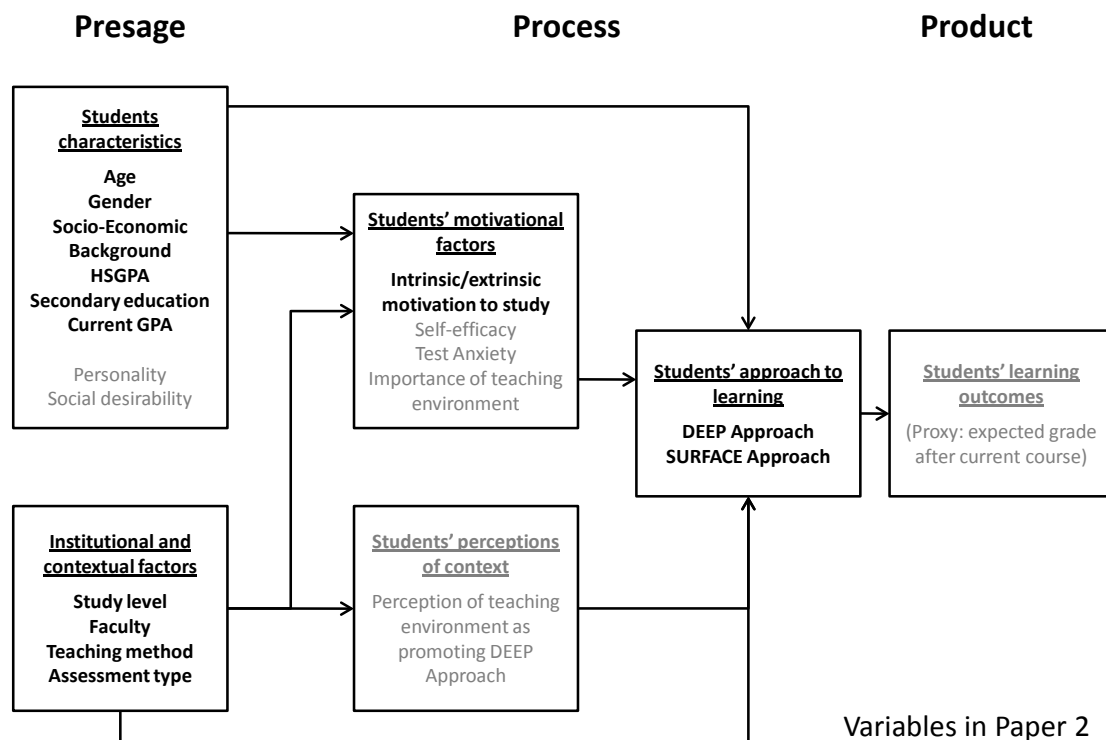


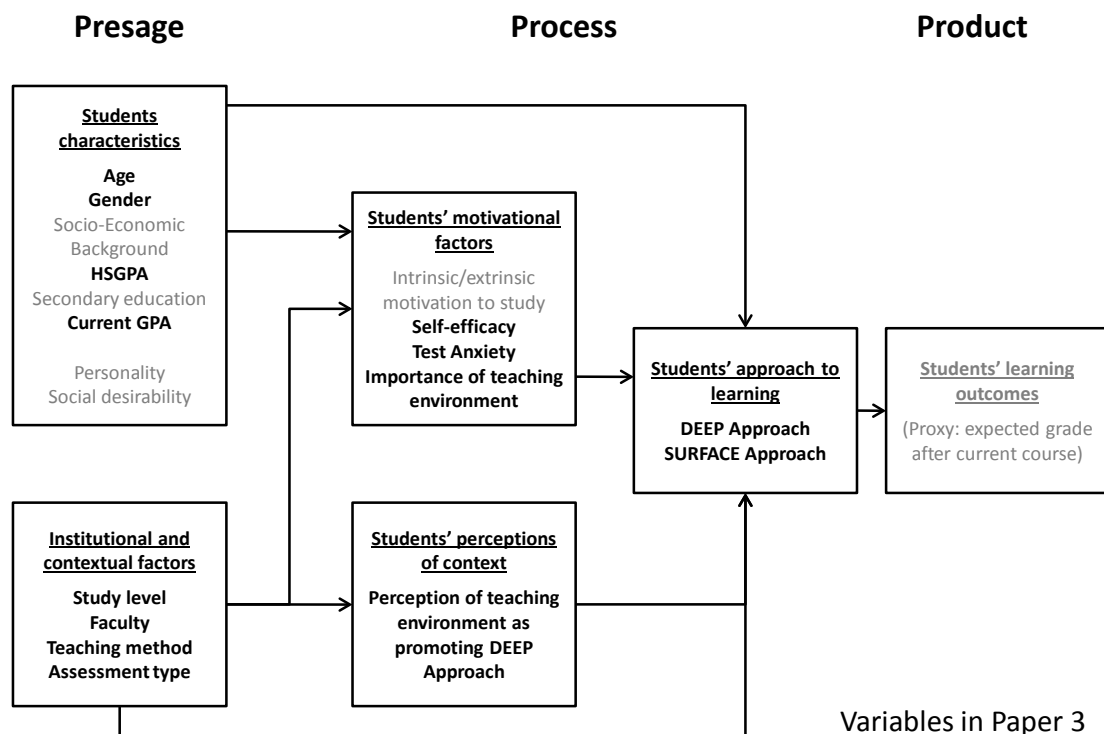
Figure 5. Variables analyzed in PAPER 2

Analytical strategy: The predictors of learning approach were analyzed with both unadjusted bivariate and multiple regression analyses adjusting for the other independent variables investigated. The main analyses were two multiple, hierarchical linear regression analyses conducted with Deep and Surface Approach as dependent variables. The analyses involved five steps: At the first step, the student characteristics or background variables were entered, at the second step, the motivational factors, at the third step, the institutional variables, and at the fourth step the current contextual variables. To reduce the risk of over-fitting, only variables that were

significant predictors at each step were carried forward and adjusted for at the next step. To reduce the risk of under-fitting, the significance-level criterion for being carried forward to the next step was set to a less conservative 10%. At the fifth step, a final model was analyzed, including all variables which were statistically significant at the 10% level at the fourth step.

Phase 4

The aim in the fourth phase was to explore the role of the motivational factors of self-efficacy, test anxiety and the perception of the current teaching environment for the students' approach to learn, while adjusting for the significant presage predictors identified in phase three. (For further details, see PAPER 3). The variables included in the analyses are shown in **bold face** in Figure 6 below.



Variables in Paper 3

Figure 6. Variables analyzed in PAPER 3

Analytical strategy: The analytical strategy was similar to the one used in phase 3. The main analyses were two multiple, hierarchical linear regression analyses conducted with Deep and Surface Approach as dependent variables, involving four steps: At the first step, the student background variables of age, gender and HSGPA were entered, at the second step, the institutional and course-related context variables, and at the third step, the motivationally-related factors of self-efficacy, test anxiety, perception of teaching environment, and current GPA. Again, variables statistically significant at the 10% level were carried forward and adjusted for at the subsequent step. At the fourth step, a final model, including all variables which were statistically significant at the 10% level at the fourth step, was analyzed.

Phase 5

Finally, a number of additional analyses that had not been included in PAPER 1, 2, and 3 were conducted:

1) Personality: When designing the present study it was planned to explore the role of personality factors, and a measure of personality had been included in the pilot study (phase 1). The measure chosen was the short version of the revised NEO personality inventory (NEO-PI-R) (Costa McCrae, 1992), which assessed personality using the so-called five-factor personality traits model. However, in the final, large sample, it had been necessary to omit this questionnaire to reduce the time and burden associated with completing the questionnaire package. To achieve a preliminary idea of the role of personality factors, the associations of the five personality dimensions: Neuroticism, Extraversion, Openness to experience, Agreeableness, and Conscientiousness with the Deep Approach, Surface Approach, and Achieving subscales of the original SPQ (Biggs, 1987) were analyzed in series of multiple, linear regressions.

2) Social Desirability: When using self-reported measures of learning approach, academic performance, and perceptions of the teaching environment, there may be a risk of reporting-bias, as some responses could be viewed as more socially acceptable or desirable than others. To be able to control for Social Desirability, a short 13-item version of the Marlowe Crowne Social Desirability Scale (MC-scale) (Crowne & Marlowe, 1960; Reynolds, 1982) had been included in the large sample of students' in the final study. As the questionnaire showed poor internal consistency (Kuder-Richardson (KR-20) = 0.43) in the present sample, it was omitted from the analyses reported in Paper 2 and 3. However, as learning approach could potentially be sensitive to social desirability and reporting bias issues, this was explored by repeating the analyses of the final models for Deep and Surface Approach reported in PAPER 2 while adjusting for Social Desirability and the results compared to the results shown in PAPER 2.

3) Expected grade: The third element in the 3-P model is "Product", i.e. the quality and quantity of what is learned by the student as a result of the learning process. When preparing the study, it was therefore considered whether to include the actual grade achieved in the course the students referred to when completing the R-SPQ-2F as a measure of "learning outcome". However, as it was anticipated that asking for consent to obtain their grades from the university registry and thereby cancelling the anonymity of the responders would threaten the willingness to participate and thus reduce the response rate and generalizability of the results, the option to include grades from the university registry was therefore abandoned. Instead, the students were asked to make judgment of their expected outcomes of their own learning by reporting their expected grade for the course in question, thus attempting to obtain a proxy for the outcome. In a series of additional analyses omitted from PAPER 2 and 3, the bivariate unadjusted as well as the multivariate, adjusted

associations between the expected grade as the dependent variable and Deep and Surface Approach, High School and current GPA, Self-efficacy and test anxiety as independent variables were explored. The variables included in the three additional analyses are shown in **bold face** in Figure 7 below.

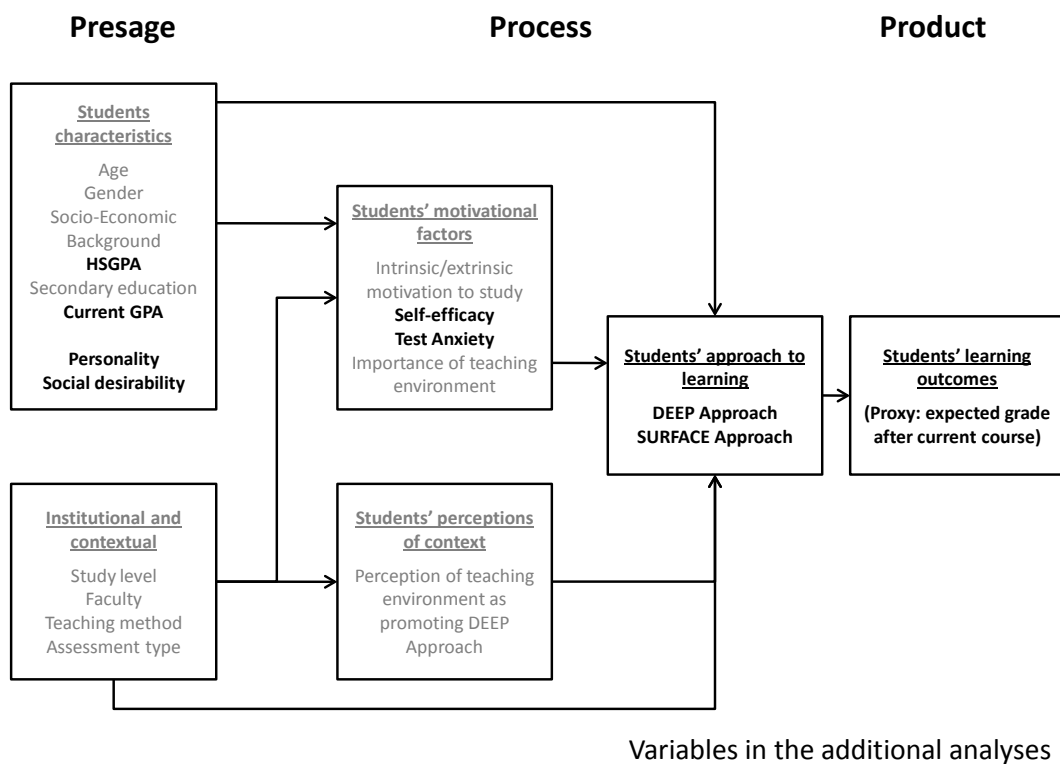


Figure 7. Variables in the additional analyses

6. Summary of results

In the following, the main results reported in PAPER 1, 2, and 3 will be summarized, together with the results of the additional analyses, which had not been included in the three papers.

6.1. Paper 1

PAPER 1 describes the results of a preliminary investigation of the psychometric properties of the Study Process Questionnaire. The Danish adaptation of the Revised Two-Factor version of the Study Process Questionnaire (R-SPQ-2F-DA) was handed out to 1350 students attending a total of 37 different classes. A total of 1084 students (80.2%) had completed all items and were included in the study. The number of missing items was small, as indicated by the mean 1.68% (SD: 1.69%) missing values per item. When analyzing the distributions of the four subscales (Deep Strategy (DS), Deep Motivation (MS), Surface Strategy (SS), and Surface Motivation (SM), as well as the two second order factors: Deep Approach (DA = DS+DM) and Surface Approach (SA = SS+SM), they all appeared normally distributed.

As described in PAPER 1, the internal consistencies (Cronbach's Alpha) were comparable to or larger than those reported by Biggs (2001). While the four subscales exhibited moderate internal consistencies (0.63 – 0.71), the values for the two combined approach factors were acceptable (0.80 and 0.78). Preliminary analyses of validity were conducted by analyzing the association between DA and SA and age, faculty, and study level, where one would expect DA to be associated with older age, higher study level, and “soft science” faculties such as the Arts. Older age and higher study level was associated with higher DA scores, and students from the Arts and Social Science has higher DA scores than students from Science and lower SA scores than students from Science and Health.

The factorial structure of the R-SPQ-2F-DA was then analyzed following the same general analytical procedure as reported by Biggs et al. (2001) with confirmatory factor analysis (CFA), first analyzing the unidimensionality of the four subscales, then analyzing a four-factor model (DS, DM, SS, SM) at the item level, followed by a final analysis treating the subscales as indicators of two latent factors (DA and SA).

As demonstrated in PAPER 1, in the analyses of unidimensionality, the fit indices (GFI: Goodness of Fit Index, CFI: Comparative Fit Index, SRMR: Standardized Root Mean Square Residual) for the R-SPQ-2F-DA indicated results comparable to those reported by Biggs et al. (2001) for the DM and DS, while this was not the case for the SM and SS subscales. When analyzing the R-SPQ-2F-DA at the item level, a reasonable fit was only achieved when the whole SS subscale was omitted from the model. Also, when analyzing the dimensionality of the questionnaire treating Deep and Surface Approach as latent variables, and the total scores of the four subscales as observed variables, the fit indices (CFI= 0.927; SRMR=0.05; GFI= 0.952) did not reach the same level as that reported by Biggs et al. (2001, model 2) (CFI= 0.992; SRMR=0.015). There are many fit indices, but CFI, GFI, and SRMR are commonly used in combination, with CFI and GFI values of >0.90 indicating “good fit” and values > 0.95 taken to indicate a “very good fit”. Likewise, SRMR values < 0.08 are considered to indicate “good fit” while values < 0.05 indicate “very good fit” (Hu & Bentler, 1999).

While the fit indices were not optimal and some concerns were raised regarding the surface strategy (SS) subscale, taken together, the internal consistencies and acceptable fit indices found in the present study for the second order two-factor model, together with the expected associations found

for age, faculty, and study level, suggested that the Danish adaptation of the R-SPQ-2F could be used for further research.

6.2. Paper 2

In PAPER 2, in addition to presenting descriptive data for male and female students at the bachelor and graduate levels from four faculties, the possible influences on Deep and Surface Approach of presage factors – student background characteristics and institutional and teaching context variables – were examined with both unadjusted regression analyses and multiple, hierarchical regressions, adjusting for the remaining variables. Both the unadjusted and fully adjusted analysis results found for the investigated sample of Danish students are summarized in Table 3 and compared with the expected results based on the findings of the available international literature. It should be noted here that previous findings have primarily been based on studies of relatively small samples, investigating few predictors, and that PAPER 2 is one of the few studies so far using a sufficiently large sample to allow for investigating the independent associations between students' approach to learn and a large number of potential predictors, while adjusting for the influence of remaining variables.

For Deep Approach, in general, the unadjusted analyses confirmed the hypothesized results. Higher Deep Approach scores were thus found associated with a) older age, b) the mother having the same education, c) higher levels of intrinsic motivation to study, d) studying at faculties teaching “soft disciplines” such as the Arts faculty, e) the course teaching method being seminars or lectures combined with seminars, and f) longer written assessment methods. All results, with the exception of those for f) assessment method, were confirmed in the multiple, adjusted analyses. While we

expected higher HSGPA to be associated with higher Deep Approach scores, this was only confirmed in the adjusted, but not the unadjusted analyses.

Table 3: Predictors of Student's Approach to Learn: Expected results and unadjusted and adjusted results found in a sample of 1160 Danish University Students. (Results reported in PAPER 2)

PAPER 2	Deep Approach			Surface Approach		
Predictors	Expected Results	Results Unadjust.	Results ** Adjusted	Expected Results	Results Unadjust.	Results ** Adjusted
Age	↑	↑	↑	↓	↓	↓
Gender (female)	↔	—	↑	↔	↑	—
Higher Socio-Economic Background (parent education)	↑	—	—	↓	—	—
Higher HSGPA	↑	—	↑	↓	↓	↓
High school as secondary education	↔	↑	↑	↔	—	—
Father had same education	↑	—	—	↓	—	—
Mother had same education	↑	↑	↑	↓	—	—
High Intrinsic motivation to study	↑	↑	↑	↓	—	—
High external motivation to study	↓	—	—	↑	↑	—
Study level (master)	↔	—	—	↔	—	—
Faculty ("Hard" disciplines)	↓	↓	—*	↑	↑	—*
Faculty ("Soft" disciplines)	↑	↑	↑	↓	↓	↓
Current GPA	↑	—	—	↓	↓	↓
Teaching method (seminar or lecture+seminar)	↑	↑	↑	↓	↓	↓
Teaching method (lecture)	↓	↓	—*	↑	↑	—*
Assessment (Long exams vs. short written)	↑	↑	—	↓	↓	—

Notes: ↑: The predictor expected/found associated with higher scores on SAL; ↓: The predictor expected/found associated with lower scores on SAL; ↔: No clear expectation/result; — : No association expected/found. Results in the expected direction are highlighted in **bold**. *) The predictor used as reference-category in the adjusted analyses. **) Adjusted for all variables.

Lower Deep Approach scores were associated with a) studying at faculties teaching “hard disciplines” such as the Science faculty and b) when the teaching method used in the course was a lecture. These results were, however, not confirmed in the adjusted analyses. We had no clear expectations with respect to study level, and no associations were found.

Some discrepancies with expected results were also found. While we had a) expected a higher socio-economic background, operationalized as a higher parental educational background, to be associated with higher Deep Approach scores, this did not appear to be the case, neither in the unadjusted nor the adjusted analyses. Likewise, in contrast to our expectations, b) the father having studied the same as the respondent, was not a predictor of Deep Approach. We had also expected c) that higher current GPA would be associated with higher Deep Approach scores and that d) higher external motivation to study would be associated with lower Deep Approach scores, which did not turn out to be the case. Due to inconsistent results in the literature, we were uncertain as to whether d) gender would be associated with Deep Approach, but the adjusted analyses showed that being female increased the likelihood of having higher Deep Approach scores. Likewise, we had no clear expectations concerning e) the role of secondary education. Both in the unadjusted and adjusted analyses, having high school as the secondary education prior to entering university was associated with increased likelihood of having higher Deep Approach scores.

As expected from the available results in the literature, the unadjusted analyses confirmed that higher Surface Approach scores were associated with a) higher external motivation to study, b) studying at faculties teaching “hard disciplines”, and c) lectures being used as teaching method in the course. Again, as expected, lower Surface Approach were found to be associated with a) older age, b) higher HSGPA, c) studying at faculties teaching “soft disciplines”, d) higher current GPA,

e) seminars as teaching method, and f) longer written assessment methods to be used at the end of the course. While we had no expectations concerning the role of gender, women appeared to be more likely to have higher Surface Approach scores in the unadjusted analyses. The results found for a) age, b) HSGPA, c) “soft disciplines”, d) current GPA, and e) seminars as teaching methods were confirmed in the multiple analyses adjusting for the remaining predictors. As for Deep Approach, we were unclear as to what to expect with respect to a) study level, and no associations were found. This was also the case for b) secondary education.

While we had expected that a) higher socio-economic background, b) the father and c) the mother having studied the same as the respondent, and d) high intrinsic motivation to study to be associated with lower Surface Approach scores, this was not confirmed in neither the unadjusted or adjusted analyses.

Taken together, the significant presage predictors of student background and institutional and contextual factors explained a relatively modest proportion of the variance of Deep (7%) and Surface Approach (10%).

6.3. Paper 3

In PAPER 3, additional predictors of Students' Approach to learn were examined. The associations with Deep and Surface Approach of psychological motivational factors of a) academic self-efficacy, b) test-anxiety, and c) the perception of the teaching environment and d) the perceived importance of the teaching environment were explored both unadjusted and while controlling for the previously investigated presage background and teaching context variables (see PAPER 2). Both the unadjusted and fully adjusted results found for the investigated sample of Danish students are

summarized in [Table 4](#) and compared with the expected results, based on the findings of the available international literature.

Table 4: Predictors of Student’s Approach to Learn: Expected results and unadjusted and adjusted results found in a sample of 1160 Danish University Students. (Results in PAPER 3)

PAPER 3	Deep Approach			Surface Approach		
Predictors	Expected Results	Results Unadjust.	Results Adjusted**	Expected Results	Results Unadjust.	Results Adjusted**
Self-efficacy	↑	↑	↑	↓	↓	↓
Test Anxiety	↓	↓	—	↑	↑	↑
Perception of teaching environment as promoting Deep Approach	↑	↑	↑	↓	↓	↓
Importance of teaching environment as promoting Deep Approach	↑	↑	↑	↓	↓	— ***

Notes: ↑: The predictor expected/found associated with higher scores on SAL; ↓: The predictor expected/found associated with lower scores on SAL; ↔: No clear expectation/result; — : No association expected/found. Results in the expected direction are highlighted in **bold**. *)The predictor used as reference-category in the adjusted analyses. **) Adjusted for all variables including background and teaching context variables examined in PAPER 2. ***) Near-significant trend (p = 0.063).

For Deep Approach, it was expected that a) that higher levels of academic self-efficacy would be associated with higher Deep Approach scores, while b) test-anxiety would lead to a reduced tendency to engage in deep approaches to learn. It was also expected that c) higher Deep Approach scores would be associated with higher levels of perceiving the teaching environment as promoting a Deep Approach to learning. Likewise, it was expected that d) students who perceived these aspects of the teaching environment as important would have higher Deep Approach scores. The unadjusted analyses confirmed all four hypotheses, and all hypotheses, except that concerning test-anxiety, were confirmed in the fully adjusted analyses, controlling for the remaining main

predictors as well as the presage factors of student background and institutional and teaching context.

In contrast, for Surface Approach, it was expected that a) higher levels of self-efficacy would lead to a reduced tendency to engage in surface approaches to learning, while b) higher levels of test-anxiety would be associated with a tendency to engage more in surface approaches to learning. It was also expected that c) perception and d) perceived importance of the teaching environment as promoting Deep Approach would be associated with lower Surface Approach. Again, all four hypotheses were confirmed in the unadjusted analyses. In the adjusted analyses, however, b) perceived importance of the teaching environment only reached near-statistical significance ($p = 0.06$).

While the significant background and teaching context predictors which had been included in PAPER 2 only explained about 7% of the variance in Deep Approach, adding the four motivational factors increased the proportion of the variance explained to 28%. Likewise, the significant background and teaching context predictors, which had been included in PAPER 2, only explained about 10% of the variance in Surface Approach. Adding the motivation factors increased the proportion of the variance of Surface Approach scores explained to 21%.

6.4. Additional results

In the following, some additional results of potential interest, which for reasons of ensuring brevity and sufficient focus of the papers, were not included in PAPER 1,2 or 3, will be reported. The aspects analyzed were: 1) the associations of Deep and Surface Approach to learn with the *expected grade* after the course, 2) the role of *personality traits* (based on results from the pilot study), and 3) the possible introduction of reporting bias on the results by *social desirability*. As these topics are not covered in PAPER

1, 2 or 3, the theoretical and empirical background is briefly described in the following together with a brief account of the methods for each of the analyses.

6.4.1. Expected grade

The positive relationship between a deep learning approach and study success has been well demonstrated (e.g. Marton and Säljö, 1976b; 1984; Prosser and Millar 1989; Trigwell & Prosser, 1991; Watkins, 2001; Duff et al., 2004; Heikkilä & Lonka, 2006). According to Ramsden (1992), these aspects are also likely to be influenced by their prior educational experiences. Significant positive associations between annual GPA and Deep Approach and negative associations with Surface Approach have been found in several other studies (Eley, 1992; Zeegers, 2001; Duff et al., 2004; Snelgrove, 2004). While, in general, research on the association between approaches to learning and quantitative outcomes suggest a positive association between GPA and deep approaches and a negative association for surface approaches, the inconsistent results in the literature suggests that other factors may be equally important in determining academic success.

When preparing the study, it was considered whether or not to include the actual grade achieved in the course the students referred to when completing the questionnaire. This would both require the students to report their student identification number, which would cancel the anonymity of responders, and require that each student gave his or her informed consent to retrieve their grades after completing the course. Our main concern was that this would threaten the willingness to participate and make it less likely to achieve a high response rate, which was one of our key aims of the study in order to attain results that were generalizable, and the option to include grades from the university registry was therefore abandoned.

Instead, the students were asked to provide a judgment of the expected outcome of their own learning by reporting their expected grade for the course in question, thus attempting to obtain a proxy for the outcome. Self-assessment is not a new technique. It has been used in a formative way to promote reflections on the students own learning processes and results (Dochy et al., 1999) and/or in a summative way as an expression of what the students expect or wish to learn within a given area (Boud & Falchikov, 1989). Studies indicate that students with lower academic ability tend to overestimate their grades, whereas students with higher academic ability tend to be more accurate or even underestimate their performance. (Boud & Falchikov, 1989; Prohaska, 1994; Dochy et al., 1999). Overestimation of grades by students of low academic ability may not always indicate overconfidence but rather unwillingness to admit that they expect a low mark. High grades are valued and students may be reluctant to assign themselves low grades even though they are expected. (Prohaska, 1994). Yet, it seems that students with low GPA in general tend to report lower expected grades than high-GPA students, perhaps indicating that they are aware of their overoptimistic expectations.

In a series of separate analyses, the associations between the expected grade and Deep and Surface Approach and High School and current GPA results were explored. The univariate associations between expected grade after the current course and Deep Approach, Surface Approach, High School GPA, Current GPA, self-efficacy, and test-anxiety are shown in [Table 5](#), together with the results of the multivariate analyses.

Table 5. Predictors of expected grade after the current course: Results of univariate and multiple, hierarchical linear regression analyses for students at the bachelor and master level

Study level	<i>Predictor</i>	Univariate		Multivariate ¹	
		Beta	Sign.	Beta	Sign.
Bachelor					

N = 458	Deep Approach	0.26	0.001	-0.01	0.872
	Surface Approach	-0.32	0.001	-0.13	0.003
	High School GPA	0.11	0.013	-0.05	0.173
	Current GPA	0.37	0.001	0.23	0.001
	Self-efficacy	0.61	0.001	0.49	0.001
	Test anxiety	-0.23	0.001	-0.04	0.258
$R^2 = 0.42$					
<hr/>					
Master N = 201	Deep Approach	0.42	0.001	-0.02	0.825
	Surface Approach	-0.41	0.001	-0.11	0.127
	High School GPA	-0.03	0.681	-0.08	0.104
	Current GPA	0.52	0.001	0.28	0.001
	Self-efficacy	0.68	0.001	0.56	0.001
	Test anxiety	-0.23	0.001	0.05	0.371
$R^2 = 0.54$					

¹⁾ All dependent variables entered together at one step.

For students at the bachelor level, the unadjusted analyses showed that all six predictors of expected grade reached statistical significance. In the multivariate analysis, only Self-efficacy and Current GPA were associated with higher expected grade and Surface Approach with lower expected grade, while the remaining factors ceased to be statistically significant. The model explained 42% of the variance in expected grade. For students at the masters level, all independent variables, with the exception of High School GPA were significantly associated with expected grade in the unadjusted analyses. When adjusting for the other variables in the multivariate analysis, self-efficacy and Current GPA were associated with higher expected grade, while the remaining variables did not reach statistical significance. The model explained 54% of the variance in expected grade.

The results showed that this question was the clearly item for which there was the highest number of missing values, with a almost one fifth of the students omitting to answer this question, thus confirming the suspicion that grades can be a sensitive issue. Taken together, the results confirm that previous assessment experience in the form of current GPA and self-efficacy are the major predictors of expected grade, with self-efficacy showing associations twice as large as current GPA, thereby emerging as the single most powerful predictor of expected grade. While expected grade is

only a proxy, it underscores the importance of self-efficacy as a motivational factor. That Students' Approach to Learn, with the exception of Surface Approach at the Bachelor level, ceased to be a significant predictor when controlling for the remaining variables, could be taken as indicating that self-efficacy and approach to learn share common variance in their association with expected grade, and further studies of the interrelationships between approach to learn and self-efficacy are needed. That test-anxiety also ceased to be significant in the adjusted model, likewise indicates shared variance between self-efficacy and test-anxiety.

6.4.2. The role of personality?

As reviewed in the present thesis, the majority of research has focused on possible demographic, institutional, and teaching contextual predictors of students' approach to learn. These factors, especially the institutional and teaching context variables, are particularly interesting as they represent factors that can be influenced by educational policy and by changes in teaching and assessment methods. This does, however, not rule out that other more stable factors, thus less susceptible to influence, may play a role in students' approach to learn. Various personality or trait dimensions represent such possible factors, but have not been given much attention in the literature (Zhang, 2002). Given that the factors included in the present study only explain between 21 % (Surface Approach) and 28% (Deep Approach) of the variation in Students' Approach to Learn, it is highly possible that other factors, including personality traits, may contribute to explaining learning approach.

When designing the present study it was in fact planned to explore the role of personality factors, and a measure of personality was included in the pilot study. The measure chosen was the short version of the revised NEO personality inventory (NEO-PI-R) (Costa McCrae, 1992), which assessed personality using the so-called five-factor personality traits model. The five-factor model is the product of several decades of factor analytical research and is considered to be most

prominent and best validated model of personality structure (Zhang, 2002). The short version NEO-PI-R measures the following five independent personality dimensions: Openness to experience is a trait associated with a tendency to be imaginative and unconventional, while people low on openness to experience tend to be more conventional, skeptical, and traditional in the views (sample items: “I have a vivid imagination” and “I spend time reflecting on things”). Conscientiousness represents a tendency to show self-discipline and to act dutifully according to external norms and expectations (sample items: “I like order” and “I pay attention to details”). People with high Extraversion scores tend to seek the company of others, be action-oriented, and to experience positive emotions (sample items: “I feel comfortable around people” and “I am the life of the party”). Agreeableness represents a tendency to be compassionate, empathetic, and cooperative, and individuals with high agreeableness scores are generally friendly and helpful with a concern for social harmony (sample items: “I take time out for others” and “I make people feel at ease”). Neuroticism represents the dimension of emotional instability vs. stability. Individuals high on neuroticism tend to experience negative emotions including anxiety, guilt, and low self-esteem (sample items: “I worry about things” and “I have frequent mood swings”). (For further details, see Costa & McCrae, 1992)

In the pilot study, 107 first and fourth year psychology students completed the NEO-PI-R inventory, and the associations between these five personality dimensions and scores on Deep Approach, Surface Approach, and Achieving, assessed by the 42-item Study Process Questionnaire (Biggs, 1987) were explored with unadjusted and adjusted multiple linear regressions. The results are shown below in Table 6.

Table 6. The five personality factors of Neuroticism, Extraversion, Openness to experience, Agreeableness, and Conscientiousness (NEO-PI-R) as predictors of scores on the SPQ-scores on Deep Approach, Surface Approach, and Achieving.

DV	N = 107 Deep Approach	Unadjusted		Multivariate	
		Beta	Sign.	Beta	Sign.
IV	NEO-PI-R (Short version)				
	Neuroticism	-0.15	0.125	-0.10	0.333
	Extraversion	0.21	0.030	0.07	0.536
	Openness to experience	0.26	0.007	0.25	0.016
	Agreeableness	0.09	0.365	-0.02	0.829
	Conscientiousness	0.15	0.122	0.13	0.179
				R ² = 0.069	
DV	Surface Approach				
IV	NEO-PI-R (Short version)				
	Neuroticism	0.16	0.104	0.17	0.108
	Extraversion	-0.15	0.114	-0.03	0.805
	Openness to experience	-0.16	0.103	-0.10	0.357
	Agreeableness	-0.21	0.026	-0.20	<i>0.052</i>
	Conscientiousness	0.02	0.863	0.10	0.343
				R ² = 0.046	
DV	Achieving				
IV	NEO-PI-R (Short version)				
	Neuroticism	-0.07	0.495	-0.02	0.820
	Extraversion	-0.01	0.886	-0.01	0.951
	Openness to experience	-0.09	0.357	-0.03	0.781
	Agreeableness	-0.14	0.144	-0.17	<i>0.097</i>
	Conscientiousness	0.17	0.080	0.20	<i>0.056</i>
				R ² = 0.016	

Results significant at the 5% level are shown in **bold**, and results significant at the 10% level shown in *italics*.

As seen in Table 6, the personality dimensions of Extraversion and Openness to Experience were positively associated with Deep Approach in the unadjusted analyses. When adjusting for the remaining factors, only Openness to Experience reached statistical significance. Agreeableness was the only statistically significant predictor of Surface Approach in the unadjusted analyses. In the adjusted analyses, Agreeableness only exhibited a near-significant trend. None of the five dimensions reached statistical significance when analyzing their association with Achieving.

Only few previous studies have explored the role of the five-factor personality model. In a study of 420 Chinese students from Shanghai, Zhang (2002) investigated the associations between the five dimensions as assessed with the NEO-Five Factor Inventory (Costa & McCrae, 1992) and Deep and Surface Approach as measured with the original Study Process Questionnaire (Biggs, 1987). The factors of Openness to Experience and Conscientiousness accounted most for the differences in learning approach. As found in the pilot study, Zhang also found that Openness was a good predictor of Deep Approach. While the results for Neuroticism in the pilot study did not reach statistical significance, they show the same direction with a positive association found between Neuroticism and Surface Approach. In a more recent study of 158 students from University College of London focusing on predictors of academic performance, Chamorro-Premuzic and Furnham (2008), assessed learning approach with the Study Process Questionnaire (Biggs, 1987) and personality with the long version of the NEO-PI-R (Costa & McCrae, 1992) and found that academic performance was predicted by Deep and Achieving approaches to learn as well as with Openness to Experience and Conscientiousness. Openness to Experience seemed to be the most consistent predictor in the pilot study and the two previous studies. In the studies by Zhang (2002) and Chamorro-Premuzic and Furnham (2008), Conscientiousness also appeared to be an important predictor, which was not the case with the relatively small sample of Danish students in the pilot study. The pilot study, however, showed associations in the direction, and it is possible that the discrepancies found are mainly due to the small sample with subsequent insufficient statistical power. The inconsistencies could theoretically, however, also be due to cross-cultural differences in the role of personality factors for students' approach to learn.

It could therefore have been interesting, if the NEO-PI-R had been included in the final study with the much larger and more generalizable sample of Danish university students. The feedback given

by students included in the pilot study, however, warned us against including the NEO-PI-R. A questionnaire package including the NEO-PI-R was considered too comprehensive. Given the study procedure which aimed at recruiting students during lectures and seminars, we were given reasons to believe that the response rate would be considerably lower, if it was included, and it was therefore decided to exclude it from the final questionnaire package. Given the few studies in the area, the preliminary findings from the pilot study suggest that the NEO-PI-R should be considered when designing future studies of predictors of students' approach to learn. While personality factors should be considered as more or less insusceptible to influence, it is possible that personality could emerge as an important moderator, with certain contextual factors, e.g. teaching and assessment methods, being more appropriate for students with certain personality profiles, thereby pointing towards possible individualized approaches to teaching and assessment.

6.4.3. Social desirability

When using self-reported measures of learning approach, academic performance, and perceptions of the teaching environment, it seems reasonable to be aware of the potential risk of reporting-bias, as some responses could be viewed as more socially acceptable or desirable than others. For example, Deep Approach could perhaps, in the university context, be viewed by students as more desirable than more surface oriented approaches. Likewise, the reliability of the included question on current GPA could likewise be influenced by social desirability. Possible over-reporting of Deep Approach behaviors and of current GPA could be due to at least two mechanisms (Jørgensen & Zachariae, 2006): "Self-deception", i.e. the individual responds in a socially desirable way, which the person truly believes is in correspondence with his or her behavior, but which differs from their actual behavior, or "impression-management", i.e. where the individual responds in a way that he or she thinks is in concordance with the expectations of the environment, but which he or she knows

differs from his or her objective behavior. In the area of Students' Approach to Learn, this has only been the subject of very limited interest. To the best of this author's knowledge, only one study of young secondary school students has explored the role of social desirability for the reporting of Students' Approach to Learn (Watkins, 1996). This study assessed social desirability among 162 students (12-13 years of age) at secondary schools in Hong Kong with the Marlowe-Crowne Social Desirability Scale (Crowne & Marlowe, 1960) and analyzed its correlations with scores on the Learning Process Questionnaire (Biggs, 1987). Higher social desirability was associated with lower scores on Surface Strategy with a stronger association found in boys, as well as with higher scores on Achieving Strategy, here with a more pronounced correlation in girls.

On this background, it was decided to include a short measure of social desirability to enable adjustment for possible effects of response bias in a social desirable direction. The instrument chosen was the Marlowe Crowne Social Desirability Scale (MC-scale) (Crowne & Marlowe, 1960; Reynolds, 1982) which for over four decades has found widespread use in a variety of different experimental and clinical assessment contexts. The full MC-scale consists of 33 items, which are thought to reflect behaviors and responses that are culturally sanctioned but rather unlikely. The primary goal of the developers of the MC-scale was to be able to identify individuals who were likely to respond to questions by stating what they thought was the socially desirable answer rather than answering the question truthfully, allowing behavioral researchers to control for possible effects of social desirability in self-report questionnaires. It is possible that associations between reports of certain behaviors, e.g. anxiety and low academic performance, may be moderated by social desirability. Failure to control for effects of social desirability on affected measures may lead to inflated or understated estimates of their relations to each other or to other measures. Although thus originally developed as a measure of social desirability response bias and still enjoying wide

popularity for this purpose, a large body of research also suggests that the MC-scale may primarily be measuring substantive individual difference dimensions in defensiveness, vulnerable self-esteem, and approval dependence (Jørgensen & Zachariae, 2006), factors which are of potential importance to both learning approaches and academic performance.

However, the reliability (internal consistency) of the 13-item short version of the Marlowe-Crowne Social Desirability Scale (MCSDS) (Reynolds, 1982) used in the present study was very low (Kuder-Richardson (KR-20) = 0.43) in the present sample. Although previous studies with Danish versions of both the original 33-item version and a developed 12-item short version have shown acceptable internal consistencies (KR-20 = 0.82 and 0.78) (Jørgensen & Zachariae, 2006), due to the questionable low internal consistency of the 13-item version used in the present sample, it was omitted from the analyses in PAPER 2 and 3. However, as learning approach could potentially be sensitive to social desirability and reporting bias issues, the possible influence of social desirability on some of the self-reported variables was explored separately.

As Deep Approach from a societal perspective could be seen as the desirable, and Surface Approach as less acceptable approach to university studies, we expected scores on Deep Approach to be positively associated with social desirability and scores on Surface Approach to be inversely associated with social desirability. It is also possible that individuals with high social desirability would tend to either refrain from reporting their High School GPA or current GPA or tend to report higher current GPA. Furthermore, individuals with high social desirability scores would theoretically be expected to underreport test anxiety. For instance, a previous study found an inverse correlation ($R = -0.30$, $P < 0.001$) (Jørgensen & Zachariae, 2006) between MCSDS-33 scores and scores on the Taylor-Manifest Anxiety Scale, which measures anxiety as a trait. As self-efficacy

could be expected to be considered socially desirable, we would expect a positive association between social desirability and self-efficacy.

As expected, in the present sample, a small, but statistically significant, positive correlation was found between social desirability scores and Deep Approach ($r = 0.09$; $p = 0.002$). Furthermore, a negative correlation was found between social desirability and Surface Approach ($r = -0.10$; $p < 0.001$). While the associations were in the expected directions, no correlations between either self-reported High School- or current GPA reached statistical significance ($r = 0.04$ and 0.03). Likewise, correlations with test anxiety ($r = -0.04$) and self-efficacy scores ($r = 0.03$) were small and did not reach statistical significance ($p: 0.20$ to 0.39). While the questionable internal consistency of the current version of the MCSDS should be taken into consideration, the results for self-reported grades, test anxiety, and self-efficacy at least do not appear to question the validity and reliability of these variables. As 20.2% chose to not disclose their current GPA, this could have influenced the results found for social desirability and current GPA. When comparing the MCSDS-scores of responders and non-responders, individuals who did not report their current GPA did show a tendency to have slightly higher MCSDS-scores (Mean: 8.2, SD: 2.2) than those who did (8.0; 2.2), but, again, the difference did reach statistical significance ($p = 0.27$). However, as significant associations were found in the expected direction for both Deep and Surface Approach, the final models presented in PAPER 3 were reanalyzed while controlling for MCSDS-scores. The results are compared in [Table 7](#) below.

Table 7: Results of the final models with and without control for social desirability (MCSDS-13)

DV: Deep Approach	Without MCSDS		With MCSD	
Age	0.12	0.001	0.12	0.001
Gender (men: referent)	0.05	0.106	0.06	0.062

High School GPA	0.06	0.064	0.06	0.070
Faculty: Humanities	0.11	0.002	0.12	0.001
Faculty: Social Science	0.06	0.084	0.06	0.082
Seminar	0.04	0.189	0.04	0.155
Lecture-seminar combined	0.07	0.021	0.08	0.015
Self-efficacy	0.30	0.001	0.30	0.001
Perception of teach. envir.	0.27	0.001	0.26	0.001
Importance of teach. envir.	0.09	0.005	0.10	0.005
Current GPA	-0.06	0.056	-0.06	0.050
Social Desirability (MCSDS)	-	-	0.09	0.001
		R ² = 0.279	R ² = 0.287	
DV: Surface Approach	Without MCSDS		With MCSD	
Age	-0.09	0.001	-0.09	0.001
Gender (men: referent)	0.12	0.001	0.11	0.001
High School GPA	-0.12	0.001	-0.12	0.001
Faculty: Humanities	-0.24	0.001	-0.25	0.001
Faculty: Health	0.14	0.002	0.14	0.002
Faculty: Social Science	-0.11	0.019	-0.11	0.014
Seminar	-0.08	0.006	-0.08	0.006
Lecture-seminar combined	-0.13	0.001	-0.13	0.001
Test Anxiety	0.10	0.001	0.10	0.001
Self-efficacy	-0.19	0.001	-0.19	0.001
Perception of teach. envir.	-0.15	0.001	-0.14	0.001
Importance of teach. envir.	-0.06	0.063	-0.06	0.050
Social Desirability (MCSDS)	-	-	-0.08	0.004
		R ² = 0.214	R ² = 0.220	

The results indicate that although social desirability remains a significant predictor in the expected direction when entering the variable in the final models, only very slight changes are found in the magnitude of the associations with the remaining independent variables. The results suggest that while self-reported learning approach may to at least some degree be influenced by social desirability, this does not appear to influence the remaining associations found, e.g. the influence of test anxiety and self-anxiety, supporting the validity of the current findings. Again, taking the questionable internal consistency of the current version of the MCSDS into consideration, the results should be interpreted cautiously.

7. Discussion

As described in the **Introduction**, there are no published studies of Danish university students' approach to learning (SAL), and, consequently, very little is known about student learning in the Danish University context. Furthermore, while there is an extensive international literature on learning approaches of students in Higher Education and factors which can explain the found variance in learning approach, the results found for several of the factors explored are conflicting or unclear, the reasons being, at least in part, due to the methodological limitations of the available studies. The aims of the present PhD-project was therefore to add to our knowledge about SAL by exploring the learning approaches of a large sample of Danish university students and to identify a number of presage and process factors which, potentially, can explain the variability in SAL among Danish university students.

7.1. Reliability and validity of a Danish adaptation of the Study Process Questionnaire

The first objective was to translate into Danish the Study Process Questionnaire (Biggs 1987; 2001), the most widely used instrument assessing SAL, and to provide a preliminary test of its reliability and validity in Danish University Students. As described in the **Summary of Methods** section, the results of a pilot phase with a preliminary sample of students indicated that the Danish translation of the original 42-item version of the SPQ (Biggs, 1987) was not satisfactory, and, as noted by Biggs (2001), higher education has undergone many changes since the first version of the SPQ was published. It was therefore decided to use the updated and shorter revised two-factor version of the Study Process Questionnaire (R-SPQ-2F) (Biggs, et. al., 2001) in the second phase of the study.

As described in **PAPER 1**, the internal consistency and factor structure of the Danish translation of the revised two-factor version of the Study Process Questionnaire (R-SPQ-2F) were investigated and the findings compared with the results of the original English-language version previously described by Biggs, Kember and Leung (2001). With respect to internal consistency, the final Danish version of the R-SPQ-2F showed moderate to acceptable internal consistencies of the four subscales with Cronbach's Alphas ranging from 0.63 to 0.80, with all coefficients exceeding the results previously reported for a sample of Hong Kong students (Biggs et al., 2001). While an Alpha of 0.63 may seem less than satisfactory, it should - as higher Alpha values are generally associated with higher number of items - be taken into consideration that the subscales of the R-SPQ-2F-DA consist of relatively few items. Generally, values below 0.60 are regarded as poor (Richardson, 2004), and none of the values for the Danish version were below that limit, suggesting that the internal consistency of the Danish R-SPQ-2F was generally acceptable.

When we subjected the factor structure to confirmatory factor analysis (CFA), following the same analytical procedure reported by Biggs et al. (2001) for the R-SPQ-2F, the results at the item-level for the Deep Motivation (DM) and Deep Strategy (DS) subscales were satisfactory and comparable to those reported by Biggs et al. (ibid.). However, the results for the subscales of Surface Motivation (SM), and, in particular, Surface Strategy (SS) were less than satisfactory. When we analyzed the dimensionality of the questionnaire treating Deep and Surface Approach as latent variables, and the total scores of the four subscales as observed variables, the fit indices for this model (CFI= 0.927; SRMR=0.05; GFI= 0.952) suggested "good fit" (Hu & Bentler, 1999), but did not reach quite the same level as that reported by Biggs et al. (2001).

While the acceptable – if not optimal – internal consistencies and fit indices found in the present study for the second order two-factor model suggested that the Danish adaptation of the R-SPQ-2F could be used for further research, the results also directed our attention to the SS-subscale. While it is here interesting to note that previous studies using the original SPQ have also found the surface scale to be the least psychometrically reliable (e.g. Snelgrove & Slater, 2003), the result could indicate that the way Danish students interpret the individual items of this dimension may be different from that of the Australian or Hong Kong students participating in the validation of the original version. Several questions in the SS scale refer to how the students go about their learning in relation to their exam, while the SM-scale refers to how much time students are willing to spend on the task. Since the 1970s, the Danish educational culture has generally attempted to dissociate itself from rote learning and strived towards what is viewed as a more meaningful way of student-centered learning. This is done by attempting to enhance intellectual competencies such as analytical and abstract thinking and by seeking to stimulate knowledge-seeking approaches, communications skills and the ability to structure own learning. As a consequence, “multiple-choice” formats are only rarely used in the Danish educational context, and instead, the assessment system often focuses on higher cognitive skills rather than of reproduction of fact. Although there most certainly are Danish students who are trying to get by their study with as little effort as possible, this could perhaps explain why the concept of *Surface Approach* to learning may be a strategy the students have difficulties relating to, and comparisons with results from other countries should therefore be interpreted cautiously.

While the results indicated that the Danish adaptation of the R-SPQ-2F could be used for further research, the concerns raised regarding the surface strategy (SS) subscale should be taken into consideration when interpreting and comparing the results with findings from the international

educational context. Our results could also be taken as suggesting that the Danish adaptation of the R-SPQ-2F should be considered preliminary and that further adjustments of the SS-subscale may be needed to establish a suitable version of the SPQ for Danish university students.

7.2. Predictors of SAL in Danish university students

As the factor structure and the preliminary reliability and validity of the Danish version of the R-SPQ-2F was found to be acceptable, a number of presage factors of potential importance for SAL assessed in the sample of 1181 Danish university students and their associations with SAL were analyzed. As described in the **Aims and Hypotheses** section, a number of hypotheses were stated concerning the expected associations between student background factors and a number of institutional and contextual characteristics and Deep and Surface Approach. The expected associations, based on the findings of existing international literature on SAL, and the results found for the present sample are described in Table 3 and 4 in the **Summary of Results** section.

7.2.1. Student background characteristics

The student background factors investigated included age, gender, parental education, high school grade point average (HSGPA), and secondary schooling. Based on previous results we expected older age to be associated with an increased tendency to use a Deep Approach and a reduced tendency to use a Surface Approach to learning (E.g. Watkins & Hattie, 1981b; Biggs, 1987; Gow & Kember, 1990; Duff, 1999; Richardson, 1995; Richardson, Morgan, & Woodley, 1999; Sadler-Smith, 1996; Sadler-Smith & Tsang, 1998; Zeegers, 2001). As reported in **PAPER 2**, these findings were confirmed in the present study, both in the unadjusted analyses and when adjusting for

potential confounders of the association between age and SAL, e.g. study level. This could indicate that students who enter university after a break of one or two years after secondary schooling, may be more motivated and willing to engage in the task in a way which are declared aims and purposes in higher education. Previous results for gender have been inconsistent (Wilson, 1996; Jones, 2002; Baeten et al. 2010), probably due to methodological limitations such as lack of adjusting for potential confounders, and we therefore had no clear expectations concerning the role of gender. While we did find that female gender was associated with higher use of Deep Approach in the adjusted analyses, gender generally did not appear to be a strong independent predictor of learning approach. The role of gender in relation to learning approach appears to be highly complex and may depend on motivational and additional contextual factors, subject and level of study, thus indicating a need for further research.

Based on previous findings (Biggs, 1987; Zhang, 2000; Cano, 2007), we hypothesized that students with parents with higher educational level would be more likely to use Deep Approach, and that lower parental educational background would be associated with Surface Approach. Contrary to our expectations, the results failed to confirm our hypothesis. This can be seen as supporting more recent sociological theories (Havnes & Aamodt, 2004), suggesting that social background is less important for learning at the higher levels of the educational system, due to, among other things, the demanding selection process of students to higher education. Another reason for the null finding could be the relatively low level of socioeconomic inequality in Denmark compared to other countries, including the English speaking countries (e.g. UK, Australia, and Hong Kong) where most SAL research has been conducted. In 2005, Denmark was the country with the lowest degree of inequality compared to 128 other countries, as measured by the so-called Gini coefficient (World Bank. 2007b. World Development Indicators 2007. Washington, D.C.). While the Gini-coefficient

for Denmark in 2005 was 24.7, the coefficients for UK and Australia were 36.0 and 35.2 respectively.

In contrast to the findings concerning socioeconomic background, there is general consensus in the literature that HSGPA is a strong predictor of academic success (e.g. Bridgeman, McCamley-Jenkins, & Ervin, 2000; Burton & Ramist, 2001; Fleming, 2002; Hoffman, 2002), and we therefore expected that higher HSGPA would be associated with Deep Approach and lower HSGPA with Surface Approach. While our hypotheses were confirmed in the present sample, the associations were moderate. One possible explanation could be the context-dependent nature of SAL making it influenced by the present learning situation which may not only require deep level processing but also fact-oriented, i.e. surface, learning strategies (Biggs, 1987; Diseth & Martinsen, 2003; Ramsden, 1992; Kember & Leung, 1998).

Although some previous studies (e.g. Harper & Kember, 1986; Volet, Renshaw & Tietzel, 1994) indicate that the nature of secondary schooling influence students' approaches to learning, we had no clear expectations to the learning approaches of students with other than high school as qualifying admission criteria. Our results indicated that students with high school as secondary educational background were more likely to use Deep Approach, while we found no associations with Surface Approach. It is thus possible that previous experiences with other educational settings than high school may lead to study habits that are less compatible with university education and continue to use these study approaches when entering university. Taken together, while the large sample allowed us to identify significant student background predictors of SAL, in particular age, gender, and HSGPA, the proportion of the variance in SAL explained by these factors was no more than approx. 2 percent.

7.2.2. Student motivational factors

In addition to student background factors, three core aspects of motivation were explored in the present study: Intrinsic value (the value component), self-efficacy (the expectancy aspect), and test anxiety (the affective component) (Pintrich 2000). The value component was explored by assessing the students' *motivation to choose their present study*, where we expected that being more motivated by the opportunity of personal growth provided by a higher education, i.e. intrinsic motivation, would be associated with Deep Approach, while extrinsically motivated students, i.e. goal-oriented students motivated by acquiring the skills necessary to obtain a good job, on the other hand, were expected to be more likely to use surface approaches to learn (Kember et al, 2008; Lassesen, 2007; Pintrich, 2003; Pintrich & Schunk, 2002; Taylor et al., 1981). As shown in **PAPER 2**, the results confirmed that intrinsic motivated students had higher Deep Approach scores, and extrinsic motivated students had higher Surface Approach scores. In the fully adjusted model, however, only intrinsic motivation remained a statistically significant predictor, suggesting this aspect to be the most important motivational factor of the two, and perhaps indicating that high intrinsic motivation does not necessarily exclude at least some level of extrinsic motivation.

With respect to academic *self-efficacy*, the expectancy aspect of motivation, we hypothesized, based on the large literature on self-efficacy and learning (albeit primarily from lower educational level contexts), that higher levels of self-efficacy would be associated with greater willingness to use deep approaches to learn, whereas low levels of self-efficacy were expected to be associated with greater use of surface approaches to learn (Prat-Sala & Redford, 2010; Diseth, 2011). As reported in **PAPER 3**, self-efficacy emerged as a strong predictor of Deep Approach, both in the unadjusted and in the fully adjusted analyses, this single factor explaining approx. 9% of the variance of Deep

Approach scores. While the explanatory power was lower (4%), low levels of self-efficacy were likewise, as hypothesized, associated with higher Surface Approach scores. Our findings are of particular interest, as previous studies have often failed to adjust for other factors, potentially related to self-efficacy such as additional motivational factor e.g. perception of the teaching environment, test anxiety, mastery experiences e.g. grades, socio-demographic factors, and institutional factors such as type of study, study level and teaching methods.

With respect to the affective component, previous research has confirmed that *test-anxiety* influences students' academic achievement (Hembree, 1988; Zeidner, 1998), leading several SAL researchers to suggest that a reason for this may be that high anxiety is likely to impair the learning process and promote a surface rather than a Deep Approach to learning (Fransson 1977; Tooth et al. 1989; Marton & Säljö, 2005; Spada et al., 2006; Birenbaum, 2007). This hypothesis was initially confirmed in the unadjusted analyses which indicated that test-anxiety was strongly negatively associated with Deep Approach and moderately positively associated with Surface Approach, supporting the findings of a limited number of previous studies which found evidence suggesting that highly anxious students tend to encode information at a more superficial level resulting in poorer knowledge of the relevant material (Benjamin et al., 1981; 1987; Spada et al. 2006). When we adjusted for the remaining variables, however, test-anxiety ceased to be a statistically significant predictor of Deep Approach. Additional explorative analyses indicated that this was likely to be primarily due to the shared variance of test-anxiety and self-efficacy. When analyzing the association with Surface Approach, test-anxiety continued to be a statistically significant predictor of the Surface Approach when adjusting for the remaining variables in the model. Taken together, our preliminary analyses seem to suggest that the associations found between high levels of test-anxiety and lower levels of Deep Approach scores to a large degree may be related to the inverse

association between test-anxiety and self-efficacy. In contrast, the data seem to suggest that test-anxiety can be regarded as an independent predictor of Surface Approach, even when adjusting for other relevant variables.

7.2.3. Institutional and contextual factors

SAL is viewed primarily as context-dependent, rather than a stable student characteristic and previous research has shown that the students' perception of the learning environment influences their approaches to learning.

For example, students from different *faculties* have been found to differ in what they perceive as important in their studies, how they view their learning environment, and how they approach their studies (Becker et al., 1968; Entwistle & Tait 1990; Richardson, 1995; Vermetten, Lodewijks & Vermunt, 1999; Entwistle & McCune, 2004). As students learn the demands of the institution and what it takes to evolve into the kind of learner the specific academic context demands, we expected that students from “soft disciplines” such as the Arts would be more likely to use deep learning approaches, while students from the “hard disciplines” such as Science would – all things equal – be more likely to use surface approaches. As seen in **PAPER 2**, the expected results were generally confirmed, as students from Arts and Social Sciences had statistically significant higher Deep Approach scores and lower Surface Approach scores than students from the faculty of Sciences. The reason may be that “soft discipline” faculties such as the Arts are more likely to focus on flexibility, adaptability, and ambiguities, while hard discipline faculties are more focused on solving logically structured problems and memorization of facts, which is taken to encourage surface learning approaches (Braxton & Nordvall, 1985; Biggs, 1987; Smart & Ethington, 1995; Entwistle 2005; Laird et al., 2008). This interpretation, however, is constrained by the cross-sectional design,

in that within-student inferences are drawn from between-student findings. That is, if two students each in a different teaching context are found to have adopted different study approaches, this does not necessarily imply that if they swapped contexts, they would also swap study approaches. Thus, the theorized institutional-dependent aspect of SAL may only be partially correct, and the differences found between faculties could also stem from students being more prone to deep learning approaches also being more likely to choose a “soft discipline” university study.

Student learning approaches in a time perspective has not received much attention in the available literature (Severiens et.al. 2001; Jones 2002). Generally, previous findings of both cross-sectional and longitudinal studies of the influence of *study level* are conflicting, with some studies finding that students, as they progress to higher study levels, show fewer meaning oriented, i.e. deep, approaches to learning (Watkins and Hattie, 1985 cited by Zeegers, 2001; Gow & Kember, 1990), while others have found either no differences or results in the opposite direction. We therefore had no clear hypothesis as to the results for study level and SAL, and, as reported in **PAPER 2**, we found no associations between learning approach and study level. While one theoretically would expect that students at higher study levels will have developed higher levels of intellectual processing and more intrinsic reasons for valuing the study topic, this could be counteracted by other contextual factors that may influence the students to move towards the greater use of surface approaches, including work pressure, assessment procedures, and their perceptions of the teaching and learning environment.

Teaching and assessment methods related to the current learning context could be among the most important contextual predictors of learning approach (Newble and Clarke 1987; Biggs 1999; Entwistle and Tait 1990; Lizzio et al. 2002; Diseth et al., 2006). Generally, teaching and assessment

methods that encourage more independent and more complex learning strategies, e.g. seminars and other small group-based teaching methods and assessments such as oral exams and extensive open-ended assignments, should be more likely to promote deep learning approaches than lectures with large audiences and assessment methods such as short written exams and multiple choice formats. As seen in **PAPER 2**, these hypotheses were generally supported by our findings showing that seminars alone - or in combination with lectures - were associated with higher Deep Approach scores than lectures, and the findings of the opposite pattern for Surface Approach. While our hypothesis that oral and open-ended written exams would be associated with Deep Approach scores were confirmed in the unadjusted analysis, type of assessment was no longer associated with SAL in the adjusted analyses. This could be due to the large variation in the assessment methods used by the institutions. Another reason could be that the participants were approached approximately halfway through the semester, and they may not yet have been too preoccupied with their final exams at the time of data collection.

According to Ramsden (1992), students' approaches to learning are also likely to be influenced by prior educational experiences, e.g. the grades obtained, and positive associations between higher *current GPA* and Deep Approach have been reported in the literature (Duff et al., 2004; Snelgrove, 2004; Zeegers, 2001; Eley, 1992). Our hypothesis that current GPA would be positively associated with deep and negatively correlated with Surface Approach, however, was only partly supported, as only *lower* GPA was associated with Surface Approach, while higher GPA appeared unassociated with Deep Approach. Our results are in concordance with those previous studies, which have found only weak associations between previous learning outcomes and learning approach (Jones and Jones, 1996; Watkins & Hattie, 1985; Sadler-Smith, 1998). Although some disciplines require more fact-oriented learning promoting surface approaches, this does not necessarily mean that the

students are incapable of mastering deep approaches to learning. Students who possess the skills that lead to high grades may in fact often be capable of adopting structurally complex understandings if necessary.

Compared to the student background factors such as age, gender, and parental educational background, who explained a fairly small proportion, i.e. approx. 2 percent, of the variation in SAL, the institutional and contextual factors explained a somewhat larger proportion. These factors explained an additional 4 % of Deep Approach scores and twice as much, 8 %, of Surface Approach.

7.2.4. Student perception of context

While our data support that SAL is influenced by the contextual and institutional factors, it is clear that it is the student's *perception* of the learning context, which influences SAL most directly, rather than the context in an objective sense (Laurillard 1979; Biggs, 1984; 2001; Entwistle 1987; Richardson 2003; Diseth et.al., 2006), and students taking the same courses may thus vary in their perceptions of the course, which in turn could influence their approaches to studying. Our results, as reported in **PAPER 3**, revealed that perception of the learning environment was an almost equally important predictor of SAL as self-efficacy. Students who perceived the learning environment as stimulating problem solving, scientific thinking, and exam preparation were significantly more likely to score higher on Deep Approach, even when adjusting for the other variables in the multivariate analyses. Furthermore, both perception and perceived importance of the teaching environment as stimulating problem solving, scientific thinking, and exam preparation were negatively associated with Surface Approach, i.e. students who perceived the teaching environment as stimulating these aspects, *and* who reported these aspects as important to them, were

significantly less likely to use a Surface Approach. The scores on perception and importance varied across faculties, with higher perception and importance scores among students from the faculty of Business and Social Science compared to Science students.

While perception and importance were intercorrelated ($r = 0.49$), suggesting that students who perceived the learning environment as stimulating Deep Approach also were more likely to report this as important, it is of interest to note that students at all four faculties at both study levels rated *importance* higher than their *perception* of the actual presence of these factors in the teaching environment. This discrepancy could be explained by differences in the students' conceptions of learning (Tait & Entwistle, 1990; Meyer & Muller, 1990). Whereas "good teaching" is generally described in terms of those aspects found to support intellectual stimulation, the students may, regardless of what they consider as important, show varying perceptions of their current teaching environment. For example, if a student believes that the nature of a specific topic is simple and straightforward, this will have an impact on his or her way of going about learning, and the criteria by which he or she judges the effectiveness of the teaching will differ from those of students who view the topic as complex and are interested in developing understanding (Entwistle & Tait, 1990).

7.3. Summary of findings

Taken together, student background factors such as age and HSGPA showed associations with SAL that were consistent with previous results reported in the international literature. The associations with gender, on the other hand, were less clear, indicating that associations between gender and SAL may be complex and show variation dependent on other factors, including faculty. In contrast to our expectations, parental educational level – a proxy for socio-economic background – appeared to be unassociated with SAL in the sample of Danish university students when adjusting for the

remaining factors. One possible reason for the latter finding being that socio-economic status may be less influential at higher educational levels; another being the relatively low level of inequality found in Denmark.

When analysing institutional and contextual factors, the associations with SAL were larger than for the background factors. This may not be surprising, as the context factors represent more *proximal* factors, especially aspects such as teaching and assessment methods. The results generally confirmed our hypotheses that studying at faculties representing “softer disciplines”, attending courses using teaching methods such as seminars and other small group teaching methods, and assessment methods such as oral exams or longer written essays were associated with greater tendencies to use deep learning approaches. The results also confirmed that the student’s *perception* of the learning context is more influential on SAL than the objective aspects. Furthermore, the role of previous learning experiences were, at least partly, confirmed by our findings of associations between higher current GPA and lower Surface Approach scores.

Finally, together with perception and importance of the teaching environment, the student motivational factors of self-efficacy and test-anxiety appeared to be the strongest independent predictors of SAL, even when adjusting for other motivational, background, and institutional factors. The more *distal* motivational factors (i.e. to what degree the motivations for choosing the particular study were *intrinsic*, e.g. related to the opportunity of personal growth provided by a higher education, or *extrinsic*, e.g. related to the career options provided by the particular study) also showed associations with SAL in the expected direction, but the magnitude of the associations were relatively small compared to those found for the motivational expectancy component of self-efficacy or the affective component of test-anxiety.

8. Strengths and limitations

8.1. Strengths

To the best of this author's knowledge, SAL has not previously been explored in the Danish university context, and the results thus add to the cross-cultural validation of both SAL as a model of learning and the SPQ as an instrument to assess SAL. Based on theory and results of the existing international literature on Sal, the present study, as presented in **PAPERS 1-3**, has explored a number of presage factors of potential importance to SAL, and evaluated their relative importance in a Danish context. To ascertain the validity of these findings is it necessary to scrutinize the strengths and potential limitations of the present study.

8.1.1. Addition to the 3-P model

To the best of this author's knowledge, the empirical evidence concerning the influence of expectancy and affective motivational components on study behavior has so far been very limited. The model of learning was therefore expanded to include these motivational variables while adjusting for other factors known to influence student approaches to learning.

8.1.2. Sample

As noted in the presentation of the international literature, many of the previous studies are characterized by methodological limitations. Among the weaknesses of several previous studies are the relatively small samples of convenience often used. Another limitation of the previous studies is the frequent inclusion of relatively few predictors in each study. This means that the associations between the predictors and SAL are rarely adjusted for other potentially confounding factors. Among the strengths of the present study are the attempts to amend these weaknesses by including one of the largest samples of students. Furthermore, the participants were at different study levels

and recruited from several faculties representing both “soft” and “hard” disciplines, thus increasing the representativity of the sample.

8.1.3. Methods

This allowed for statistical adjustment for several relevant factors using a multivariate approach, enabling comparison of unadjusted bivariate associations with results adjusting for the remaining factors investigated. Our results thus support several previous findings, which mainly have been explored in studies based on relatively small samples and focusing on a few selected variables. Furthermore, in the present study, the selection of predictor variables and the order in which they were entered in the multiple regression models was done based on theoretical grounds, i.e. a revised version the 3-P model (Biggs, 1987). This is especially relevant when applying multiple regression, as this statistical method can be sensitive to the way predictors are entered in the analysis. Furthermore, this approach is important in order to avoid over-fitting, i.e. having too many variables that make little contribution to predicting the outcome (Field, 2009). This, on the other hand, also relates to the risk of under-fitting, i.e. excluding important predictors. The risk of under-fitting was taken into account by applying a significance level of $p < 0.10$ as a threshold for which variables were carried forward in the analyses at each step. In addition, the large number of participants from each study level and faculty increases the statistical power of the study, thereby increasing the chance of finding statistical significant findings and reducing the risk of type-2 error. Finally, attempts were made to ascertain that the main instrument to measure the dependent variable, the SPQ (Biggs, 1987;2001), was translated following the general recommendations for cross-cultural adaptation, tested in a pilot study, and its psychometric properties explored with the appropriate methods, e.g. confirmatory factor analysis prior to the analyses of the final dataset.

8.2. Possible limitations

In spite of the strengths described above, a number of potential challenges and limitations of the present study should also be noted. Although it was not practically possible to amend several of these limitations within the constraints of the present PhD-project, identifying these limitations are important as this could provide strategies for improvements in future studies and they are therefore discussed in considerable detail in the following.

8.2.1. Representativity

First, while the number of participants is large, we cannot be certain that the sample is sufficiently representative. All participants were students from Aarhus university, and while have no clear reasons to expect that they differ fundamentally from students from other Danish universities, this possibility should be considered, and future studies with students from other universities are needed. Still, in order to be able to examine the variation in the approaches to learning as reliably as possible, it was, when selecting the participants, attempted to achieve a reasonable variation concerning levels of study and faculties. Another issue related to representativity is the response rate and possible non-responders. While the overall response rate of 88.3% can indeed be considered highly satisfactory, the total number of students at the master level included was somewhat smaller than originally intended. Class sizes at master level are often small, and in many occasions the expected numbers of students were overstated, and many of the classes we approached consisted of no more than 5-8 students. Furthermore, many of the approached teachers reported back that they didn't think they could spare the time to let their students participate, and this meant that fewer master students were recruited than intended. Also, in some cases, the teacher offered to hand out the questionnaires themselves and ask the students to return them to the

researcher's mailbox, a procedure, which produced lower response rates. In most cases, however, the researchers were allowed to attend during the last ten minutes of a class, and the overwhelming majority of students chose to participate.

8.2.2. Quantitative versus qualitative methodology

Among the potential weaknesses of this study is the quantitative questionnaire-based methodology used. Quantitative methods imply reductionism, and the explanatory power could of course be challenged if the suggested model, as it is operationalized in the SPQ, does not sufficiently capture the fundamental nature of the factors related to SAL. One of the main weaknesses of the psychometric approach is perhaps the inevitable restriction of the analysis to the set of statements contained in the questionnaire, a restriction which constraints the students to describe their approach within a framework of ideas provided by the researcher. Here, combining the quantitative approach with qualitative methodology, e.g. in depth individual or focus group interviews, in the second phase of the study could have provided further validation of the findings.

8.2.3. Reliability and validity of the Danish version of the SPQ

Another issue is that while the SPQ, developed and revised by Biggs (1987; 2001), has been used in a large number of international studies with the results of these studies providing validation of the instrument, it had not previously been used in a Danish context, and evidence for the reliability and validity of the Danish adaptation is still not fully available. The internal reliability coefficients found for the subscales of the Danish adaptation of the SPQ ranged from moderate to high and were consistent with the findings of Hattie and Watkins (1981), O'Neil and Child (1984) and Biggs (1987), and the internal reliability coefficients obtained for the SPQ subscales could warrant further research into the overall efficacy of this instrument as a measure of students' approaches to learning. In particular, the reliability coefficients derived for both the surface motives and strategies were

below the minimum 0.80 Alpha value expected for norm referenced or standardized measures. That the Danish versions of the surface subscales, in particular the Surface Strategy (SS) subscale, could be potentially problematic was confirmed by the results of the confirmatory factor analyses, indicating less than satisfactory fit at the item-level.

Also, based on results from preliminary qualitative interviews, it was decided to omit item 10, belonging to the deep strategy scale of the original version of R-SPQ-2F (Biggs et al., 2001), making the Danish version less comparable to original version. Item 10 was omitted due to the results from the focus group, where all the members regarded this item irrelevant to their study situation. Richardson (2004) points out that questionnaires are may be extremely sensitive to nuances and interpretations and that, ideally, any research instrument should be validated from scratch in each new context in which it is used. He points out that the same distinctions, e.g., between deep and surface approaches, emerge from research from different systems of higher education, but they receive different interpretations within each system or culture. By omitting the item in the pilot phase before it was tested in a larger population we disqualified ourselves from knowing whether it would have increased or decreased the reliability of the deep strategy scale in the final larger sample of students. It should be noted, however, that the internal consistency of 0.69 found for the resulting four-item scale can be considered acceptable.

One type of reliability, which was not explored in the present study, was the test-retest-reliability. While one could be critical of this omission, it should be remembered that SAL is viewed as primarily context-dependent and is not seen as a stable student trait, but rather as a phenomenon susceptible to changes over time, depending on the current teaching context, and the perception of this as well as previous experiences. Test-retest reliability may therefore be difficult to interpret and therefore less relevant in the current context.

While there may be reasons to be somewhat critical of the SPQ from a purely psychometric viewpoint, part of the practical value of the SPQ undoubtedly lies in its potential for raising students' awareness of their approaches to learning, and for providing them with norms against which to evaluate their approaches. From a counseling perspective, an instrument like the SPQ provides a means of increasing the meta-learning capacity of the individual student - that is, leading the student towards conscious deployment of resources, time, strategies, and energy so as to achieve their personal academic goals. Research by Biggs and Rihn (1984) has demonstrated the possibility of successful intervention to decrease surface, and increase deep, approaches to academic tasks. They concluded that maladaptive strategies can be extinguished and adaptive ones taught. Taken together, the present study has – with the several results found which are in concordance with the model of learning, the existing results, and the stated hypotheses – provided preliminary evidence for the validity of the SPQ, and it seems feasible to use the SPQ as a tool within the learning context of Danish university students, while at the same time focusing on attempting to increase the validity of the instrument, in particular the Surface Approach aspect, in a Danish context.

8.2.4. Between groups vs. within groups

Another potential issue lies in that within-student inferences are drawn from between-student findings. When we report findings of associations between reported study approaches and the teaching and assessment methods used in separate student classes, this is consistent with the notion that individual students adopt study approaches discriminatively but does not demonstrate it directly. That two students each in a different teaching context are found to have adopted different study approaches does not necessarily imply that if they swapped contexts they would also swap study approaches. By themselves, such between-student comparisons cannot logically distinguish

an association between study approaches and teaching contexts from one between students and teaching contexts. To properly establish that individual students might discriminatively vary their study approaches dependent upon the course requirements and procedures with which they are confronted, requires cumulative corroborative findings from a variety of sources. A strong test would be to directly manipulate the course requirements and procedures, or rather, the students' perceptions of these, and then observe the effects on the study approaches adopted. Given the difficulties inherent in trying systematically to control specific variables within a multivariate setting like tertiary teaching, this might be an impracticable ideal.

8.2.5. Cross-sectional design

An issue related to the within-between groups problem described above is the cross-sectional design used in the present study. The primary weakness of cross-sectional designs is that it is, if not completely impossible, difficult to determine causality. While the theory-based selection of the order in which the variables are entered in the regression models certainly increases our ability to make preliminary causal assertions, further large studies using longitudinal between-within-group designs, and – ultimately – experimental designs aimed at manipulating the proposed causal factors (here: the motivational factors of self-efficacy, test anxiety and perception of the teaching environment) are necessary to determine this.

One of the aspects which were attempted explored was the influence on SAL of the progress through the study from lower study to higher study levels. Another was the influence of age. This was done by comparing the SAL of students at the bachelor and the master student levels and exploring the role of age. However, a cross-sectional study cannot investigate intra-individual

change over time, and it is not possible to distinguish such differences from possible so-called cohort or generation effects.

8.2.6. Outcomes of learning

One of the main limitations of the study was that the product, the “third P”, i.e. the outcome of the learning task was not included. Without a doubt it could have served as an important validation of the model of SAL in the Danish context if associations between SAL and the subsequent outcome in terms of the grades obtained after course had been available, and it was considered whether or not to include the actual grade obtained in the course the students referred to when completing the questionnaire. This, however, would have required the students to report their student identification number, which would cancel the anonymity of responders, and would also have required that each student gave his or her informed consent to retrieve their grades after completing the course. The main concern was that this would threaten the willingness to participate and reduce the response rate, thereby threatening the generalizability of the results, and the option to include grades from the university registry was therefore abandoned in the present study.

As described in the section on **Additional results**, the students were instead asked to estimate the expected outcome of their own learning by reporting the expected grade for the current course.

While the expected grade is no more than a proxy for the outcome, the literature suggests that such a measure may have some predictive value in that students with low- GPA in general tend to report lower expected grades than that of high-GPA students, perhaps indicating that they are aware of their overoptimistic expectations (Prohaska, 1994). The unadjusted results confirmed that Deep Approach was a significant predictor of higher expected grade and Surface Approach a predictor of lower expected grade. However, when adjusting for other relevant factors (including HSGPA,

current GPA, self-efficacy, and test anxiety) current GPA and self-efficacy emerged as the main predictors of expected grade – in particular at the Masters level. A possible explanation could be that self-efficacy and approach to learn share common variance in their association with expected grade, and further studies of the interrelationships between approach to learn, self-efficacy, and academic outcomes – both expected and objective – are clearly needed.

8.2.7. The influence of personality

While the majority of research has focused on possible demographic, institutional, and teaching contextual predictors of students' approach to learn, and while SAL is viewed as primarily influenced by contextual factors, this does not rule out that other more stable factors that are less susceptible to influence may play a role in SAL. Personality or trait dimensions represent such possible factors, but have not been given much attention in the literature (Zhang, 2002). Given that the factors included in the present study only explained between 21 % (Surface Approach) and 28% (Deep Approach) of the variation in SAL, it is possible that other factors, including personality traits, may contribute to explaining learning approach. As described in the section on **Additional results**, it was in fact planned to explore the role of personality factors, and a measure of personality, the short version of the revised NEO personality inventory (NEO-PI-R) (Costa McCrae, 1992), which assesses personality using the so-called five-factor personality traits model, was included in the pilot study with 107 first and fourth year psychology students, which in addition to the NEO-PI-R inventory had included the older 42-item Study Process Questionnaire (Biggs, 1987). The results revealed, perhaps due to the limited sample size in the pilot study, only few statistical significant associations between personality and SAL, which appeared to explain only little of the variation in SAL.

While it could have been interesting if we had included the NEO-PI-R in the final study with the much larger and more generalizable sample of Danish university students, the feedback given by students included in the pilot study, however, warned us against this, as the questionnaire package including the NEO-PI-R was considered too comprehensive, which could have influenced the response rate, which was given higher priority in the present study. While personality factors should be considered as less susceptible to influence, it is possible that personality could emerge as an important moderator, with certain contextual factors, e.g. teaching and assessment methods, being more appropriate for students with certain personality profiles, thereby pointing towards possible individualized approaches to teaching and assessment. This could suggest that the option of including the NEO-PI-R should be considered when designing future studies of predictors of students' approach to learn.

8.2.8. Social desirability

Another limitation potentially challenging our ability to interpret the results lies in the potential risk of reporting-bias that is present when using self-reported measures of learning approach, academic performance, and perceptions of the teaching environment. For example, higher scores on Deep Approach could, in the university context, be viewed by students as more socially desirable than more surface oriented approaches. While, to the best of this author's knowledge, only one study of young secondary school Hong Kong students has explored the role of social desirability for the reporting of Students' Approach to Learn (Watkins, 1996), this study did find associations between social desirability (SD) and self-reported SAL, e.g. between higher SD-scores and lower reported Surface Approach scores. It was decided to include a short 13-item version (Reynolds, 1982) of the Marlowe Crowne Social Desirability Scale (MC-scale) (Crowne & Marlowe, 1960) to enable

adjustment for possible effects of response bias in a social desirable direction. Although previous studies with Danish versions of both the original 33-item version and a developed 12-item short version had shown acceptable internal consistencies ($KR-20 = 0.82$ and 0.78) (Jørgensen & Zachariae, 2006), the final results, however, revealed that the internal consistency of the Danish version of the 13-item short version MC-scale used in the present study was very low ($KR-20 = 0.43$), and the results were therefore omitted from the analyses in **PAPER 2 and 3**.

As considered in the **Additional results** section, when examining the possible influence of SD on some of the self-reported variables, small, but statistically significant correlations in the expected directions were found between SD and Deep and Surface Approach, i.e. positive correlations between SD and Deep Approach and inverse correlations between SD and Surface Approach. Furthermore, individuals who chose not to report their current GPA showed a tendency, although very small and non-significant, towards higher social desirability. In spite of the low internal consistency, to rule out the influence of SD on our results, the final regression models were recalculated while adjusting for SD. Whereas SD continued to be significantly associated with both Deep and Surface Approach in the expected direction, and some of the associations were diminished, adjusting for SD did not appear to influence the main results in any significant way. In conclusion, while the results should be interpreted cautiously due to the low reliability of the version of MC used, there does not seem to be reason to abandon the general conclusions due to response bias.

9. Conclusions and perspectives

The results found in the present thesis confirm that students' approaches to learning vary. Deep Approach (studying to develop personal understanding) has generally been found to lead to a more successful adaptation to the requirements in higher education than Surface Approach (studying with the purpose of reproducing knowledge at a later time). However, similar teaching and learning environments are not necessarily experienced in a similar way by the students attending, and teachers as well as administrators in higher education should be aware of factors that may either promote or hinder students in active engagement in and development of their own individual understanding of what is being learned. Taken together, the results identified a number of independent factors that appear to promote Deep Approaches to Learning among Danish university students. A summary of these factors are shown in [Table 8](#).

Table 8. Predictors of Deep Approach.

Weak ¹	Moderate ²	Strong ³
Recruitment <ul style="list-style-type: none"> • Age (older) • Gender (female) • High School GPA (higher) • Intrinsic motivation to choose present study • Mother has same education 	Context <ul style="list-style-type: none"> • "Soft" or "Dry"⁴ disciplines • Seminars 	Motivational <ul style="list-style-type: none"> • Higher academic self-efficacy • Lower test anxiety⁵ • Perception of the teaching environment as promoting deep approaches to learn

Notes: Based on the final fully adjusted models: ¹"Weak": Beta's < 0.15; ²"Moderate": Beta's = 0.15 – 0.20; ³"Strong": Beta's: > 0.20; ⁴ Humanities and Social Science; ⁵ Not significant in the adjusted model due to shared variance with self-efficacy.

The results that are most readily applicable to Danish university education and teaching (as discussed in PAPER 2 and 3) imply that – if achieving deep approaches to learning is the priority – there is reason to continue the current admission requirements focusing on HSGPA; partly because higher HSGPA is associated with Deep Approach and partly due to the findings that students with previous experiences other than high school tend to a Surface Approach to learning. Secondary education other than high school appears to be associated with study habits that are less compatible with university education, and students who have qualified for entry in an elite discipline at university during secondary schooling seem capable of doing the same at university level.

During the last decades students have met a substantial pressure to complete their studies on time. However, pressuring students may be hypothesized to contribute to more dropouts as they may not be suited – or ready for the demands on them in higher education. In general, both students and educators consider intrinsic motivation to be more desirable and to result in better learning results than extrinsic motivation, and the results from the present thesis confirm that a choice of study based on intrinsic motivation is associated with Deep Approach. So, while the results indicate that there seems to be good reason to continue the current admission requirements, it is also important that students have a genuine interest for the subject they have chosen. It should be noted, however, that the factors that may – at least hypothetically – be influenced through the recruitment are relatively weak- moderate predictors of students' approach to learning.

Among the more salient predictors were teaching methods and – most prominently – motivational factors such as academic self-efficacy, test anxiety, and perception of the teaching environment as promoting deep approaches to learn. The results indicate that the learning environment and learning objectives, the students' perceptions of these, and their self-efficacy, i.e. their perceived capacity to

succeed at the task in question, are potentially important variables through their effects on student motivation and learning, regardless of the remaining demographic, institutional, and contextual variables. This suggests that approach to learn may be promoted by certain characteristics of the subject they have chosen to study and the teaching environment. Although some faculties are moving towards the implementation of more constructivistic forms of teaching, e.g. case-based, project-based, or problem-based learning, the main challenge that remains is to create learning environments which will improve students' learning processes and stimulate their academic work. Students' come from different backgrounds with different goals and concerns. Some are concerned with obtaining an insight in the project, whereas others are concerned with the acquisition of knowledge for later reproduction, e.g. for assessment purposes.

Teachers may think that they have little power to influence or enhance the value of a task to the students, but educators naturally play an important role in this process. In order to match the expectations of the curriculum, presenting the syllabus, setting the stage, and discussing it with the students are fundamental activities that help clarify the objectives and the means to obtaining them. Besides being role models by showing enthusiasm for the subject, teachers are important moderators when it comes to building the ability and effort required for deep learning.

To develop deep learning it is essential to draw the students' attention towards their own practices. Provision of feedback *from the teacher to the student* is a very powerful source to enhance students' self-efficacy, i.e. their confidence in handling a learning task. At the same time, it is crucial to obtain feedback *to the teacher from the students*. The results indicate that teachers need to seek information on the students' perception of the teaching environment, e.g. whether the students' are engaged in the subject or not, whether they are provided with the necessary time to engage in the

project, what they know, and where mistakes and misconceptions are made. However, teachers often do not have the opportunity to engage personally with the students. It is therefore essential to facilitate active student collaboration and problem-solving learning activities in which students are given the opportunity to regulate their own learning activities and form their own opinion of what is being learned. Learning practices should as far as possible go beyond trivia and simple memorizing for examinations.

Although it could benefit from further adjustments, the Danish adaptation of an instrument such as the Two factor Study Process Questionnaire validated in the present thesis provides new opportunities for further examination of the quality of the ongoing learning activities at Danish universities, for assisting in raising students' awareness of their own approaches to learning, and for exploring the impact of teacher training and changes in the teaching-learning system (e.g. educational planning, alignment, etc.).

In conclusion, teaching is essentially about helping students to become competent learners in their chosen field of interest. Optimal teaching that promotes learning requires continual support and feedback through the whole process. Most Higher Educational institutions in Denmark have in recent years established resources to help departments to develop curricula, course designs, teaching and assessment methods and to provide teacher training in student learning theory with the aim of improving students' personal involvement in the learning task. However, successful intervention relies on scientific evidence. Instruments like those used in the present thesis may be utilized to measure and interpret the variation in students' approaches to learning, their involvement and attitudes towards education, their perceptions of the learning environment, and motivation, which in turn are likely to predict academic achievement. It will be exciting to follow the continued research

in Danish Higher Education over the coming years, as this line of research has the potential to influence our understanding of the students' learning processes as well as the teachers' intentions, thinking, and understanding of the subject matter - influences which are likely to benefit both students and Higher Educational institutions.

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