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Profiles of Occupational Therapy Students: A Cluster Analysis

Gry Mørk [1,*], Astrid Gramstad [2], Linda Stigen [3], Susanne Grødem Johnson [4] and Tore Bonsaksen [1,5]

[1] Department of Health, Faculty of Health Sciences, VID Specialized University, 4024 Stavanger, Norway; tore.bonsaksen@inn.no
[2] Department of Health and Care Sciences, Faculty of Health Sciences, UiT The Arctic University of Norway, 9037 Tromsø, Norway; astrid.gramstad@uit.no
[3] Department of Health Sciences Gjøvik, Faculty of Medicine and Health Sciences, Norwegian University of Science and Technology, 2815 Gjøvik, Norway; linda.stigen@ntnu.no
[4] Faculty of Health and Function, Western Norway University of Applied Sciences, 5063 Bergen, Norway; susanne.grodem.johnson@hvl.no
[5] Department of Health and Nursing Sciences, Faculty of Social and Health Sciences, Inland Norway University of Applied Sciences, 2406 Elverum, Norway
* Correspondence: gry.mork@vid.no

Abstract: While studies have examined predictors of study performance in various student groups, cluster analytic studies identify groups of students with similar characteristics. The purpose of this study was to explore relevant clusters of occupational therapy students and examine profile differences between participants in different clusters. A total of 177 first-year students from six occupational therapy programs in Norway participated in this study. Data on age, gender, study approaches, study effort, and study performance were collected. A two-step cluster analysis was conducted. Three clusters were identified. Cluster 1, the high-strategic high-performing students, comprised the successful students, mostly females, who invested much effort and used productive approaches to studying. Cluster 2, the high-surface average-performing students, consisted of less successful female students, who used poor study strategies and made little effort. Cluster 3, the low-strategic low-performing students, comprised the least successful students, who were all male, with study efforts and study strategies in the middle range. Overall, this study suggests that occupational therapy students can be classified into clusters based on a combination of measures. To enhance student learning and performance, educators should pay particular attention to male students and to students investing little effort and using poor study strategies.

Keywords: approaches to studying; cluster analysis; higher education; occupational therapy; study performance

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1. Introduction

Students' academic performance has repeatedly, and across fields and disciplines, been shown to be related to their ways of studying during the course or study program. Approaches to studying, sometimes alternatively denoted as approaches to learning, usually refer to students' intentions concerning their studies as well as their learning processes (e.g., [1–3]). The deep approach to learning is used to describe the approach of intrinsically motivated students whose intentions are to understand and engage in meaningful learning. In opposition to the deep approach, the surface approach refers to students engaging in learning only superficially, selectively memorizing to complete the task, motivated by the desire to avoid failing exams while using minimal effort [1,3]. Ramsden [4] also identified the strategic approach, describing students who seek to maximize their academic performance through well-organized studying [1,5]. As research in higher education has developed, questionnaires used to explore approaches to learning and studying have become more oriented toward how students manage and organize their learning, and less toward achievement motivation.

Underpinning this research area is the belief that there exist more and less effective ways of learning and studying [3]. While several studies have employed statistical techniques to identify distinct factors that co-vary with study approaches and study performance [6–10], another line of research has been involved in exploring similarities within groups of students and, conversely, dissimilarities between them [11–15]. Such studies are often referred to as cluster analytic studies, or studies of latent classes. In several of these studies, the classification of students into clusters is often strongly linked with the distinction between surface-approach and deep-approach study profiles, closely resembling the theoretical definition of the study approaches (e.g., [16,17]). In addition to these two groups, Parpala et al. [16] classified two groups of psychology students based on their high versus low scores on organized studying. Vanthournout et al. [17], on the other hand, classified two additional groups based on their combination of scores on the deep and surface approach scales. One group had a high mean score on both the deep and the surface approach scales, indicating that students in this group applied both deep learning and memorizing strategies. Conversely, the other group had low mean scores on both the deep and the surface approach scales, likely indicating students at risk of failure [17]. These students had a background in different undergraduate programs when they were admitted to the course of "Education and psychology".

Investigating students' study approaches and their academic performance, Duff [18] reported two different clusters among accounting and business economics undergraduates. The first cluster was labeled *ineffective learner*, denoting students with high scores on surface approach, whereas the second cluster was labeled *effective learner*, denoting students with high scores on deep approach. The age and gender composition of the students in the two clusters was similar, but students in the *ineffective learner cluster* had poorer academic performance compared to students in the *effective learner cluster* [18]. Later, Haarala-Muhonen and colleagues [19] studied first-year law students and identified four clusters similar to those reported by Parpala et al. [16]. According to this study, the most successful students belonged to the profile *students applying a deep approach*, and the least successful students belonged to the profile *students applying a surface approach.* Herrmann and colleagues [20] performed a large study in one faculty at a Danish university, which covered a multitude of programs offered by seven departments. The study showed that students with the lowest academic achievement were found in the cluster characterized by high scores on the surface approach scale and low scores on the subject area affinity and academic self-efficacy scales. Students with the highest academic achievement were found in the cluster characterized by strong subject area affinity and an organized deep approach to studying [20]. The research summarized above shows that higher education students have often been clustered according to their approaches to learning and that the deep approach cluster has largely also contained high-performing students. The strategic approach has been utilized in some, but not all, cluster analytic studies of higher education students.

A national investigation in Norway has so far expanded our knowledge about occupational therapy students' perceptions of the learning environment [21], their approaches to studying [22,23], and associations between the perceived learning environment and study approaches [24,25]. Associations have been found between study approaches and academic performance, showing that better exam grades are associated with higher scores on strategic approach and lower scores on surface approach [26]. Gender has been found to be associated with higher scores on the strategic study approach [23–25] and with better study performance [26], and spending more time on independent study has been found to be associated with higher scores on the deep and strategic approaches to studying [23,24]. These findings all address relationships between single predictor and outcome variables. It seems likely, however, that scores on a range of variables can be used for clustering students into groups based on their similarities (within groups) and dissimilarities (between groups). To our knowledge, no published studies of this kind exist using occupational therapy students as a sample. If clusters of students are found, knowledge about the characteristics

of students in these clusters may improve the understanding of patterns in occupational therapy students' characteristics.

Study Aim

The aim of this study was to explore relevant clusters of occupational therapy students in Norway and examine profile differences between participants in different clusters. The present study sought answer to the following research question: What are the identifiable clusters of occupational therapy students when taking differences in age and gender, approaches to studying, study effort, and study performance into account?

2. Materials and Methods

2.1. Design

This study is part of a longitudinal study of occupational therapy students' perceptions of the learning environment and approaches to studying. The current study had a cross-sectional study design, and we used data from first-year participants only.

2.2. Participants

This study concerns occupational therapy students in Norway. All of the six occupational therapy education programs in the country are three-year full-time undergraduate programs, with class sizes varying between 24 and 77 students. The possibilities are limited for choosing elective courses, but students have a degree of independence (with regards to syllabus and specific study content) within some of the courses. Clinical practice education of a minimum of 30 weeks is mandatory and can be carried out in various clinical contexts before completion of the bachelor's degree. The students participate in diverse study activities, such as practical skills training, traditional lectures, seminars, case studies, problem-based, team-based, and project-based learning, and individual self-organized studies. In each of the education programs, one member of faculty distributed the questionnaires and consent forms to the students. Of a total of 305 students who were eligible to participate, 187 first-year students participated (61.3% response rate). Ten students had missing scores on one or several of the variables included in this study, and given the small numbers, these students were removed from the sample based on the listwise deletion principle. The sample therefore included 177 students to be analyzed.

2.3. Measurement

2.3.1. Sociodemographic Variables

Information about the students' age (years) and gender (male or female) was collected as a part of the questionnaire.

2.3.2. Approaches to Studying

To measure the students' study approaches, this study used the *Approaches and Study Skills Inventory for Students* (ASSIST) [27], more specifically, a validated Norwegian translation of the inventory [28]. The ASSIST consists of 52 statements about what students usually do in study and learning situations. The participants are instructed to rate their level of agreement (1 = disagree, 2 = disagree somewhat, 3 = unsure, 4 = agree somewhat, 5 = agree). The inventory has a three-factor structure, a structure replicated in a cross-cultural study of undergraduate occupational therapy students [29] as well as in the current sample [22]. The main scale scores, the *deep*, *strategic*, and *surface* approaches to studying, are calculated by adding the scores on the relevant items. When used with the sample while in their first year of study, the internal consistency estimates (Cronbach's α) for the study approach scales were 0.71 (deep approach), 0.84 (strategic approach), and 0.76 (surface approach) [22,25].

2.3.3. Study Effort and Study Performance

Individual study efforts, operationalized as hours spent on independent study during a typical week, were collected as part of the questionnaire. Study performance was measured

using the students' grade point average (GPA) in the first year of study. The exam grade scores were based on the Universities Norway (UHR) [30] general qualitative descriptions; 6 = *A/excellent*, 5 = *B/very good*, 4 = *C/good*, 3 = *D/satisfactory*, 2 = *E/sufficient,* and 1 = *F/fail.*

2.4. Data Analysis

Cluster analysis is a statistical technique for detecting latent groups in data based on a number of relevant variables [31]. The approach is exploratory rather than confirmatory. Therefore, a number of solutions may be explored in order to establish a useful set of indicators that can be used to classify participants into homogeneous groups. The basic principles of the analysis are that participants are classified into one and only one group, or 'cluster'. Within each cluster, there should be substantial similarity or cohesion between participants, whereas there should be substantial dissimilarity or separation between participants belonging to different clusters. The cluster analysis procedure produces an overall 'silhouette' validity measure of the cluster model's ability to retain cohesion between participants in the same cluster, and to separate between participants belonging to different clusters. The measure's range is from −1 to +1, where <0.2 is poor, 0.2–0.5 is fair, and >0.5 is good, with fair or good considered acceptable clustering [32].

For the analysis, we used the two-step cluster analysis in IBM SPSS Statistics (Version 26). We included seven variables on which the clustering of participants would be based: age, gender, time spent on independent study, average exam grade, and ratings on the deep, strategic, and surface approaches to studying. Schwartz's Bayesian Information Criterion (BIC) was used to automatically determine the number of clusters. As we included both categorical and continuous variables in the model, the log-likelihood criterion was used as a distance measure. In principle, the preferred cluster model would be the model producing the lowest BIC value (indicating cohesion within clusters) in combination with the highest distance value (indicating separation between clusters). One should also consider the proportion of participants in each cluster. Optimally, the ratio between the largest and the smallest cluster should not be very large (preferably < 3).

Differences between clusters were assessed using one-way analyses of variance (ANOVA) and Chi-Square tests as appropriate. The partial η^2 was used as the effect size (ES) of the detected differences, with values of 0.01, 0.06, and 0.14 indicating small, medium, and large effects, respectively [33,34]. In cases of significant differences between clusters, the Bonferroni correction was applied to the post hoc comparisons. Statistical significance was set at $p < 0.05$.

2.5. Research Ethics

All participants provided written informed consent to participate in this study. Approval for collecting, storing, and using the data was granted on 12 October 2017 by the Norwegian Center for Research Data (project no. 55875).

3. Results

The mean age of the sample was 22.7 years (SD = 4.3 years), and a large majority were women (n = 143, 80.8%) (Table 1).

Table 1. Comparisons between the three clusters of students.

Variables	HSHP	HSAP	LSLP	p	Partial η^2
Gender					
Male	2 (5.9)	0 (0.0)	32 (94.1)	<0.001	
Female	49 (34.3)	94 (65.7)	0 (0.0)		
Mean age (SD)	24.2 (6.7)	21.6 (2.4)	23.2 (2.7)	0.002	0.07
Mean deep approach (SD)	59.9 (6.5)	54.0 (7.8)	58.3 (11.7)	<0.001	0.10
Mean strategic approach (SD)	81.1 (7.4)	68.9 (9.1)	68.5 (9.5)	<0.001	0.29
Mean surface approach (SD)	42.4 (9.1)	50.7 (7.3)	46.4 (10.1)	<0.001	0.16
Mean time spent on independent study (SD)	12.8 (9.5)	7.1 (3.3)	10.3 (8.1)	<0.001	0.13
Average exam grade (SD)	4.4 (0.9)	3.8 (1.0)	3.2 (1.2)	<0.001	0.15

3.1. The Clusters

The three clusters were identified as the best cluster solution; this solution had the lowest BIC value (843.612) and the highest ratio of distance measure (1.618). The silhouette coefficient was 0.3, indicating 'fair' validity of the cluster model. Cluster 1 consisted of 51 (28.8%) participants, Cluster 2 consisted of 94 (53.1%) participants, and Cluster 3 consisted of 32 (18.1%) participants. The main classification predictors were, in decreasing order, gender (1.0), strategic approach (0.37), surface approach (0.18), average exam grade (0.17), time spent on independent study (0.15), deep approach (0.11), and age (0.08).

Note. HSHP is Cluster 1, the *high-strategic high-performing* students. HSAP is Cluster 2, the *high-surface average-performing* students. LSLP is Cluster 3, the *low-strategic low-performing* students. Average exam grade is averaged across all exams in the first year of study. 6 = *A/excellent*, 5 = *B/very good*, 4 = *C/good*, 3 = *D/satisfactory*, 2 = *E/sufficient,* and 1 = *F/fail. p*-values refer to the Chi-Square test of equal proportions (gender) and the *F* test of linearly independent pairwise comparisons among the estimated marginal means (all other variables).

3.2. Differences between Clusters

Overall, students in Cluster 1 had the substantially highest score on strategic approach, but also the highest score on deep approach, as well as the lowest score on surface approach. The students in this cluster were for the most part females and they had the highest mean age. Compared to students in the other clusters, they spent the most time on independent study and had the highest average exam grade. Cluster 1 students may therefore tentatively be named the *high-strategic high-performing* (HSHP) students. In Cluster 2, the students had the highest score on surface approach and the lowest score on deep approach. These students were younger, compared to students in the other clusters, and were only females. They spent the least amount of time on independent study and received average exam grades. Students in Cluster 2 may therefore tentatively be named the *high-surface average-performing* (HSAP) students. Students in Cluster 3 had the lowest score on strategic approach, but their scores on deep approach were almost as high as the HSHP students' scores in Cluster 1. The students in this cluster were exclusively male and had the lowest average exam grade. Cluster 3 students may therefore be named the *low-strategic low-performing* (LSLP) students.

The detailed differences between clusters, with effect sizes, are displayed in Table 1 and illustrated in Figure 1. The gender proportions differed significantly between clusters. While practically all (94%) of the male students were classified as LSLP students, none of the female students were. A larger proportion (66%) of the female students were classified as HSAP students, while a smaller proportion were classified as HSHP students. The differences between clusters were also statistically significant for all other variables, with effect sizes ranging between 0.07 (age) and 0.29 (strategic approach). The pairwise analyses revealed that the mean age was significantly higher among HSHP students compared to HSAP students (mean difference of 2.6, $p = 0.001$).

Compared to HSAP students, the mean rating on deep approach was higher among HSHP students (mean difference of 5.87, $p < 0.001$) and among LSLP students (mean difference of 4.3, $p < 0.05$). The mean strategic approach rating was higher among HSHP students, compared to HSAP students (mean difference of 12.2, $p < 0.001$) and LSLP students (mean difference of 12.6, $p < 0.001$), while there was no significant difference between HSAP students and LSLP students. The mean rating on surface approach was higher among HSAP students compared to HSHP students (mean difference of 8.3, $p < 0.001$) and LSLP students (mean difference of 4.3, $p < 0.05$).

Compared to HSAP students, the mean number of hours spent weekly on independent study was higher among HSHP students (mean difference of 5.8, $p < 0.001$) and LSLP students (mean difference of 3.3, $p < 0.05$), while there was no significant difference between HSHP and LSLP students. The mean average grade was significantly higher among HSHP students compared to HSAP (mean difference of 0.6, $p = 0.001$) and LSLP students (mean

difference of 1.2, $p < 0.001$). The mean average grade was also significantly higher among HSAP students compared to LSLP students (mean difference of 0.6, $p < 0.05$).

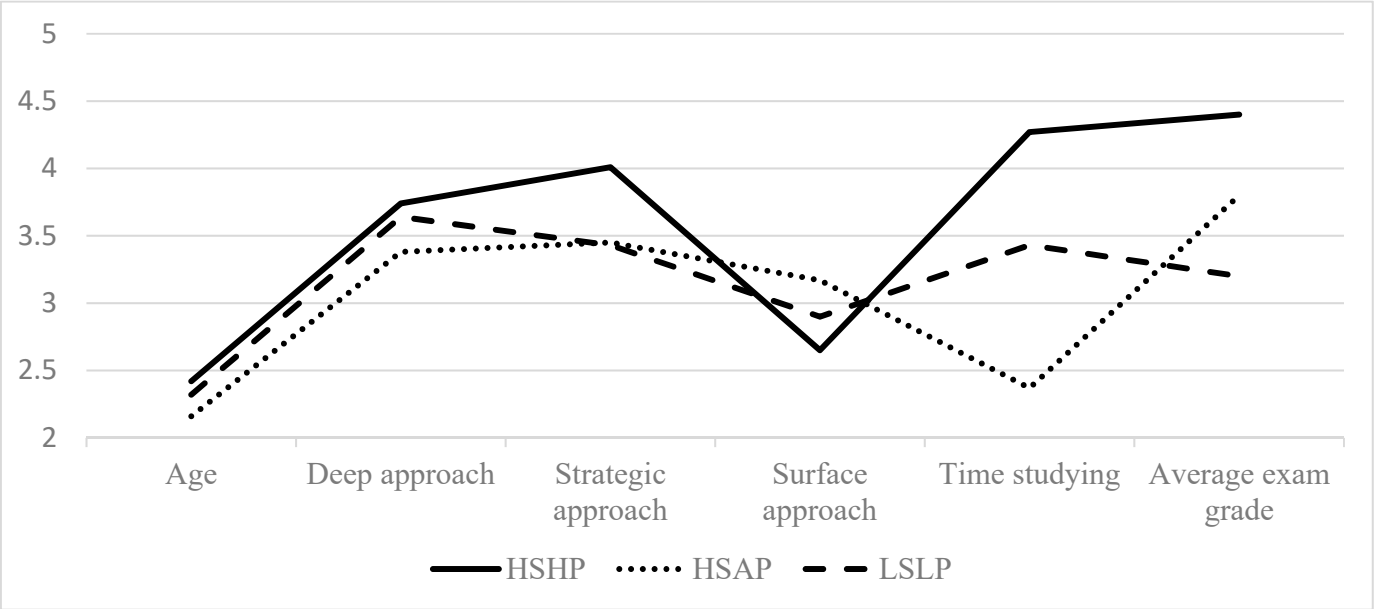

Figure 1. The profiles of the three clusters of students. Note. HSHP is Cluster 1, the *high-strategic high-performing* students. HSAP is Cluster 2, the *high-surface average-performing* students. LSLP is Cluster 3, the *low-strategic low-performing* students. The values are transformed to fit into the same figure. Transformation key: age divided by 10, deep approach divided by 16, strategic approach divided by 20, surface approach divided by 16, and time studying divided by 3. Average exam grade was not transformed.

4. Discussion

The purpose of this study was to explore relevant clusters of occupational therapy students and examine profile differences between participants in different clusters. Three clusters were identified based on the employed variables.

4.1. The Clusters of Students

The composition of the HSHP students in Cluster 1 is in line with a previous study from the same project [26] and strengthens the link between high strategic approach ratings and high study performance. Other studies have found similar results. Rytkönen et al. [35] and Asikainen et al. [8] both found that students who organize their studies and manage their time well receive higher grades, and Karagiannopoulou et al. [6] found that a strategic study approach had a direct positive effect on grade point average. Karagiannopoulou and colleagues also found that psychological maturity and use of adaptive defense styles involving personal engagement led to a higher grade point average through the development of personal understanding and increased use of strategic and deep study approaches [6]. If this is the case, the majority of older (and consequently more mature) students among the HSHP students may also have contributed to the higher academic performance in this cluster.

The HSHP students also had the highest mean scores on deep approach to studying. The importance of a deep approach to studying for students' academic performance has been debated [3,35–38]. Plant and coworkers, for example, stated that it is the quality of studying, not the effort, that matters most for obtaining higher grades [39]. No association was found between deep study approach ratings and exam grades in previous analyses conducted with the students [26]. However, some studies have shown that the relationship

between the deep study approach and better academic outcomes depends on the students' organizing study skills [19,40]. Our study results appear to point in a similar direction.

When comparing the HSAP and LSLP students, it might have been fair to expect the HSAP students to have the lowest average exam grades. This is, in particular, because the HSAP students had low strategic ratings in combination with high surface ratings. That combination of study approaches has been found to be linked with poorer academic outcomes [7,20,41]. However, we found that HSAP students in Cluster 2 performed better than LSLP students in Cluster 3. Some researchers have highlighted the less fortunate combination of being unorganized and applying a deep approach to studying, also resulting in poorer study success [19,42]. This dissonant study profile [43,44] resembles our description of the LSLP students. When students combine deep, yet unorganized approaches to studying, Entwistle and coworkers suggested that the frequently resulting poor academic performance lies in the mismatch between the deep outcomes the students are seeking and their ability to achieve them [45]. A combination of a deep interest in understanding and engaging in the learning materials with good time management and appropriate planning can be essential for succeeding. Higher education faculty should therefore support motivated students by enhancing their planning and organizational skills, thereby increasing their chances of success [46].

Nevertheless, given that gender was—by far—the most important predictor of the cluster solution, the all-male composition of the LSLP students in Cluster 3 is likely the most important reason for the poorer grades in this group. Other studies have also found gender to predict academic achievement among students in higher education [47–49], and in a systematic review and meta-analysis [37], the researchers found that female students obtained higher grade point averages. Gender differences in approaches to learning can emerge in particular academic contexts [50]. Occupational therapy is a female-dominated profession and educational environment, and as expected, there was a highly imbalanced gender ratio in our sample. Similar to our results, a study of British occupational therapy students showed that the female students performed better—the odds of male students failing to pass at each level of the program was significantly higher than for female students [51]. Thus, while several studies point to gender differences in study performance, such differences appear to be only partly explained by differences in study behaviors between male and female students.

Thus, the HSHP students in Cluster 1 represent the most successful students, and the group's composition points to some of the reasons why they are successful. The interpretation of the HSAP and LSLP students is not straightforward, but the profile differences in terms of female representation among the HSAP students and male representation among the LSLP students are of obvious importance. Sadly, it appears that being a male student in the occupational therapy program is a stronger 'risk factor' for poor grades compared to having an unproductive study approach (as shown for the female HSAP students). As emphasized by Watson [51], occupational therapy educators need to reflect upon and examine how they can promote a productive learning environment for both male and female students.

4.2. Study Strengths and Limitations

Collecting the data from all six occupational therapy education programs in Norway adds to the generalizability of the results. However, the response rates varied substantially between the education programs, which may have biased the results as education institutions with higher response rates would be given more weight. Furthermore, this study is based on self-evaluations of students' approaches to studying, which can produce biases related to students overestimating or underestimating their attitudes or related to social desirability. The self-evaluation of study approaches was performed with three validated scales, and Cronbach's alphas were satisfactory for all scales, implying good internal consistency between scale items. The sample might have been affected by student attendance—only students who attended the classes had the opportunity to participate in

this study and fill in the printed questionnaires. We have no information about the eligible students who did not take part in this study. Furthermore, our sample suffered from a high gender imbalance, but the gender distribution was typical for occupational therapy students [51,52]. The cluster model used in this study was adequate, but not optimal for the clustering of students into groups, based on their similarities and dissimilarities. In addition, gender was by far the dominant variable in the classification process. While the strategic approach also contributed moderately, the other included variables were less important for the obtained cluster solution. Future research aiming to identify and compare relevant groups of students may include larger samples and a greater variation in measures used to differentiate between clusters. This may produce better functioning cluster models and may enhance our understanding of the student cohorts and their composition. Moreover, research may further explore the situation for male students enrolled in occupational therapy study programs.

5. Conclusions

This study aimed to explore relevant clusters of occupational therapy students in Norway and examine profile differences between participants in different clusters. We identified three groups of students with interpretable combinations of age and gender, study approaches, study effort, and study performance. The model identified one cluster comprising the HSHP (*high-strategic high-performing*) students, consisting of one-third of the female students investing much effort, using productive study strategies, and having the highest average exam grade. Two additional clusters were identified, where a large group of female students using poor study strategies and spending little effort, the HSAP (*high-surface average-performing*) students, still achieved better grades than the all-male group with study efforts and study strategies in the middle range, the LSLP (*low-strategic low-performing*) students.

To prevent dropouts and poor exam results, higher education study programs should adapt the curriculum and learning activities so that, in particular, students who have a deep approach to learning, but are less able to organize their studies, become more structured in their studying. Higher education study programs should also place more emphasis on teaching students how to plan and organize their studies. These students initially have a substantial interest in their elected study program and will likely benefit from a support system that enables them to better organize their daily lives as students.

Overall, this study suggests that students can be classified into clusters based on a combination of measures. Particular attention should be given to male occupational therapy students, who may be underperforming, so that a productive learning environment is promoted for both male and female students. More generally, students who invest little effort and use poor study strategies, or have a dissonant study profile, may need additional support to enhance their performance. First and foremost, such support should aim at enhancing their strategic study behaviors.

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Informed Consent Statement: All participants provided written informed consent to participate in this study.

Data Availability Statement: The data underpinning this study's results may be obtained by reasonable request to the project leader (tore.bonsaksen@inn.no).

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