

Approaches to Studying as Predictors of Academic Achievement

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Abstract—Students' motivation to study for exams and their strategies to achieve academic success attract the interest of many university teachers. This paper investigates the relationship between self-perceived approaches to studying and academic achievement. Quantitative analysis involving undergraduate students at the Faculty of Public Administration, University of Ljubljana was conducted. The revised two-factor study process questionnaire was used to measure students' approaches to studying, together with quantitative analysis of grade point averages. Self-perceived study approaches were found to predict academic achievement. The empirical results reveal a connection between the surface study approach and higher achievement at exams. These findings are counter to many studies suggesting the opposite.

Keywords—academic achievement, approaches to learning, university students, motivation

I. INTRODUCTION

In higher education, teachers have always attempted to understand the factors that influence students' academic success so as to help them achieve better learning outcomes. Research shows that there are many academic performance determinants, such as students' capabilities, stimuli, opportunities, individual traits, and learning approaches [1]. Liu *et al.* [2] saw a strong connection between learning approach and motivation, which in turn influences student performance.

A number of instruments have been developed to measure studying approaches to help understand why students learn and how they learn. One of the most widely used instruments for measuring study motivation and strategy is Biggs *et al.*'s [3] revised two-factor Study Process Questionnaire (R-SPQ-2F). It contains 20 questions that categorize a student's approach to studying as either deep or surface (see the appendix). A study approach is deep when intrinsic motivation and an expectation of enjoyment are present; it is surface when extrinsic motivation and a sense of duty are present. The two approaches include two subscales: students' study strategy and students' motive for strategy adoption. The R-SPQ-2F questionnaire helps to: (1) identify areas that need support; (2) detect students who have problems with

studying; and thus (3) improve curricula and assure quality [3].

The questionnaire has been used extensively by teachers seeking to measure students' deep and surface approaches to studying [4]. For example, Ellis *et al.* [5] employed it to explore the e-learning experience of undergraduate students in a context where e-learning supported face-to-face learning. The questionnaire was also relied on by Taher *et al.* [6] to measure master's students' performance based on their personality traits and approaches to studying. Chan [7] harnessed the questionnaire to study the relationship between study approach and study outcomes, and the effect of extracurricular activities on study approach and study outcomes. A recent study by Leiva-Brondo *et al.* [8] determined that the R-SPQ-2F questionnaire is a valid tool for measuring approaches to studying.

Some researchers revised the R-SPQ-2F questionnaire to better fit their contexts. For example, Stes *et al.* [9] found that it was cross-culturally sensitive and thus adapted it slightly to fit the Dutch higher education context better. The questionnaire also informed Ellis *et al.*'s [10] questionnaire design in a study of students' deep and surface approaches to learning. A recent modification of the R-SPQ-2F questionnaire was proposed by Zakariya *et al.* [11] who removed a question about rote learning (SS8) because it was unsuitable in the Norwegian cultural context. It hence seems that over the 20 years of its use, the R-SPQ-2F questionnaire has proved useful for measuring students' approaches to studying in higher education, whether in its original or modified form.

This study aims to contribute to this line of research by using R-SPQ-2F to explore the relationship between approaches to studying and grade point average. Therefore, the following research question is posed:

- Is there a correlation between students' approach to studying and their academic success measured by grade point average and exam pass rate (the number of exams passed divided by the number of exams attempted)?

II. METHODOLOGY

To answer the research question, we employed an online survey focusing on the determinants of students' perceived studying approach using R-SPQ-2F [3] conducted at the

Faculty of Public Administration, University of Ljubljana during onsite classes. Ethical approval for the study was obtained from the institution’s Human Research Ethics Committee. At the end of the semester before the exam period, teachers informed students about the survey and asked them to use their smartphones to answer the questions available in an online form. The response was not mandatory or conditioned by any means. Students responded on a five-point Likert scale ranging from “this item is never or only rarely true of me” (value 1) to “this item is always or almost always true of me” (value 5). Academic performance was measured as the grade point average achieved over the course of one exam period including the exams students took that semester (ATTEMPT – number of the exam attempts, NO_POS – number of exams passed, SUC_RATE – number of exams passed divided by exam attempts, AVE_GRADE – average grade of exams passed).

The survey included 294 undergraduate students, 120 of whom were enrolled in the university study program Public Sector Governance and Informatics in Public Administration, and 174 in the higher education professional study program Administration (Table I).

TABLE I. NUMBER OF STUDENTS PARTICIPATING IN THE SURVEY

Year	University	Higher education professional	Total
1st	51	112	163
2nd	20	41	61
3rd	49	21	70
Total	120	174	294

All students were over the age of 18 and invited to complete the survey voluntarily, without any coercion or undue influence. They were informed of the anonymity and confidentiality of the collected responses and research findings in the written introduction before completing the survey. Students’ identification numbers were only used to

complement the responses with demographic data in the student database prior to the anonymization of responses to prevent the results being linked to any individual. The data about students’ success in the examination period were taken from the student information system. All data were anonymized before conducting further analysis.

III. FINDINGS

TABLE II. DESCRIPTIVE STATISTICS OF MEASURED INDICATORS

Scale / Subscale	Indicator	N	Mean	Std. deviation
Deep approach / Deep motive	DM1_SATIS	294	3.31	1.017
	DM5_DEEP	294	3.15	1.215
	DM9_EXCITE	293	2.52	1.118
	DM13_INTERES	294	2.92	1.031
	DM17_EXPLAIN	293	4.09	1.006
Deep approach / Deep strategy	DS2_EFFORT	294	3.54	1.056
	DS6_ADDON	294	2.55	0.979
	DS10_REFERSH	293	3.53	1.078
	DS14_FREETIME	292	2.11	1.120
Surface approach / Surface motive	SM3_EASY	294	3.23	1.282
	SM7_UNITERE	294	1.90	1.076
	SM11_KEYEXAM	294	2.39	1.093
	SM15_USELESS	293	1.98	1.037
Surface strategy	SM19_LOWEXAM	292	2.56	1.103
	SS4_LLECT	293	3.13	1.205
	SS8_REPEAT	294	2.70	1.123
	SS12_STRESSED	293	2.28	1.068
Academic success	SS16_NOEXAM	292	3.01	1.256
	SS20_REMEMB	294	2.78	1.204
	ATTEMPT	294	3.89	1.167
	NO_POS	294	2.91	1.547
Academic success	SUC_RATE	294	71.48	30.51
	AVE_GRADE	294	6.84	1.07

TABLE III. CORRELATION HEATMAP (COLORED CELLS REPRESENT SIGNIFICAN CORELATION, P < 0.005)

	DM1_SATIS	DS2_EFFORT	SM3_EASY	SS4_LLECT	DM5_DEEP	DS6_ADDON	SM7_UNITERE	SS8_REPEAT	DM9_EXCITE	DS10_REFERSH
DM1_SATIS	1.000	0.362	0.437	0.483	0.176	0.220	0.400	0.328	0.253	0.253
DS2_EFFORT	0.362	1.000	0.500	0.465	0.057	0.155	0.454	0.363	0.319	0.419
SM3_EASY	0.437	0.500	1.000	0.540	0.057	0.184	0.539	0.324	0.515	0.329
SS4_LLECT	0.483	0.465	0.540	1.000	0.053	0.244	0.542	0.364	0.550	0.385
DM5_DEEP	0.176	0.057	0.057	0.053	1.000	0.217	0.031	0.172	-0.042	0.223
DS6_ADDON	0.220	0.155	0.184	0.244	0.217	1.000	0.083	0.196	0.082	0.150
SM7_UNITERE	0.400	0.454	0.539	0.542	0.031	0.083	1.000	0.301	0.520	0.332
SS8_REPEAT	0.328	0.363	0.324	0.364	0.172	0.196	0.301	1.000	0.204	0.331
DM9_EXCITE	0.253	0.319	0.515	0.550	-0.042	0.082	0.520	0.204	1.000	0.351
DS10_REFERSH	0.253	0.419	0.329	0.385	0.223	0.150	0.332	0.331	0.351	1.000
SM11_KEYEXAM	-0.278	-0.280	-0.247	-0.264	-0.006	-0.070	-0.201	-0.179	-0.253	-0.250
SS12_STRESSED	-0.340	-0.315	-0.257	-0.413	-0.116	-0.159	-0.254	-0.293	-0.211	-0.274
DM13_INTERES	-0.124	0.071	0.021	-0.124	-0.088	0.076	0.013	-0.040	-0.031	-0.121
DS14_FREETIME	-0.238	-0.153	-0.187	-0.234	-0.052	-0.005	-0.072	-0.168	-0.085	-0.200
SM15_USELESS	-0.189	-0.259	-0.181	-0.245	-0.006	-0.026	-0.227	-0.154	-0.178	-0.164
SS16_NOEXAM	-0.010	-0.072	-0.014	-0.060	0.069	0.098	-0.127	-0.004	-0.091	-0.120
DM17_EXPLAIN	-0.150	-0.053	-0.027	-0.171	0.081	0.099	-0.120	-0.066	-0.036	-0.028
DS18_EVERYTH	-0.214	-0.187	-0.162	-0.187	-0.077	-0.053	-0.110	-0.177	-0.123	-0.260
SM19_LOWEXAM	-0.158	-0.210	-0.192	-0.206	0.114	0.009	-0.239	-0.004	-0.132	-0.112
SS20_REMEMB	-0.010	-0.033	-0.005	-0.096	0.037	0.065	-0.062	-0.001	-0.065	-0.013
ATTEMPTS	-0.030	-0.146	-0.079	-0.069	-0.027	-0.011	-0.045	-0.016	-0.043	-0.151
NO_POS	-0.043	-0.157	-0.086	-0.021	-0.006	-0.051	-0.049	0.029	-0.068	-0.172
SUS_RATE	-0.020	-0.131	-0.084	0.008	0.026	-0.041	-0.043	0.045	-0.081	-0.099
AVE_GRADE	0.045	-0.144	-0.103	0.040	0.087	-0.036	-0.073	0.045	-0.065	-0.114

	SM11	SS12	DM13	DS14	SM15	SS16	DM17	DS18	SM19	SS20
	KEYEXAM	STRESSED	INTERES	FREETIME	USELESS	NOEXAM	EXPLAIN	EVERYTH	LOWEXAM	REMEMB
DM1_SATIS	-0.278	-0.340	-0.124	-0.238	-0.189	-0.010	-0.150	-0.214	-0.158	-0.010
DS2_EFFORT	-0.280	-0.315	0.071	-0.153	-0.259	-0.072	-0.053	-0.187	-0.210	-0.033
SM3_EASY	-0.247	-0.257	0.021	-0.187	-0.181	-0.014	-0.027	-0.162	-0.192	-0.005
SS4_LECT	-0.264	-0.413	-0.124	-0.234	-0.245	-0.060	-0.171	-0.187	-0.206	-0.096
DM5_DEEP	-0.006	-0.116	-0.088	-0.052	-0.006	0.069	0.081	-0.077	0.114	0.037
DS6_ADDON	-0.070	-0.159	0.076	-0.005	-0.026	0.098	0.099	-0.053	0.009	0.065
SM7_UNITERE	-0.201	-0.254	0.013	-0.072	-0.227	-0.127	-0.120	-0.110	-0.239	-0.062
SS8_REPEAT	-0.179	-0.293	-0.040	-0.168	-0.154	-0.004	-0.066	-0.177	-0.004	-0.001
DM9_EXCITE	-0.253	-0.211	-0.031	-0.085	-0.178	-0.091	-0.036	-0.123	-0.132	-0.065
DS10_REFERSH	-0.250	-0.274	-0.121	-0.200	-0.164	-0.120	-0.028	-0.260	-0.112	-0.013
SM11_KEYEXAM	1.000	0.405	0.242	0.365	0.377	0.303	0.198	0.466	0.297	0.183
SS12_STRESSED	0.405	1.000	0.290	0.379	0.311	0.200	0.277	0.463	0.221	0.208
DM13_INTERES	0.242	0.290	1.000	0.432	0.216	0.278	0.403	0.507	0.308	0.334
DS14_FREETIME	0.365	0.379	0.432	1.000	0.374	0.321	0.354	0.554	0.377	0.239
SM15_USELESS	0.377	0.311	0.216	0.374	1.000	0.214	0.085	0.313	0.409	0.323
SS16_NOEXAM	0.303	0.200	0.278	0.321	0.214	1.000	0.206	0.419	0.263	0.301
DM17_EXPLAIN	0.198	0.277	0.403	0.354	0.085	0.206	1.000	0.331	0.163	0.265
DS18_EVERYTH	0.466	0.463	0.507	0.554	0.313	0.419	0.331	1.000	0.332	0.264
SM19_LOWEXAM	0.297	0.221	0.308	0.377	0.409	0.263	0.163	0.332	1.000	0.277
SS20_REMEMB	0.183	0.208	0.334	0.239	0.323	0.301	0.265	0.264	0.277	1.000
ATTEMPTS	0.112	0.057	-0.010	0.075	0.036	0.065	-0.038	0.028	0.043	-0.158
NO_POS	0.108	0.022	-0.021	0.084	0.128	0.132	-0.073	0.065	0.111	-0.159
SUS_RATE	0.091	-0.004	-0.019	0.039	0.156	0.124	-0.060	0.070	0.130	-0.081
AVE_GRADE	0.080	-0.004	-0.023	0.112	0.127	0.116	-0.099	0.087	0.159	-0.160

Microsoft Excel was used to conduct basic descriptive statistics and IBM SPSS 28 to perform correlation and factor analyses. Descriptive statistical results include mean values and standard deviation values for all measured indicators (Table II).

Moreover, we created a correlation heatmap to test the correlation between the indicators (Table III). The color of each cell represents the strength of the correlation, which is indicated with an asterisk.

TABLE IV. PATTERN MATRIX (EXTRACTION METHOD: PRINCIPAL COMPONENT ANALYSIS. ROTATION METHOD: PROMAX WITH KAISER NORMALIZATION)

Indicator	Factor 1	Factor 2
DM1_SATIS	0.611	
DM5_DEEP	0.710	
DM9_EXCITE	0.799	
DM13_INTERES	0.789	
DS6_ADDON	0.768	
DS10_REFRESH	0.551	
DS14_FREETIME	0.699	
DS18_EVERYTH	0.594	
SM11_KEYEXAM		0.776
SM15_USELESS		0.719
SS4_LECT		0.613
SS8_REPEAT		0.583
SS12_STRESSED		0.778
SS16_NOEXAM		0.538
SS20_REMEMB		0.602

We performed an exploratory factor analysis using principal components Extraction with a Promax rotation to detect possible factors within the studying approach data. The theoretical four subscale factors were not detected using the Eigenvalue and thus we fixed the number of factors to 4 and later to 2 (two scales). Even when the number of factors was fixed at 4, subscale factors did not emerge (too many cross-loadings). Finally, the fixing of

factors to 2 showed a possible desirable result (Table IV), albeit we still had to remove some indicators to obtain no cross-loadings. The total variance explained by two factors was 50.55, with a KMO value of 0.833, $p < 0.001$.

TABLE V. SPEARMAN CORRELATION COEFFICIENT

Indicator	ATTEMPT	SUC_RATE	AVE_GRADE
DM1_SATIS	-0.030	-0.020	0.045
DS2_EFFORT	-0.146*	-0.131*	-0.144*
SM3_EASY	-0.079	-0.084	-0.103
SS4_LECT	-0.069	0.008	0.040
DM5_DEEP	-0.027	0.026	0.087
DS6_ADDON	-0.011	-0.041	-0.036
SM7_UNITERE	-0.045	-0.043	-0.073
SS8_REPEAT	-0.016	0.045	0.045
DM9_EXCITE	-0.043	-0.081	-0.065
DS10_REFRESH	-0.151**	-0.099	-0.114
SM11_KEYEXAM	0.112	0.091	0.080
SS12_STRESSED	0.057	-0.004	-0.004
DM13_INTERES	-0.010	-0.019	-0.023
DS14_FREETIME	0.075	0.039	0.112
SM15_USELESS	0.036	0.156**	0.127*
SS16_NOEXAM	0.065	0.124*	0.116*
DM17_EXPLAIN	-0.038	-0.060	-0.099
DS18_EVERYTH	0.028	0.070	0.087
SM19_LOWEXAM	0.043	0.130*	0.159**
SS20_REMEMB	-0.158**	-0.081	-0.160**
	AVE_GRADE		
	1st year	2nd year	3rd year
SM15_USELESS	0.210**	-0.169	0.082
SS16_NOEXAM	0.208**	-0.154	-0.068
SM19_LOWEXAM	0.184*	-0.082	0.266*

Although two factors emerged, thus defining deep and surface indicator groups, the factor loadings were too low to allow any conclusions to be drawn.

However, successful students with a high number of exam attempts (ATTEMPT) show a statistically

significant yet weak negative correlation with the indicators DS2_EFFORT, DS10_REFRESH, and SS20_REMEMB (Table V). Further, there is a statistically significant negative weak correlation between DS2_EFFORT and success rate and average grade of exams passed. At the same time, there is a statistically significant positive weak correlation between the average grade of exams passed (AVE_GRADE) and SM15_USELESS, SS16_NOEXAM, and SM19_LOWEXAM (Table V). The same situation is detected for the success rate variable (SUC_RATE).

IV. DISCUSSION

The purpose of this study was to explore the relationship between students' self-perceived approaches to studying and their academic performance. The findings reveal several significant correlations. First, those students who find that they have to do enough work on a topic so that they can form their own conclusions before they are satisfied (DS2) sat exams fewer times and had a higher pass rate. However, despite having a deep strategy for studying, these students did not obtain high grades.

Second, students who reported that they test themselves on important topics until they have a full understanding of them (DS10) also sat exams fewer times. This could mean that these students, who demonstrate a deep strategy for studying, are more cautious and take exams only when they feel they are well prepared. They might invest more study time because they feel they are weaker and need to devote greater effort to pass an exam.

Next, the results also revealed that three surface strategies correlate significantly with academic success: (1) students who stated that the best way to pass examinations is to try to remember answers to likely questions (SS20) sat exams fewer times but with a high average grade; (2) students who generally do not study topics in depth, restrict their study to only what is specifically set, and who think it is unnecessary to do anything extra (SM15, SS16, SM19) passed their exams more often, and had a higher grade point average. It seems that they believe that exams are easy and hence a surface approach is sufficient for a passing grade. Perhaps these students prepared themselves on the basis of past exam papers, which seemingly helped them to succeed and obtain higher grades; (3) a similar correlation was detected between higher grades and those students who do not find it helpful to study topics in depth because it confuses them and they regard it as a waste of time since all they need is a passing acquaintance with the topics (SM15).

Nevertheless, it is important to note that further analysis considering the study year revealed that the correlation between surface study (SS15, SS16) and average grade is only significant for Year 1 students and not for Year 2 or Year 3 students. We may then infer that as they progress to the second and third study years students realize that these strategies are no longer serving them, and that to pass exams a more in-depth approach to studying is required, which is in line with the findings of other authors [12–14]. An exception to this is Year 3 students who see no point in learning material which is unlikely to be in the

examination (SM19), yet still have a higher grade point average. This suggests on one hand that these students have perhaps acquired the skill of ascertaining what a minimum requirement for a passing grade is. On the other hand, it may mean that teachers wish to help these students graduate as soon as possible and thus they dedicate more class time to exam revision. Alternatively, this result could reflect the teachers' efforts to raise the students' awareness of the course objectives and the core course resources, as well as the faculty's well-developed tutoring system. This result echoes Leiva-Brondo *et al.*'s [8] finding of a less deep approach with students in their final year of study. The authors attribute this to the greater workload that students acquire due to thesis writing, which requires them to adopt a more strategic approach to studying.

Unlike many studies that established a positive correlation between students' deep study approach and their academic success [7, 12–14], this research reveals that students with a surface study approach performed better. Although the surface approach is generally considered to reflect students' satisfaction with the reproduction of knowledge, passivity regarding which ideas or information they accept, the lack of a study plan, and rote learning [6], our findings could suggest that students who use this approach may, in fact, be very strategic when it comes to completing their course requirements.

V. CONCLUSION

Students' approach to studying depends on the study circumstances, the level of difficulty, the method of knowledge testing as well as the motives and strategies used to acquire knowledge. A surface approach leads to mere memorization of the subject matter whereas a deep study approach aims towards understanding, and consequently promotes the long-term retention of knowledge. In higher education, students are expected to have or develop a deep learning approach along with critical thinking and self-regulated study, which should also be promoted by teachers. The R-SPQ-2F questionnaire could serve as a measure of teaching quality and provide an instrument for analyzing teaching approaches and promoting deep studying. Since students optimally adapt to their study environment, the importance of teachers' role is well worth noting; namely, students' approach can change if the teachers' requirements change. We thus conclude that the negative correlation between academic performance and surface study approach is primarily of interest for teachers who need to reconsider their teaching practices that promote it.

APPENDIX REVISED STUDY PROCESS QUESTIONNAIRE

Revised Study Process Questionnaire (R-SPQ-2F) [3]:

- DM1. I find that at times studying gives me a feeling of deep personal satisfaction.
- DS2. I find that I have to do enough work on a topic so that I can form my own conclusions before I am satisfied.

- SM3. My aim is to pass the course while doing as little work as possible.
- SS4. I only study seriously what's given out in class or in the course outlines.
- DM5. I feel that virtually any topic can be highly interesting once I get into it.
- DS6. I find most new topics interesting and often spend extra time trying to obtain more information about them.
- SM7. I do not find my course very interesting, so I keep my work to the minimum.
- SS8. I learn some things by rote, going over and over them until I know them by heart even if I do not understand them.
- DM9. I find that studying academic topics can at times be as exciting as a good novel or movie.
- DS10. I test myself on important topics until I understand them completely.
- SM11. I find I can get by in most assessments by memorizing key sections rather than trying to understand them.
- SS12. I generally restrict my study to what is specifically set as I think it is unnecessary to do anything extra.
- DM13. I work hard at my studies because I find the material interesting.
- DS14. I spend a lot of my free time finding out more about interesting topics which have been discussed in different classes.
- SM15. I find it is not helpful to study topics in depth. It confuses and wastes time, when all you need is a passing acquaintance with topics.
- SS16. I believe that lecturers shouldn't expect students to spend significant amounts of time studying material everyone knows won't be examined.
- DM17. I come to most classes with questions in mind that I want to be answered.
- DS18. I make a point of looking at most of the suggested readings that go with the lectures.
- SM19. I see no point in learning material which is not likely to be in the examination.
- SS20. I find the best way to pass examinations is to try to remember answers to likely questions.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

AUTHOR CONTRIBUTIONS

Conceptualization: D.K. and M.D.; data curation: D.K. and M.D.; formal analysis: D.K. and M.D.; investigation: D.K. and M.D.; methodology: D.K. and M.D.; resources: D.K., M.D. and V.Z.; supervision: D.K., M.D., and V.Z.; writing – original draft: D.K., M.D., and V.Z.; writing – review & editing: D.K., M.D., and V.Z.; all authors had approved the final version.

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