Students' study routines, learning preferences and self-regulation: are they related?

Rita Payan-Carreira
D*ept. Zootecnics*
Univ. de Trás-os-Montes e Alto Douro
Vila Real, Portugal
email address: rtpayan@gmail.com

Gonçalo Cruz
Crithinkedu fellowship
Univ. de Trás-os-Montes e Alto Douro
Vila Real, Portugal
email address: redeyeg@gmail.com

Abstract— **Good self-regulatory skills and study habits seem to be essential conditions to students' engagement with active learning approaches, critical thinking development and academic achievement. This exploratory research study aimed to assess possible relationships between students' self-regulation, learning preferences and study routines towards their engagement in student-centered approaches. Seventy-nine undergraduate students from an integrated master program in Veterinary Medicine were surveyed at the beginning of a redesigned course. The Tangney' short form of Self-Control Scale was used to measure students' self-regulation, and a questionnaire with close and open-ended questions was applied to assess students' study routines and learning preferences. The results revealed some associations between gender and self-regulation, and between self-regulation, study routines and learning preferences for the type class format. Female students presented higher self-regulation scores than male ones. Students with regular self-study habits also had higher self-regulation scores. Further research will analyze the relationship between students' self-regulation, academic performance and critical thinking development, as well as the impact of active learning approaches in students' study routines or learning preferences.**

Keywords—self-regulation, study routines, learning preferences, active learning, critical thinking

I. INTRODUCTION

The adoption of active learning strategies increases students' engagement, high-order thinking and memory retention [1]. With the implementation of the Bologna process, a shift in learning paradigm challenges higher education institutions to move from traditional lecture-based approaches to a more student-centered learning –in which the teacher is responsible to ensure the quality of the learning process encouraging students to assume an active role in the achievement of the expected learning outcomes [2]. For that purpose, students need to be responsible and autonomously involved in their own learning, requiring high levels of motivation, confidence and self-regulation [3].

Despite the implementation of this new paradigm in Portuguese universities, between 2006 and 2009, institutions and teachers frequently claim different barriers and difficulties, like a large student/staff ratio and the lack of students' engagement in the learning process [4]. As a consequence, the traditional teaching approach remains in practice, representing a passive transfer of knowledge. Students' assessment is often based on knowledge memorization and retrieval [5]. In parallel, the traditional teaching approach encompasses increased failure rates, reduced levels of conceptual understanding, and high absenteeism, which represents a major concern for universities [6]. To counterpoise, universities request the use of active learning strategies as a form to motivate students and to revert the effects of the failure rates and disinterest.

Students in tertiary education are expected to possess the competence to sustain their cognition, the positive motivation and behavior to pursuit their academic and professional goals. However, some university students enter academic programs poorly equipped with self-regulation skills [7]. The inability to develop such skills is often at the origin of disinterest for learning and increasing failure rates. To support and facilitate students' active learning and success, it is necessary to investigate the influencing factors shaping the students' engagement in the learning process.

Students' motivation and engagement to learn can be affected by diverse factors, such as the instructor teaching approach, the type and quality of learning spaces, organizational constraints, or even the existence of personal beliefs [6, 8]. Any of those factors may represent a barrier that needs to be overcome. Therefore, it is important the analysis of students' self-regulation and learning strategies– assuming that they are intertwined with motivation and engagement [9].

Self-regulation can be defined as "*the self-directive process by which learners transform their mental abilities into academic skills*" [10, p.65]. It relates, but is not limited, to goal setting, time management, task strategies, environment structuring, and help-seeking [11]. Self-regulation may also be related to deepness of the learning approach and the development of an optimistic learning strategy [9]. Evidence suggests that a large number of higher education students lack self-regulation learning skills [12], which reflects in an inability to effectively monitor their learning outcomes. According to [13], it is possible that qualitative and quantitative differences exist between the self-regulatory processes of effective and less effective self-regulated students. However, the relations between self-regulation, engagement and the success of learning are still scantily clarified. However, a clear, direct relationship between self-regulation and the learning success is still controversial, suggesting that self-regulation effects on learning are a complex phenomenon [9].

Moreover, [3] defend that student's engagement in learning varies with the learning style, making students dependent of its passivity or activity. Since the active learning requires the students' involvement in "doing things" and thinking about what they are doing, one question remains: may the students' learning preferences, study habits and self-regulation abilities affect the way they involve on active learning activities and therefore their academic achievement and the development of their high-order thinking?

This exploratory research study aimed to assess how students' self-regulation, study routines and learning preferences might be dependent in 79 undergraduate students of the course of Animal Reproduction (sixth semester in the Veterinary Medicine integrated master degree at UTAD, Portugal). In particular, we tried to collect information on potential relationships between these three variables. Thus, our results can be useful when designing and structuring pedagogical interventions to support learners' self-regulation and subdue inefficiencies in their natural tendencies.

II. CONTEXT AND COURSE BACKGROUND

The course of Animal Reproduction is located in the 2nd semester of the 3rd year of the integrated master in Veterinary Medicine, together with other semiotics subjects, previously to the clinical subjects. Two main learning goals were presented to students: 1) to acquire knowledge over the reproductive function in the male and female of domestic species, empowering the ability to analyze a situation, synthetize information and intervene in the monitoring of fertility in those animals; 2) to develop technical procedures needed to practitioners working in this field, enhancing the autonomy, self-confidence and the awareness of diverse values (e.g., social, cultural or economic) and ethical concerns applied to practice.

Until the last academic year (2016/17), generally, the theoretical classes were taught using traditional expositive methods, where the instructor passively transferred information in the form of a lecture to an audience presenting different levels of attention/interest. In the past two years, when discussing with the students the possibility to change the learning strategies used in the theoretical classes into more student-centered ones, they were reluctant to accept the proposed changes like in other courses during the program [14]. Contrasting, the practical classes in this grade are usually more active since they apply specific procedures related to the professional practice.

Despite the students´ reluctance, the changes were introduced in the current academic year, and the feelings/expectations of the students were collected through a survey at the beginning of the classes. Then, in a small briefing on the course contents, methods of learning, and expected outcomes, the teacher explained the gains in knowledge and critical thinking associated with the use of active learning strategies and exposed the methodologies to be used in the theoretical classes. Students were also informed that in this course, the assessment would measure both the scientific knowledge and the ability to develop higher levels of thinking.

In general, the theoretical classes now follow the flipped classroom methodology [15]. This methodology assumes that students prepare the course-related topics in advance – self-study/individual work - being the self-learning activities directed through the Moodle online platform, by the availability of supportive information. The student is therefore called to mobilize the knowledge acquired previously (during the self-study and in other courses) in the analysis of subject-related situations, in the discussion and summarization of contents and in the proposal of corrective or alternative measures to mitigate situations. Here, the main goal is to foster students' critical thinking skills. In the classroom, the students contact with practical situations extracted from the professional practice, which they have to analyze, propose a justification for the situation, select procedures and/or propose a corrective intervention to restore or maximize the fertility of the animal/group/farm.

In the practical classes, the learning purposes are mainly directed to the execution of techniques crucial to the professional practice in this field. The classes are organized in small groups and taught in different spaces (e.g., at the laboratory, at the University Veterinary Hospital) by follow-up of casuistry or simulation of clinical situations, in-class. Besides the basic training in technical procedures, practical classes also aim to develop advanced cognitive skills, by the analysis of data or results gathered during interventions, by establishing inferences and assessing arguments/data/information, as well as by the ability to communicate efficiently with colleagues or operators, to explain data, to make a decision and share it with third parts.

There are also tutorial classes. The tutorial classes are mandatory contact hours and are scattered through the semester. This kind of classes aims to reinforce learning, direct the teacher intervention towards topics that are more difficult to understand. Similar strategies to those described above are used.

III. METHODS

This paper presents the results of an exploratory research study [16]. It explores the way students' self-regulation, study routines and learning preferences are related at the beginning of a redesigned course proposal which promotes a more active learning approach. As a work in progress, it allowed us to get a first insight to develop further research (e.g., quasi-experimental), that can enable a deeper analysis of the relationship between these variables with other key indicators, such as the students' academic achievement or critical thinking development.

Thus, at the beginning of the semester students were requested to fill a short form of the Self-Control Scale developed by [17], at the end of the first class. This questionnaire contains 13 items allowing to establish people's ability to exercise self-control, alter their emotions and thoughts, and in particular to override temptations and refrain from acting [18]. From the collected filled forms, one was in blank and two were named after fictional personages, and therefore were excluded from the analysis.

In addition, students were also asked to complete an online questionnaire survey. It was composed of 10 questions regarding their commonly used study routines until then for their academic achievements and on their preferences for the theoretical and

practical classes. In the first set of questions, three close questions regarded the way students study for assessment and if some self-learning before the classes was done, and an open-question asked the reasons for their answers; in a second set, two closed questions asked their preferences for the pedagogical approach in theoretical and practical classes and one open question asked the reasons for their answers. On three additional open questions, students were requested to share their expectations about the course: what could be their contribution to the course success, and what they would like that the teacher knew about them. This questionnaire was made available through the Moodle platform, and the students had one week to fill it. In both cases, by submitting their questionnaire or self-rating scale the students were aware of giving consent for the anonymous use of data.

After matching the two instruments, using the students´ name for pairing, identifications were removed before sending data for analysis. The responses to the survey on the study routines were analyzed qualitatively and quantitatively, using the SPSS software, version 25. For quantitative data, differences were tested by Student t-test for independent samples, the significance set at $\alpha=0.05$. The final score for the self-control survey was used to test an association between the students' self-regulation score and their disposition to participate in active learning strategies. Quantitative data is presented as mean ± SEM.

IV. RESULTS AND DISCUSSION

Of a total of 92 students enrolled in the Course, nine did not fill either the self-control form or the online survey. From a total of 83 students who submitted either the self-rating scale or the online survey, 63 (75.9%) were women (Table I).

TABLE I. CHARACTERIZTION OF THE GENDER OF PARTICIPANTS.[a]

Respondents	*Filled the survey*	*SELF-REGULATION SCALE [IN-CLASS]]*	*ONLINE SURVEY*
Women	Yes	57	62
	No	6	1
Men	Yes	17	17
	No	3	3
TOTAL		74	79

[a.] As the two questionnaires were filled at different moments, an overlapping of 93,7% between the two questionnaires was achieved.

Regarding the scores of the short form of the Tangney´ Self-control Scale (Table II), the mean score for the participants (n=73) was 43.62 ± 0.95 (range, 26 to 60). Higher scores were found in women compared to men respondents (44.88 ± 1.03 – range, 26 to 60 *vs.* 39.20 ± 1.80 – range, 26 to 56, respectively; p= 0.011; Figure 1).

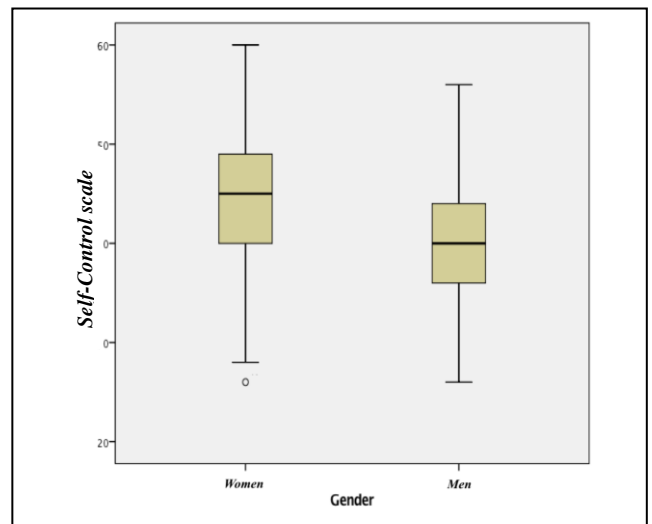Fig. 1. Distribution of self-control scores in respondents according to gender

TABLE II. SELF-CONTROL SCORES WITHIN PARTICIPANTS

	N	*Average ± SEM*	*Median*	*Q1*	*Q3*
Women	56	44.88 ± 1.03	45.00	40.00	49.00
Men	17	39.47 ± 2.02	40.00	36.00	44.00
Totals	73	43.62 ± 0.95	43.00	39.00	48.50

Respecting to the participants' study routines, most students regularly study for the practical classes but concentrate the study for the theoretical (64.56%; 51/79), while 18.99% (15/79) usually concentrate their study a few days before assessment in either the theoretical and practical topics, and 16.46% (13/79) regularly study throughout the semester.

Analyzing data collected from students submitting the two tests (n=70), it was found that the self-control scale was slightly lower (p=0.046; Table III) in students mentioning to concentrate their study in the few days before assessment (39.15 ± 2.28; n=13) compared with that of students studying regularly for the practical's, but not for the theoretical classes (44.10 ± 1.08; n=49), or those who study regularly for both the theoretical and practical classes (46.50 ± 1.76; n=8).

When inquired if they prepared themselves before classes, most students referred preparing the practical classes with self-study, but not the theoretical ones (56.69% *vs.* 13.92%, respectively). Among the reasons presented for their routines in students concentrating their study a few days before the assessment, the most frequently pointed out reasons were "*the large workload*", the unavailability of lecture notes on time (even when the list of recommended books is communicated in the learning platform), "(…) *it´s easier to have the teacher explaining the topic before our study*", the fact that "(…) *the teacher says everything that is needed*", and the fact that the students believes it unnecessary or not a good method for him/her.

Study routine	n	Average ± SEM	Median	Q1	Q3
Concentrated for both theroretical and practical classes	13	39.15 ± 2.28[a]	39.00	36.00	45.00
Concentrate for theoretical but not for practical classes	49	44.10 ± 1.08 [a,b]	40.00	36.00	48.00
Study regularly for theoretical and practical classes	8	46.50 ± 1.76 [b]	47.00	43.50	49.50

Within a column, different letters represent statistical differences at p<0.05

For students that concentrate the study only in the theoretical topics, while preparing the practices in advance, the most common presented arguments were that it was easier to understand/achieve a good performance in the practical work if prepared in advanced, and the limited time available to prepare both the practical and theoretical classes, as well as "(…) *is easier to take notes and listen to the professor in the theoretical lectures, and study afterwards*" and "(…) *it is better to first listen to the teacher*". Other reasons presented included the higher interest students have in practical classes compared to theoretical, or the fact that students don´t feel the need to a preparatory self-study for the theoretical classes because they are expositive.

Students that prepare themselves before each class often argue that they achieve "*… better understanding of the topics*", "(…) *to avoid accumulation of the study material*", or "(…) *to get better grades*".

The second set of questions showed that most of the students prefer the teacher to demonstrate the procedures to be developed during the practical classes (79.75%; 62/79); 17.72% (14/79) prefer the teacher present a short theoretical background review in the beginning of the practical classes, while only 2.53% (2/79) prefer to start the practical classes hands-on. No differences were found in the self-control scale among students in the three groups.

Regarding the format of the theoretical classes, the majority of students prefer them to be expositive (58,23%; 46/79), 22.78% (18/79) would like them to be developed as a discussion between students and the teacher, while 18.99% (15/79) would prefer that classes detailed the most difficult topics in a subject. No student selected the option for non-in presence/virtual classes. Although non-significantly (p=0.072), slight higher self-control scores existed in the group that prefer expositive classes (Table IV).

The most frequent reasons to sustain their preferences on expositive classes were "(…) *is easier to understand what and how to do (something) when the teachers show first*", "(…) *I understand better when it is the teacher explaining (than when I prepare myself at home)*", "(...) *I feel that I understand better the topic when the teacher explains it*" and "*without self-study before the classes, it is easier to have expositive classes*". Other

students said "(…) *I prefer when the teacher shows how to work, because I am short-experienced*", and "(…) *even when we prepare ourselves at home, there are some issues more difficult to understand, so it is important to have expositive classes*". One student also argued that "(…) *for a better communication between the teacher and students, the teacher should previously show how to perform any task*".

	n	Average ± SEM	Median	Q1	Q3
Expositive	41	45.22 ± 1.28	45.00	40.00	50.00
Discussion between teacher and students	18	40,83 ± 1.13	41.00	49.00	44.00
Focusing on more difficult issues of a topic	11	41.18 ± 2.23	41.00	38.50	47.00

On the other hand, students who prefer the classes to evolve as a discussion around a topic defend their preferences because "(…)it *is easier to understand, while expositive classes are boring*", "(…) *are more dynamic and participative*", "(…) *are more captivating*", and "(…) *they have a positive dynamic that facilitates absorbing knowledge*" and "*(...) they request (the student) to prepare himself in advance*".

Regarding the students who marked the acceptance of classes in which the teacher would focus on the more difficult topics of the syllabus, the reasons included "(…) *this would facilitate learning of more difficult issues*", and "(…) *the more difficult topics should be addressed in the class, as the easier ones could easily be learned at home*". One student argued that "(…) *these (classes) go against everything we are used to*".

Gender did not affect neither the study routines nor the preferences for different forms of the theoretical or practical classes.

In relation to their expectations towards the course, it was clear that students showed some inquisitive predisposition, focusing on the need and desire to learn mainly concrete knowledge (e.g., factual and conceptual), technical and practical skills within the specific domain. For this, students seem to be aware of the importance behind both theoretical and practical classes, of establishing an interdependence between them. Also, the majority considered that this course was essential for their professional life, representing an undeniable added valued in multiple scenarios, from clinical practice to the management of large-scale animal production. Even a smaller minority, who seemed to be less interested in this specific domain or without great expectations, showed openness to learn: "*I think that the course will be of great important to those who will work in farm animals medicine, however it doesn't mean that who will work with other (animal) species wouldn't value it as well attending to the incertitude of the upcoming future*".

Additionally, students seemed to be highly committed to the course. They expressed it expecting to be more "*responsible*", "*diligent*", "*participative*", "*organized*", "*concentrated*", "*studious*", etc. They also presented some signals of intellectual modesty and humility, being aware of their own limitations in

terms of cognitive or self-control abilities: *"I'm a person highly distracted but I struggle to obtain better results and do a good work."*.

V. Conclusions, Limitations and Future Work

The aim of this 'work in progress' study was to analyze the students' self-regulation, learning preferences and study routines in an initial phase of the Animal Reproduction course at the Veterinary Medicine integrated master degree. Despite its exploratory nature, the results allowed us to characterize the students' profile in relation to these aspects and draw some questions for further research that will be carried-out during and at the end of the course.

Our findings suggest some significant relationship between gender and self-regulation. Female students seem to have higher self-regulation than male ones. This is in agreement with previous studies [12] [19] [20], suggesting that woman at this particular age are more mature and self-regulated, result that has been associated with a willingness of female students to delay gratification to increase the chances of getting a good mark [21]. Further research should also attend to the gender variable in order to examine how active learning activities can influence these abilities in female or male students.

Secondly, study routines and self-regulation seem also to be linked. In fact, students presenting higher self-regulation scores also show systematic and ongoing habits to study and prepare themselves before the classes throughout the semester. On the contrary, those with lower self-regulation scores concentrate the study mainly for the assessment in the theoretical topics, which might indicate a lack of abilities in time management. In addition, since theoretical classes are often lecture-based and teacher-centered, students seem to undervalued the need to be prepared in advance contrasting to the practical classes where they need to perform procedures requesting previous study (e.g., protocols, ultrasound assessment, physical exams). Therefore, study routines are apparently affected by the type of teaching approaches adopted by the teacher. This is in agreement with other authors, who found that stronger self-regulated students are able to change learning strategies in response to the requirements of a course [12].

Regarding the students' learning preferences, the lecture-based format seems to be more preferred than the student-centered one, like discussion or hands-on learning. This could be related with different factors, such as students' self-confidence, explanatory and communication abilities (e.g., to engage in a debate with peers, presenting arguments and debating different approaches to analyze professional cases or situations), or even due the learning culture of "easiness" that still remains in our universities, as previously suggested [5, 6]. Future studies would be needed to evaluate if the students' learning preferences are determined by the format of the classes (teacher-centered vs student-centered approaches).

In future work and at the end of the course, additional issues will be addressed, like seeking the establishment of a relationship between the students' self-regulation and the academic performance, critical thinking development, the changes in study routines or learning preferences.

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