

Metacognitive, Management and Affective Strategies of Dental Students at the Beginning and the End of the University Curriculum

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ABSTRACT

Introduction: This study aimed to evaluate students' metacognitive, resource management, and affective strategies at the Faculty of Dentistry in Casablanca and to observe their evolution between the beginning and the end of their university course.

Method: A questionnaire on the different strategies was distributed to students in their first and fifth years of the 2021/2022 academic year.

Results: 79.4% of fifth-year students began preparing by creating a schedule, compared with 59.3% of first-year students. 65.2% of fifth-year students and 60.1% of first-year students could adapt their planning to circumstances and unforeseen events. 78% of fifth-year students vs. 68.9% of first-year students gave enough time to their studies without neglecting other important aspects of their lives. 81.9% of first-year students and 85.1% of fifth-year students used the internet to search for difficult words. Efficient time management was noted in the fifth-year compared to the first-year students, as 69.5% of fifth-year students stated. 54.8% of first-year and 70.2% of fifth-year students opted for a clean, quiet study space to maintain motivation.

Conclusion: The strategies adopted by the two classes were largely similar. However, fifth-year students felt they had better stress management, time management, and understanding of medical vocabulary than first-year students. This means effective study strategies and the ability to manage them develop over the years.

Keywords: Dental students, evolution, learning strategies, university curriculum.

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1. INTRODUCTION

Much research has been done on learning strategies to improve students' academic performance. While authors are unanimous in recognizing the existence of cognitive and metacognitive strategies, the other categories are not yet accepted in the literature by some authors. Similarly, many authors categorize strategies as resource management, while others include them in metacognitive strategies. Wolfs combines affective and resource management strategies in a single category, *support strategies* (Larue & Cossette, 2005).

The concept of *metacognition* was introduced in 1970 by Flavell to "designate the knowledge an individual possesses of his cognitive processes and the control he can exercise over these processes" (Portelance & Ouellet, 2005). Metacognition means that learners become aware of the

mechanisms they use to learn, how they learn, and when they exercise a certain amount of control over their cognitive processes (Dilk, 2010). Metacognitive strategies can be divided into three sub-categories:

- 1) Planning strategies: They enable the learner to plan and organize how the information to be learned will be processed. These strategies involve estimating the time needed, drawing up a work plan, estimating the difficulty of learning content, and activating prior knowledge.
- 2) Monitoring strategies: These strategies are used during the learning process to take stock of the information-processing activities that are carried out. They involve self-evaluation and self-reinforcement, focusing attention, and evaluating the effectiveness of the chosen strategy.

- 3) Regulation strategies: The learners use the strategies in the logical sequence of the findings made in the strategic control activities. Regulation strategies represent the logical consequences of control activities. This type of strategy involves making decisions and putting them into practice, i.e., adjusting reading speed, evaluating the effectiveness of the chosen strategy, modifying it if necessary, skipping a test question, and returning to it later.

Resource management strategies are designed to help students organize their environment and available resources to suit their needs. It may resemble certain cognitive and metacognitive strategies. We could call them study behaviors: establishing a work schedule, finding a suitable place to work, taking advantage of peer support, and attending all classes (Saint Pierre, 1991). This type of strategy can be subdivided into four sub-categories:

- Identify available resources (materials, peers to consult, times to consult the teacher).
- Manage time effectively (plan work periods in advance, plan shorter and more frequent periods, and set sub-objectives for each work period).
- Manage the study environment (find a specific place to study, a quiet place, an organized place).
- Seek help from others (seek help from the teacher, seek help from peers, work in small groups, get tutoring from a peer or teacher).

Affective strategies are used by learners to control their feelings or emotions. Affective strategies are naturally used by the learner to facilitate learning by creating a favorable psychological climate (Saint Pierre, 1991). It can be divided into three sub-categories (Larue & Cossette, 2005):

- 1) Establishing and maintaining motivation, which presupposes the student's recognition of the effect of attitudes on behavior and the implementation of means to maintain a positive affective disposition towards the learning to be achieved (Examples: rewarding oneself, forming an image of oneself as competent and effective, using skills already mastered).
- 2) Maintaining concentration, based on the learner's awareness that he or she can exercise power over his or her ability to concentrate and on his or her knowledge of the degree of attention required by a task (creation of a healthy work and study climate, elimination of distractions).
- 3) Anxiety control or stress management strategies: deal with the control of harmful feelings and emotions that the student has with regard to completing a task: planning rest periods, identifying and using relaxation techniques, creating a positive state, and having self-confidence.

We carried out a study on the first-year and fifth-year students and concluded that the cognitive strategies used were similar. This second part of the work aimed to evaluate the metacognitive strategies, resource management strategies, and affective strategies of students at the Casablanca Faculty of Dentistry (FMDC) and to observe their evolution

between the beginning and the end of their university course.

2. METHOD

This is a descriptive cross-sectional study conducted at the Casablanca Faculty of Dentistry using a questionnaire distributed directly to students at the faculty.

Our sample consisted of 177 first-year students and 141 fifth-year students during the 2021–2022 academic year.

We developed and distributed a questionnaire comprising different sections on metacognitive learning strategies, resource management, and affective strategies. A final section was intended solely for fifth-year students, focusing on their progress between the beginning and end of their course.

Given the descriptive and non-analytical nature of the study, the results were entered using Excel software.

3. RESULTS

Of an initial 322 students, 318 responded. Data on the different strategies studied are summarized in [Tables I–VI](#):

4. DISCUSSION

We were faced with a number of difficulties in carrying out both parts of our study: the non-cooperation of some students, questionnaires not handed in or handed in late,

TABLE I: METACOGNITIVE LEARNING STRATEGIES

Variables	First-year (%)	Fifth-year (%)	P
Begin preparation by drawing up a revision schedule.			0.00028
- Always/Often	59.3	79.4	
- Never/Rarely	40.7	20.6	
Preparation start date:			0.0029
- One month or more before the exam	54.8	58.9	
- A few days before the exam	35.6	40.4	
- Be up-to-date	9.6	0.7	
Start preparation with:			0.111
- The easiest subjects	25.4	16.3	
- The most difficult subjects	43.5	52.5	
- It doesn't matter	31.1	31.2	
Planning preparation periods:			0.715
- Short, frequent periods	61.6	59.6	
- Longer and less frequent periods	38.4	40.4	
Planning preparation periods during:			0.0101
- Morning	27.6	14.9	
- Evening	21.8	32.6	
- Morning and evening	50.6	52.5	
Adapt the schedule to circumstances and unforeseen events while respecting the time reserved for the program:			0.126
- Always/Often	60.1	65.2	
- Never/Rarely	39.9	34.8	

TABLE II: LEARNING STRATEGIES FOR RESOURCE MANAGEMENT

Variables	First-year (%)	Fifth-year (%)	P
Favorite place to study:			
Library	18.1	14.2	0.350
Coffee room	21.5	40.4	0.00024
Empty classroom	4.5	2.8	0.433
House	78	74.5	0.465
Garden	5.1	6.4	0.618
Other	–	–	
Study:			
Alone	79.5	79.4	0.980
With friends	20.5	20.6	
Ways to understand a difficult word:			
Find the meaning from the context	3.8	26.2	0.194
Ask someone to explain it	22	29.8	0.121
Research it on the internet	81.9	85.1	0.515
Translate it into another language	7.9	23.4	0.178
Don't dwell too much on the word	21.5	4.3	0.700
Give enough time to your studies without neglecting other important aspects of life (leisure, family):			
Always/Often	122 (68.9%)	110 (78%)	0.036
Never/Rarely	55 (31.1%)	31 (22%)	

TABLE III: AFFECTIVE STRATEGIES FOR MAINTAINING CONCENTRATION

Variables	First-year (%)	Fifth-year (%)	p
Concentration time during lessons:			
10 min	30.1	26.2	0.084
30 min	46.6	58.9	
60 min	17	12.8	
More than 60 min	6.3	2.1	
Strategies to maintain concentration:			
Drink a beverage (coffee/juice/water)	58.2	78	0.0001
Take vitamins	20.3	26.2	0.213
Shower or wash up face	40.1	27	0.0140
Others:			
Get away from social networks	9.6	4.3	0.067
Listen to music	0.6	–	
Smoking	1.1	–	
Consult social networks	–	0.7	
Sleep	–	0.7	
Nothing	4.5	1.4	

the loss of questionnaires by some students, and the need to hand in a new copy, and the coincidence of the questionnaire distribution period with the exam period. Despite these difficulties, the participation rate was 98.8%.

For metacognitive planning strategies, the results of our study showed that there was a significant difference ($p = 0.00028$) between first and fifth-year students in setting a revision schedule. 79.4% of fifth-year students began their preparations by drawing up a timetable, compared with 59.3% of first-year students. However, when it came to

TABLE IV: AFFECTIVE STRESS CONTROL STRATEGIES

Variables	First-year (%)	Fifth-year (%)	
Strategies to control stress:			
Playing sports	30.5	20.6	0.044
Listening to music	53.1	67.4	0.010
Going out with friends	32.8	34.8	0.709
Cooking	10.2	23.4	0.0013
Others	13.6	14.2	

TABLE V: AFFECTIVE STRATEGIES FOR AVOIDING FATIGUE AND MAINTAINING MOTIVATION

Variables	First-year (%)	Fifth-year (%)	p
Strategies to avoid fatigue:			
Sleep for 8 hours and 9 hours	50.8	66	0.0079
Healthy, balanced diet	27.1	32.6	0.285
Taking breaks	67.2	70.9	0.480
Taking vitamins and food supplements	14.7	19.1	0.289
Others:			
Consult social networks	0.6	0.7	0.264
Sleep	1.1	0.7	
Strategies to maintain motivation:			
clean, quiet study area	54.8	70.2	0.0059
Stay away from social networks and games	38.4	44	0.337
Reward yourself after each study session	29.9	33.3	0.539
Study in groups	24.3	17.7	0.148
Others	5.3	2.1	0.166

TABLE VI: CHANGES IN STUDENTS' LEARNING STRATEGIES BETWEEN THE BEGINNING AND END OF THEIR UNIVERSITY CAREER

Variables	Number	Percentage
Clinical internships:		
Do not affect academic performance	2	1.4%
Reduce exam preparation time	87	62.4%
Help to understand better the concepts acquired in theoretical courses	92	65.2%
Better stress management than in first-year:		
Yes	118	83.7%
No	23	16.3%
Better time management compared to first-year:		
Yes	98	69.5%
No	43	30.5%
Faster note-taking:		
Yes	103	73%
No	38	27%
Better understanding of most medical vocabulary:		
Yes	135	95.7%
No	6	4.3%
Attend fewer and fewer lectures:		
Yes	123	87.2%
No	18	12.8%

planning study periods, we found no significant difference between both classes ($p \geq 0.05$). The students preferred to

start their preparations with the most difficult subjects, as well as planning short and frequent preparation periods. On the other hand, the majority of first-year and fifth-year students preferred to start their preparation a month or more before the exam. Few students were up to date with their studies. A study carried out at the Cégep in Canada showed that the use of planning when to study, predicting study time, studying in advance, and dividing work into stages were frequent from the first semester onwards and continued to progress during the course of training. In Term 3, each of these strategies was mentioned by over 70% of students (Larue & Cossette, 2005). Dilk S conducted a study on the learning strategies used by first-year female students. The strategy of giving study priority to the most difficult subject was uncharacteristic of successful students and characteristic of students at risk of failure (Dilk, 2010).

For the metacognitive strategies of control and regulation, we didn't find a significant difference between the two classes ($p = 0.126$). In fact, 65.2% of fifth-year students and 60.1% of first-year students were able to adapt their schedules to circumstances and unforeseen events while keeping to the time set aside for this program.

For resource management strategies, the results of our study showed that the preferred place to study most cited by both first-year and fifth-year students was home. As for the use of the café as a place to study, our study showed that senior students preferred it to study more than junior students. In Larue's study of students' learning strategies in a nursing course using problem-based learning, the majority of students studied at home (28/31), at a desk (30/31), and in silence (19/28) (Larue, 2008). Strategies for identifying available resources also appeared to be identical in both classes. Indeed, the first-year and fifth-year students preferred to study alone rather than with peers. This is in line with a study carried out at Midwestern State University in 2007, which showed that 55% of students had never used study groups, and only 14% always did (Rybczynski & Schussler, 2011). According to the results of our study, 81.9% of first-year students and 85.1% of fifth-year students searched the internet to understand difficult words. On the contrary, a study published in 2005 on Internet use by medical students at Süleyman Demirel University (Turkey) showed that students mainly preferred textbooks and/or course documents (76%) when they needed information on dental topics, while 32% referred the Internet (Komerik, 2005).

Furthermore, we observed from the results of our study that there was an improvement in time management between first-year and fifth-year students and that fifth-year students gave a certain priority to their studies without neglecting other important aspects of their lives (leisure, family) more than first-year students. This translates into efficient time management in the fifth-year compared to the first year, as 69.5% of fifth-year students declared. In contrast, a study published in 2006, which compared the learning strategies used by medical students at the University Libre of Bruxelles over the three years of the first cycle of medical studies (PCEM), showed increasing difficulties in time management, probably due to the multiplication of courses (Vanmuylder et al., 2006).

For affective strategies to maintain concentration, there was a significant difference ($p < 0.05$) between first-year and fifth-year students. To stay focused during the preparation period, fifth-year students preferred to drink a beverage (e.g., coffee, juice) more than first-year students. In addition, junior students preferred to shower or wash their faces more than senior-year students. However, students from both classes seemed to have difficulty staying focused during a lecture, and their maximum concentration time in a lecture was 30 min. A study published in 2017, which aimed to describe the effect of technology as well as other types of distractions on students' concentration in the classroom, at the King Saud bin Abdulaziz University for Health Sciences in the Kingdom of Saudi Arabia, revealed an increase in the rate of distraction among seniors (fifth, fourth and third years) compared with juniors (second and first years), indicating that first-year students are more attentive than senior students (Attia et al., 2017). Stress and anxiety, as well as fatigue, are important issues for medical students. The level of difficulty associated with the medical program is conducive to increased anxiety. A study carried out at the University of the Witwatersrand in South Africa in 1995 showed that medical students had a higher level of anxiety than students in other faculties (commerce, engineering, art) (Agar & Knopfmacher, 1995). For this reason, each student developed a strategy to manage it. Our study showed that the use of music and cooking to overcome stress was more frequent among fifth-year students than first-year students. On the other hand, first-year students preferred sports to beat stress more than fifth-year students. To avoid fatigue, 70.9% of fifth-year students and 67.2% of first-year students took breaks. Furthermore, 66% of fifth-year students versus 50.8% of the first-year students enjoyed a good night's sleep from 8 am to 9 am. This is in line with a study carried out in 2012 at the Faculty of Medicine, University Laval, Canada, on the sources and means of stress reduction among medical students. The results showed that students identified loved ones, sports, and time planning as stress-reducing factors (Morneau-Séigny et al., 2013).

Regarding affective strategies for maintaining motivation, the majority of students in both classes opted for a clean, quiet study space. In a study designed to assess the level of motivation of fourth-year medical students at two educational establishments in Brazil, intrinsic motivation (IM), represented by the satisfaction of increasing one's knowledge and professional skills, was higher than extrinsic motivation (EM), linked to the desire to have a good life in the future and monetary compensation (Cadête Filho et al., 2021). In a 2011 study of first-year and fifth-year FMDC students designed to measure and compare the degree of motivation of dental school students at the beginning and end of their training, the degree of motivation of students at the end of their training was lower than that of students in their first year (Badre et al., 2016).

To verify whether there is a real evolution of fifth-year students between the beginning and the end of the curriculum, it would be desirable to follow the same sample from the first year to the fifth year to describe the evolution of their learning strategies along the years of study. In the last part of the questionnaire, questions were administered

only to fifth-year students to measure their degree of evolution between the beginning and the end of the curriculum. Fifth-year students reported that clinical placements had an impact on their learning. 65.2% said that clinical placements helped them to better understand notions acquired in theoretical courses, but 62.4% of these students said that clinical placements reduced their exam preparation time. A study published in 2001 showed that clinical rotations workshops had a positive impact on externs at Sherbrooke University in Canada (Chamberland et al., 2001). By the end of a clinical placement, students had improved their clinical reasoning. In addition, fifth-year students noted an improvement in time management, stress management, note-taking speed, and a better understanding of medical vocabulary than in first-year. Finally, the majority of fifth-year students attended fewer and fewer lectures.

5. RECOMMENDATIONS

Following the results of our study, we propose these recommendations:

- 1) Strengthen the teaching of learning strategies in the FMDC dental program.
- 2) Teach not a single tactic but rather a repertoire of strategies from which the student can draw not only cognitive strategies but also metacognitive, affective, and resource management strategies.
- 3) Also develop knowledge of the conditions under which a particular strategy applies more specifically.
- 4) Create tutoring sessions tailored to the profile of first-year students, either by teachers or by students further along the curriculum, to help them adapt to university teaching.
- 5) Teachers can also take part in ongoing pedagogical training to change the traditional lecture into an interactive and innovative course to attract students' curiosity, improve their concentration in the course, reduce absenteeism, and motivate them to study.
- 6) Make students aware of strategies that are ineffective or that they don't use properly.

6. CONCLUSION

The learning strategies adopted by first-year and fifth-year FMDC students are largely similar. However, the senior students have better stress management, better time management, and a better understanding of medical vocabulary than first-year students. This means that effective study strategies and the ability to manage them develop with the academic years. However, it would be desirable to introduce a learning strategies teaching program to help students admitted to the Faculty of Dentistry integrate into the university education system and develop effective learning strategies from their first year of study.

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CONFLICT OF INTEREST

The authors declare that they do not have any conflict of interest.

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