

DEVELOPING A PRACTICAL GUIDE FOR TEACHING HISTOLOGY. AN EVALUATION OF DIDACTIC COMPONENTS

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Abstract

Didactic Guides are valuable tools complementing and making learning more dynamic. These guides are designed using creative didactic strategies that simulate the presence of the tutor and generate a dialogue in order to offer students different possibilities to improve their understanding and self-discovery learning. This way, students are the protagonist of their own learning process. In this context, is highly important to consider self-discovery learning as a goal facilitating significant learning. The use of practical guide enables students to manage their own time, goals, techniques, contents and evaluation. In medical histology, teaching several models of didactic guides could be use, and they normally include numerous activities, text, questionnaires, pictures, and drawings that may enhance the effectiveness of this tool in the learning process. In this work, we have evaluated the usefulness of different sections of a histology didactic guide in order to determine the key sections that enhance the learning process in human histology.

For this purpose, a practical histology guide was designed with different sections: take-home message, theoretical text, objectives, drawings, pictures, clinical cases, games, blank spaces for notes and drawing and final self-evaluation questions. In this work, a simple questionnaire was applied in 90 students enrolled in histology practical sessions to analyze the student's perceptions and preferences related to the histology guide. Average results and standard deviations were calculated for each option and all participants, as well as for each gender, separately. Comparisons were done for drawings vs. blank spaces for drawing, theoretical contents vs. blank spaces for notes, drawings vs. pictures for all students and for each gender separately using the Mann-Whitney non-parametrical test.

Our findings revealed that visual strategies such as images and pictures were considered to be more useful for learning histology in the practical session. Similarly, the students rated the self-evaluation questions and blank spaces for self-notes and drawings to be more attractive to the students. However, texts with theoretical information, messages, objectives, and clinical cases revealed to be less useful for the students in the learning process of medical histology. Moreover, statistically significant differences between theoretical contents vs. blank spaces for notes were observed, but no differences were found between genders. All these results point out the importance of including pictures and drawings in the practical guide accompanied of blank spaces allowing the development of creativity and autonomy leading the students into self-discovery learning. Interestingly, the students do not appreciate the presence of theoretical background in the practical guide as relevant information for their academic formation in the practical session.

1. INTRODUCTION

The process of integration into the European Higher Education Space has introduced major changes in the organization of university studies and teaching [1]. The introduction of the European credit as the reference unit in which the curriculum is structured acts as a measure of the overall work developed by the students in and out of class. This system requires educational programming to be carried out taking as reference the students self-learning process. In this context, the need of careful planning of each curriculum by the elaboration of practical guides provide teachers and students the necessary information about what the student needs to learn and how to achieve and verify the results. This would thereby motivate the students and reinforce the role of the teacher as a facilitator [2]. This planning is also associated with quality teaching that should be based on the precise definition of the skills that students must acquire after completion of the learning process in order to integrate theory with practice. In this context, it is necessary that faculty possess the knowledge and tools needed to address the task of planning in order to achieve success by designing useful practical guides according to the aims of the European convergence.

Histology in their daily work is a highly practical discipline. Teaching Human Histology is basically developed through lectures, seminars and practical classes [3]. For practical classes, the students use an optical or virtual microscope and histological preparations are examined for identification of human cells, tissues and organs. In this milieu, the elaboration of practical guides constitutes a useful tool in the learning process of practical histology that promotes the self-discovery learning by the students [4]. The practical guide is a detailed planning of the subjects based on the principles that guide the process of convergence to the creation of the European Higher Education Area. The goal of the practical guide document is to present the tutorials as a methodological resource that mediates pedagogical interaction between teacher and student, and it covers a wide range of topics, some in broad outline, and others in more detail.

In this context, is well known that there is no single method that works best for all students [5,6]. In this context, there is no ideal learning guide covering all aspects related to the learning of histology. Consequently, to design and evaluate an integrated guide to different training goals is absolutely necessary to reinforce the students' abilities during the teaching-learning process. In this work, we have developed a practical guide comprising different forms of access to knowledge, the development of different skills and abilities in order to assess progress in both the acquisition of knowledge and the skills.

2. METHODOLOGY

A total of 90 first year students of the medical curriculum at the University of Granada were selected for this study. The practical guide method was implemented during the "Histology of stem cells and body tissues" course (4 months). First, a practical histology guide was designed for each of the 9 practical sessions of the subject "Histology of stem cells and body tissues". Each guide included the following sections: take-home message, theoretical text, objectives, drawings, pictures, clinical cases, games, blank spaces for notes and drawing and final self-evaluation questions.

Then, all the students received the practical course (9 practical sessions of 1.5 hours of duration each one) using the previously designed practical guide without interruption. In total, each student received 13.5 hours of practical sessions. Each session was taught in groups of 25 students in practical halls. An instructor was available during the sessions in case the students required the instructor's presence.

Once the course finalized, each student completed a questionnaire in order to evaluate the student's perceptions and preferences related to the histology guide. The general question inquired in the questionnaire was "Assess the usefulness of each part of the practical guide". This questionnaire included the evaluation of all section included in the practical guide: take-home message, theoretical text, objectives, drawings, pictures, clinical cases, games, blank spaces for notes and drawing and final self-evaluation questions. The responses for all sections were recorded with a symmetric Likert-like scale by which students indicated the usefulness of each part of the guide according to their own perception. Each participant rated each option on a five-point scale ranging from 1 to 5 as follows: 1= useless; 2= barely useful; 3= neither useful nor useless; 4= useful; 5= very useful. The options evaluated in the questionnaire are shown in Table 1.

•Asses the usefulness of each part of the practical guide:					
a) Take-Home message					
1	2	3	4	5	
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b) Theoretical Text					
1	2	3	4	5	
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c) Objectives					
1	2	3	4	5	
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d) Drawings					
1	2	3	4	5	
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
e) Pictures					
1	2	3	4	5	
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
f) Clinical cases					
1	2	3	4	5	
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
g) Games					
1	2	3	4	5	
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
h) Blank Spaces for Drawing					
1	2	3	4	5	
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
i) Blank Spaces for Notes					
1	2	3	4	5	
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
j) Self -evaluation					
1	2	3	4	5	
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Table 1. Questionnaire used in this work for the practical sessions of the “Histology of stem cells and body tissues” course.

Average results and standard deviations were calculated for each option and for all participants, as well as for each gender, separately. To identify statistically significant differences between groups, comparisons were done for drawings vs. blank spaces for drawing, theoretical contents vs. blank spaces for notes and drawings vs. pictures for all students and for each gender separately using the Mann-Whitney non-parametrical test. P values below 0.05 were considered statistically significant.

3. RESULTS

As shown in table 2, our results demonstrated that the highest scores assigned by the students corresponded to the presence of drawings in the practical guide (4.28 ± 0.92), pictures (4.22 ± 0.90), blank spaces for drawing (4.10 ± 1.01), self-evaluation questions (4.10 ± 1.03) and blank spaces for notes (3.92 ± 1.08). In contrast, the lowest scores according to the student's perceptions were found for the take-home message (2.72 ± 1.11), games (2.84 ± 1.19) clinical cases (3.30 ± 1.19), theoretical text and objectives (3.67 ± 0.89 and 3.70 ± 0.80) (Figure 1, Table 2). The comparison of the scores assigned to each item by male and female students did not show any statistically significant differences between genders ($p > 0.05$), although female students tended to show higher values than male students for all contents of the practical guide (Figure 2, Table 2).

The comparison analysis between specific groups of contents of the practical guide revealed that the students preferentially opted for the incorporation of blank spaces for notes as compared to the presence of theoretical text in the guide ($p = 0.0291$ for the Mann-Whitney test). However, no statistically significant differences existed between the presence of drawings and spaces for drawing ($p > 0.05$ for the Mann-Whitney test) and between drawings and pictures ($p > 0.05$). When this comparison was specifically carried out for female students (Figure 2, Table 2), we did not find any statistically significant differences for any of the comparisons (drawings vs. spaces for drawing, drawings vs. pictures and theoretical text vs. blank spaces for notes). For male students (Figure 2, Table 2), statistical differences were found for the presence of theoretical text in the guide ($p = 0.0193$ for the Mann-Whitney test), but not for the other two comparisons.

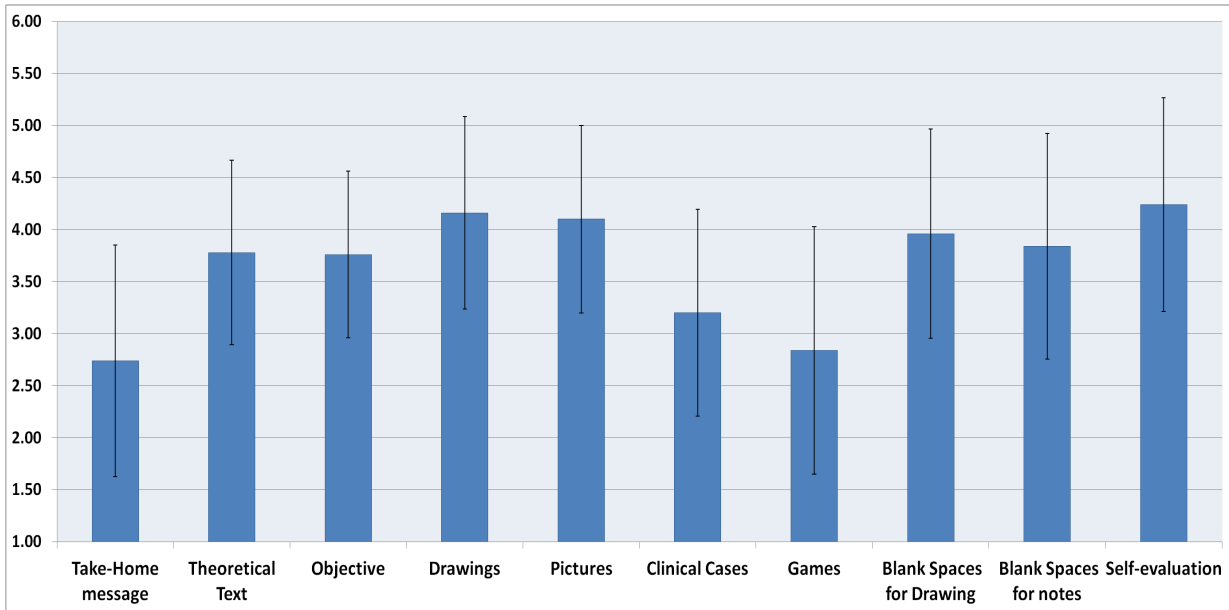


Figure 1. Average scores obtained in the evaluation the questionnaire for each item related to the “Assess the usefulness of each part of the practical guide”.

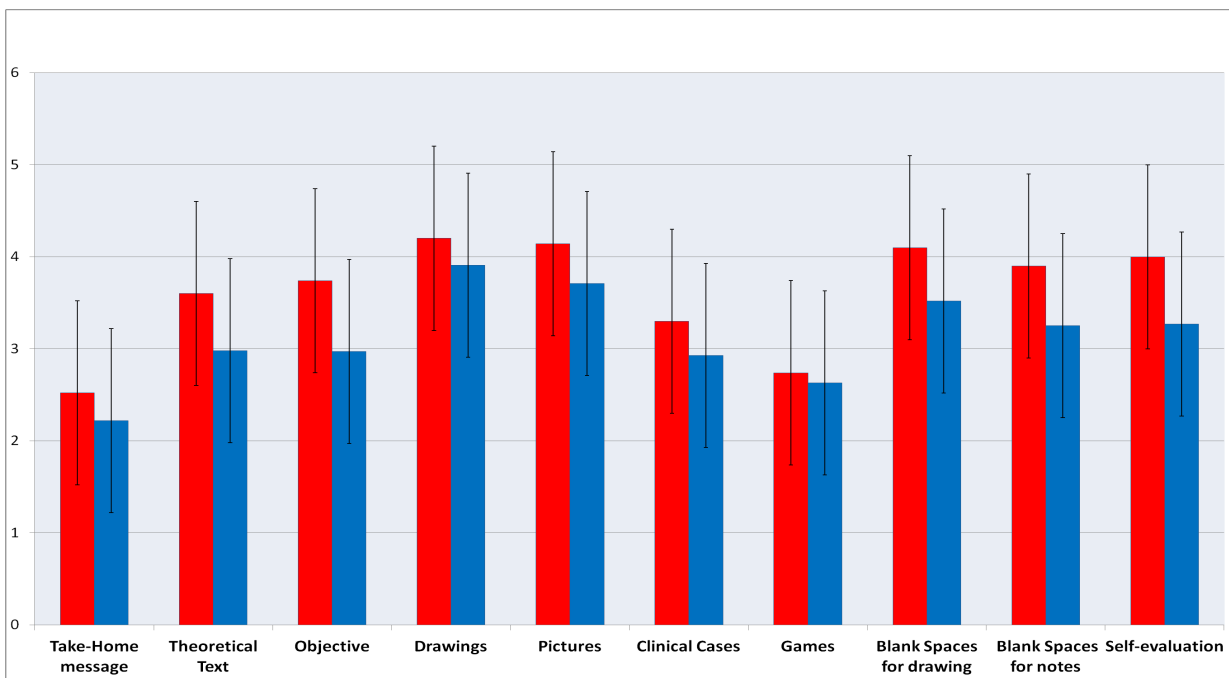


Figure 2. Average scores obtained in the evaluation by gender for each item related to the “Assess the usefulness of each part of the practical guide”. The results obtained for female students are represented by red bars and male students by blue bars.

		Take-Home message	Theoretical Text	Objective	Drawings	Pictures	Clinical Cases	Games	Blank Spaces for Drawing	Blank Spaces for Drawing	Self-evaluation
ALL	MEAN	2.72	3.67	3.70	4.28	4.22	3.30	2.84	4.10	3.92	4.10
	SD	1.11	0.89	0.80	0.92	0.90	0.99	1.19	1.01	1.08	1.03
FEMALE	MEAN	2.52	3.60	3.74	4.20	4.14	3.30	2.74	4.10	3.90	4.00
	SD	1.13	0.97	0.83	1.01	1.02	1.07	1.24	1.09	1.05	1.16
MALE	MEAN	2.22	2.98	2.97	3.91	3.71	2.93	2.63	3.52	3.25	3.27
	SD	1.00	1.23	1.21	1.58	1.46	1.21	1.20	1.60	1.50	1.39

Table 2. Results corresponding to each item included in the questionnaire for all students and for each gender separately. All values are expressed as means and standard deviations.

4. DISCUSSION AND CONCLUSIONS

Histology has traditionally been taught as a lecture and microscopy-based practical course that required developing certain skills allowing the students to consolidate their learning. Different methods and learning routes have been traditionally used, and students make use of the knowledge they have previously acquired in theoretical courses. Therefore, it is important that academics provide tools that facilitate and guide this learning process and to allow the students to acquire autonomy and to be responsible for building their own knowledge under tutorization by their mentors and teachers [7]. Thus, new learning strategies should be developed for university teaching [8], and novel programs should be designed and implemented to increase the students' motivation and self-regulation during the learning process. This way, awareness and control over what is to be learned could be facilitated [9,10].

In this context, the university education is currently interested in empowering the student and gradually fade dependent relationship with the tutor, who plays a role into phase proactive learning and is who should lead, guide and facilitate the learning process of students. This should be done by the implementation of learning environments and dynamic, constructive and meaningful situations, using innovation tools such as tutorials and guides that enhance self-learning, solving problems and developing the scientific curiosity for learning. In other words, university professors should employ teaching strategies as practical guides that facilitate students to learn cooperatively, creating an environment conducive to the growth of personal autonomy and encourage students' critical thinking and reflection on the learning process [11-13].

Experiential learning theory and its development distinguishes different ways to approach, plan and respond to the demands of learning, and four learning styles can be distinguished: active -based on direct experience-, reflexive -based on observation and data collection-, theoretical -based on abstract conceptualization- and pragmatic -based on active experimentation and finding practical applications- [14]. In this study, we have developed a practical guide that could contribute to improve the learning process of the students enrolled in a histological subject by complementing and consolidating their knowledge by combining the four learning styles. This practical guide could be used to stimulate the students' creativity in the context of self-learning, where each student is the protagonists of their own learning process. This guide was divided into ten sections, each one focused on a specific aspect of the practical learning, including a take-home message, theoretical text, objectives, drawings, pictures, clinical cases, games, blank spaces for notes and drawing and final self-evaluation questions. By using this tool, the student could probably improve their learning process in relation to histology. To determine the usefulness of each section of the practical guide according to the perceptions of the students, we inquired them to rate each section of the guide by using a questionnaire.

According to the students' perceptions, the visual tools are most useful for the student, especially the use of drawings (4.28 ± 0.92), photographs (4.22 ± 0.90), and blank spaces allowing the student to draw the histological structures that are being observed during the practical course. The high rating found for the presence of blank spaces for drawing (4.10 ± 1.01) may suggest that students are keen to participate and interact, actively developing their creativity and enhancing self-discovery. In contrast, the inclusion of the theoretical statements in the guide such as a take-home message (2.72 ± 1.11), theoretical text (3.67 ± 0.89) and objectives (3.70 ± 0.80) were less useful for the development of the practical sessions according to the students. Probably, students consider that practical sessions should be exclusively focused on practical activities based on the use of microscopes and slides, and they may think that the necessary theoretical knowledge has been previously acquired during the theoretical learning sessions based on lectures and presentations. Therefore, in practical sessions the students give more importance to the tools that enable

them to acquire skills in the identification and characterization of cells, tissues and organs such as pictures and drawings. These results suggest that visual tools should be improved and developed during practical sessions.

Strikingly, other strategies based on the use of games, which have been previously used as learning strategies [15], was rated very low by the students (2.84 ± 1.19). Perhaps, this type of strategies are not considered useful by the students enrolled in a practical course because these tools are not directly related to direct handling of histological samples as expected in a practical session. It is also noteworthy that the students did not rate clinical cases as highly useful (3.30 ± 1.19). Although histology should be taught with a clear medical orientation, students are likely focused on the visual recognition and identification of the tissue structures during the practical session and do not consider the future applications of the acquired knowledge. This should be reinforced by the use of alternative teaching strategies more focused on the clinical usefulness of each practical session.

Although the literature over the years has shown that men and women do not learn in the same manner because they have different interests, skills, motivations and maturational processes specific to each gender, the analysis of our results related to the preferences of the students according to their gender showed no significant differences between males and females. The research related to aspects of personality and cognitive tasks appear to offer a scenario where males in general are more extroverted, impulsive, with better yields numerical and spatial tasks and women turn more introverted, more emotional and better verbal tasks yields [16-20]. In the case of histology learning, the differences between genders are not made visible, and both, men and women are required to develop the same skills especially in terms of perception and visual acuity to achieve consolidate their knowledge.

In consequence, after developing a didactic guide and assessing its usefulness as perceived by students, we may conclude that the practical guide could show effective results if visual tools such as drawings, diagrams, pictures and microphotographs reflecting the structure of the tissues that students are observing under the microscope. The presence of theoretical contents was less attractive for the students and should be reduced to the minimum necessary for the development of the practical sessions.

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