

# GUIDED WEEKLY REFLECTION PAPERS: A STRATEGY FOR ACHIEVING ACADEMIC GOALS

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## Abstract

Rapid changes in innovative teaching need multidisciplinary efforts to accomplish a variety of goals through a collaborative tool which inspires and stimulates the students to learn and use the knowledge in a more a critical way. In this context, our team of lecturers concerned by educational innovation had carried out during three academic years a learning tool based on "Weekly Reflection Papers" (WRP). With the experience gained in this process we have implemented an essential modification in the procedure in order to improve the teaching-learning process.

The goal of this communication is to show the development of the initial tool and how it has been changed until the actual proposal called "Guided Weekly Reflection Papers" (GWRP).

Keywords: Guided weekly reflection papers, teaching-learning tool, feedback process, continuous and formative evaluation.

## 1 INTRODUCTION

The social and educational changes that have taken place over the last few years, the European Higher Education Area (EHEA) and the role of teachers, students and new technologies in the construction of knowledge have promoted a new vision of the whole educational system. For that reason, it is necessary that teachers rethink their own practice and construct new expectations about student outcomes. Having in mind that the current educational context calls for an active and reflective student-centred learning, a group of professors of diverse areas of knowledge at the University of Alcalá started-up, some years ago an innovative teaching experience based on "reflective diaries" [1, 2].

One of our priorities has been the use of this pooling of ideas, ways of teaching and knowledge from different areas to diversify the initial methodology "Weekly Reflection Papers" [3, 4] and design a more flexible and valuable tool for improving academic results. In this line, the last modification introduced, called "Guided Weekly Reflection Papers" [5] gives us the opportunity to introduce the students in a process of more active and participative learning, which motivates and encourages them to achieve more significant and reflective knowledge and generates interest in emergent topics.

In the originally described Weekly Reflection Papers, students wrote and handed in to the lecturer periodically (week, fortnight, topic unit), a clear and concise exposition of the most relevant concepts studied in this period, as well as a reflection about the difficulty of the subject, the evolution of their knowledge or any other point of interest. The style and structure of the papers is totally free. Both the clarity to express the ideas and the level of personal communication achieved are considered to be key elements in writing the papers. Once they have been checked, the lecturer returned the papers as soon as possible with a view to clarifying concepts, correcting errors, marking [6] the works and responding to the students' comments (The papers are evaluated on the basis of three main criteria, with points being awarded from 1 to 5: A= Capacity to extract all the fundamental concepts, B= Capacity to synthesis and clarity of expression and C= Capacity to reflect and comments, and these marks are expressed in a table with three columns per each WRP). The results were statistically

analysed to find out the correlation between the number and quality of the works prepared by the students and the final marks obtained. Participation of students in this Project was voluntary, but strongly recommended on account of its utility as a learning tool.

The main goal pursued in applying this activity was the development of the ability to synthesise and select the most important items taught, but at the same time to bring out their ideas with correct and clear writing. However, this goal was not always accomplished, at least at the expected level, since often the WRP were a mere transcription of the notes taken in class. The greatest deficiency was observed to be the students' scant capacity to reflect and think critically. Moreover they showed a lack of ability to establish relationships with the knowledge acquired in other related subjects.

In order to improve the activity and correct as much as possible the observed weakness, our innovation group has started the implementation of the mentioned modification of the methodology, called GWRP. In addition to the usual scheme (with some particularities depending on the subject) and the critical reflection, the students have to follow the suggestion of the professors, who guide their work through a series of questions on which the students must apply the most significant concepts studied each week, to prove the acquisition of the selected aptitudes and skills. This point provides the information about the level of comprehension of the knowledge reached by the students. Lecturers could gradually check progress in the teaching-learning process and therefore focus it appropriately ("feedback process"). The activity allows the students to correct mistakes and to distinguish clearly what they had understood and what they had not along the learning process, without having to wait for the eve of the exam. All these benefits were already observed in the former WRP but we have checked that with the modification described in this paper the results are very much satisfactory as we will mention below.

The aim of this paper is to show the evolution of the initial tool and how the actual proposal called "Guided Weekly Reflection Papers" has been implemented by the different lecturers of our Educational Innovation Group.

## **2 IMPLEMENTATION OF THE GWRP**

### **2.1 General**

The changes accomplished in the new methodology are focused on encouraging the students to write the GWRP in an enthusiastic, original and interesting way, avoiding the mere repetition of the notes taken in class, but at the same time, not following a classical "question-answer scheme" as in an exam.

The main changes introduced are:

The students have to apply the concepts developed during the week to solve some questions or problems stated by the lecturers. They also have to find solutions to situations of the real life by means of the learned concepts. Or explore beyond the walls of the classroom to discover where around them is it possible to find the material presented by the teachers. In some of the subjects the stated questions were oriented to solve certain problems which might appear in a professional future situation. Finally, the students have to search correspondence among related concepts taught in other parts of the same subject or, specially, in other subjects. It is necessary to avoid studying the topics as isolated compartments. At the end of the course students evaluate this activity by means of a final questionnaire.

As in the former methodology once the students finished the filling of each "Guided Weekly Reflection Papers", the professor corrects and returns them in the shortest possible time. Each lecturer monitors the activity by filling in a table in which the number of papers handed in by each student and the corresponding mark are included. We introduce a new column (D) in the marking table to evaluate the answers to the questions stated by the professors. On the basis of these data, the degree of participation in the activity is statistically analysed, together with its influence on students' attendance at classes and exams, and its relation to the final marks obtained.

### **2.2 Detailed Implementation Strategy**

Firstly we have to point out that our Innovation group is a very multidisciplinary group of teachers. All of them were very much engaged by the work of the coordinator of the group who described in 2007 the first implementation of this type of activity in the University of Alcalá [3]. In spite of having the same

fundamental basis, the exact implementation by the diverse teachers is different in each of the subjects. It is interesting to compare how the “way to guide students” has its own characteristics in the different areas. This variety of points of view enhances the interest of the team work (see below). In the next paragraphs we will detail how the professors implement the GWRP in the corresponding subjects.

### *2.2.1 Chemistry (written by M<sup>a</sup> Gloria Quintanilla. Dept. Organic Chemistry)*

The subject I teach is located in the first semester of the first year of Health Biology, a new degree in the University of Alcalá, where the students arrive with a relative good mark. Although Chemistry is not exactly a major in the curriculum of this degree, but a kind of “supporting and basic” subject, the students are highly motivated by the learning process. This is proved by both their attendance, the involvement in the presential classes and their participation in the exams. I must admit that it is quite easy to get these students engaged with what can be seen as an interesting new way to acquire Chemistry knowledge. For exchange the main problem I have to carry out this experience is the large number of students in the course (113 registered) and the relatively limited number of contact hours per week (only two and just six seminars in the whole semester) which prevents in part to enjoy as I would like in the teaching process. Because of the number of students, somehow my first contradiction is to engage the students to take part in the activity but at the same time to be able to assume the huge amount of work which provokes the reading and correction of their GWRP, if all of them indeed would participate. Fortunately, on one hand, not all of them write the papers and also the number of participants (69 in the first week) decreased considerably along the course due to the overload with the academic work in all the subjects and the subsequent lack of time. Anyway, even the students who stop writing the papers believe that it is a very attractive activity and they sorry very much about not being able to follow until the end.

Students are used to see science teaching as a transmission of knowledge as opposed to the view that science is a way of exploring and of understanding the world. For them Chemistry is a collection of symbols, formulae, equations and “tricks” to solve the chemical problems, which they have to learn in order to pass the exam to be accepted in the University. Scarcely have they considered Chemistry as something present in their life. This is also supported by the “ecological idea”, spread by the media that “all the biological things are healthy but the chemical things are dangerous”. For this reason my “way to guide” the students through the GWRP and hence through the study of the subject is addressed to help them learn how to enjoy discovering Chemistry in the real world. In each paper they have to look around and find where they have at home, in the car, in the food, etc, the compounds we were talking about in the class. For example, when teaching organic formulation, they were really surprised by the fact of finding that so many alcohols were in deodorants or in the hair shampoos, or how some organic acids are used as preservatives for human food, to mention only a couple of examples.

At the same time they are encouraged to apply what we learn in our subject to the processes studied in other subject, like solving buffer problems applied to the situations seen in the course of Biochemistry (located in the same semester) or to understand the tetrapyrrole ring of the haemoglobin in relation to the planar, aromatic structure of the pyrrole ring.

They feel themselves very much concern by the applicability that the knowledge in Chemistry will have for them, in all this quoted aspects, having in mind that they will become Health biologist, and I firmly believe that the writing of these GWRP is a factor which contributes enormously for them to achieve this academic goal.

### *2.2.2 Microbial ecology (written by José Luis Copa-Patiño. Dept. Microbiology and Parasitology)*

Microbial Ecology is a subject belonging to the curriculum of the old Degree (Licenciatura) of Biology at the University of Alcalá. The subject is elective and it has 6 ECTS. In spite of being an elective subject in the first semester of the 5th course, it is very popular among the students because it offers to the students a different point of view about the microorganisms. I mean, in the classical Microbiology subjects the microorganisms were considered to be responsible for diseases and problems for the human beings, whereas in this subject the microorganisms are studied as an important part of the life in the Earth, connected with all the living creatures including the humans, permitting the live in our Planet.

In order to implement the GRWP I followed the general principles of the methodology explained above. In this sense, first of all I ask them to prepare a kind of conceptual map where they integrate

all the concepts explained in each topic unit and secondly a personal reflection of each topic unit. I like the later activity because I want to know the points that the students found more complicated or the suggestions they make me about each topic and if the way to teach the concepts to them has been appreciated. Finally, I give at the end of each topic two questions to the students. This is my "way to guide students". The questions have not an unequivocal answer, but on the contrary they are opened to be discussed looking for the different opinion of the students. The main objective is to make the students to think about the question, giving an answer based in their background obtained studying this subject or/and another subjects, after a reflective time. For instance a question could be, at the end of the Hydroecosphere Microbiology unit: where the microbial diversity is higher, either in ocean or in river waters? Other example after explaining the different theories about the origin of the life in the Earth: Which theory do you think is more correct? With these questions I can obtain different goals: (a) evaluate the maturity of the students by the answers of the students, (b) detect mistakes in the conceptual approximation to the questions and (c) at the same time I could use the answers to promote formative discussions with and between the students during the teaching class. The students that attend class from the beginning were very enthusiastic and all of them participate in the activity. However, along the course the number of participants decreased due to other academic works. The experience from other years indicates me that this is a very formative activity for all the students and it helps them to understand and follow the subject along the course.

### *2.2.3 Programming (written by Antonio Guerrero. Dept. Automation)*

This subject belongs to the first year, second semester of the Graduate studies in Telecommunication Engineering. It is a compulsory subject with 6 ECTS credits that teaches the students how to create computer programs using a programming language which is very popular for engineers among the technological industries and companies: the "C" language. The students have learnt the basic concepts of this computer programming language during the first semester in another subject, so my subject is a continuation from the point where they stopped. Since this is an essential tool for the professional future of these students, most of them feel very interested in it. The number of students in my group is small (about 15), since it is the evening's group and it is the least demanded by the students (there are other more crowded groups in the morning). That's why I can apply my GRWP system in a relatively comfortable way.

In order to implement the GWRP, I propose every week one or two practical problems to be solved in a computer by a C program, related to the contents studied during that week and published in the website of the subject. The students should voluntarily write the programs and send them to me by email. Each problem contains also some hints or suggestions about the way to solve it and about the main programming functions that they have to use, from the ones studied so far in this course. They can also use this communication tool to include any question, doubt or comment about the contents studied during that week. Once received by email, I revise these solutions of the students as soon as possible and then I return them by email to the student during the following week, including my comments to the errors detected, suggestions about improving the writing or programming style and answers to their direct questions, if any.

I also evaluate the quality of the solutions given by the student and give a mark that I transfer to a weekly results table. This table will finally be processed statistically confronting with the results obtained by the students in their final examinations, and will let me extract conclusions about the effectiveness of this GWRP teaching tool. The main conclusion in the previous implementation (WRP) was that this tool is highly effective for the students who follow the activity during many weeks, since all of them had passed the subject and most of them with good marks.

To encourage the student's participation in this modified activity, they are told at the beginning of the course that the final grade of the subject will be raised a bit if they present at least 11 of the 14 possible papers (one for each of the 14 weeks in the semester), but with no quantification of this raise. In the practice, in some cases I have raised up to 1 point out of 10 maximum in our evaluation system.

Every week I select the best paper work presented by the students and I send it by email to all the students that participate in this activity, without any mention to the name of the selected student, and including my comments and corrections. This is also very appreciated by my students and even by students from other groups that, from time to time, ask me to send them the selection of best weekly papers.

After two weeks, I publish in the website of the subject my solutions to the problems proposed every week, full of comments, so that they can compare with their own solution and with the best student's solution of that week.

#### *2.2.4 Human Histology (written by Marta González- Santander. Dept. Medical Specialities)*

The Histology is a science which deals with the study of the structure and function of biological tissues, integrated within the human body as cell populations. It's a basic discipline that relates the cellular with the macroscopic level. More in depth, it is the scientific field that provides the necessary information for the descriptive knowledge of human body architecture and puts it at the service of pathological processes and the clinic practice. This subject is sustained in the progress of the scientific knowledge carried out within other disciplines like embryology, genetics, molecular biology, biochemistry, physiology, etc... In addition, currently, it forms the basis behind a new discipline called Tissue engineering. If we know how we are specifically built, we can design artificial biological tissues for medical use with a therapeutic and rehabilitative projection in response to the current demand of the society of the 21st century. It is necessary to know deeply the structure of healthy tissues (including not only the variants of the state of health but of renewal, regeneration, repair, degeneration and ageing phenomena) in order to apply this knowledge when studying the pathological processes.

Human histology is a subject of the first year of the new Bologna Degree in Medicine along the second semester, once the students have obtained the necessary knowledge in the discipline of Biology developed previously. In this context the "GWRP" tool in my subject, is intended to achieve the objectives outlined above in the general methodology, through following implementation strategy:

My students have to write a brief, clear and complete summary at the end of the unit topic taught. The student must include the most relevant concepts and establish a relation among them. They can perform it as traditional scheme or they can develop a conceptual map. Besides, I propose them several points for reflection: comparative structural diagrams, conceptual or interaction questions, or short questions about clinical applications. Finally a personal reflection and a self-assessment on their work will be required.

I intend to improve the perception in the student that the acquisition of structural knowledge of Human Histology is necessary for the understanding and acquisition of knowledge in the field of the clinic.

#### *2.2.5 History of music and folklore (written by Nieves Hernández. Dept. Didactics)*

History of music and folklore is a subject which belong to the degree Teacher training in music. It is a mayor subject located in the 2nd year, along the second semester, in only seven weeks with three sessions of two hours. Paradoxically, in spite of being a career with strong vocational component, many students are not very motivated, and, in general, they have a low level of knowledge of music, specially the group on which we are speaking.

All these factors involve a challenge. I think that the GRWP are an excellent tool to overcome that challenge. They make the students study the concepts, analyze them, detect their lacks and think how to teach them. In fact, one of the main objectives in this degree is that students could apply the knowledge to their future teaching practice. To reach this goal, main of the questions I ask to the students are referred to teaching aspects like creating didactic activities to be developed in classes with children in their educational practices in the future. The proposed activities are carried out in class to verify their viability and they are discussed between all the students. With this process the students go deep into the subject while they think about how they would teach it.

On the other hand they also must associate this subject with aspects of other ones, as didactic, vocal and instrumental teaching, history of the art, psychology, etc... so another proposed goal of the GRWP is reached.

Unfortunately only few students participate in this activity. Many of the non-participant students invoked the lack of time. Even though many of them recognize its usefulness, in general they are not concerned enough with all the aspects involved in the learning process, as I have mentioned above. However those who participate were very much satisfied. This is proved by the fact that I have proposed this activity along three years in different subjects to the same students and those that have participated are always the same. In spite of the low participation in this group, I believe that the writing of the GRWP is a relevant tool in the teaching-learning process.

#### *2.2.6 Organic Chemistry (written by M<sup>a</sup> Selma Arias. Dept. Organic Chemistry)*

In the Organic Chemistry area, the activity is directed to students following the old degree in Chemistry in a core subject called Advanced Organic Chemistry. The course is located in the second term of the 4th year and introduces students to important concepts in the context of mechanistic and synthetic organic chemistry. I implemented the GWRP methodology in the first part of the subject during seven

weeks. This part falls within the Physical Organic Chemistry, a constantly changing and evolving field, which has a multidisciplinary and eminently practical character. The purpose of this subject is the knowledge and understanding of structural effects on reactivity of organic compounds as well as the experimental and theoretical models which can be used to investigate the reaction mechanisms. The intention is to illustrate the use of both types of interpretations with the goal of facilitating the student's ability to apply these viewpoints.

I think that students can truly learn organic chemistry if they are actively involved in developing a practical understanding of the structure and reactivity relationships rather than trying to master organic chemistry through memorization. I try to help students to think in a new way as practicing chemists do. I encourage students to develop skills in analysing problems, reasoning by analogy and the use of quantitative data (such as rates of reaction) to make qualitative predictions about structure and reactivity relationships in systems new to them. I remind students that reactions can be understood in terms of mechanistic similarities although they can look very dissimilar.

Students hand in the GWPR for feedback at the end of each unit topic (five in total). In each paper students discuss and solve some questions and problems that I proposed related with the more relevant concepts learned. Some questions are intended to encourage students to think about and review concepts learned in earlier units of the same subject, or in other subjects, in a different context. I try to select questions and problems using examples from the research literature. I tell the students that the problems they are solving are related to real chemistry performed by chemists working on interesting and important research lines ranging from biological chemistry to the properties of materials, with great social implications in different fields such as health and pharmaceutical industry. I have become convinced that encouraging students to analyse problems systematically is an important factor in increasing their overall intellectual skills and promoting an active and participative learning.

Moreover, GWPR help personalise the learning experience providing a continuous and formative method of assessment. Feedback from students has been extremely valuable in making clearer to me certain misconceptions about the learned topics such as conformational effects on reactivity or acid and base catalysis.

Of the 120 students that are enrolled in the course only 30% participate in the activity probably due to the heterogeneity of the group with a wide disparity of prior training, needs, concerns and interests. The participating students were seen to be highly committed, however the students matriculated for the first time participated more actively. A direct relationship between the writing of the papers and the results achieved is observed. The large majority of students feel GWRP as a worthwhile activity that provide them with a way to express their views about what they are doing and claim that they increased their learning.

### *2.2.7 Industrial Pharmaceutical Technology (written by M<sup>a</sup> Ángeles Peña. Dept. Pharmacy and Pharmaceutical Technology)*

Industrial Pharmaceutical Technology, it is an elective subject belonging to the second semester of the last year of Pharmacy, course where still has not been implemented Bologna Plan. First at all, the students are very encouraged with the learning process of this subject because is directly related with one of their principal professional future, for that reason the attention and interest is highly favourable. According to the innovation methodology explained, I give the students one or two questions at the end of each topic unit. The questions, eminently, have a practical application in the professional word and the response only depends of the criteria of the student.

I consider my "way to guide" the students an important way to study this subject as much as any other with a great utility in the real world. For example, when teaching the topic of heating, ventilation, and air-conditioning system in the pharmaceutical industry, the students have to apply in the corresponding GWRP all these theoretical knowledge to a real fabrication process of any pharmaceutical forms, as suppository, tablets o syrups. When the students reflect about this question they realized that to maintain good indoor air quality through adequate ventilation with filtration and provide thermal comfort is necessary to get high production results, but at the same time they have to consider the economical aspects, among others, provide that this systems are among the largest energy consumers.

In other example, they are encouraged to apply the knowledge learnt in the interpretation of the information printed in the secondary packaging, taking into account that packaging plays a vital role in the marketing strategy. It is important to highlight, how satisfied the students feel when they discover the applicability of the theoretical teaching in their real life.

In summary this tool allows to reach one of the methodological proposal goals, because the students are lead to reflect much more than they are used to do in the classical way of teaching.

### 3 BENEFITS OF THE TOOL FOR STUDENTS AND PROFESSORS

In spite different grade of implementation carried out by the professors of the group we can highlight certain preliminary conclusions summarized below which are some of the most significant benefits for the students and lectures:

The students have “direct communication” with the lecturer, expressing ideas, making suggestions, asking questions and giving opinions, all of which would otherwise have remained unaided and are able to “correct errors” which they would have remained unaware of if they had not taken part in the experience. The activity helped them to “distinguish between what they had understood” of the lecturer’s explanations and what they had not. In their opinion, the lecturer may form a clearer idea of the “degree of understanding” of the knowledge imparted. They valued positively the information the papers afforded the lecturer for evaluating and grading their completion of the subject and the “efforts made by lecturers” to correct the papers.

In the opinion of the professors GWRP enhance enormously students and professor’s motivation, give both of them greater involvement in the teaching-learning process, and improve teacher’s teaching practice. The writing of GWRP makes the students more autonomous and more confident in the perception of the subject, because the questions are chosen by us to force them to reflect much more deeply and to have and holistic point of view of the topic. Lecturers have to work hard to correct the papers handed in by the students. Nevertheless, we consider that the benefits for both students and lecturers make that effort worthwhile.

We have to remark what we could deem as one of the most important benefits of the team work of our innovation group. Although the implementation of this strategy is addressed to the students, this team work has enormously enriched the personal interrelationships among us. The components of the Innovative Education Group belong to different knowledge areas; therefore the point of view which each of us contributes to this activity with is quite different. This fact, far from being an obstacle, makes much wider our mind and our seeing of the science. Moreover, the projection of our work as teachers is improved because we managed to increase the level of engagement of the students through our self-enrichment.

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