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Pascual Vicente; García López, José Manuel; Alaminos, Miguel
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MICROTEACHING AS A SELF-LEARNING TOOL. STUDENTS' PERCEPTIONS IN THE PREPARATION AND EXPOSITION OF A MICROLESSON IN A TISSUE ENGINEERING COURSE

**Antonio Campos-Sánchez¹, María del Carmen Sánchez-Quevedo¹, Pascual Vicente Crespo-Ferrer¹,
José Manuel García-López¹, Miguel Alaminos²**

¹Tissue Engineering Group, Department of Histology, Medical School, University of Granada, Avenida de Madrid 11, E18012 Granada, Spain

²Department of Histology, Medical School, University of Granada, Avenida de Madrid 11, E-18071 Granada, Spain

acampos@ugr.es, mcsanchez@ugr.es, pvcrespo@ugr.es, jmgarcia@ugr.es, malaminos@ugr.es

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Abstract

Microteaching is a didactic tool of recent application to undergraduate and postgraduate students as a way to promote self-learning. In this work we compared the perceptions of the students who provide instruction in tissue engineering using microteaching and the perceptions of the same students when they receive such instructions. Two similar questionnaires with items related to the preparation and exposition of a microlesson were used to investigate the perception of 56 students before and after the microteaching session.

In our results, students significantly prefer to use specific objectives, textbooks and Internet information when they are preparing a microlesson as compared to the situation when they receive it. On the other hand, the use of a pre-programmed index during the exposition and the reduction of the use of slides are significantly more preferred by the students after receiving the microlesson. No statistical differences were found for the rest of the options analyzed.

These results show that the self-assessment generated in the microteaching session, which is linked to the feedback related to the self-learning process, makes microteaching a technique not only useful for self-learning but also an important tool to promote self-regulation across the curriculum.

Keywords – microteaching, self-learning, tissue engineering, self-assessment, self-regulation

1 INTRODUCTION

The use of microteaching as a didactic tool was introduced during the last decades of the past century as a way to improve the skills of the teachers (Ananthakrishnan, 1993; Macleod, 1987; Perrot, 1976). Recently, microteaching was implemented in different curricula as a useful self-learning instrument in undergraduate and postgraduate students (Clifford & Edwards, 1975; Kamboj, Kamboj, George, & Jha, 2010; Popovich & Katz, 2009; Sana, 2007). As it is well known, self-learning involves the active participation of the students and encourages them to construct their own learning program (Campos-Sánchez, Martín-Piedra, Carriel, González-Andrades, Garzón, Sánchez-Quevedo et al., 2012). Self-learning techniques are able to place students at the forefront of their own learning process, making learning more effective, efficient and meaningful (Campos-Sánchez et al., 2012; Gaikwad & Tankhiwale, 2012). In higher education, self-learning promotes active learning and critical thinking, which may effectively reinforce knowledge and skills (Gaikwad & Tankhiwale, 2012). However, these techniques require periodical guidance by mentors, and their application to novel disciplines such as tissue engineering has not been well explored yet.

Microteaching involves a simulated teaching session known as microlesson of five to ten minutes of duration in which students teach a short lecture to their classmates (Ananthakrishnan, 1993). Microteaching-microlearning exercises are effective methods to enhance and develop communication, problem-solving and critical-thinking skills in students (Popovich & Katz, 2009). In traditional reception learning strategies, a lesson is considered as an educational tool based on the participation of a teacher or instructor who transmits information to the students. In contrast, a microlesson is elaborated and taught by the students, who present the information to other students without systematic external guidance. For that reason, microlessons should be categorized as educational tools in the context of self-learning (O'Brien & Shapiro, 1977). In this sense, microteaching techniques focus on the same final goals that other types of self-learning techniques used in higher education such as virtual learning (Shaw & Friedman, 2012) and self-discovery learning (Campos-Sánchez et al., 2012), although the methods used are different.

Tissue engineering is an emerging science that applies the principles of engineering, medicine and life sciences to the generation of biological substitutes (artificial tissues, bioengineered tissues or tissue constructs) to restore, maintain, or improve tissue functions. Although the term Tissue Engineering was introduced in the eighties (Skalak & Fox, 1988), the concepts of tissue engineering and its development and application have been increasing since the work published by Langer and Vacanti (1993). Currently, the construction of artificial tissues by tissue engineering is becoming a reality, not only as a basic research line, but also as a first-rate industrial activity destined to have a huge impact on the economy and development of more advanced countries. In this context, the subject "Tissue engineering" is an open elective subject at our University in which a microteaching method of education has been implemented as a self-learning method of instruction.

The goal of this study was to assess the perceptions of how the students who provide instruction using microteaching would design such activity and to compare these with the perceptions of the same students when they receive such instruction. The study of the perceptions of the students in both circumstances could contribute to develop and implement a self-learning program using this instrument. This is especially important because the student's perceptions are not only at the base of self-learning but also because they could be a reference to define the students' expectations regarding the tasks and skills they should acquire in their learning process (Chan, 2011; Schommer, 1990; Wolters, 2004).

2 METHODOLOGY

This study was performed at the University of Granada, in Granada, Spain. The sample consisted in 56 third-year undergraduate medical students enrolled in the elective "Tissue engineering" course. None of these students had previously worked with microlesson tools. Before beginning the present study, instructors briefly explained to the students the objectives of microteaching as a self-learning tool (Ananthakrishnan, 1993), and pointed out the different possibilities that the students could use to implement this technique. No references or demo-examples were used.

In this work, two different questionnaires were used to evaluate the perceptions of the students. The first questionnaire consisted of ten items related to the question "To prepare a microlesson you would use:". The second one had ten items related to the question "To expose a microlesson you would use:". The specific items included in each questionnaire are shown in Tables 1 and 2. The responses in both questionnaires were recorded with a symmetric agree-disagree Likert-like scale on which students indicated their level of agreement or disagreement for each item. Each participant rated each option on a five-point Likert scale from 1 to 5, with each score corresponding to the following level of agreement: 1: strongly disagree; 2: disagree; 3: neither agree nor disagree; 4: agree; 5: strongly agree.

Both questionnaires were completed by the students twice. The first time (Q1), the questionnaires were presented to the students in charge to prepare and teach a microlesson in order to evaluate their preferences on how to prepare and carry out the microteaching, before this activity was completed. The second time (Q2), the same questionnaires were answered by the students who had already received the microlessons in order to analyze their preferences as students and recipients of information.

For each questionnaire and for each specific item, mean results and standard deviations were calculated for all participants. Perception differences between the Q1 and Q2 results were identified by using the Mann-Whitney non-parametric statistical test using the SPSS 15.0 software. $P < 0.05$ was considered as statistically significant for the double-tailed tests.

3 RESULTS

The average scores obtained for each item in both questionnaires are shown in Tables 1 and 2. The lowest scores in the first and second questionnaire were found for the items “to prepare a microlesson, you would use internet information” and “to expose a microlesson you would use the same tone of voice”, both in Q2 (students who had received the microlesson) (scores 3.16 ± 1.15 and 1.85 ± 1.08 , respectively). The highest scores corresponded to the items “to prepare a microlesson, you would use specific objectives” (4.80 ± 0.44) in the first questionnaire and “to expose a microlesson you would use the relevance of the topics” (4.55 ± 0.56) in the second questionnaire, both in Q1 (students who are preparing to teach a microlesson).

Interestingly, the Mann-Whitney test revealed statistically significant differences between Q1 and Q2 regarding five of the options: “To prepare a microlesson you would use specific objectives”, “To prepare a microlesson you would use textbooks” and “To prepare a microlesson you would use internet information” in the first questionnaire, and “To expose a microlesson you would use a programmed index” and “To expose a microlesson you would use slides”, in the second questionnaire. No statistically differences were found for the rest of the options. Figure 1 shows the options that yielded statistically significant differences for the comparison of Q1 vs. Q2.

To prepare a microlesson you would use	Q1 (Before the Microlesson) Mean \pm SD	Q2 (After the Microlesson) Mean \pm SD	Q1 vs. Q2 P value
1. Specific objectives	4.80 ± 0.44	4.39 ± 1.07	0.043*
2. Textbooks	4.23 ± 0.73	3.76 ± 1.07	0.026*
3. Scientific journals	4.73 ± 0.48	4.39 ± 1.05	0.168
4. Divulcation journals	3.44 ± 1.14	3.73 ± 1.01	0.191
5. Internet information	3.66 ± 1.01	3.16 ± 1.15	0.030*
6. Pedagogic information	3.42 ± 0.78	3.26 ± 0.99	0.346
7. Historical information	3.33 ± 0.93	3.21 ± 1.13	0.683
8. Technical information	3.73 ± 0.82	3.39 ± 1.03	0.098
9. Tutors information	4.64 ± 0.69	4.28 ± 1.18	0.118
10. Students background information	4.64 ± 0.61	4.5 ± 1.04	0.988

Table 1. Results obtained with the first questionnaire before the microlesson session (Q1) and after the microlesson session (Q2) and statistical comparison of both results. The results are shown as means \pm standard deviations, and the statistical comparison is shown as p values for the Mann-Whitney test. Statistically significant p values are labeled with asterisks (*)

To expose a microlesson you would use	Q1 (Before the Microlesson) Mean \pm SD	Q2 (After the Microlesson) Mean \pm SD	Q1 vs. Q2 P value
1. A Programed Index	3.62 ± 1.00	4.37 ± 1.00	0.000*
2. Blackboard	3.41 ± 0.96	3.42 ± 0.98	0.953
3. Slides	4.33 ± 0.76	3.56 ± 1.04	0.000*
4. Videos	3.82 ± 0.76	3.48 ± 1.06	0.082
5. The same tone of voice	1.92 ± 1.20	1.85 ± 1.08	0.819
6. Voice inflections	4.30 ± 0.76	4.12 ± 1.07	0.733
7. The relevance of the topic	4.55 ± 0.56	4.28 ± 1.05	0.382
8. The sense of humor	3.75 ± 0.87	3.67 ± 0.95	0.703
9. A take-home message	4.44 ± 0.71	4.30 ± 0.97	0.641
10. A solving problem	3.85 ± 0.92	3.83 ± 1.14	0.693

Table 2. Results obtained with the second questionnaire before the microlesson session (Q1) and after the microlesson session (Q2) and statistical comparison of both results. The results are shown as means \pm standard deviations, and the statistical comparison is shown as p values for the Mann-Whitney test. Statistically significant p values are labeled with asterisks (*)

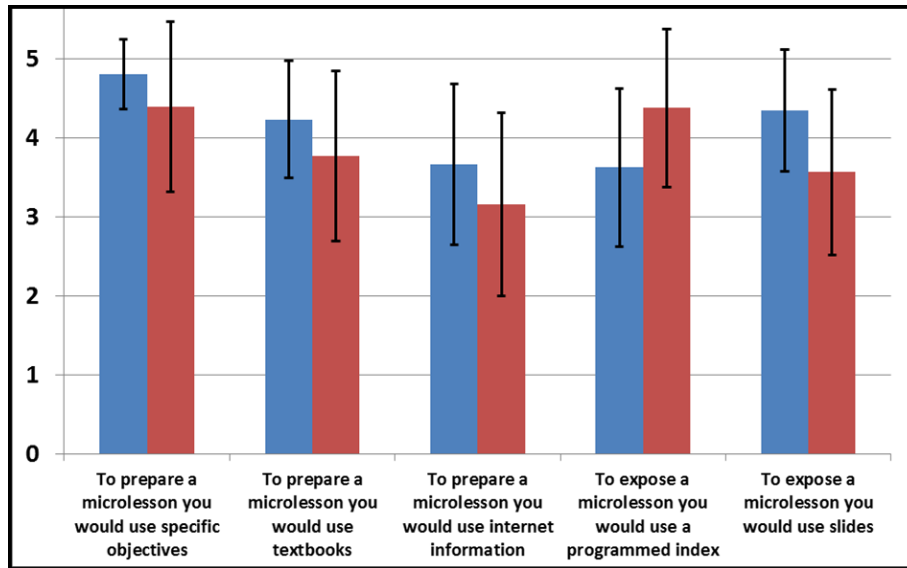


Figure 1. Items that showed statistically significant differences for the comparison of Q1 (before the microlesson) vs. Q2 (after the microlesson) responses. Responses corresponding to Q1 are shown in blue and Q2 responses are in red. Black bars represent standard deviations

4 DISCUSSION

The application of microteaching as a self-learning method to tissue engineering is of interest not only as a way for students to acquire new competences and skills but also because tissue engineering is a multidisciplinary field that requires major teaching synthesis efforts (Sánchez-Quevedo, Cubero, Alaminos, Crespo & Campos, 2006). In the present work, we have analyzed the perceptions of the students in the preparation and exposition of a microlesson in a tissue engineering course. Although the study has several limitations, including the possibility that even a brief previous information might affect the results, it could shed light on our comprehension of the students' preferences involved in microteaching.

In our results, the perception of students involved in teaching and receiving a microlesson was similar for most of the items analyzed in both questionnaires. This means that in most of the items, students do not change their perceptions about preferences on how to elaborate a topic for teaching and how to expose it, before and after a microteaching session. This result implies that the application of microteaching method is useful because it will strengthen the beliefs about the teaching and learning procedure that the students previously had, and therefore, allows them to be more involved and committed with their own learning process (Gelula & Yudkowsky, 2002; Trott, 1976).

However, in our results, the perception of students also revealed statistically significant differences, before teaching a microlesson and after receiving it, in several items: three items regarding the preparation of the microlesson and two ones related to its exposition.

Interestingly, students consider they would use more significantly specific objectives, textbooks and Internet information before preparing a microlesson than after its reception. This could be linked to the information that the students consider that should be incorporated to a microlesson and to the objectives that they believe they should reach before the microteaching session. When receiving the microlesson they realize that it is impossible to teach efficiently with such extensive information. Regarding the exposition, the students showed significant differences in the use of a previously programmed index and in the use of slides. Following a pre-programmed index during the exposition and a limited use of slides are more preferred by the students after receiving the microlesson. It is paradoxical and very interesting that students give less importance to the expository order when they are preparing the microteaching session than when they are receiving it. Similarly students want less slides when they receive the microlesson that when they are in charge to prepare the microteaching session. Nevertheless, the ultimate reasons why certain items are preferred by students remain unexplained, and future qualitative studies should be carried out to investigate these reasons.

Although microteaching was initially addressed to young teachers to improve their pedagogical techniques under supervision of skilled colleagues, the extension of this technique to the students as a self-learning tool

has demonstrated to be very useful to change the student's behavior and therefore, their attitude towards the learning process. As shown in our study, the main reason for this change could be in the process of self-assessment that students do. As pointed out by Popovich and Katz (2009), microteaching technique not only helps students to "think on their feet" and be reflective, but it also provides an opportunity to get a constructive feedback.

The new teaching guidelines emphasize the need for students to engage in self-regulation of learning and practice (Brydges & Butler, 2012; Butler & Winne, 1995). As the self-assessment is linked to how individuals seek and interpret feedback as pointed out by Sargeant, Mann, van der Vleuten and Metsemakers (2008) and Sargeant, Armson, Chesluk, Dornan, Eva, Holmboe et al., (2010), we consider that the use of microteaching techniques is not only useful for self-learning but also as a tool to promote self-regulation across the curriculum.

5 CONCLUSIONS

In this study we compare the students' perceptions of the students who provide instruction in tissue engineering using microteaching and the perceptions of the same students when they receive such instructions. To know the student's perceptions in both circumstances, is a key element to develop and implement a self-learning program using this instrument.

We conclude that students prefer to use more significantly specific objectives, textbooks and Internet information in order to prepare a microlesson than after the reception of such microlesson. To make use of the programmed index in the exposition and to reduce the use of slides are preferred more significantly by the students after receiving the microlesson than when they are preparing it. These results show that the self-assessment generated by the microteaching session, which is linked to the feedback related to the self-learning process, makes microteaching a technique not only useful for self-learning but also an important tool to promote self-regulation across the curriculum.

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AUTHORS BIOGRAPHY

Antonio Campos-Sánchez

Master degree at the University of Granada, Granada, Spain. He is involved in education research with a focus on self-learning methodologies.

María del Carmen Sánchez-Quevedo

Professor of histology and dental histology at the University of Granada, Granada, Spain. She is a member of the Tissue Engineering Group and is responsible for higher education research projects.

Pascual Vicente Crespo-Ferrer

Professor of histology at the University of Granada, Granada, Spain. Responsible of the cell viability and electron microscopy unit at the Tissue Engineering Group.

José Manuel García-López

Professor of histology at the Pharmacy School at the University of Granada, Granada, Spain. Responsible of the histochemical unit at the Tissue Engineering Group.

Miguel Alaminos

Professor of histology and tissue engineering at the University of Granada, Granada, Spain. He is a member of the Tissue Engineering Group and responsible for higher education research projects.

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