

Discovering CRISPR/Cas9

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1. Introduction

Clustered regularly interspaced short palindromic repeats (CRISPR) and CRISPR-associated (Cas) proteins are found in many bacteria and most archaea.

The type II system is a prokaryotic adaptive immune system that uses non-coding RNAs to guide the Cas9 nuclease to induce site-specific DNA cleavage, thanks to stored DNA sequences derived from plasmids and phages (Fig. 1).

As a technology, CRISPR/Cas9 system allows for simple and specific genomic targeting in any organism and, that way, it improves the existing genome editing approaches (Clontech 2016).

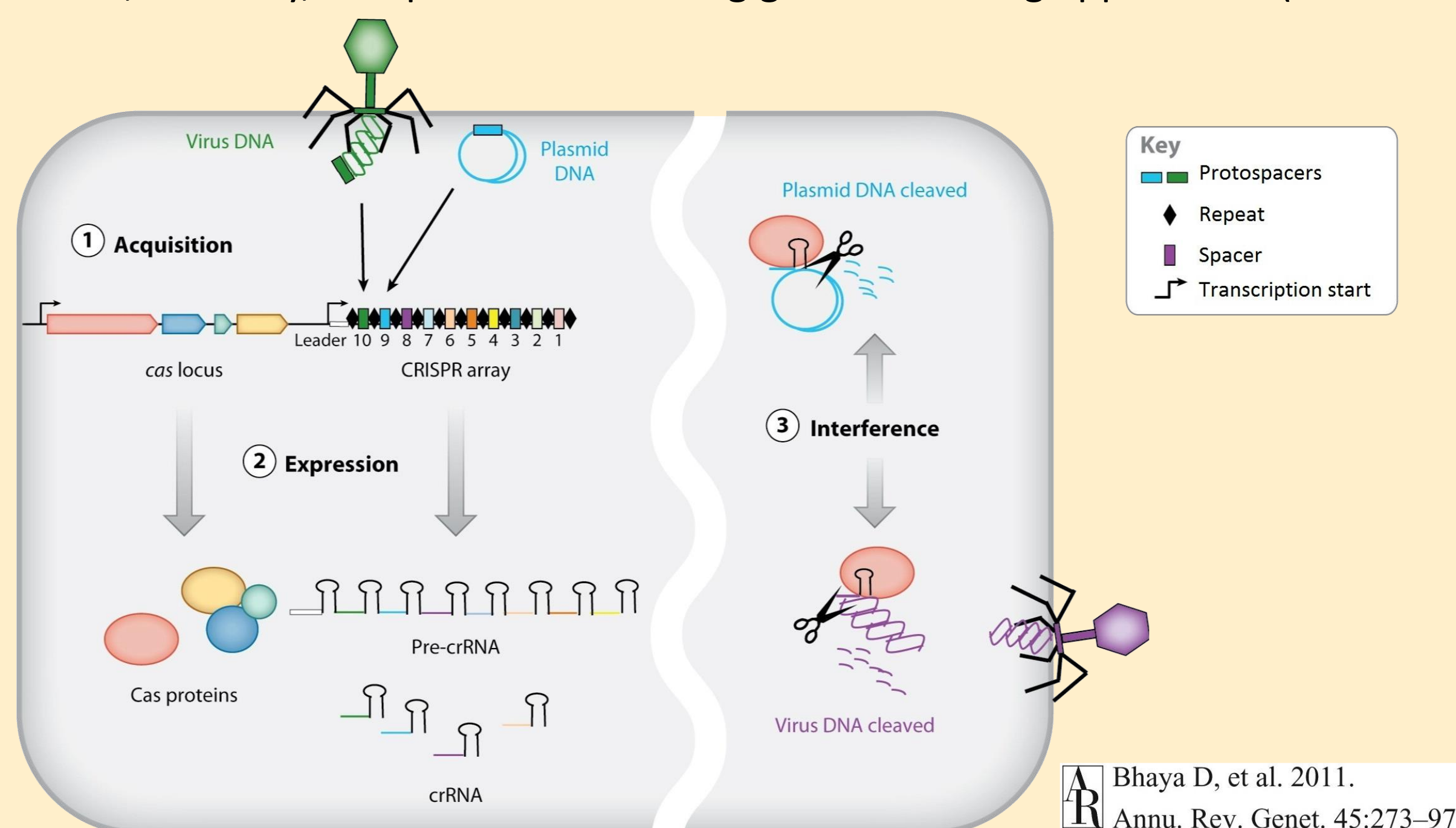


Fig. 1 CRISPR/Cas adaptive immune system

2. Objective

The aim of this project is to increase the knowledge of CRISPR/Cas9. As it is not well known, this topic provides an excellent opportunity to assess the effectiveness of educational material since everything that the project's target groups learn can be attributed to such material.

Due to the complexity of the subject, the project is addressed to students of a scientific baccalaureate and also to high school teachers with scientific basis.

I decided to do this project because I think scientific dissemination is one of the key steps in the generation of knowledge and because good scientists should be good communicators too.

4.1 Teachers' results

Educational video

After answering the questionnaire for the first time without looking up any information, I sent teachers a link to the video, [which can be found on Youtube](#), and also to my website. The video consists of a slideshow presentation explained through voice-over. It also includes an excerpt from a video on genome edition edited and subtitled by me.

Website

As a result of the bibliographic search I have created the website [crispr.esy.es](#) (which includes all the other educational material), helped by a computer engineering student. It is supported by HTML and CSS languages and it is written in Catalan (appropriate for the target) and in English (to expand the range of possible receivers).

The website has nine sections (Fig. 2) properly referenced and complemented with a glossary to facilitate the understanding of a non-scientific audience.

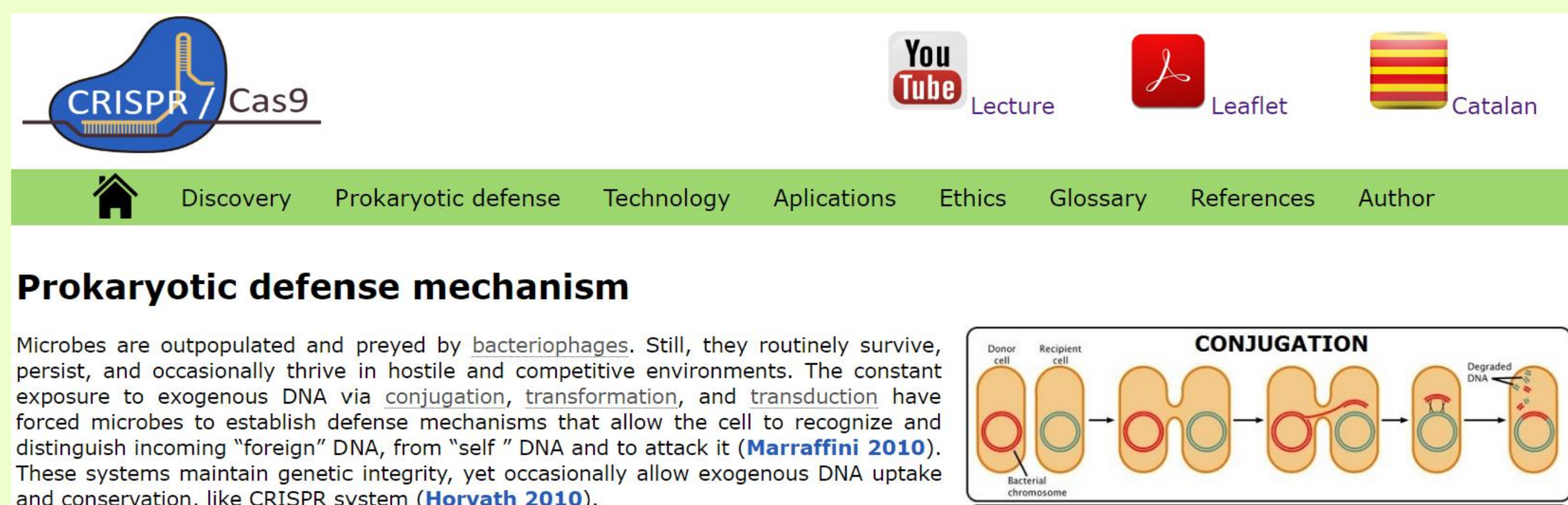
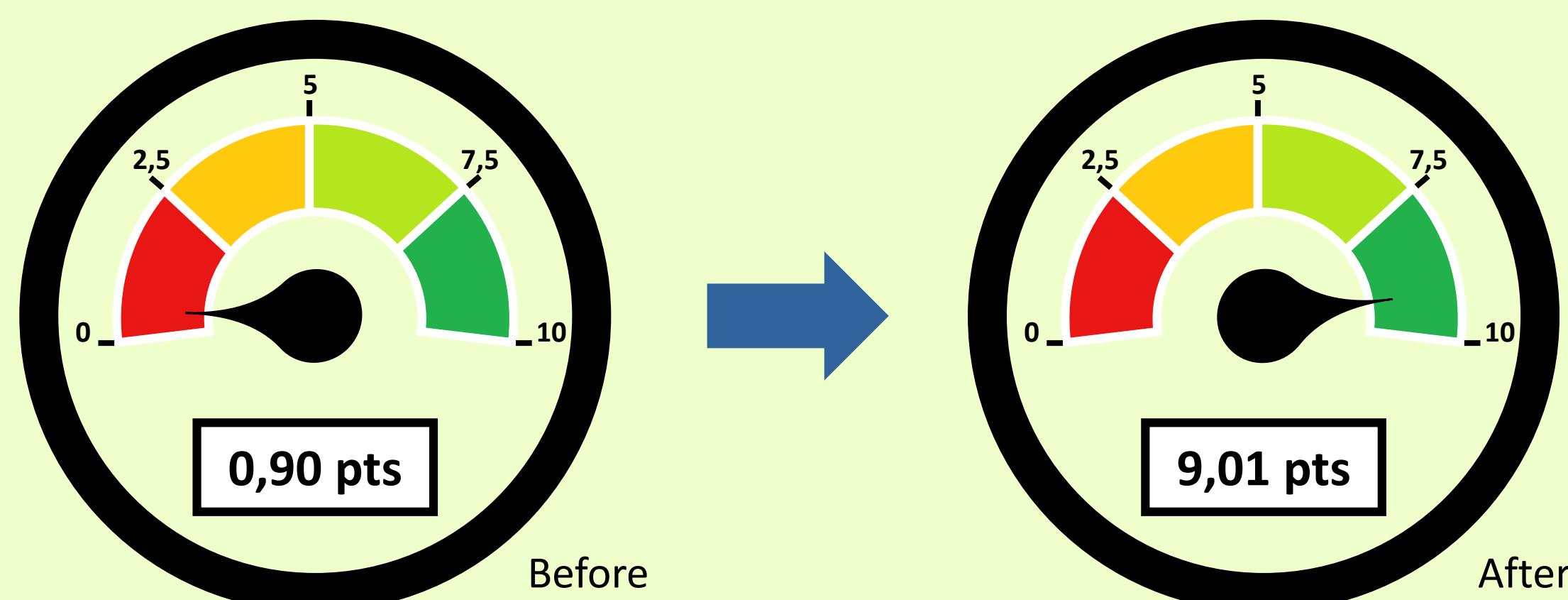


Fig. 2 CRISPR/Cas9 website

These are the results of the 19 teachers before and after seeing the video and consulting the website:

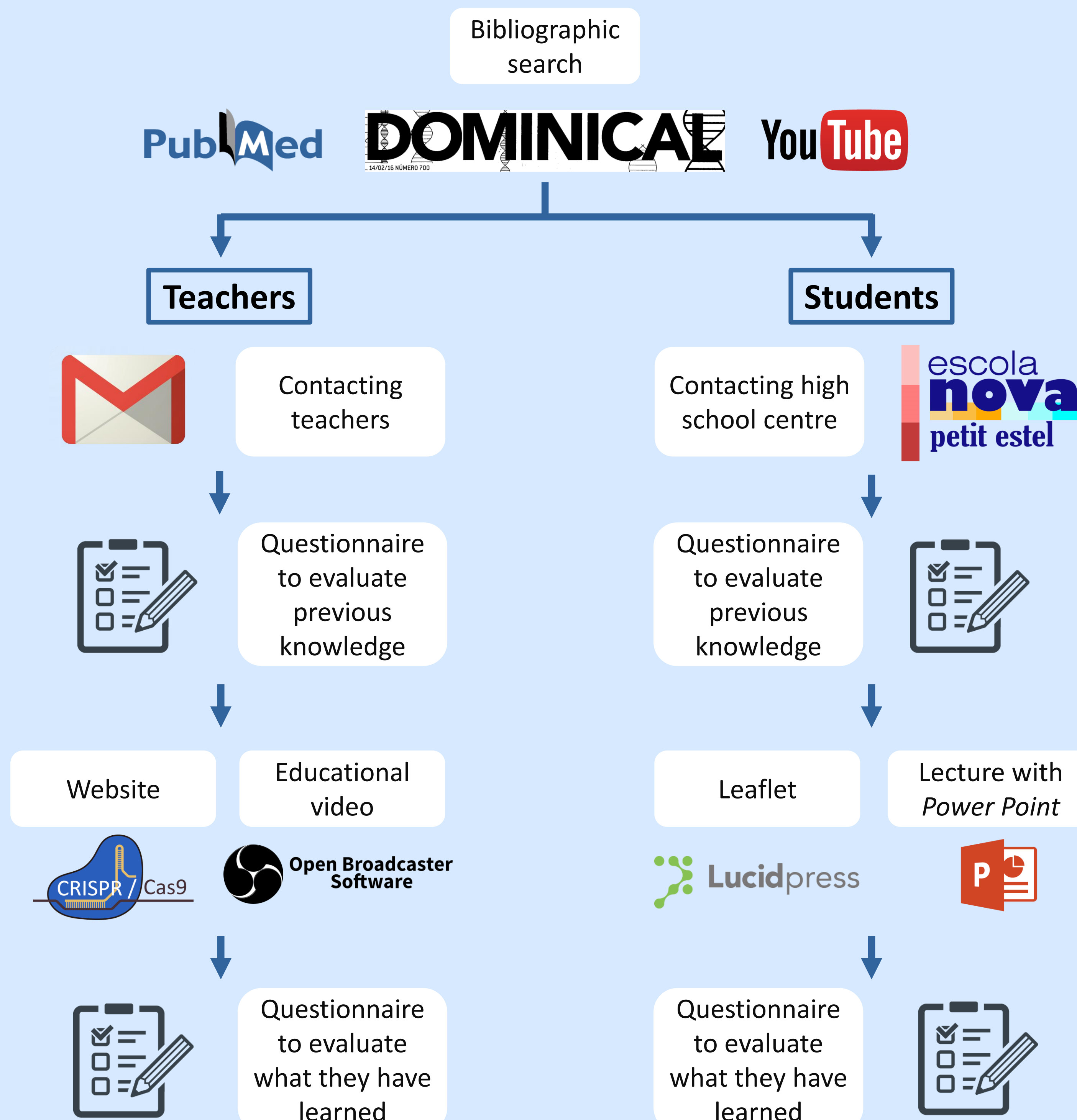


5. Conclusion

The initial objective has been achieved, that is, I have contributed to increase the knowledge of CRISPR/Cas9 in the target groups. But also it has unexpectedly spread, because the video of the lecture has about 215 views and the teachers' video, over 80. In addition, some teachers showed them to their students.

3. Material and Methods

In this project both traditional written methods and Information and Communication Technologies (ICTs) have been used.



4.2 Students' results

Lecture

I have given a lecture to first and second year students of a scientific baccalaureate, [which can be found on Youtube](#), following the structure of the website and supported by a Power Point slide presentation.

Leaflet

It is a schematic summary of the key points of CRISPR/Cas9, easy to understand and pleasing to the eye. The leaflet (Fig. 3) includes a link to the website so students could consult it within the two days after answering the questionnaire and before the lecture. But the teacher in charge forgot to deliver it, so they had to read it in five minutes before the lecture and none was able to consult the website prior to answering again the questionnaire.

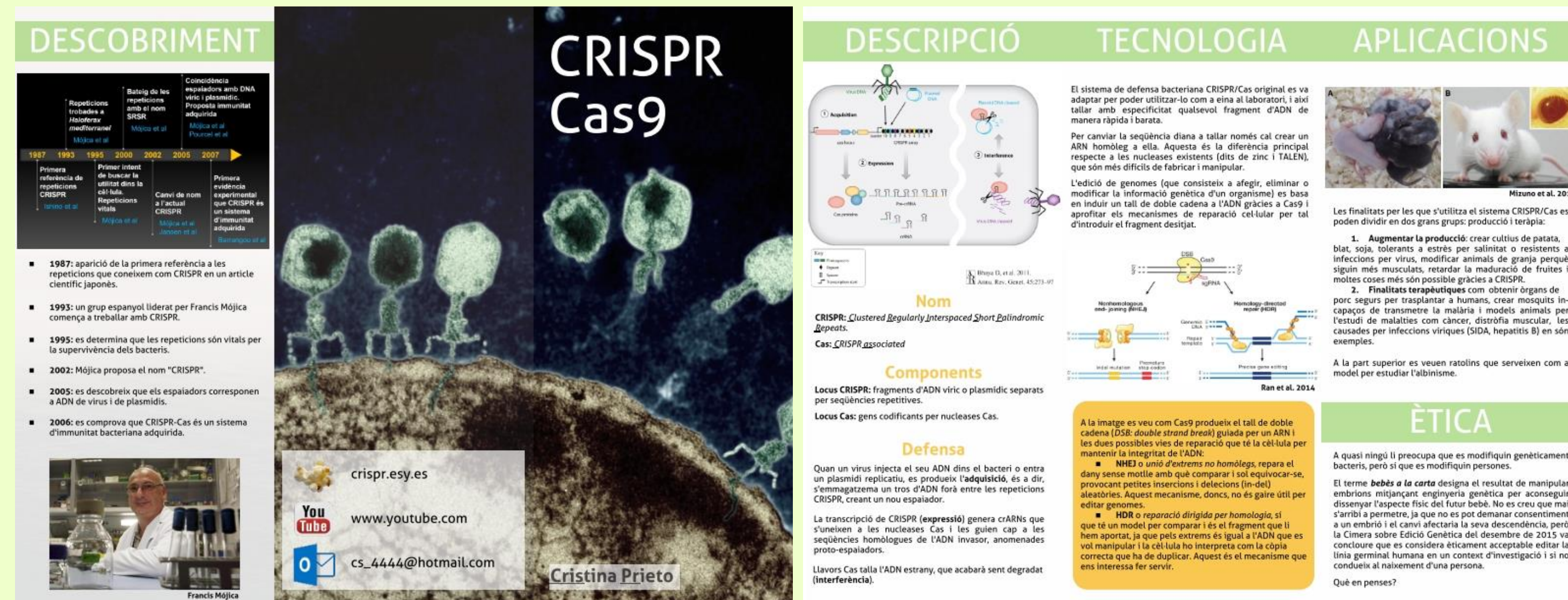
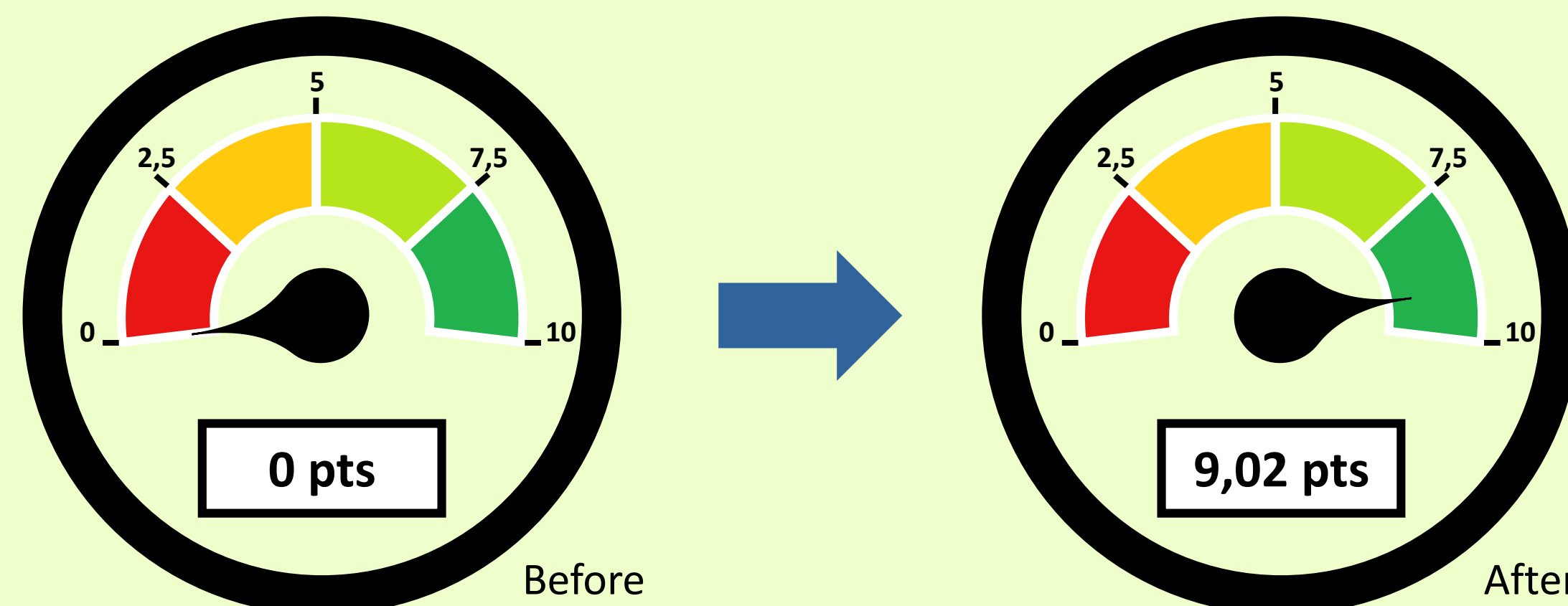


Fig. 3 Leaflet. Outer side (left) and inner side (right)

These are the results of the 19 students before and after reading the leaflet and attending the lecture:



References

- Catanzaro 2016: Catanzaro, M. (2016). *ADN de tallar and enganxar*. Dominical, 700, 18-23
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- Mojica 2016: Mojica, F. (2016). *Sistemas CRISPR-Cas, una revolución biotecnológica con origen bacteriano*. Conference, Málaga. Retrieved 12 March 2016, from <https://www.youtube.com/watch?v=GOK6FkfHdQ>