THE INCORPORATION OF APPLICATIONS AND VIDEOS TO THE TEACHING OF STATISTICS IN POSTGRADUATE STUDIES


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Abstract

We explain the innovation activity carried out in the subject "Requirements of the Measurement and Applications of Correlation" of the Master's Degree in Physical and Sports Performance at Pablo de Olavide University in Seville (Spain) during the 2018-19 academic year. This experience attempts to take academic advantage of the digital and technological revolution we are experiencing, incorporating both mobile applications and teaching videos to postgraduate studies.

More and more mobile applications help us on a daily basis. Their variety and potential improve diverse social aspects and, of course, educational. In the academic field, mobile applications are an incentive for the acquisition of the competences taught in this subject. During 2018-19, the use of free mobile applications as an improvement of the statistical skills and competences developed in this subject has been proposed. Different activities through applications such as "Probability and Statistics", "Stat Suite" or "Statistical Test" have been realized in the classroom to maintain the student's attention and suggested to work at home in order to advance in the teaching-learning process.

In addition to these theoretical-practical content applications, the use of an instant messaging application, namely "Hangouts", has been promoted as a tool to facilitate communication between the student and the teacher and even among students. This proposal eases specially the communication channel for those students who, with great frequency, do not reside in our city and attend only the face-to-face classes. The aim was to provide an easily and widely accessible interaction medium where students could make comments and raise individual and/or collective questions. This new channel of communication offered a wide flexibility of action with the students, which receives special emphasis when dealing with postgraduate students who often combine their studies with their professional activity.

On the other hand, the tutors of such a subject considered necessary to create learning objects in order to help the understanding and assimilation of the contents, which would reinforce and complement the traditional documentation available in the Virtual Classroom for the students. The creation of this new audio-visual material intended the students had the possibility of revising, when they wanted, practical contents taught in the classes. Students sometimes may present difficulties to assimilate correctly the written documentation due to the difficulty of the topic, the rhythm of the classes or the students’ statistical level. That is why it is a very interesting opportunity to visualize, as many times as you like, ad-hoc explanations of specific content explained in the classes. These teaching videos, which were made with the help of the Multimedia Lab staff, explained the most relevant aspects taught in the sessions, but using a "digital board" where the most significant aspects of the techniques and models explained could be visualized, helping the acquisition of the competences required in this subject.

These activities improved the teaching-learning process and encouraged the interest of the students in their learning.

Keywords: postgraduate studies, mobile and instant messaging applications, teaching videos.

1 INTRODUCTION

More and more mobile applications support us on a daily basis. Their diversity and potential improve diverse social aspects and, of course, educational. In the academic field, mobile applications are a motivation for the acquisition of the competences taught in the subjects.
On the other hand, focusing on Master studies, it is known that postgraduate students often combine their studies with their professional activity. Also, with great frequency, they reside in different cities and attend only the face-to-face classes. Moreover, given the multidisciplinary nature of these students, with training in different degrees and universities, they sometimes may present difficulties to assimilate correctly the written documentation due to the difficulty of the topic, the rhythm of the classes or different levels of knowledge.

For this reasons, a five-professor group, who members belong to area of Statistics and Operations Research in Pablo de Olavide University, Seville, considered interesting to proposed the use of free mobile applications, as well as the use of an instant messaging application, named "Hangouts" in the development of a subject taught in a Master. The realization of different activities through mobile applications (Apps) as a teaching resource in the classroom to maintain the student's attention is expected to be an useful tool for the acquisition of the statistical skills and competences in the teaching-learning process. The main advantage of the use of statistical applications is that students can make use of them from their own mobile devices or tablets by incorporating them into the weekly study. Moreover, the use of statistical Apps can help the student to make a self-assessment of studied statistical techniques. As well, having an instant messaging system eases specially the communication channel between student and professor and providing an easily and widely accessible interaction medium where students could make comments and raise individual and/or collective questions. This new channel of communication would offer a wide flexibility of action with the students.

Furthermore, the professor considered necessary to create learning objects, as mini-videos, in order to help the understanding and assimilation of the contents, which would reinforce and complement the traditional documentation available in the Virtual Classroom for the students. The creation of a new audio-visual material intended the students have the possibility of revising, when they want, practical contents taught in the classes. That is why it is a very interesting opportunity to visualize, as many times as you like, ad-hoc explanations of specific content explained in the classes. These teaching videos, explain in detail the most relevant aspects taught in the face-to-face sessions, helping the acquisition of the competences required in this subject.

In particular, this experience is applied in the subject "Requirements of the Measurement and Applications of Correlation" of the Master's Degree in Physical and Sports Performance during the 2018-19 academic year, and is part of a teacher innovation project within the framework of the Innovation and Teacher Development Plan of Pablo de Olavide University.

2 METHODOLOGY

For the development of the project the following actions have been carried out during the course. Before the beginning of the classes, the teachers involved in the project had a meeting to organize the different tasks that were to be developed both at the teacher's level and with the students in the subject. In particular, the teachers analysed the different Free Apps related to Statistics that exist in the market and selected the most convenient for students to use during the course. Within the deadline set to make available the material of the subject, an email was sent to them through the Virtual Classroom informing them about the characteristics of the project and the way in which it was to be executed.

In the first class of the subject of "Requirements of the Measurement and Applications of Correlation" of the Master's Degree in Physical and Sports Performance, a small group tutorial was held where the teaching tools that were to be incorporated into the subject were explained to the students, indicating which were the objectives, the methodology and the Apps that had been selected for them to use during the course and could apply the statistical concepts that they acquired during the development of the classes. In addition, they were asked for their Gmail email to add to the "Hangouts" application through which students have been able to have a direct communication with their classmates and their teachers.

We know that WhatsApp is the most widely used instant messaging application in society. The growth of this service has been so vertiginous that some teaching centres use it as a synchronic communication system between teachers and students. Román Graván [1] tries to know the relevance and suitability of the use of academic WhatsApp groups as alternative communication systems in virtual tutoring in university teaching. However, WhatsApp requires a SIM card, which is a serious inconvenience to maintain privacy. Therefore, we have used an instant messaging application with...
features similar to WhatsApp and without the need of a SIM card: Hangouts, which is free, can be integrated for Android, PC and iPhone, and only needs a Google user and Internet connection.

In the Hangouts group there were 5 teachers and 25 students of the 30 enrolled, that is, 83% of the class has been interested in the project and has actively participated. It is interesting to comment that Hangouts can be followed both through the Smartphone and the computer. Fig. 1 shows a real screenshot of the Hangouts tool.

This group of messaging has been used frequently to expose any doubt, which has been answered quickly by one of the teachers of the subject, as well as to inform students about deadlines, review of grades... All this has made it possible to generate a feedback between student-teacher very appreciated by students and teachers. This new tool has been validated by the students through a survey designed in Google Forms, where questions are asked to identify the utility that the use of these computer applications has given them: if they consider that they encourage interest in it, their better understanding, as well as the opinion they have about the relationship created between teacher-student through Hangouts. Once the surveys are collected, the teachers analysed the data and made a report where the appropriate conclusions were obtained.

Throughout the course, students have downloaded and practiced with several of the Statistical Apps indicated by the teachers. In addition, some students commented that certain Apps are not supported by some phones and select similar Apps with which to practice. Fig. 2 gives us the most useful Statistical App for the subject according to the opinion of the students poured into the final questionnaire.

Likewise, given the multidisciplinary nature of the students of the Master's Degree, with training in different Degrees and Universities, learning capsules have been developed that complement the use of the Apps and the messaging group. With them it is intended that students can access and review some of the content taught in classroom, thus improving the acquisition of the skills marked in this subject of Master. As a result of this main objective, five “learning objects” have been created with the
use of the electronic board of the multimedia laboratory at Pablo de Olavide University. In particular, the theme and URL of each video has been as follows:

Learning object 1: Main tools for analysing research activity (impact factor of periodicals and citation indexes). https://upotv.upo.es/video/5c6a850dabe3c6a13c8b456b

Learning object 2: How to carry out a research work and main thesis institutional repositories. https://upotv.upo.es/video/5c4ad08bf6f22563b8b4567

Learning object 3: Reading a table of descriptive statistics. Relationship between shape indicators and the box and whisker plots. https://upotv.upo.es/video/5c3c6283fd6f2255068b4567

Learning object 4: Correlation between quantitative variables. Point cloud. Estimation of a simple linear regression model. Analysis of results. https://upotv.upo.es/video/5c458ac1fd6f225b0d8b4567

Learning object 5: Non-linear relationship between quantitative variables. Comparison of curvilinear models. https://upotv.upo.es/video/5c52b897abe3c63d4e8b4567

These learning objects consist of two parts: a first theoretical as concise as possible and another eminently practical within the context of Physical Activity and Sports.

At the end of the class period, students have been asked about the usefulness of these learning capsules using a Google Forms form. This reference material, complementary to the material in pdf file format, with the main techniques used has been very well received and valued by the students.

3 RESULTS

In order to evaluate the project we have to explain that the development of it was based on some fundamental actions:

Action 1:

Before the beginning of the subject, the pupils were informed about the project (content, objectives and actions to be carried out) by mail (Virtual Classroom tool). Then at the beginning of the classes we have discussed all in order to check the project has been understood. We could confirm that the pupils have been understood our objectives and the tools we have explained: statistical Apps, Hangouts and teaching videos.

Action 2:

An online survey form (Google Forms tool) was used to know pupils’ opinion about the project (utility and complexity). Fig. 3 provides us a screenshot of a part of the survey.

![Figure 3. Screenshot of the survey conducted in Google Forms.](image)

The data were analysed and the main results are described below:
Although the survey was filled up by only nine pupils of the thirty students the results have been satisfactory from teachers’ point of view (30% of the students participated voluntarily in the questionnaire).

The average age of the students enrolled in the Master's Degree in Physical and Sports Performance, and who answered the survey, was 24.22 years (with a standard deviation of 2.54 years). None of the respondents were high-performing athletes. Among them there was only one woman and, of the total of the sample, 77.8% was worker (affirming 22.2% to work temporarily).

Regarding the issues related to virtual supervise or guide, all students responded that supervise or guide process plays a key role in the teaching-learning process and that the attitude, value and posture adopted by teachers in that process have been good or very good. It should be mentioned that although more than 66% of the students surveyed did not know the Hangouts tool before participating in the projects, almost 90% think it is an interesting tool for virtual guide (see Fig. 4 and Fig. 5). In addition, 77.8% of respondents answered to a positive overall view of the supervise process received through Hangouts, by assigning an average note of 4 (Scale from 1 to 5) to the care received through such process.

![Figure 4. Knowledge of Hangouts tool.](image1.png)

![Figure 5. Hangouts interest for virtual supervise process.](image2.png)

As it is shown in Table 1, the opinion on the attitude of the class facing the supervise process has been varied, notice that only 55% believe it has been good or very good, while the rest points out that as much has been not so good.

<table>
<thead>
<tr>
<th>Attitude of the class facing the supervise process.</th>
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<tbody>
<tr>
<td>Very Good</td>
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<td>-----------</td>
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<td>11.1%</td>
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As a more positive aspect of the supervise process received through Hangouts, the most marked option was the possibility of having a quick response to any query, whereas if it is worth noting a
negative aspect of the use of this tool, it would be the limitation to give more extensive or complex answers. In addition, although students value the possibility of having a way of answering without having to move to a physical place and increase the communication between student-teacher and student-pupil, still exists among some of them, the preference of face contact with the teachers.

Regarding to the use of Statistical Apps as a tool and complement to learning the concepts seen in the subject, only 11.1% was not useful, and regarding to the intuitive character and complexity, more than half of the respondents thought they were quite intuitive and of little complexity its use. In particular, among the Apps used, the one that was considered most useful was "Probability and Statistics" (see Fig. 2).

Through the analysis of the surveys we can conclude that the students consider very positive or positive to have these objects of learning (teaching videos), because they have the possibility to access online to these capsules of learning about the content of the subject. They also consider it is very important to be able to review at any time these statistical techniques explained by the teachers, since it helps them in the study of the subject and in the accomplishment of the tasks that must carry out both in the subject and in their Master’s Degree final project as they will have access at any time to the explanations given by the teachers valuing very positively the ease they will have to access to the material from any place. This encourages us to make more learning objects with similar characteristics, but naturally with different themes.

4 CONCLUSIONS

We conclude that this experience motivated the teaching-learning process of students and, consequently, enhanced their academic performance (not only by the qualifications, but by its future projection in the accomplishment of other tasks). This set of teaching actions has been very enriching for all the involved agents and has not required additional costs, since they were either free (Google user, Hangouts and Statistical Apps) or we all had the necessary tools previously (computer, Smartphone and Internet) or the University provided us (computer and Wi-Fi). Students recognized that the extra teaching activities served to improve the performance of the subject and the percentage of participation has been very high (83%). Zabalza Beraza [2] highlights the digital competences and the management of technologies as one of the features that characterize a good University teacher, and that is why we will continue looking for new strategies to incorporate the technologies to the teaching practice.

Moreover, the group of activities carried out is very versatile, in the sense that the main and basic idea can be put into practice in any subject regardless of the area of knowledge, going from the humanities to the sciences, as well as allowing a total flexibility between students and teachers and an individualization of student learning.

These results encourage us to continue working in this line, incorporating the latest technological advances into teaching. Today’s learners require new strategies to engage and cooperate. Technologies deliver us new opportunities to grow as teachers and students.

REFERENCES
