



## **APPEL A PROJETS PARIS-NUS : PROJETS PROPOSÉS AU FINANCEMENT (FORMATION 2021)**

### **FACULTÉ DE SANTÉ**

#### **ENJOY learning infectious diseases with AntibioGame® (ENJOY Antibio)**

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Antimicrobial resistance is a major public health topic, identified by the WHO in the 10 threats to global health. Most antibiotic prescriptions are made by clinicians who are not specialists in infectious diseases, making the teaching of antibiotic prescriptions fundamental during the initial medical training.

Various teaching methods are used during medical training, but they suffer from limitations. Conventional lecture-based teaching requires face-to-face meeting and/or are taught at fixed times; they lack practical training, and do not allow students to develop medical skills; and they may seem outdated relative to the development of new technologies in other domains. Mankini based simulations also required face-to-face meetings but are also costly in human terms. Virtual reality allows to overcome the previous limitations but are very expensive and require complex software and materials. Furthermore, COVID-19 outbreak highlighted the need to create innovative teaching methods based on up-to-date technologies.

Serious games are interactive computer applications, which may provide solutions to these issues. They facilitate learning by providing an entertaining learning environment where students are exposed to various real-life medical problems. They have been shown to increase student motivation to learn, allow teaching of procedural and technical skills as well as allow remote training at any time. They are therefore particularly well adapted to both the complexity of teaching during a pandemic, but also the students' inclination to more skill-based playful learning.

In the domain of infectious diseases, the French University previously developed a pilot version of a serious game named AntibioGame® (1). This is a case-based game in which students play the role of doctors who are confronted with diagnostic and therapeutic problems as well as inter-professional communications mimicking real-life situations. This pilot serious game which has yet to be improved, was tested on cohorts of students from different backgrounds and has been validated by infectious diseases consultants.



As such, the Université de Paris (UP), the University of Sorbonne Paris Nord (USPN) and the National University of Singapore (NUS), aim at designing and implementing an innovative approach based on AntibioGame® to improve the training of medical students in infectious diseases. A more sophisticated version of AntibioGame® will be developed, implemented and assessed in the French-Singapore universities. The new version will integrate new functions necessary for the implementation of the game in medical education. It will allow students to improve their medical knowledge as well as develop their skills for their future job. The game will be assessed by medical students and medical teachers from the University of Paris (UP), the University of Sorbonne Paris Nord (USPN) and the Singapore University (NUS).

In the future, we expect to implement AntibioGame® into an innovative international curriculum offered by UP, USPN and NUS, based on new and up-to-date digital technologies.

## **Evaluation of Haptic Simulation for Immersion Learning in dental education**

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The current principle of medical education is based on the link between the assimilation of knowledge and the acquisition of skills. Dentistry is largely procedure-based; there is a wide range of treatment procedures that dentists need to perform, and each requires task-specific skills. Clinical training is based on constant and regular practice to acquire and strengthen these motor skills. Classically, practical pre-clinical education for dental students consists of a combination of theoretical education and practical work. Following this learning, the student finds himself / herself confronted with his / her first patients even before acquiring all the necessary clinical skills. There remains an obligation to provide optimal treatment as well as ensure the well-being and safety of these patients. In the 2000s, haptic technology virtual simulators appeared in various sections such as restorative dentistry, periodontology, endodontics, implantology and maxillofacial surgery. There is little evidence to show that training provided by haptic simulation is superior to physical simulation through the use of phantom heads and jaws. However, it is encouraging that such haptic simulation was found to be at least as effective as training on phantom head simulators. The literature seems to agree on the fact that currently haptic simulation would be a promising educational tool in pre-clinical teaching in dentistry, to be used in addition to traditional learning methods rather than replacing them. The advantages and disadvantages of haptic simulators need to be properly weighed. Schools may also need to identify where, how, and to what extent such haptic simulation training should be introduced and integrated to the curricula for students to learn a new procedure and to reach the required competency.

**Aim:** The objective of this educational project is therefore to measure the effect of the haptic simulator, in combination with physical simulation, on the acquisition of skills in dental students facing difficulties in terms of dexterity. The proposed study aims to evaluate dental student competency in 2 requisite skill sets in Restorative Dentistry (cavity preparation and crown preparation).



Methodology: After evaluation of the skills in practical work using a standardized grid, students situated at the top and bottom of the respective classes are assigned in a random manner either in the group of haptic simulators or physical simulators. Following a designated amount of self-practice, a new skills assessment is carried out, allowing for data collection and analysis.

## **FACULTÉ DES SCIENCES / FACULTÉ DE SANTÉ**

### **Team UP with NUS: improving Plasma for massive teaching in life sciences and deployment from UP to NUS**

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The Plasma platform, aka in French “Plateforme d’eLearning pour l’Analyse de données Scientifiques MAssives”, is an interactive active learning platform for computational analysis of massive scientific data. Since its deployment at the Université de Paris (UP) in September 2020, Plasma has already enabled us to train students in the exploration and analysis of massive digital data, particularly in genomics and genetics. When connected to the servers, students can learn to program in various languages and to analyse data in a user-friendly and highly-performant environment based on a JupyterLab web interface and Jupyter notebooks: a type of interactive digital notebook becoming an international standard. Thus we offer our students an accessible and intuitive learning experience based on an authentic professional situation. The originality of Plasma, compared to standard Jupyter Hubs, is that each teacher can define a customized containerised environment for each training course with the appropriate versions of programming tools and libraries. This open-access solution was found to be really useful and handy for ensuring hybrid courses, one of our goals even before the pandemic, and it has been a valuable asset in the current context. We have therefore opened the platform to UP colleagues for whom Plasma was the best solution to carry on their computational biology classes. They enjoyed the flexibility of the tool, which allowed them to create a variety of lessons adapted to different pedagogical contexts.

On the basis of this positive experience, we wish to share our solution with other teachers both at UP and at NUS. However, to reach more students it is necessary to scale up Plasma. In order to enhance the possibilities for hybrid learning and to envision an efficient massification, we want to add two software improvements: first, an automated management of hundreds of user accounts and second, the possibility to automatically correct Jupyter notebooks.

These functional extensions will allow expanded use of Plasma and will address the requests of colleagues who have shown a strong interest in this solution. As a proof of usage, we also propose to organise a joint workshop on a cutting-edge topic in genomics, held simultaneously at both universities. With the goal of enhancing teaching and learning by promoting digital capacity in academic education, this project will pave the way to future teaching collaborations between the two academic partners.