ANNALS

IUPS & ADInstruments Teaching workshop 2017

Harmonization of teaching and learning for better education

Atlantico Hotel and Convention Center
August 5-8th, 2017
Buzios, RJ - Brazil

Satellite meeting of the 38th Congress of the International Union of Physiological Sciences (IUPS)

Sponsors

Welcome & Overview

The IUPS and ADInstruments 2017 Teaching Workshop – "Harmonization of teaching and learning for better education" was held on August 05-08, in Armação de Búzios, RJ, Brazil immediately after the 2017 IUPS International Congress hold in Rio de Janeiro City. Búzios is located approximately 165 km miles (130km) of the IUPS Congress site in Rio de Janeiro.

The Teaching Workshop featured a mix of plenary talks with hands-on workshops and activities that engaged with current educational issues related to the teaching and learning of physiology.

One hundred and forty-four teachers, graduate and undergraduate students, from 25 different countries attended the event.

Committees

International Organizing Committee

- Maria José Alves da Rocha, co-chair
- Robert G. Carroll, co-chair
- Fernanda Klein Marcondes
- M. Irfannudin
- Christina Karatzaferi
- Arif Siddiqui
- Frank Mojiminiyi
- Malcolm Gordon
- Mauricio Giuliodori
- Mei-Lin Tsai
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- Yasser El-Wazir

Program Committee

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- Christina Karatzaferi, co-chair
- Fernanda Klein Marcondes, co-chair
- Mei-Lin Tsai
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- Mauricio Giuliodori
- Arif Siddiqui
- Rudolf Schubert
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- Erica Granjeiro
- Luis Henrique Montrezor
- Maria Tereza Nunes
- Marcia Carvalho
- Pamela B. Mello-Carpes
- Paulo Fernando G. P. Montenegro
- Vania Maria Correa da Costa
- Ana Cláudia Ceccato Montemor
- Kelly Cristina Gavião Luchi
- Laís Tono Cardozo

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- Piracicaba Dental School, Informatics: Luiz Henrique Alves dos Santos and Felipe Alexandre Soares

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Scientific Program

Scientific program included lectures, conferences, workshops, round-table and poster session.

Workshop activities involved many aspects of physiology education, such as technology use in classroom, cooperative learning, evaluation and alternative methodologies.

Teaching laboratory experiences included interactive demonstrations of games, quizzes and ADInstruments data acquisition systems, including Lt.

Scientific Program - Overview

	5th August - Saturday			
17:30 /20:00	Transfer Rio de Janeiro –Búzios and check-in Hotel Atlântico Convention & Resort			
	6th August – Sunday			
8:00 -9:00	Registration			
9:00 - 10:00	*Room JOÃO FERNANDES* **Welcome speech**: Robert Carroll, East Carolina University, USA Maria José Rocha, University of Sao Paulo, Brazil . **Physiology Education, past, present and hope to the future** Penelope Hansen, Memorial University of Newfoundland, Canada.			
10:00 - 10:30	*Coffee break*			
10:30 - 12:30	*Workshop 1* *Room ARMAÇÃO* **Management of Integrated Curriculum and Blue Print in Physiology Education**. *Osamu Matsuo* Kindai University, Japan; *Dee U Silverthorn* University Texas at Austin, USA *M. Irfannuddin* Sriwijaya University, Indonesia.	*Workshop 2* *Room BRAVA* **Using social media and smartphone applications in practical lessons to enhance student learning** *Camilo Lellis-Santos* Federal University of Sao Paulo, Brazil *Patricia A. Halpin* University of New Hampshire at Manchester.	*Workshop 3* *Room AMORES* **Developing activities on physiology issues for teacher education.** *Paulo F. G. P. Montenegro, Fabiola da Silva Albuquerque* Federal University of Paraiba	*Workshop 4* *Room CANTO* **Creative use of open educational resources to support practical class teaching.** *David Dewhurst* University of Edinburgh *Maria del Mar Quiroga* Monash University, Australia.
12:30 - 14:00	*Lunch time*			
14:00 - 16:00	*Workshop 5* *Room ARMAÇÃO* **Developing Experimental Design and Analysis Skills in Undergraduates.** *Dawn Davies and Frankie MacMilla* University of Bristol, UK.	*Workshop 6* *Room BRAVA* **The use of digital story telling in physiology teaching.** *Muhammad Adnan Kanpurwala* Karachi Institute of Medical Sciences, Pakistan *Feisal Subhan* Plymouth University, UK.	*Workshop* *Room AMORES* **The use of team-based learning and rubrics to guide student feedback** *Barbara E. Goodman* University of Oregon, USA.	*Workshop 8* *Room CANTO* **Educational Games in Physiology** *Fernanda K. Marcondes, Kelly C.G. Luchi, Lais T. Cardozo, Michelle F. B. Leite* University of Campinas; *Luis H. Montrezor* University of Araraquara; *Érica M. Granjeiro* State University of Feira de Santana *Pamela M. Carpes* Federal University of Pampa, Brazil.
16:00 - 16:30	*Coffee break*			
16:30 - 17:30	*Room JOÃO FERNANDES* **Conference - "Constructing a good learning experience"** Tony Macknight – ADInstruments			
	Night free			

	7th August - Monday			
08:00 - 10:00	*Workshop 9* *Room ARMAÇÃO* **Medical Physiology across the life span.** *Thad A. Wilson* Marian University College of Osteropathic Medicine, USA.	*Workshop 10* *Room BRAVA* **Innovative tools for teaching comparative physiology and functional morphology.** *Malcolm S. Gordon* University of California - Los Angeles *Stacy Farina*, Harvard University, USA.	*Workshop 11* *Room AMORES* **The Use of Dramatization to Teach Physiology.** *Helena Carvalho* Virginia Tech Carilion School of Medicine, USA.	*Workshop 12* *Room CANTO* **Dissemination &Publishing in Physiology Education.** *C. Karatzaferi* University of St Mark & St John Plymouth, UK; *D. Silverthorn* The University of Texas at Austin, USA. *R. G. Carroll* East Carolina University, USA *S. Roe* Queen's University Belfast, Northern Ireland.
10:00 - 10:30	*Coffee break*			
10:30 - 11:30	*Room JOÃO FERNANDES* **Conference - The use of models to replace practical classes using animals.** Mauricio J. Giuliodori, Universidade Nacional de La Plata, Argentina.			
11:30 - 13:30	*Lunch time*			
13:30 - 15:30		Workshop 13 *Room BRAVA* **Replacing live animals to teach physiology in practical classes** *Maria José Alves da Rocha* University of Sao Paulo, Brazil *Mauricio J Giuliodori* Universidad de La Plata, Argentina.	*Workshop 14* *Room AMORES* **Setting the evaluation in the right place.** *Hilda Weissman* University of Buenos Aires, Argentina *Luis H. Montrezor* University of Araraquara, Brazil; *Oscar Bottasso* National Research Council, Argentina.	*Workshop 15* *Room CANTO* **Improving physiology learning and understanding by adding outreach activities to the teaching.** *Pamela B.Mello-Carpes, Felipe Piveta Carpes, Mauren Souza, Liane da Silva de Vargas and Rithiele Gonçalves* University of Pampa, Brazil.
15:30 - 16:00	*Coffee break*			
16:00 - 17:30	**Poster Session**			
20:00 - 24:00	***Celebrate Diversity Party***			
	8th August - Thursday			
8:30 -10:00	*Room JOÃO FERNANDES* **Round table - Challenges in teaching around the world.** Maria Tereza Nunes - University of Sao Paulo , Brazil, Dee U Silverthorn - University Texas at Austin, USA, Christina Karatzaferi - University of St Mark & St John Plymouth – UK, Osamu Matsuo - Kinki University , Japan Yasser Al Wazeer - Suez Canal University, Egypt.			
10:00 - 10:30	*Coffee break*			
10:30 - 11:30	*Room JOÃO FERNANDES* Plenary			
11:30 - 12:00	*Closing ceremony*			
14:30	Transfer Búzios - Rio de Janeiro			

Workshops

Workshop 1 Management of Integrated Curriculum and Blue Print in Physiology Education	It is important to build up the integrated curriculum in Physiology education, especially with mode of active learning. However, most of physiologists has never experienced management in physiology course. In this WS, participants were challenged to understand significance/importance of management as they contribute as a lecturer, laboratory assistant or director of the course in Physiology Education. Sharing each others about doing curriculum design and mapping, considering government outcomes, licensing examination topics, society medical physiology learning objectives, and institutional goals and objectives. Participants were asked to bring whatever they have done to share to bring their course learning objectives and try mapping them to one of our sets of competencies and outcomes.
Workshop 2 Using Social Media and samartphone applications in practical lessons to enhance student learning	In this session we discussed ways to use smartphones as laboratories for practical lessons in physiology. Engagement of tech-savvy students is the new challenge for teachers and professors, but most of them do not belong to the same generation of the students or do not know how to apply smartphones applications on their teaching and learning processes. Learning goals for this session included: * Briefly reviewing mobile learning concepts and use of mobile learning laboratory; * Exploring available smartphones'applications for physiology practical lessons; and * Sharing and discussing pedagogical practices in physiology and mobile devices. Participants in this workshop also signed up for a Twitter account, learned how to tweet, retweet, message, use a URL shortener, and hashtags. Participants then located articles from the Twitter accounts of credible science sources (*American Journal of Physiology, The Scientist,* CDC.gov, WHO.int). They then applyed their twitter skills to discuss a current science topic of interest.
Workshop 3 Developing activities on physiology issues for teacher education	Teachers at any level of educational system may be uncomfortable dealing with issues on physiology, since many experiments or demonstrations may be difficult to perform. Simple and low-cost activities can be useful alternatives to this embarrassment, contributing to significant learning. The aim of this workshop was to present some of these alternatives to those interested in physiology teaching, through the use of hands-on activities.
Workshop 4 Creative use of open educational resources to support practical class teaching	The aim of this workshop was to present online educational resources to support practical class teaching in undergraduate courses: virtual experiments, animations, images and textual descriptions of the preparations, the experimental methods. In addition, it was presented data showing that virtual experiments improved student understanding of the theoretical concepts going in to the practical laboratory. The workshop was highly interactive and explored ways in which these resources may be used to support teaching and learning both in the classroom, lab and online. Participants worked in small groups to create short teaching or learning sessions based on one or more resources together with wrap-around learning outcomes, and assessments to measure student learning. Each group presented their outline lesson plans to the whole group to stimulate critical discussion and disseminate ideas.
Workshop 5 Developing Experimental Design and Analysis Skills in Undergraduates	The aims of this workshop were to explore ways in which experimental design and analytical skills could be developed in undergraduate students to enable them to be fully prepared for final year research projects. The skills they develop should also enable students to understand scientific method in experimental design and gain confidence for example when analyzing original research papers. In Bristol we have a progressive development and assessment of these skills through short first and second year experimental design research projects that are assessed via talks or posters. The workshop explored, through 'brain storming' in groups of participants, innovative ways of developing these skills and assessing the students, using minimal resources, through the following questions 1. What skills do we want undergraduate students to develop in first and second yearrelating to experimental design 2. How can we develop these skills in students through self-directed hands on activities 3. How can acquisition of these skills be assessed
Workshop 6 The use of digital story telling in physiology teaching	Digital storytelling is an engaging educational strategy and can be defined as the application of varied software techniques to illustrate a topic in multimedia format including aural narration, pictures, script and background music. Although it has been around for decades, with the exponential increase in social media use, its use has become more relevant to today's millennial learner, and it incorporates many pedagogic styles of learning. At the end of this workshop participants understood the importance of digital storytelling and how to use it, discussed how it can be used for assessment in your physiology curriculum; constructed a digital story by using multiple digital resources and critique peer work. Feedback on the process was also given to participants.
Workshop 7 The use of team-based learning and rubrics to guide student feedback	The purpose of our workshop was to describe the methods we use in our undergraduate and graduate courses to provide students with concise feedback on their work. Specifically, Dr. Goodman described her use of team-based learning and how she has incorporated peer evaluations and evaluation of team members during class. Furthermore, Dr. Goodman described her use of background knowledge assessment, prior to the onset of each system, to guide her teaching. I (Zach) described the role of rubrics and method of rubric delivery in guiding student learning and performance in a third year human physiology course.
Workshop 8 Educational Games in Physiology Teaching	The aim of this workshop was to perform with the audience, a practical activity with a puzzle used to teach the cardiac cycle and to discuss how the student´s perception about it and the effect of this educational game on students´ learning are being evaluated in different careers (Biology, Medicine, Nursery, Physiotherapy, Dentistry). Other educational games were also presented but without the development of respective activity (action potential, synapse, muscle contraction). All of them were shared with the participants.

Workshop 9 Medical Physiology Across the Life-span	Medical physiology is taught from the lens of the normal adult human and the incorporation of pathophysiology of acute insults and chronic disease. Many medical school curricula do not focus on Pediatrics or Geriatrics until later in student education and often physiologists are not directly involved. This workshop session focused on practical and theoretical aspects of adding developmental and aging physiology content and concepts that can be directly incorporated into your learning activities and curriculum. There was also a discussion on the idea of potentially being more inclusive of the physiology across the life-span within each organ system in the APS/ACDP Medical Physiology Learning Objectives
Workshop 10 Innovative tools for teaching comparative physiology and functional morphology	Aims of the workshop: Introduce participants to some non-traditional ways of teaching comparative physiology and functional morphology course laboratories. Laboratory sections are run as supervised and monitored student-developed research projects, not series of standardized experiments. Facilitators introduced and demonstrated two groups of methods that can be used in a wide range of different projects: 1) 3-dimensional printing and micro-CT datasets, primarily useful for anatomical and functional morphological studies; 2) Computer-based digital photographic image analysis using freely available on-line software packages, primarily useful for biomechanical and behavioral studies.
Workshop 11 The Use of Dramatization to Teach Physiology	The proposed workshop aimed to present and lead its participants to *learn by doing* as they become an active part of alearning/teaching exercise. Volunteers were instructed to 'act' in the dramatization of the cardiac cycle and action potential (Carvalho H. Adv Physiol Educ35: 312–313, 20114). Each person represented a 'cell' and working together we mimiced the autonomic nervous system modulation of heart rate. Because no previous knowledge or equipment were required, the attendees were able to reproduce the activity in their home institutions without any additional costs. In summary the workshop aimed to demonstrate an original and alternative teaching methodology designed to improve long-term memory retention and recall in our students.
Workshop 12 Dissemination & Publishing in Physiology Education	Publication of peer-reviewed articles is not only a meritorious way of scholarly increasing scholarly output and international exposure for research-focused academic staff but is also frequently required by faculties for career progression of teaching-focused staff. Physiology teachers can publish their brilliant teaching methods and teaching related research but are often at loss to the selection of journal, as 'traditional' educational journals are not always suitable for physiology related work. Advances in Physiology Education offers the optimal platform for publishing scholarly work toward the understanding and enhancement of teaching and learning of physiology, neuroscience and pathophysiology, at all educational levels. From illustrative descriptions of innovations, to research to essays and review articles, *Advances* attracts submissions worldwide and has a reading audience transcending various scientific and pedagogical sectors, with a 63% acceptance rate (2015 statistics). A team of experts, reviewers and members of the editorial board of *Advances*, familiarised the participants with the types of articles, discussed frequent errors and supported attendees in preparing their manuscript, for the opportunity to publish and disseminate their work and good practices to an international audience. *Aims of the workshop* * To familiarise attendees with the various formats submissions can take * To support younger colleagues in creating their first submission * To enhance chances of acceptance * To promote the aims of international outreach *Proposed Structure* * Description of the journal (incl Sourcebook of laboratory activities) 15-20 min * Types of articles/requirements/do's and don't's- 30 min * Hands-on advice on material participants will bring 45 min * Discussion groups (participant led) - 10 min * Summary remarks (facilitator led)- 20 min
Workshop 13 Replacing live animals to teach physiology in practical classes	The aim of this workshop was to present alternatives for replacing animals in practical classes.
Workshop 14 Setting the evaluation in the right place	The speakers made oral presentations to discuss the role of evaluation. Evaluation is very often understood as a verification of the information assimilated by the student and as a mean for social control. Indeed, it is generally considered as a measure of the achievement of objectives, to assign grades and accredit acquired knowledge. In other words, the emphasis is placed on examination as an instrument. In our understanding, evaluation should be the space that provides information about the quality of the teaching proposal. From the side of the students, the evaluation should serve to make aware the learning and gain confidence in their abilities to solve problematic situations based on their knowledge. Our challenge is to recover this space, trying to give the evaluation the place it deserves, i.e. to build knowledge and subjectivities and not to control and reproduce errors.
Workshop 15 Improving physiology learning and understanding by adding outreach activities to the teaching	This workshop showed different possibilities for adding outreach activities as part of a regular physiology course. The speakers will share their experiences in outreach activities performed by undergraduate students in cooperation different publics, showing evidences that the involvement of undergraduate students on this type of the activity improves their physiology understanding.

Poster session

Abstract/ Poster No.	Author(s)	Title
1	Saunders, P. R and Tsai, M.	What do we learn from PBL Pathophysiology in a hybrid medical curriculum during 2004-2015?
2	Saeed, A. M.	A Conceptual framework for learning the basic medical sciences
3	Stokes, C.; Hall, S.; Harris, J.; Scott, D.; MacMillan, F. and Davies, D.	The Physiological Society: Supporting International Dissemination of Teaching Innovations in the Life Sciences
4	Polyzou, E.; Tsigkarida, E.; Efthymiou, G.; Diggelidis, N. and Karatzaferi, C.	Primary school educational program for the development of CPR skills: a pilot study in Greece
5	Vinagre A.S.; Fraga, L. S.; Rodrigues, M. I. V.; Souza, M. G. T.; Deodato, D.; Noan, I.; Godoy, M.; Carneiro, M. L. and Trapp, M. .	Development of video-class: microcirculation in the frog mesentery
6	Dewhurst, D. G.	An online repository of free educational resources to support practical class teaching
7	REMOVED – UNABLE TO ATTEND	
8	Enrique, N.; León, I. E.; Moncada, M.; Tolosa, M. J.; Milesi, M. V. and Mobili, P.	Evaluation as a key step of the teaching-learning process in Physiology: different strategies to promote the development of content-related and non content-related skills
9	Aguiar, F. H. B.and Marcondes, F. K.	Integrated curriculum of Dentistry course: the experience of Piracicaba Dental School, University of Campinas
10	Inamori, P. M.; Monteferrante, G. A.; Pedraga, B.; Medeiros, J. S. and Lellis-Santos, C..	MestreChef Nutritional: a strategy to teach obesity and nutritional concepts through gamification
11	Albuquerque, F. S.; Gouveia, R. L. B.; Cantalice, T. S. A.; and Oliveira Júnior, F. A.	Supplementary resources in teaching-learning of cardiac electric potentials physiology
12	Deliberali, J. V and Monteferrante, G. A.	Interdisciplinarity biology-chemistry: a didactic strategy to elucidate the physiology of methylmercury intoxication through chemical experiments
13	Monteferrante, G. A. and Lellis-Santos, C.	Cardiovascular physiology concepts integrated with artistic elements as an engaging and effective strategy for science teaching and learning
14	Jinshun, Qi	Feed-forward control is not limited to conditioned reflex
15	Leite, A. M. A.; Barroso, N. V. C. and Montenegro, P. F. G. P.	Mobile apps as educational tools for use in cardiovascular physiology classes
16	Carroll, R. G.; *, Lust, R. M. and. Brown, D. A.	Patterns of Technology Use Indicate Decreased Reliance on Handouts and Increased Use of Internet During Lecture in a Medical Physiology Course
17	Nogueira, T.; Morais, V. L.; Esposito, A. C.; Lucio, A. B. M.; Mollo, I. X.; Moraes, C. P., Barros, N. M. T. and Lellis-Santos,	Interactive and wearable glossary for inclusive education in introductory bone physiology classes

	C.	
18	Quiroga, M. M and Choate, J.	Using an online simulation to prepare students for an enquiry-based laboratory class
19	Bhargava, A.	Online skills hub: Blending the best of both worlds
20	Souza, G. L. P.; 1, Bueno, D. S.; Campilongo, G. B.; Contrucci, C.; 1, Costa, D. L. and Lellis-Santos, C.	Portfolio in physiology courses improves performance of students enrolled in undergraduate science teacher education program
21	REMOVED – UNABLE TO ATTEND	
22	Dewhurst, D. G.	Technology supported transformation of clinical officer education in Malawi
25	REMOVED – UNABLE TO ATTEND	
26	Campilongo, G. B. and Lellis-Santos, C.	Investigating human physiology: an inquiry-based learning approach merged with mobile learning
27	Tolosa, M. J.; Doña, V.; Palomo, R. R.; Milesi, V. and Alvis, A. G.	The use of clinical cases and an integrated evaluation in a Physiopathology course for Pharmacy students
28	Gonçalves, R.; Sosa, P. M.; Altermann, C. and Mello-Carpes, P. B.	Reactivation of a previous knowledge thought weekly tests improves human physiology learning
29	Cardozo, L. T.; Luchi, K. C. G. and Marcondes, F. K.	Assessment of long-term learning on the use of educational games compared to traditional lessons
30	Bueno, D. S.; Souza, G. L. P.; Costa, D. L.; Contrucci, C. and Lellis-Santos, C.	Secret Santa Cell: promoting trans-customized-learning in human physiology courses
31	Castro, A. P. and Marcondes, F. K.	The use of an educational game to integrate the physiology of sinapses, muscle contraction and autonomous nervous system: perception of students
32	Caldiz, C.; Vittone, L.; Said, M. and Lapasta, L.	Detecting a problem, finding a solution: Cooperative work in the academic environment as a key to success
33	Carpes, F. P.; Rocha, E. S.; Kunzler, M. R. and Mello-Carpes, P. B.	Using the olympics games ideals to improve teaching-learning: the biomechanics olympics games
34	Lima, K.; Souza, M. A.; Carpes, F. P. and Mello-Carpes, P. B.	Junior scientific initiation on neurophysiology: high-school students perception

Abstracts

Abstract 01

What do we learn from PBL Pathophysiology in a hybrid medical curriculum during 2004-2015?

Saunders, P. R[1]; Tsai, M[2]

[1]Global Competency Center, Office of International Affairs; [2]Department of Physiology, College of Medicine, National Cheng Kung University, Tainan 70101, Taiwan

The major recommendation from Taiwan Medical Accreditation Council TMAC's initial accreditation visits (2000-2002) was the lack of integration between preclinical and clinical medical training. The medical program of National Cheng Kung University (NCKU) decided to promote self-directed learning by enhancing student self-learning experiences via vertical integration across preclinical and clinical training in its 7-year program. The specific major reforms implemented involved the three new learning approaches of converting lecture-based courses in years 5 and 6 to first computer-aided teaching and second small group teaching/discussion, and this coincided with a new single term course in the Spring semester called "Pathophysiology" taught to Year 4 medical students in a Problem-Based Learning (PBL) format. These reforms were integrated with the existing traditional learning approaches that remained: patient-centered learning through bed-side teaching; some lectures; student practicums; discussions with experts. Student survey upon graduation in 2004-2009 showed the highest number of students who consider PBL as a least effective tool and the lowest number of students PBL who consider PBL number. However, students' perception on PBL was not correlated with course integration but that on lecture was not. During 2009-2015 when pathophysiology was horizontally into various courses. The numbers of the all graduates who experience the pedagogy is increased. None of each pedagogy was positive correlated with improves learning integration. 6o% students felt ineffective of using these pedagogies and all graduates do not show the positive correlation with Lack of work. It becomes clear that PBL may not be the major impact on learn new knowledge in English, not him.

Abstract 02

A Conceptual framework for learning the basic medical sciences.

Amal M Saeed

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The question of relevance and transition from basic to clinical studies has lead to several innovative approaches to curriculum design such as PBL and TBL. However, the above and other impediments hamper the application of these developments in addition staff shortage, training and time constraints, to mention a few. To design innovative integrated courses for basic sciences in Nile medical college using evidence based good education methods and considering available resources. The study of basic medical sciences assumes good knowledge of the natural sciences, good English language and well developed study skills. The methods adopted attempts to cater for these short comings. The basic science objectives and contents were identified. This step points the way to select relevant and major case studies to illustrate the pathophysiological applications. An integrated approach was adopted where pathologists, microbiologist, community physicians and clinicians were involved in selection and presentation of the case studies. A four semester course was designed. Integration was adopted for the main organ systems. Student's assignments and seminars were consistently used to develop self learning and study skills. Lectures were judiciously used to introduce course objectives, outlines and explain concepts. The case studies reinforced the physiological, biochemical and pathological basis of disease. This model was economical in using a reasonable number of highly qualified staff with opportunities of junior staff to guide and help with assignments and seminars. The inclusion of case studies paved the way for smooth transition for good results in pathology microbiology, pharmacology and clinical studies as the student progress.

Abstract 03

The Physiological Society: Supporting International Dissemination of Teaching Innovations in the Life Sciences

Stokes, C[1]; Hall, S[1,2]; Harris, J[1,3]; Scott, D[1,4]; MacMillan, F[1,3]; Davies, D[1].

[1]Education and Outreach Committee, The Physiological Society; [2]Cardiff University, UK; [3]University of Bristol, UK; [4]University of Aberdeen, UK.

The Physiological Society provides funding to members and non-members seeking to develop their teaching portfolio in Higher Education (HE). One aspect of this is to support, and share good practice across, the international community of HE educators and teaching professionals. The International Travel Grants for Teachers scheme provides funding of up to £2,000 per applicant to support international sharing of ideas, and to build collaborative networks of teachers across the world. Launched in 2015, the scheme has so far supported 4 applicants. Funding to date has facilitated overseas travel of teachers from the UK and the Republic of Ireland (RoI). The purpose of the travel has included attendance at specialist training courses not available in the applicant's country of residence, setting up collaborative links through international conference attendance and supporting overseas institutions in their educational initiatives. All the travel grants have had the common output of sharing excellence in teaching internationally. Some examples are described below. Funding was provided in 2016 to support the travel of one member of The Society from the UK to a University in South America; the purpose was to provide feedback on the teaching of the physiology component of a medical degree that was seeking accreditation. Building on personal experience of teaching in the UK, the awardee provided recommendations to improve the teaching and assessment of physiology, the motivation of the teachers and ultimately the training and experience of the medical students. The visit is also likely to lead to collaborative agreements, and possibly student and/or staff exchanges, between the awardee's home institution and the University visited. Further funds in 2016 provided support for a physiologist from the RoI to travel to the US in order to gain specialist training in using innovative electrophysiological and optogenetic techniques in invertebrates for undergraduate teaching. This experience will be used to develop new laboratory preparations in the awardee's host institution to extend and enhance undergraduates' practical skills. The awardee's intention is to publish these new experimental preparations in an educational journal so that other institutions can use them for undergraduate teaching. Finally, an awardee from the UK was supported to present work at an overseas educational conference. As well as providing the opportunity to disseminate their own work, the award led to an ongoing project in which the awardee is advising a conference delegate from Australia how best to adapt a pharmacology textbook for the UK market. All recipients of funding through this scheme have commented on the long term, and potentially widespread, impact envisaged from the travel. The Physiological Society will continue dialogue with the recipients to support them in the dissemination of their outputs, for example at teaching symposia and workshops, and in educational journals. We are keen to see travel between the UK and abroad become truly reciprocal, and particularly encourage applications from HE teachers from outside of the UK.

Abstract 04

Primary school educational program for the development of CPR skills: a pilot study in Greece.

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Background: Sudden Cardiac Arrest (SCA) is a major public health problem worldwide and one of the most frequent causes of death. SCA causes ~20% of all deaths in Europe. The direct application of Cardiopulmonary Resuscitation (CPR) from any person attending the incident is one of the most successful strategies to reduce CSA mortality and morbidity. In countries where CPR training is integrated into the school curriculum improvements in survival rates of cardiac arrest victims have been observed. The recent recommendations by the ERC or the World Health Organization on teaching CPR skills to children bring to the fore the great importance attached by international organizations in the education of children and adolescents in CPR. Biology and physical education (PE) teachers have been proposed to be the most suitable to implement CPR training by integrating it within the curriculum due to their knowledge of human physiology. In Greece currently no CPR training is provided at schools. Aim: this pilot study explored the efficacy of CPR training implementation by PE teachers in primary schools, including an evaluation of pupils' attitudes and knowledge/skills. Methods: The study design was approved by the local ethics committee, the Educational Authority of Thessaly region and the Ministry of Education in Greece. Moreover, consent was provided at the level of the school and class (with parents/guardians being asked to provide written informed consent along with their children). The implementation followed the WHO guidelines and the instructions of the European Resuscitation Council taking into account the Greek Primary School Programme of Studies (Health Education module). PE teacher trainees were initially trained in CPR by members of the ERC in order to serve as instructors. Following an open call of interest, six schools in the city of Trikala responded. A total of 173 primary school pupils (aged 11 -12 years, 6th grade) participated. A presentation of basic concepts and knowledge, using anatomy models, was performed. Then, training into the actual skills involved took place via a hands-on experiential seminar. The intervention lasted for 120 min. Pupils evaluated the effectiveness of the program using a stances and attitudes questionnaire adapted for children, at the end of training session. Questionnaire results were tested for internal reliabiliy (Cronbach's α) and structure validity (factor analysis). In parallel, levels of CPR skills attainment were noted by CPR instructors and feedback from other stakeholders (teachers, school management) was collected. Results:The implementation was performed successfully in all cases. Internal reliability of the questionnaire was high (Cronbach's α: 0.81) however there is space for improvement in structural validity. Materials and space available in schools were sufficient. Implementation was performed in the prescribed time. Instructors evaluating children's levels of attainment considered that the lesson plan and time needed were effective. Pupils showed a positive attitude towards providing CPR, with the empathy score increasing, and felt confident to apply CPR skills if needed. Notably, children's attitudes towards providing CPR appeared to be positively associated with a number of other altruistic tendencies. Conclusions: The students and teachers responded well to the educational process. Students felt confident to have achieved basic life-saving CPR skills, while instructors verified a good level of attainment. Feedback from various stakeholders is being collated to support future recommendations. The questionnaire analysis indicate a need for improvements in the measuring instrument. The pilot study indicates that CPR can be implemented successfully in the Greek primary school educational system within the module of Health Education.

Abstract 05

Development of video-class: microcirculation in the frog mesentery

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Introduction: Practical classes with experimental animals, a classical approach in physiology education, are commonly in disuse because of many ethical issues. So the development of alternative didactic-pedagogical activities is a pressing necessity, since these can have the same advantages of a practical class, with regard to teaching-learning relations, but without the need to promote the sacrifice of a large number of experimental animals. The objective of this work was to develop a video-class demonstrating the practical class "microcirculation of the frog mesentery". The objectives of this class are to allow the student to observe and characterize the different vascular segments that make up the microcirculation and to evaluate the action of the autonomous neurotransmitters on the microcirculation. **Methodology**: Initially a script of the video to be recorded was developed in which the audio and video of each scene were described in detail. The recording was performed in the Laboratory of practical classes of the Department of Physiology. The audio components, the development of animations and editing were carried out by the Nucleus of Pedagogical Support for Distance Education (NAPEAD). The video is available at (http://www.ufrgs.br/napead/repositorio/objetos/microcirculacao-ra/). The video was attended by the students of the Biological Sciences course, as a complementary activity to the theoretical classes on the Cardiovascular System of the discipline of Human Physiology. At the end of the video, the students were asked some questions in order to evaluate it. Question 1(**Q1**): Are the images and the audio clear and comprehensible? **Q2**: Was the information presented in didactic form? **Q3**: Does this video aid in understanding the Physiology of Microcirculation? **Q4**: Do you consider this learning object useful in the teaching-learning process? **Q5**: Would you recommend this video for other colleagues to watch? These questions were answered according to Likert Scale: Totally Disagree (TD), Disagree (D), I do not agree or disagree (NAD), Agree (A), Totally Agree (TA). In addition to these, another question of qualitative analysis was proposed: Do you have any suggestions for the improvement of this learning object or some placement that you consider important? **Results:** Quantitative analysis: **Q1:** 54.6% TA; 36.4% A; 9.1% NAD. **Q2:** 72.7% TA; 27.3% A. **Q3:** 81.8% TA; 18.2% A. **Q4:** 100% TA. **Q5:** 81.8% TA; 18.2% A. Qualitative analysis: all the students who participated in the activity demonstrated their approval of the practice, describing that they enjoyed doing it and that it was useful in their learning process. **Conclusions:** This video-class proved to be a good tool to replace the practical classes with animals, as it stimulated the students to develop a critical thinking. **Financial support:** NAPEAD/UFRGS.

Abstract 06

An online repository of free educational resources to support practical class teaching

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Teaching practical physiology and pharmacology has become compromised over recent years mainly due to its high cost, requirement for specialised equipment and laboratories and time pressure from an ever expanding curriculum. The number of traditional practical classes in many universities has been reduced and in some instances third-party computer-based resources have replaced them with varying degrees of success. The degree of success is highly dependent on enthusiastic adoption by teachers and it is clear that some teachers are reluctant to use third-party resources as they have little control over their content and would like to be able to edit and tailor them to meet their specific needs. The Virtual Pharmacology Lab (www.virtualpharmacologylab.com) was developed to give teachers greater control over the content of such resources. The proof-of-concept version is an open access repository of more than 650 quality assured, metadata-tagged teaching and learning resources acquired by disaggregating a number of existing computer-based simulations of practical pharmacology classes developed by the author (www.sheffbp.co.uk). Disaggregation of each simulation yields 50-100 resources. The resources include: data traces from experiments including some where various parameters are controlled by the user; (HTML) text descriptions; images; diagrams; illustrations; video; interactive student tasks and activities; and self-assessment questions. It is hoped that these more granular formats will make the resources more easily re-usable and make it simpler for teachers to tailor their teaching by, for example, embedding the resources into their own teaching materials or adding their own wrap-around resources. Teachers or students access the repository via a web interface and search for resources using a refine-able keyword search facility. Each resource in the resulting post-search list has descriptive text, a web link (url), the code to embed the object into a webpage or other online content, and a preview of the resource (e.g. image, animation). Users are requested to complete a short questionnaire and the feedback from that will inform future developments. While at the moment the repository contains few 'physiology' learning objects it will be of interest to physiologists who teach pharmacology and/or those interested in contributing their own resources under the same not-for-profit Creative Commons license. Future developments will depend on the level of interest in the repository and whether faculty are willing to support expansion and management of the repository through contribution of their own learning objects.

Abstract 08

Evaluation as a key step of the teaching-learning process in Physiology: different strategies to promote the development of content-related and non content-related skills

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We generate a new approach in the teaching of Physiology, initially modifying curricular aspects, understanding that a curricular innovation will be effective only if it is accompanied by innovations in the way of evaluation (Bonsón and Benito, 2005). The planification of the Physiology course was developed in a sequential way, starting with basic aspects of general cellular physiology and advancing towards the physiology of the systems. We changed the traditional summative evaluation for several evaluation methodologies, to improve the teaching-learning processes. We incorporate: (a) weekly evaluations; (b) oral exposition group workshop; (c) mock test; (d) final open book written exam. **(a) Weekly evaluations -** We create not mandatory multiple-choice online exams in the Moodle platform. We asked about contents developed during the week, which we consider elementary for the understanding of the topics. The next class we reviewed the concepts that had a high percentage of incorrect answers. Objective: periodical revision of student learning in specific topics. **(b) Oral workshop.** It consisted of a group work with open guidelines and topics. The workshop was defended orally during a class and evaluated by teachers, peers and themselves. Objective: evaluate in similar conditions to professional life (group work, oral exposition, written reports). **(c) Mock test.** Near the exam date, we performed a mock test. This was solved on individually, open book and then we made a final discussion. Objective: acquire practice and become familiar with the exam situation (reduce stress levels and lose the fear in problematic situations). **(d) Final open book written exam.** This exam constitutes the accreditation of the course. Since 2016, we have given to the students the possibility to use bibliography during the exam (open book). The aim of this change was to reduce the factors that students commonly indicated as impediments to demonstrate learning. Objective: evaluation of the student's individual learning. **CONCLUSIONS:** The experience of these years allowed us to reflect on the importance of accompanying the curricular changes with changes in the evaluation methodology, seeking that the qualification of the student is more related to the acquired skills solving problems than the ability to remember information. We also consider important to give students responsibility in the process of their own learning, giving them the chance to participate and to evaluate the course and the teaching-learning processes.

Abstract 09

Integrated curriculum of Dentistry course: the experience of Piracicaba Dental School, University of Campinas.

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The success of teaching-learning process depends on the integration of previous and new knowledge. However, most of the time, the subjects in Brazilian universities use to be taught in a compartmentalized way. The curriculum of the undergraduate course in Piracicaba Dental School – UNICAMP have always presented clinical disciplines in integrated way in which students simultaneously perform procedures in different areas of Dentistry. However, the integration of basic, preclinical and social subject is a more recent process. In the year of 2005, all the isolated basic subjects like Anatomy, Histology, Biochemistry, Physiology and Pharmacology have been reformulated in two new integrated subjects. In the year of 2012, the preclinical and social subjects were also mixed in integrated way, with the aim of facilitating the understanding for the student of the relationships between the contents approached to apply the knowledge acquired in clinical cases. In all the subjects the teachers from several disciplines gives lectures, practical classes and integrative activities. These integrative activities take the form of group activities, such as discussing pre-prepared questions, dramatization and video making. During the presentation and correction of these activities, the teachers discuss together the student's doubts and how to solve them with the correct answers. Every semester, the students evaluate the subjects and the teachers. These evaluations are discussed in the undergraduation committee with the coordinators. These assessments provide continuous improvement of the curriculum. Before these subject integration, the opinion of 60 to 70% of the students were that the basic subjects were unnecessary for dental surgeon training. Currently, 100% of the students evaluate the basic subjects as fundamental for their formation. There was also a significant increase in the percentage of students (from 60-70% up to 97-100%) who considered the criteria of the evaluation clear and in accordance with the content taught. In the preclinical and social subjects, the students indicated as positive aspects the recovery of contents studied in previous years and the integration among the subject matters. In clinical subjects, the integration and the student's assessment process are evaluated in a continuous way by a multifactorial collaboration of teachers of all involved areas. Although the integrated disciplines presents continuous challenges for the teaching staff, their positive effects on the students' attitudes and performances support professors to continue the improvement of this curriculum.

Abstract 10

MestreChef Nutritional: a strategy to teach obesity and nutritional concepts through gamification

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The growing number of obese children and adolescents demands studies and development of teaching strategies focused on physiology of nutrition that facilitate student comprehension and reflection on eating habits. Obese and overweight students have increased chances of becoming an obese adult, which makes schools become a key learning environment for health education. In order to innovate by creating a contextualized and engaging learning opportunity for K-12 students, we developed a teaching strategy that involves a didactic game with similar rules of a television program, which we have entitled as MestreChef Nutritional (MCN). Participants with complete or incomplete primary and secondary school were divided into groups and challenged to do the grocery considering an ordinary daily diet for a normal or obese person. Then, they made dietary and nutritional calculations, and measured the ingredients (soy protein, sugar and oil) using graduated cylinders according to the chosen diet. The MCN activity promoted a strong engagement of the participants. The analysis of the student performance revealed trends on greater attention of groups challenged to plan diets for obese people. Additionally, our gamified learning showed mathematical reasoning limitations of the participants, although their capacity of making decisions for coherent alimentary items and daily proportions was well elaborated. Thus, the study has shown that the gamification of a traditional activity can be effective to engage students in cognitive processes related to nutritional choices and energy balance concepts. It also could be used as a powerful tool for teachers, to identify limitations and competences of the students in contents of scholar subjects such as science, biology and mathematics.
Financial support: OCRC-FAPESP

Abstract 11

Supplementary resources in teaching-learning of cardiac electric potentials physiology

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In the face of the current challenges of the teaching-learning process, involving detailed, complex and rich contents, physiology professors in the DFP/CCS/UFPB have been developing supplementary didactic resources, called maquette, with the purpose of investigating their contribution to the learning of electrical potentials involved in cardiac automatism. To this end, 119 students from six different courses answered a pre-test about the referred subject during class. In the subsequent laboratory and practical class, they studied the maquette and answered a post-test, which had questions resembling those the pre-test. The students' performance pre and post-tests were used as a dependent variable. ANOVA 2 (gender) x 6 (courses) factors was used to analyzed the performance and the test T paired was used to compared pre and post-test. The significance level was p <0.05 for all analyses. In the pre-test, psychology students exhibited significantly higher scores, but in the post-test the obtained scores were similar among the students from the different courses; the performance following the maquette was significantly better than before its use to all courses except psychology. We suggest the maquette may have contributed to show that the complexity of a subject can be overcome and that it can be used as an instrument to engage students in the construction of their own knowledge, hence favoring the learning process.

Abstract 12

Interdisciplinarity biology-chemistry: a didactic strategy to elucidate the physiology of methylmercury intoxication through chemical experiments.

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Anthropogenic activity in the current molds has been raising increasing concerns. The environmental pollution caused by the release of potentially toxic substances such as the release of industrial and urban effluents without adequate treatment is not restricted to ecosystems and other species, but has revolted against its own creator and generated numerous problems to human health. One of the challenges of science teachers is to elucidate the understanding of these phenomena holistically, including with respect to how human homeostasis is disturbed as a result of this reality. Mercury, especially in its most toxic form, methylmercury (MeHg), is a neurotoxic agent and, as it passes through the blood, it is distributed through the tissues through the erythrocytes and is concentrated in places such as the brain, kidneys, lungs, intestinal wall, among others. This is especially true in organisms at higher trophic levels, including man who feeds on contaminated fish because of the presence of the metal in industrial and agricultural effluents or from natural concentrations of mercury in the soil. Regardless of the source of contamination, this is a public health issue, but in schools this topic generally comes down to be treated only at an ecological level and is not discussed in a physiological context. In view of these observations, this study focused on developing a didactic strategy that explored the subject of contamination, bioaccumulation and biomagnification of methylmercury in the physiological scope, through the interdisciplinarity between the biology's and chemistry's teaching, in a perspective in which experimentation, the investigation and discussions provide in addition to a greater physiological understanding, a stimulus to the citizen's positioning of the student. It is proposed that, during classes that explore the physiology of methylmercury intoxication, occur experiments should be are presented and realized by k-12 students, in which they can observe, understand the mechanisms by which this organization and its occurrence in favorable environmental and physicochemical conditions, contributes to increase the toxicity index of this chemical species in organisms, relating solubility concepts to methylation of Hg^{2+} by assigning the results observed in the experiments with the damaging bioaccumulation of this mercurial form in organisms exposed to sources of Hg. It is hoped that this proposal will have repercussions on students' performance in class and tests on human physiology regarding toxicodynamics of methylmercury in the body. It is believed that this didactic model can generate moments of reflection on the socio-environmental question that involves the contamination by this metal, acting in the conscious formation of the student.

Abstract 13

Cardiovascular physiology concepts integrated with artistic elements as an engaging and effective strategy for science teaching and learning

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Arts-based pedagogy has been shown to be an effective educational strategy to promote engagement and development of scientific reasoning by means of evocating creativity and integrating emotional and social aspects of the learning process. In order to evaluate the effectiveness of the use of artistic elements as background for cardiovascular physiology teaching and learning, we created three pedagogic activities by using dance, music and plastic arts to cover heart rate, electrical cardiac properties and cardiac cycle topics. As content of Human Morphophysiology course, Science Teacher undergraduate students performed the didactic activities at Federal University of São Paulo. The cardiac rhythm dance protocol engaged students in listening and dancing classical, POP and samba music and measuring heart rate through smartphones. After discussion, students plotted graphics and statistical analysis confirmed significant alteration in heart rate, allowing comprehension of bradicardic and tachycardic movements. To integrate electrical properties and music, students were asked to make analogical cognitive articulations among their knowledge in cardiovascular physiology, the lyrics of a Brazilian famous song and a Wizard of the OZ cartoon. The students were able to figure out multiple combinations among the three elements to explain characteristics of the cardiovascular system. Finally, after folding an origami heart that beats and emits sounds in allusion to cardiac contraction and relaxation, students were encouraged to write cardiovascular physiology information on its surfaces to be used as a "licit cheat sheet" during exams. The analysis of the cheat sheets of the participants revealed major concerns in blood pressure, vascular morphology and cardiac cycle. Besides, students who attended all activities have achieved significant higher scores in final exam, and physiology learning was significantly improved when compared to anatomy and histology contents in learning assessments. Thus, the use of arts is appropriate to be used as background for teaching cardiovascular physiology. Also, integration of cardiovascular physiology concepts and artistic elements can be a powerful strategy to engage and improve performance in undergraduate students.
Financial support: OCRC-FAPESP, ProGRAD-Unifesp

Abstract 14

Feed-forward control is not limited to conditioned reflex

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The automatic control of physiological activities is the most interesting system in the body. Some biological messages arriving to the control center before feedback information are called feed-forward information. In physiological teaching, lots of conditioned reflexes have been referred in the examples of feed-forward control. In thermoregulation, for example, body heat can be produced before body temperature falling in cold environment, owing to the input of feed-forward messages from visual and audio sensory organs. In fact, many un-conditioned reflexes are also involved in the feed-forward control. In the thermoregulation, peripheral temperature sensors just play an important role in the feed-forward regulation. Skin thermoreceptors primarily provide the hypothalamic thermoregulatory center with information about ambient temperature (especially cold information). Importantly, skin thermoreceptors provide an anticipatory signal and allow the autonomic nervous system to exert thermoregulation before body temperature changes. Thus, the responses to changes in the average skin temperature should be thought of as anticipatory rather than negative feedback information in nature. In contrast, the deep or central temperature sensors are mainly responsible for detecting the deep body temperature (mainly hot). So, the information from the deep thermoreceptors belongs to feed-back, not feed-forwad information, because they provide the center with information after body temperature changed. Similarly, insulin secretion induced by eating is another example of feed-forward control in un-conditioned reflex. The food signals such as glucose, amino acid and fatty acid-induced GIP, in the form of "foresight" signal, can stimulate insulin secretion in advance before the increase of blood glucose.

Abstract 15

Mobile apps as educational tools for use in cardiovascular physiology classes

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The use of mobile Communication Technologies for educational purposes is a growing trend in our modern society, and despite the availability of many apps for smartphones dealing with cardiovascular physiology, few data exist on their usefulness as educational tools. This study aimed to investigate the disponibility of apps for android system dealing with this issue, and to create a rubric as an evaluation tool. While searching for apps at *Play Store* using "fisiologia cardiovascular" as keywords, we found 161 apps included in 12 categories, and in 08 different languages. Our rubric included domains related both to technical and pedagogical issues, and was used to evaluate the app "Sistemas do Corpo humano 3D" developed by EvoBooks, the only one that was free, included in educational category and in portuguese language. According to the proposed rubric, this app is useful as an educational tool.

Abstract 16

Patterns of Technology Use Indicate Decreased Reliance on Handouts and Increased Use of Internet During Lecture in a Medical Physiology Course

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A survey of technology use was administered to first year medical students enrolled in a lecture based physiology course in 2015 through 2017. Questions were asked anonymously during class, and the number of responses were 67 in 2015, 45 in 2016 and 44 in 2017. PowerPoint slides are posted before class, and lectures are recorded for review, both of which can be accessed by the course Management System Blackboard. Laptop computers were the most common way to follow along in class, with the use of printed handouts decreasing from 40% to 15% over the 3 year period. About 2/3 of the students report watching the recordings of the lectures 'Occasionally', with about 30% reporting they 'Never' watch the recorded lectures. Internet use during lecture has increased, with the number of students indicating they 'Never" accessed the internet dropping to 20% in 2017. The use of clickers was reported as a 'Useful Learning Tool' by >90% of students. Together, the data from these surveys indicates that students' use of paper handouts is decreasing as students rely more heavily on laptop computers during lecture.

Abstract 17

Interactive and wearable glossary for inclusive education in introductory bone physiology classes

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Bone location comprehension is a pre-requisite to understand bone physiology, but its teaching method usually encompasses anatomy atlas and visual tools to facilitate memorization of terms and concepts. By exploring multiple sensory stimuli, anatomy and physiology education would be able to engage students and optimize the learning process in a more democratic and inclusive manner. This project focused on creating an inclusive bone physiology class for visually impaired students by developing a learning sequence that includes an interactive virtual class, a wearable multisensory interactive shirt and inclusive assessment. The virtual class was created using VisualBasic from Microsoft Corporation to explore simultaneously images and sounds addressing core concepts in bone classification, osteogenesis and bone physiology. As hands-on activity, we built an electronic prototype of a long sleeved shirt with LED lamps and vibrators controlled by a glossary board containing buttons, images and terms in Braille. The wearable prototype can be easily manufactured by teachers and students, and it is low cost, interactive and eco-friendly if materials were collected from old mobile phones. The interaction student-prototype allows students to experience tactile vibration over ulna, radius, humerus, clavicle, scapula, ribs, sternum, lumbar vertebra and thoracic vertebra. Flashing LED lamps facilitate identification of non-volunteer classmates. The wearable glossary that we have created can be used in basic and higher education to teach bone classification, bone function and musculoskeletal correlation. About 50 students have attended the experimental class demonstration, which was rated as engaging, curiosity-arouser and well-structured. Thus, the use of a wearable shirt can provide an innovative learning experience for any students and overcome learning issues in blind and visually impaired students.

Abstract 18

Using an online simulation to prepare students for an enquiry-based laboratory class

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Science units commonly involve some component of teaching through direct experience and observation of scientific phenomena, usually in "hands-on" or "wet lab" practical classes. One factor that limits the value of such classes is that many students arrive lacking an understanding of the underlying theoretical concepts. Students then tend to follow the experimental steps as if following a recipe, without giving much thought to the relationship between the experimental procedure and the research hypotheses. To address this issue, we developed an online simulation for students to complete in advance of a practical class that examines the neuronal control of gut motility in the isolated rabbit ileum (see the virtual experiment at ilearn.med.monash.edu.au/physiology/GastroSmoothMuscle/). We also transformed the existing practical class from a recipe-based to an enquiry-based practical laboratory exercise. Rather than following an extensive set of instructions, we introduced students to the context of the experiment, and asked them to produce research hypotheses and an experimental design that allowed them to determine which type of autonomic nerves modulated motility in their preparation.We administered anonymous surveys at the beginning of the practical class to examine the relationship between the (self-reported) time spent on the online simulation and the understanding of the practical preparation and underlying physiological concepts. Analysis of this survey data showed that student understanding of the theoretical concepts underlying the practical class was significantly correlated with how long they spent on the virtual experiment, but not with how long they spent reading the practical notes. Anecdotal feedback from the teaching associates also suggested that the virtual experiment improved student understanding of the practical preparation compared to previous cohorts. This suggests that self-paced online interactive simulations are an effective way to ensure student understanding of theoretical concepts in advance of practical classes, allowing for a more realistic experience of the scientific method and a more effective use of the time spent in the laboratory.

Abstract 19

Online skills hub: Blending the best of both worlds

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This paper reports on a collaborative project currently underway at the University of Auckland, Faculty of Medical and Health Sciences, to develop a suite ('hub') of online resources for undergraduate students studying biomedical science. The purpose of the online biomedical skills hub is to enable students to develop the deep learning and critical thinking required to successfully complete their degree and prepare them for a career in science. The modules will complement and reinforce skills taught in laboratory classes and developed through assessments such as report writing and literature reviews. Modules are designed to be self-directed and engaging and have the potential to be adapted to other science subjects. This paper will showcase two of the modules developed so far (report writing and literature reviews). We will discuss the development process, opportunities for blended learning, how a student-centred approach was incorporated, and highlight some of the key active learning elements. Finally, we examine the impact (to date) on teaching and learning along with future developments.

Abstract 20

Portfolio in physiology courses improves student performance in undergraduate science teacher education program

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Portfolio in teachers training has been shown to promote ownership of learning and to encourage students on premature thinking of their teaching practices. However, the impact of portfolios in the performance of undergraduate science teacher students in physiology courses remains to be elucidated. To address this issue, we created a portfolio, for the Human Anatomy & Physiology course of a science teacher education program, to evaluate the engagement of the students and its correlation with grade, scores and student performance. Firstly, the analysis of the learning style preferences of the undergraduate Science and Math teacher students, from the Federal University of São Paulo, revealed a combination of kinesthetic (28%), auditory (26%) and read/write (26%) preferences. Then, we created a tailored portfolio including different styles of activities, such as: inquiry-based learning, customized learning, problem-based learning, collaborative-learning, arts-based learning, mobile learning, game-based learning, and traditional practical lessons. Approximately 98% of students who scored at least 6 out of 10 points on their portfolios passed the course without a retake. On the other hand, about 66% of failed students scored less than 6 on their portfolios. Also 74.3% of the Students that improved or sustained their grades between exams scored more than 6 on their portfolios. Finally, Pearson analysis revealed a statistically significant Strong positive correlation between portfolio completion and scores in the final exam ($r = 0.79$, $p < 0.01$), consequently portfolio was also positively related with student's success in the course ($r = 0.62$, $p < 0.05$). Thus, portfolio experience in a physiology course is an effective supplemental didactic tool that improves student performance, engagement and literacy in physiology for science teacher students.

Abstract 22

Technology supported transformation of clinical officer education in Malawi

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Malawi's population of ~17m is served by only 600 doctors and Clinical Officers are vital to delivering health care and providing basic and emergency surgery including caesarean sections in rural district hospitals. In 2013 the University of Malawi College of Medicine (COM) introduced specialty 3-year BSc courses for qualified Clinical Officers to provide them with a career ladder and potential to further their education at Masters level. The BScs have a campus-based first semester (biomedical sciences) followed by clinical attachments in various hospitals and health centres. The University of Edinburgh (UoE) has had a ten-year association with the COM through several Scottish Government-funded initiatives. One of these enabled a team of UoE faculty, technical and library staff to work with their counterparts at COM to help them to deliver a modern curriculum making use of educational technologies where appropriate. A course VLE (COMPASS) was jointly developed in 2013/14 by UoE and COM technical staff using Moodle and deployed for the 2014 cohort. COMPASS is delivered from COM servers, and maintained and further developed by COM technical staff. Alongside the technical development, COM staff attended training workshops led by UoE staff to provide them with the knowledge and skills to create course content to populate COMPASS, develop online learning resources and introduce online assessment systems. A range of data was collected including: student IT ownership, awareness and skills (annual survey); VLE usage statistics; number of staff trained in VLE use, resource creation and e-assessment; number of online resources made accessible via the VLE. In summary the data shows: A) all students have mobile phones and the % of smartphones has risen from 15% in 2013 to 56% in 2015. Computer ownership (mainly Windows laptops) also increased from 26% in 2013 to 100% in 2015. B) the Project trained a total of 93 COM staff in UoE-led workshops and 103 staff have been trained locally by COM staff. 2) there are 123 modules represented in COMPASS across the biomedical sciences (5) and five specialties (Paediatrics & Child Health; Obstetrics & Gynaecology; Anaesthesia & Intensive Care; General Surgery; Trauma & Orthopaedics). C) >400 Teacher-developed files have been uploaded to COMPASS including: course support documents (e.g. PDF, PPT); interactive learning resources created by COM staff (e.g. video and content rich, interactive virtual patients) and >50 links to UoE and external resources sourced and quality-assured by COM staff. D) Between October 2013 and March 2016 there were 3723 logins and 73000 page views from 83 unique users (two cohorts of students (approx 40/cohort plus staff). Most students access COMPASS between 9am-5pm. E) 45 students from the 2015-16 BMS module successfully completed a summative online exam delivered via COMPASS and developed and supported entirely by COM staff. Both staff and students reported very positive experiences. In conclusion the joint UoE/COM Project has delivered a modern technologically supported curriculum for five specialty BSc courses. The emphasis has been on training COM staff to deliver sustainable platforms, systems and educational processes that can be supported and further developed locally.

Abstract 23

The Achievement of Learning Objectives, and Perceptions of Students And Lecturers, After Following Team Based Learning And Problem Based Learning Methods In a Single Physiology Module

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Application of Problem Based Learning (PBL) was considered less effective for achieving the learning objectives of basic medical sciences, such as physiology. Students tend to focus on the discussion of clinical topics that are more applicable. A cross over parallel study was conducted to compare between the application of PBL and Team Based Learning (TBL) in a single learning module. The study aimed to assess achievement of learning objectives, student's perception and feedback from lecturers. Study was conducted on students who were undergoing "Body Function" module for 7 weeks. Students were divided into two parallel classes (class A and class B). In each group, the students were exposed to both TBL and PBL methods, with similar scenario and the same learning objectives. This study found that the achievement of learning objectives physiology score through TBL method were significantly better than PBL method. Students responded that TBL helped them better focus on achieving the learning objectives and more easily understand physiology, so they were more motivated to explore the topic. Both methods were considered equal good in terms of establishing a framework of hypotheses, stimulating self-learning, expanding science, and building critical thinking skills and logical thinking. PBL method was considered better at spurring discussion activity, and brought them closer to the tutor. The facilitators gave a response that TBL method was better in building students's understanding of physiology. TBL method should be carried out by facilitators who master in physiology. The facilitator should spend a greater concentration on TBL, because of the involvement of a facilitator in the discussions should be more intensive than PBL. This study revealed that TBL method was able to make the students focused to achieve learning objectives, without having to leave SPICES strategy. However, TBL method is less better in building the generic capabilities in the areas of communication and group dynamics.

Abstract 24

Understanding clinical trials by using data collected during the physiology laboratory course

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Clinical trials are crucial for advancing medical knowledge and improving patient care. Medical students are exposed during their studies and later in their professional life to many clinical studies, but they must keep a critical eye on the many studies published to ensure that a new approach is safe and useful. However, their understanding of study design, clinical data gathering, data verification/interpretation, and proper use of statistics is often limited. To familiarize the student early in education to the objectives and complexity of clinical research, we have developed in our Physiology curriculum a practical way, within the frame of a larger module on scientific thinking and methodology, to teach clinical data gathering and hypothesis testing. In a first step, our students take the opportunity during several sessions of our standard human physiology laboratory course to collect a lot of personal data on their own bodies, such as blood pressure and heart rate supine and standing, ECG characteristics, body weight and composition by bio-impedance, respiratory parameters by plethysmography, lifestyle habits and parental risk factors via a questionnaire, and so on. At the end of the course, all collected data are entered anonymously in a big database. Then, the students are divided in small groups of 4 or 5 students and instructed to use the database after proper data verification to test various preset hypotheses such as studying the relationship between blood pressure and total body fat or between gender and heart rate reactivity to standing. After a formal statistical course, they use the proper statistics to test the initial hypothesis; they make a review of the literature and present and discuss their results with statistics and graphs both as a poster and as an oral communication in a scientific symposium in front of all students. We have found that this approach motivates the students, by using their own data, for a better understanding of study design, clinical hypothesis testing and data analysis and interpretation. Furthermore, it gives them the opportunity in a team work to present and discuss their data in a mock scientific symposium.

Abstract 26

Investigating human physiology: an inquiry-based learning approach merged with mobile learning

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The use of inquiry-based learning in practical lessons has been shown to be more effective in developing scientific reasoning than traditional step-by-step instruction. However, the application of this approach in human physiology courses is restricted to the availability of specific facilities and lab equipment. Aiming to encourage undergraduate science and math teacher students in expanding their didactic repertoire, an inquiry-based project were asked to be performed by means of using smartphones' application (App) to collect data and confirm their hypothesis. Approximately 70 freshman students enrolled in the science and mathematics course from the Federal University of São Paulo had to create and test a hypothesis to investigate some non-invasive variable of their bodies, as project for summative assessment. Although the use of smartphone was suggested in order to introduce the concept of mobile learning laboratories (MobLeLabs) to the future science teachers, about 80% of students adopted it, but 20% opted for a smartphone-free project. Considering our taxonomy for MobLeLabs, approximately 87.5% of the approaches used genuine/built-in and 8.33% were alternative/built-in Apps. Cardiovascular physiology and neurophysiology were the most recurrent topics chosen by the students. Among physiological variables investigated, heart rate (35.8%), blood pressure (12%) and sleep quality (10.45%) were the most frequent. In addition, analytical hypothesis were 48% more observed than descriptive hypothesis, and the majority of the projects were conclusive rather than speculative. Overall, we have created an engaging activity that motivates students to use smartphones in a creative manner to test a scientific hypothesis in physiology, independently of lab equipment. This inquiry-based approach can stimulate undergraduate students to elaborate scientific reasoning and can be transposed to secondary education.

Abstract 27

The use of clinical cases and an integrated evaluation in a Physiopathology course for Pharmacy students

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Introduction. In 2016, in order to make the class more interactive and promote active participation of the students in the acquisition of knowledge, we made a methodological-didactical change in Physiopathology course. We used a specific problem, a clinical case (CC), to integrate the basic area with the clinical aspects and promote the development of clinical thinking. (Castaneda Licon 2015). The subject previously consisted of theoretical classes and each topic was evaluated independently. The classes did not have enough teacher-student interaction and an integrative deficiency was observed. This evaluation methodology offered the students an organizational advantage to pass the course, but it prevented them from integrating knowledge and relating pathologies that tend to occur together. Taking these observations into account, we considered incorporating the didactic resource of problem-based learning through the use of CCs. The evaluation consisted in the resolution of CCs integrating different pathologies developed throughout the course. **Objective.** Analyze the general opinion of the students about the inclusion of CCs and the changes in the evaluation methodology. **Results.** A voluntary and anonymous survey was filled in by the students at the end of the course. The results showed that: a)100% of the students believed that knowledge acquired in Physiopathology will be useful for their professional practice. B) 47% of the students said that the use of CCs was a good practice, 42% that it was not so good, and 11% that it was a bad choice. Students who gave satisfactory opinions, stated that the application of clinical reasoning allowed them to achieve a better understanding and integration of contents, and that it was useful as a practice for test resolution. The negative opinions were related to insufficient time to completely understand these practical problems. C) 84% of the students said that they would be interested in having more classes with CCs. D) 61% of the students said they preferred the former evaluation methodology, because they found it easier to organize their study, while 39% preferred the new one because it gave them a better understanding as a whole. There were no significant differences in the number of students who passed or failed to pass the course in 2014 -2015 compared to 2016. **Conclusions.** The inclusion of CCs in Physiopathology promotes students' interest in the subject and helps them to understand the different topics developed. The students showed interest in having more classes with this new methodology, but still preferred to have the topics evaluated separately. This discrepancy could show a perception that studying the topics separately would be an easier way to organize their studying and pass the course. The students' opinions will allow us to elaborate new strategies to improve next year's course, such as more CCs, more complex CCs that relate different associated pathologies, and dedicating more time in the most difficult topics, hoping that improving these new methodology could lead us to an increase in students' motivation and performance.

Abstract 28

Reactivation of a previous knowledge thought weekly tests improves human physiology learning

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Physiology is an essential basic curricular component in health and biology undergraduate courses; however, a lot of students have difficult in its learning. So, it is necessary to search for alternatives that circumvent this difficulty and favor the students' learning. Recent find of neuroscience demonstrate that it is easy learn something through the reactivation of previous memories, since the retrieval can induce memory reconsolidation, and, so, new information can be added to the previous ones. This propose have the objective to evaluate the effectiveness of the use of weekly tests to promote memory reactivation and improve students' physiology learning. This study was conducted with two groups of students from Physiotherapy and Nursing that were coursing Human Physiology between 2014 and 2015 (n = 86). Both groups had physiology classes one time in the week for 17 weeks. One group was submitted (n=41), in the first moment of each meeting, to one test related to concepts and content worked in the preceding class; the other group no. Except for the test, the class was equally developed in the two groups. The weekly test consists in a subjective question related to the content worked in the preceding weekly class and the questions were always developed seeking cover the main themes of each content, looking for stimulate the student to retrieval the memory formed in the previous class, reactivating the memory and, so, promoting its reconsolidation, strengthening and retaining that knowledge. After the test, the professor stimulated the discussion of the issue. To evaluate the proposal, we compared the groups' performance in a physiology test. Additionally, students of group one were invited to answer a questionnaire addressing their perception about the proposal. The results of the questionnaires were quantified and are expressed in percentages, while for the performance comparison was made by a Student t-test, considering significant values of $P < 0.05$. The average score of the students who performed the tests was significantly higher (7.0 ± 0.21) than the ones that did not (5.4 ± 0.19) ($P < 0.0001$). Additionally, 87% of the students considered that the proposal contributed to their physiology understanding and 87% said that this methodology facilitated the identification of problems and difficulties related to the contents. Yet, 77% said that the weekly tests were effective in improving their performance in physiology. These results demonstrate that the reactivation of previously memories related to the topic that will be teach can facilitate the learning and improve human physiology learning.

Abstract 29

Assessment of long-term learning on the use of educational games compared to traditional lessons

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The aim of this study was to compare the long-term learning of students about physiology subjects learned by active teaching methods or by traditional lectures. This study was approved by Ethics Committee (protocols 34/2015 and 22/2015). A total of 146 students from the Dentistry School of the State University of Campinas (UNICAMP) participated in the study, being the number of students participating in the survey from the fourth (n = 30) and fifth (n = 11) years. They answered questions about subjects that had been studied in the first year of the undergraduate Dentistry course. In the first year of the undergraduate course, they had classes about cardiac cycle and action potential with combination of lectures, educational games and group discussions, and traditional lectures about pancreas physiology. The students were invited to answer one multiple choice question about each one of the themes indicated above. The percentage of correct answers about cardiac cycle (46.7%, 63.6%) and action potential question (33.3%, 45.5%) was significantly higher than the percentage of correct answers about pancreas (20%, 9.1%), respectively, for students in the fourth and fifth year respectively. These preliminary results suggest that the use of the educational games puzzle combined with lectures and group, as active method in teaching seem to improve learning and fixation of the content in the long term when compared with only lectures.

Abstract 30

Secret Santa Cell: promoting trans-customized-learning in human physiology courses

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During adolescence boredom, the search for acceptance in their social groups and the rapid changes of ideas make students to conquer their individual space and identity. Oppositely, teaching practices and didactic materials tend to be generic and decontextualized of students life and personality. Considering that teachers and professors have so many students, which make infeasible customization of learning activities, we have created and analyzed the outcomes of a didactic approach to engage students in learning physiology through a purposely customized-learning. By the end of the semester of our Human Anatomy & Physiology course, students are in the mood of Christmas, and preparing their creativity to by the gift for his Secret Santa Friend. So, all students were, one month in advance, named as human body cells and each student secretly picked a cell-friend in order to understand the characteristics of that cell, and buy a customized gift to be given to the cell-friend by playing a guessing game. Voice recordings, photographs and notes were taken to analyze the scientific reasoning in anatomy and physiology throughout the process. After categorization, it was observed that the majority of the students (47%) chose tips related to cell function, followed by cell location (23%) and free-association (8%). The student decision to buy a personalized gift to the cell-friend was mostly (57%) based on physiological characteristics. Also, the most recurrent gifts were chocolates, which were given to secret cell-friends related to glucose metabolism such as adipocytes and pancreatic cells. Condoms were also highly chosen to gift spermatozoids and oocytes secret friends. Overall, students were very engaged, participative, creative and committed to understand themselves cells and their secret Santa friend. The activity we created is very effective to transform impersonal learning into a customized learning. The outcomes show high levels of engagement and inspiration to acquire knowledge after classes.

Abstract 31

The use of an educational game to integrate the physiology of sinapses, muscle contraction and autonomous nervous system: perception of students

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Educational games may increase students´ motivation and engagement. In order to help students to integrate their knowledge about the physiology of synapses, muscle contraction and autonomous nervous system (ANS), we use an educational game in physiology classes. The objective of this project is to present this game and evaluate students' perceptions about it. The game is a kind of puzzle constituted by one board divided in 3 columns (1- synapse /neurotransmitters/ receptors, 2 – target organ and 3 - effects on target organ) and chips to fill the columns (acetylcholine, noradrenaline, adrenaline and figures of neurons; adrenergic and muscarinic receptors; skeletal muscle, vascular smooth muscle, gastrointestinal muscle). The institutional ethics committee (protocol # 033/2015) approved this study. Students of the first year of the Dentistry undergraduate course at Piracicaba Dental School, University of Campinas, Brazil, participated in this study. After having lectures about synapse, muscle contraction and ANS, the students were divided into groups of 5 to 6 members, in a laboratory. Each group received a game, and was instructed to fill in the columns with the chips correctly. During this activity, the students should remember and apply their knowledge about the diversity of receptors for neurotransmitters in the body, the diversity of neurotransmitter effects depending on the subtype of activated receptor, the diversity of the synapses in the somatic and autonomic nervous system. When the group finished filling the table, a monitor evaluated if the placement of the pieces was correct. If there was an error, the students were informed that they should review the placement of the pieces, but they were not given any indication of which were the errors. In this way, we tried to stimulate the discussion among the students so that together they identified the incorrectness. After all the chips were placed correctly, the group received questions to discuss and answer. In order to analyze students' perceptions about the educational game, in a later class, the teacher asked them to answer the question: "In the last practical class of physiology you used a puzzle about synapse, SNA and muscle contraction. Did the use of the puzzle improve in your learning? Why? ". Of the 81 students enrolled in the course, 74 answered the question to evaluate the educational game. For all the students, the educational game helped in learning, because with it made the content more concrete, the class was more dynamic, and there was more interaction among the students. These results, although preliminary, seem to be in agreement with the data of the literature showing that educational games can improve learning.

Abstract 32

Detecting a problem, finding a solution: Cooperative work in the academic environment as a key to success

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A tutorial program for retaking students was recently established at the Department of Physiology and Biophysics, School of Medical Sciences, UNLP. We observed that most students belonged to the Teacher Training in Biological Sciences of the School of Humanities and Learning Sciences (FaHCE), who have attended this subject in the mentioned Department for many years. The syllabus content is about understanding the mechanisms that work to keep the human body alive and functioning as compared to a pathological state. These topics does not seem to meet the future Humanities teachers' interests. Consequently, at the end of the year 2015 the professors of the present Department and the Director of the Department of Natural and Exact Sciences (FaHCE) had concern about creating a space for the development of the specific needs of training professionals. Thus, we have created a cooperative department where the students attend theoretical classes in their academic unit, and they go to specific practical works together with the students of the School of Medical Sciences of UNLP. This particular approach arises to maximize the use of teaching and building resources and at the same time to maintain the scientific formation granted by the School of Medical Sciences and develop academic activities more efficiently. Teaching is organized with theoretical classes given before teaching the practical works, so students have previous knowledge which enables them to interpret the performed experiments; their learning becomes significant. On the other hand, we carry out activities together with the Department of Specific Didactics in Biological Sciences of the FaHCE to articulate and focus the contents within the framework of the ongoing programs of secondary education. Given the reduced number of students, we proposed a course with an automatic pass subject to a continuous evaluation, considering the individual performance, the commitment to the preparation of theoretical activities such as seminars, and the expository and research classes. Since our students are potential teachers, the development of competences linked to their professional practice will be considered: knowledge communication, expository clarity, and correct use of academic language. As a final step to accomplish the objective, we decided the implementation of a final written communication consisting of a potential school planning. They chose a topic included in the syllabus and adapted its content to a class environment. Out of 11 enrolled students, 90% automatically passed the subject, the remaining students satisfactorily passed the final exam. Although the program has a recent implementation, the results are promising. We observe our cooperative work has granted a positive attitude and a new perspective to these students.

Abstract 33

Using the olympics games ideals to improve teaching-learning: the biomechanics olympics games

Carpes, F. P. [1]; Rocha, E. S. [1,3]; Kunzler, M. R.[1]; Mello-Carpes, P. B.[2]

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While teaching biomechanics for undergraduate students, some characteristics of the Olympic games were used to create the "Biomechanics Olympic Games", an educational project, included in the regular course, and that includes ideals and philosophy of the Olympic games to motivate students and stimulate productivity and a full enrollment with the topics of the course. The project is developed along the academic semester and involves different activities, identified with the philosophy of Olympic modalities, and dedicated to improve teaching-learning process, but also contribute to the hidden curriculum by promoting team working, personal and group challenges, contact with the local community and with other students, and science popularization. At the start of the course, the professor and teacher assistants propose activities that compose the Biomechanics Olympic Games (BOG). Students are free to join the project or they can take the course and complete the regular written assignments, laboratory practices and reports. BOG activities are fully explained to the students. They have the whole academic semester (17 weeks) to complete 7 tasks. They work in teams, and by using the online website of the BOG (site in Portuguese: https://sites.google.com/site/olimpiadadebiomecanicagnap) they can be updated about the ranking of the teams, and also check all the orientation for each one of the tasks anytime they need. In the end of the semester, the points obtained in BOG will compose up to 20% of their final grade. The others 80% of the grade are completed by 3 written exams plus an individual research proposal (60%) and research-driven experiments that they performed in the laboratory and present orally in the class (20%). BOG is performed extra-class. Our more important quantitative result is that redo percentage dropped. In general redo percentage dropped from 60% in 2012 to between 10 and 20% from 2013 to 2015 and 8% in 2016. However, there are other results, sometimes more subjective, that are worth to be mentioned. Those include the opinions of the students. As first year students, most of them still are building their idea about academia and future profession. Some remarkable comments (requested by anonymous reports) concerning the BOG initiative includes that BOG helps them to study in extra class time, promote interaction between students, help them to learn additional topics, like scientific writing and statistics. Furthermore, some activities involved laboratory experiments and it was reported as good because during the regular laboratory practices there is limited time and sometimes just some of the student can perform tasks. The inclusion of innovative strategies for teaching and learning in the university are welcome by the students since they are previously informed and can participate not only in the development of the project, but also its creation. In our case, the project BOG has been successful as it helped to drop the redo rations. Furthermore, contributes to the divulgation of scientific knowledge inside and outside the university and increase the expectative of he students before starting the biomechanics course.

Abstract 34

Junior scientific initiation on neurophysiology: high-school students perception

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Scientific initiation (SI) is a function in which undergraduate student develops activities related to the planning, execution, interpretation and communication of scientific research. Since 2003, the National Council of Scientific Development and Technology – CNPq/Brazil implemented scholarships for high school students (named Junior scientific initiation - JSI). This project main to disseminate scientific and technological knowledge, as well to develop skills for students' scientific and technological education. At Federal University of Pampa (UNIPAMPA) this program was implemented in 2014 and there are still no indicators of the program impact on JSI lives. In this way, the goal is to report expectations, experiences and the impacts of the JSI in their lives. Between 2014 and 2017, the Research Group on Physiology (GPFis) and Research Group on Applied Neuromechanics (GNAP) - UNIPAMPA Uruguaiana/RS, that research in some aspect of neurophysiology, received 5 JSI. These high school students, aged 14 to 16 years, are from public schools in Uruguaiana/RS/Brazil. JSI students were selected in specific periods (according CNPq public announcement) through interviews. After selection, the tudents started JSI activities at GPFis or GNAP. Although Activities included participation in routine laboratory tasks, reading and discussion of book chapters, as well as presentation in weekly scientific discussions. In addition, the students assisted in the execution of ongoing projects in the laboratories and participated in scientific events and outreach activities promoted by research groups. These activities were advised by the professor leader for the research group and supervised by graduate students. In order to evaluate the participation of JSI students, after 1 year scholarship, a semi-structured interview with open questions was conducted. The interview addressed four main aspects: i) previous knowledge; Ii) expectations; Iii) participation in junior scientific initiation; and, iv) impacts: in personal, schoolar and professional life. The interview was done individually with each student, being recorded with the consensus of the same and later transcribed. Most of the students already knew Unipampa before starting JSI, although some had never visited the university before. In addition, one of the students stressed that he did not know the gratuity of the university. Concerning expectations regarding JSI, all students reported that the search for knowledge and learning were the main factors that encouraged his participation in the program, it was also agreed among them that their expectations were met during their period in the research groups. To reinforce, the students stated that JSI was beyond what they expected. As for the changes in personal and professional life, it is especially important to increase the knowledge of the students in which they reported feeling more interested in researching and in learning new things. All them emphasized that, in some way, their involvement in the program positively changed their way of thinking. Faced with students participation in JSI program and the reports about the impact of JSI in their lives, this has been a fruitful experience and has positively impacted the lives not only of JSI students, but also of the other members of their respective groups of research.

Distinctions

Poster No 03
Stokes, C; Hall, S; Harris, J; Scott, D; MacMillan, F; Davies, D.
"The Physiological Society: Supporting international dissemination of teaching innovations in the life sciences"

Poster No 11
Albuquerque, F. S.; Gouveia, R. L. B.; Cantalice, T. S. A.; Oliveira Júnior, F. A.
"Supplementary resources in teaching-learning of cardiac action potentials physiology"

Poster No 17
Nogueira, T.; Morais, V. L.; Esposito, A. C.; Lucio, A. B. M.; Mollo, I. X.; Moraes, C. P.; Barros, N. M. T.; Lellis-Santos, C.
"Interactive and weareble glossary for inclusive education in introductory bone physiology classes"

Poster No 18
Quiroga, M. M.; Choate, J.
"Using an online simulation to prepare students for enquiry-based laboratory classes"

Poster No 19
Bhargava, A.
"Online skills hub: blending the best of both worlds"

Poster No 28
Gonçalves, R. ; Sosa, P. M.; Altermann, C.; Mello-Carpes, P. B.
"Reactivation of a previous knowledge thought weekly tests improves human physiology learning"

Poster No 30
Bueno, D. S.; Souza, G. L. P. ; Costa, D. L.; Contrucci, C.; Lellis-Santos, C.
"Secret Santa Cell: promoting trans-customized learning in human physiology courses"

Poster No 33
Carpes, F. P.; Rocha, E. S.; Kunzler, M. R.; Mello-Carpes, P. B.
"Using olympic games ideals to improve teaching-learning: the biomechanics olympics games"

Awards

4th Place (Poster No 31)
Amício Castro (presenter)
Co-authors: Marcondes, F.K
"The use of an educational game to integrate the physiology of sinapses, muscle contraction and autonomous nervous system: perception of students"

3rd Place (Poster No 13)
Gabriela Monteferrante (Presenter)
Co-authors: Lellis-Santos, C.
"Cardiovascular physiology concepts integrated with artistic elements as an engaging and effective strategy for science teaching and learning"

2nd Place (Poster No 32)
Claudia Caldiz (Presenter)
Co-authors: Vittone, L.; Said, M.; Lapasta, L
"Detecting a problem, finding a solution: cooperative work in the academic envoirоment as a key to sucess"

1st Place (Poster No 08)
Nicholas Enrique (Presenter)
Co-authors: León, I. E.; Moncada, M; Tolosa, M. J.; Milesi, M. V.; Mobili, P.
"Evaluation as a key of the teaching-learning process in Physiology: different strategies to promote the development of content-related and non-content-related skills"