

Project title: *Impact of interactive instructional tools in Gross Anatomy for Optometry Students: a Pilot Study*
ASCO Starter Grants for Educational Research

I. Cover sheet

Dear Dr. Christina Doyle and members of the Association of Schools and Colleges of Optometry,

Please consider my application for the Starter Grants for Educational Research Program.

The title of the project I am submitting is: "*Impact of interactive instructional tools in Gross Anatomy for Optometry Students: a Pilot Study*". This is a new project and I have not submitted it to any additional agency to request for financial support.

In this application package I am including a description of the project, justification of the requested budget and a short version of my CV for your consideration.

Yours truly,

A handwritten signature in dark ink, appearing to read 'Patricia C. Sanchez Diaz', with a large, sweeping flourish at the end.

Patricia C. Sanchez Diaz, DVM, PhD
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Rosenberg School of Optometry, UIW
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II. Description of Educational Research Project

Background: Different studies and theories have historically aimed to find the perfect strategy to obtain the best achievements fitting the peculiarities of adult learning.

However, it seems that there is not a perfect recipe for success in this matter. Consistent with humanistic and constructivist learning theories, some recent studies have demonstrated the effectiveness of student motivation and of the utilization of interactive experience-based learning methods (constructivism) in anatomy courses.

Clinical Anatomy is a challenging discipline for Optometry students. It requires deep knowledge of anatomical structures, function and relations in order for the student to successfully establish the clinical correlates. Classical approaches to learn anatomy have emphasized in the memorization of endless lists of descriptive anatomical terms and features. Prove of this is the also endless and maybe even creative catalog of mnemonics to remember them. New technologies are having a huge impact in teaching and learning techniques. Interactive visual tools are becoming very popular, especially virtual dissections and 3D interactive anatomical models that aim to visualize and to better understand the potential clinical implications of anatomical dysfunction. The aim of the study proposed here is to determine if these web-based tools may have a positive effect in learning outcomes in Optometry Students.

Hypothesis: The utilization of audiovisual web-based resources and 3D models may complement the classical instructional tools used in anatomy, may implement the benefit of the laboratory instruction and may provide with a set of valuable review tools that students can access anytime.

Methods: 60 first-year Optometry students will be split into two laboratory groups. In both groups, laboratory instruction will be performed for a period of 12 weeks. For the first group of students, traditional methods will be followed based on the use of atlas, textbooks, and anatomical laboratory models. Instruction of the second laboratory group will be supplemented by the addition of interactive and audiovisual tools including dissection, medical procedure, and/or functional anatomy short videos. At the end of each laboratory session, the students will be asked to: i) perform a laboratory evaluation using a standardized questionnaire using a five-point Likert scale to gather student feedback and;

ii) to take a post-laboratory quiz. For normalization purposes, the score the students obtained in each post-laboratory quiz will be divided by the final grade each student obtained in the Gross Anatomy course. The distribution of the relative scores will be compared between both laboratory groups. Statistical differences in students' scores will be determined using T-test ($p < 0.05$).

Significance: To my best knowledge, this is the first study of this kind to be performed within a School of Optometry. The use of interactive tools may have a positive impact in student motivation. Students may become more cognitively engaged and thus improving their performance in this course. Furthermore, a positive outcome in this pilot study will allow us to test similar strategies in additional and more clinical Optometry courses. The potential application of interactive strategies may boost student confidence and, consequently, they may become less dependent on the instructor. Overall this may result in a more efficient utilization of instruction time.

Timeline: The study proposed here will be performed during Fall Semester 2011. Analysis and interpretation of the data will be carried out during Spring Semester 2012.

III. Detailed Proposed Budget

Concept	Price per unit	Total
iPad: 3 units	\$620	\$1,860
<u>Anatomy applications for iPad: 3 units each</u>		
Netter's Anatomy Flash Cards, 3rd Edition.	\$40.00	\$120
Gray's Anatomy for Students Flash Cards	\$40.00	\$120
Heart Pro (NOVA Series) - iPad edition By 3D4Medical.com, LLC	\$18.00	\$54
Skeletal System Pro II - (NOVA Series) - iPad edition By 3D4Medical.com, LLC	\$18.00	\$54
About Muscle System Pro II - (NOVA Series):	\$18.00	\$54
Nervous System - iPad edition By	\$5.00	\$15

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3D4Medical.com, LLC		
Digestive System - iPad editionBy 3D4Medical.com, LLC	\$5.00	\$15
Office supplies		\$200.00
TOTAL amount requested		\$2,384

- **Conflict of Interest:** The applicant has not submitted this project to any additional funding agency.

IV. Curriculum Vitae of Project Coordinator

- **Education and training:**

INSTITUTION AND LOCATION	DEGREE <i>(if applicable)</i>	YEAR(s)	FIELD OF STUDY
Facultad de Veterinaria, Universidad de Extremadura, Spain	DVM	1997	Veterinary Science and Medicine
Centro Nacional de Biotecnología (CSIC), Madrid, Spain	PhD	2002	Molecular Biology
Hospital Universitario Ramon y Cajal, Madrid, Spain		2003 – Aug 2004	Molecular Biology
Greehey Children's Cancer Research Institute, UTHSCSA, San Antonio, TX		Sep 2004 – Jun 24 th 2008	Molecular, Cell and Tumor Biology
Greehey Children's Cancer Research Institute, UTHSCSA, San Antonio, TX		Jun 24 th 2008- present	Molecular, Cell and Tumor Biology

Positions and Employment

- Sep 2010- present: Assistant Professor. School of Optometry. UIW. San Antonio, TX.
- Jun 24th 2008- present: Post-doctoral fellow. Gail E. Tomlinson laboratory, Greehey Children's Cancer Research Institute, UTHSCSA, San Antonio, TX

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- Sep 2004 – Jun 24th 2008: Post-doctoral fellow. Luiz O. F. Penalva laboratory, Greehey Children's Cancer Research Institute, UTHSCSA, San Antonio, TX
- Jan 2003 – Aug 2004: Post-doctoral fellow. Fernando BaqueroMochales laboratory, Ramon &Cajal Hospital (SERMAS), Madrid, Spain
- Jan 1999 – Dec 2002: Graduate Student. Jose Luis Martinez Menendez laboratory, Centro Nacional de Biotecnologia (CNB, CSIC), Madrid, Spain
- Nov 1993 – Dec 1998: Student Associate. Department of Animal Health, Facultad de Veterinaria de Caceres (UEx), Spain

Laboratory supervision

- Aug 2005-Dec 2006: Kathleen Morneau. Project Student.
- Mar 2005-Aug 2007: SoudhaminiChennasamudaram.Master Student. Co-supervised with Luiz O. Penalva.
- Feb 2006-Aug 2007: Tarea L. Burton. Especial Program Student.
- Sep 2006-Jun 08: Tarea L. Burton. Research Assistant.
- Jul 2008-Aug 2008: Tyler W. Snedden. Summer Student. Co-supervised with Jaclyn Y. Hung.
- Mar 2009-present: Anne Romeo. Graduate Student. Co-supervised with Jaclyn Y. Hung.
- Jun 2009-Aug 2009: Caroline Chung. Summer Student.
- Jun 2009-Aug 2009: Kate Bennert. Summer Student.
- Jul 2009: Mimi L. Chang. Medical Student.
- Nov-Dec 2009: DivyaChakravarthy. First year graduate student. 6 weeks rotation.
- Jan-Feb 2010: Erika Lackey. First year graduate student. 6 weeks rotation.

Teaching

- Sept 2010-Dec 2010: Clinical Gross Anatomy and Histology (18 lectures and 12 labs). Rosenberg School of Optometry, UIW. San Antonio, TX
- Jan 2011- May 2011: Ocular Biochemistry and Molecular Biology (13 lectures). Rosenberg School of Optometry, UIW. San Antonio, TX
- Jan 2011-May 2011: Clinical Ocular Anatomy Laboratory (shared with another instructor). Rosenberg School of Optometry, UIW. San Antonio, TX

Scientific Communications to international meetings in the last 5 years (inverse chronological order)

1. Anne Romeo, Judy C.Y. Chang, **Patricia C. Sanchez Diaz**, Kihoon Yoon, Gail E. Tomlinson, Jaclyn Y. Hung. "Ubiquitin carboxy-terminal esterase L1 (UCHL1) in stem-like cancer cells of embryonal neural tumors". AACR Special Conference: Stem Cells, Development and Cancer. March 3-6, 2011. Vancouver, BC. Canada.
2. Chang, Judy C, **Sanchez-Diaz, Patricia C**, Romeo, Anne, Tomlinson, Gail E., Chen, Yidong, and Hung, Jaclyn Y. "Regulatory functions of microRNAs in stem-like populations from embryonal tumor cell lines". AACR Special Conference: Stem Cells, Development and Cancer. March 3-6, 2011. Vancouver, BC. Canada.
3. **P. C. Sanchez-Diaz**, T. L. Chen, R. Meyers, M. H. Malogolowkin, J. Y. Hung, G. E. Tomlinson. "Sorafenib, gamma-secretase inhibitor and bortezomib as potential therapeutic agents for hepatoblastoma". ASCO 46th Annual Meeting 2010. Chicago, IL. American Society for Clinical Oncology. Poster presentation.
4. Anne Romeo, **Patricia C. Sanchez-Diaz**, William E. Haskins, Gail E. Tomlinson, Jaclyn Y. Hung. "Ubiquitin carboxy-terminal esterase L1 (UCHL1) in stem-like cancer cells of embryonal neural tumors". AACR 101st Annual Meeting 2010. Washington, DC. American Association for Cancer Research. Poster presentation.
5. Penalva, Luiz O.; **Sanchez-Diaz, Patricia**; Burns, Suzanne; Burton, Tarea; de Souza Abreu, Raquel; Vogel, Christine; Ko, Daijin. "A Multi-step approach to dissect the gene network regulated by the RNA binding protein Musashi1". International Conference on Systems Biology (ICSB) 2008. Gothenburg, Sweden, 2008. CMB at the University of Gothenburg, Chalmers Biocenter and Fraunhofer-Chalmers Center. Poster presentation.
6. **Sanchez-Diaz Patricia C.**, Vogel Christine, Hung Jaclyn Y., Burns Suzanne C., Burton Tarea L., KoDaijin, JianhuaRuan, PenalvaLuiz O F. "A multistep approach to dissect the gene network regulated by Musashi1 and its link to tumorigenesis". Systems Biology: Global Regulation of Gene Expression. Cold Spring Harbor, NY, 2008. Cold Spring Harbor Laboratories. Oral presentation by Luiz O.F. Penalva.
7. **Patricia C. Sanchez-Diaz**, Suzanne C. Burns, Tarea L. Burton, DaijinKo, Jaclyn Y. Hung, JianhuaRuan, Marilyn Archer, Luiz O.F. Penalva. "A role for the RNA binding protein Musashi1 in medulloblastomatumorigenesis". AACR 99th Annual Meeting 2008. San Diego, CA. American Association for Cancer Research. Oral presentation by Patricia C. Sanchez-Diaz.
8. Linares J.F., **Sanchez P.**, Martinez J.L. 16th European Congress of Clinical Microbiology and Infectious Diseases. Nice, France, 2006. European Society of Clinical Microbiology and Infectious Diseases. "Connexion between efflux pump expression and virulence in *Pseudomonas aeruginosa*". Oral presentation by J.L. Martinez.

Peer-reviewed publications in the last 5 years (inverse chronological order).

1. **P.C. Sanchez-Diaz**, T. L. Chen, R.L. Meyers, M. H. Malogolowkin, J. Y. Hung, G. E. Tomlinson. "Sorafenib, bortezomib, gamma-secretase and PI3K/Akt inhibitors target stem-like populations in aggressive hepatoblastoma cell lines". In submission.
2. Alvaro Hernández, María J. Maté, **Patricia C. Sánchez-Díaz**, Antonio Romero, Fernando Rojo, and José L. Martínez. "Structural and functional analysis of SmeT, the repressor of the *Stenotrophomonas maltophilia* multidrug efflux pump SmeDEF". *Journal of Biological Chemistry* **284** (21): 14428-14438. 2009.
3. Raquel de Sousa Abreu[#], **Patricia C. Sanchez-Diaz**[#], Christine Vogel, Suzanne C. Burns, DaijinKo, Tarea L. Burton, Dat T. Vo, SoudhaminiChennasamudaram, Shu-Yun Le, Bruce A. Shapiro, and Luiz O. F. Penalva. "Genomic analyses of Musashi1 downstream targets show a strong association with cancer related processes". *Journal of Biological Chemistry* **284** (18): 12125-12135. 2009. # co-first authors.
4. **Patricia C. Sanchez-Diaz**, Tarea L. Burton, Suzanne C. Burns, Jaclyn Y. Hung, and LuizOtavio F. Penalva. "Musashi1 modulates cell proliferation genes in the medulloblastoma cell line Daoy". *BMC Cancer*. **8**: 280. doi: 10.1186/1471-2407-8-280. 2008.
5. **Sanchez-Diaz P.**, Penalva LOF. "Post-Transcription Meets Post-Genomic: The saga of RNA Binding Proteins in a New Era". *RNA Biology*. **3**:101-109. 2006.

Participation in Research Projects in the last 5 years (inverse chronological order):

1. Project title: Gene Expression and Bone Biology
Institution: South Texas Veterans Health Care System
Funding agency: Veterans Affairs Office of Research and Development (VA-ORD)
Duration: Sep 2010-Sep 2012
PI: Sherry Abboud-Werner
Patricia C. Sanchez Diaz: Co-Investigator
2. Project title: Correlative Genetic Markers in Childhood Hepatoblastoma
Institution: Greehey Children's Cancer Research Institute, UTHSCSA. USA
Funding agency: NIH
Duration: from 29 Sep 2008- 31 Aug 2010
PI: Gail E. Tomlinson
Patricia C. Sanchez Diaz: post-doctoral fellow
3. Project title: microRNA and stem-like cancer cells in embryonal tumors
Institution: Greehey Children's Cancer Research Institute, UTHSCSA. USA
Funding agency: San Antonio Area Foundation
Duration: From Jun 2009-Jun 2010

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PI: Jaclyn Y. Hung

Patricia C. Sanchez-Diaz: collaborator.

4. Project title: Dissecting the participation of Musashi1 in brain tumors
Institution: Greehey Children's Cancer Research Institute, UTHSCSA. USA
Funding agency: San Antonio Cancer Institute and American Cancer Society
Duration: Dec 2006-Dec 2007
PI: Luiz O. F. Penalva
Patricia C. Sanchez Diaz: post-doctoral fellow

5. Project title: Role of the RNA binding protein Musashi1 in medulloblastoma formation
Institution: Greehey Children's Cancer Research Institute, UTHSCSA. USA
Funding agency: San Antonio Area Foundation
Duration: Jun 2006-Jan 2008
PI: Patricia C. Sánchez Díaz

OTHER

- Member of San Antonio Life Sciences Association
- Associate member of the American Association for Cancer Research
- Associate member of the American Society of Clinical Oncology
- Award to the best academic grades in Veterinary Medicine studies course 1996-1997 ("Primer Premio Nacional para Estudios de Veterinaria") by the Ministerio de Educacion y Cultura. (Published in BOE 12 of May 1998)
- Award "Luis de Cáceres": for Veterinary Medicine graduates year 1997
- "Ayudas al Estudio de Argentaria" award year 1998
- "Alumna Distinguida" Award by the Universidad de Extremadura for academic year 1996-1997