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Perspectives on Mathematics and Science (SCE4194/MAE4394)
Syllabus Spring 2019

Course Description and Objectives

Using socio-cultural perspectives, this course explores a selection of topics and episodes in the history of mathematics and science from around the globe as well as how these events impact mathematics and science education. The specific objectives and expectations include broad, intersecting learning goals including:

- demonstrating knowledge related to issues of multicultural mathematics and/or science education using historic perspectives from across the globe
- developing multicultural mathematics or science education lesson plans that incorporate historic perspectives and contexts
- conducting a global multiple-perspective historic analysis of an issue that impacts mathematics and/or science education
- demonstrating analytic and critical thinking skills through discourse and reflective writing

This is a Discipline-Specific Global Learning course that counts toward your graduation requirement.

Meeting Information

Meeting time: 9:30-10:45 Tuesday, Thursdays
Location: PC 331

Contact Information

Professor: Zahra Hazari
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Office phone: (305) 994-2222
Office hours: and by appointment

Nicole Cook
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and by appointment

Grade Scale

- A: 90-100%
- B: 80-89%
- C: 70-79%
- D: 60-69%
- F: <60%

Requirements

Textbook: Montgomery, S.L., & Kumar, A. (2016). A History of Science in World Cultures: Voices of Knowledge. Routledge.
Course Management: <http://canvas.fiu.edu/login/> (required every day)

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Grading Scheme

Activities	Points
Class Preparation and Participation	10
Homework	10
Reading Quizzes	10
Lesson Plan Draft	15
Lesson Plan Final	15
Presentation	15
Paper Outline/Draft	15
Paper Final	15
Professional Development Calendar	5
	100

Note: Late submissions will lose 10% per day including weekends/holidays.

Class Preparation and Participation

Punctual attendance is required. If you are absent or more than 15 minutes late for class, you will not receive the participation credit for that day. If you miss a class, you will be responsible for all notes, assignments, and announcements made in class. In addition to attendance, you will be expected to come prepared (complete all assigned readings) and actively participate throughout the class period in discussions and activities. Failure to participate will also result in your not receiving participation credit for that day.

The assigned readings for this course vary in length, and you are encouraged to read thoughtfully in all cases. Lightly skimming the material will not adequately prepare you for the level of critical thinking and engagement you are expected to display in class discussions. Some of the readings are from primary sources (such as writings by prominent scientists), other readings are from secondary texts (such as biographies). You are also required to do additional research and reading to inform your lesson plan. (Keep this in mind when budgeting your time for this course.)

Homework

Homework will be in a variety of formats including: timely and thoughtful responses to discussion board topics; giving peer feedback on assignments, and completion of in-class activities.

Reading Quizzes

There will be several reading quizzes throughout the semester. These will be administered in class only using a real-time response system. More details will be provided in class.

Lesson Plan

As a key component of this course, you will design and prepare a multicultural 5E Lesson Plan in groups of 3 to 4. The first version of the lesson plan will be due Feb. 12. You will receive written

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feedback on the lesson plan and each group will meet with the professor to discuss their lesson plans prior to submitting the final lesson plan on March 21. You will select the subject of these lesson plans from a variety of options. (Detailed instructions will be distributed separately.)

FEAPs fulfilled: multiple (multicultural lesson plan)

Presentation

In the same groups, you will teach a part of your lesson plan (e.g. activity) to the class. The grade for this component will partially be based on the instructor's assessment and partially on the assessment of your peers.

Paper

You will be required to write a paper of at least 2000 words (not including references) that addresses at least two historic perspectives that have influenced the teaching and learning of mathematics and science. These historic perspectives can draw on important mathematicians/scientists, texts, scientific norms, cultural practices, religious movements, and other socio-cultural influences on the development of knowledge. The paper will not only document these perspectives with evidence but also detail how they have influenced modern mathematics and science education. The draft of the paper is due March 5 and the final paper is due April 23.

Professional Development Calendar

You will be asked to identify and list a calendar of professional development opportunities and attend one of these opportunities online or in person. For each opportunity, write a paragraph describing the professional development that will occur and how it will improve your teaching practice. Be sure to include professional development in the history of mathematics/science or on global perspectives. The calendar is due April 18.

FEAPs fulfilled: professional development

Academic Integrity

"Florida International University is a community dedicated to generating and imparting knowledge through excellent teaching and research, the rigorous and respectful exchange of ideas, and community service. All students should respect the right of others to have an equitable opportunity to learn and to honestly demonstrate the quality of their learning. Therefore, all students are expected to adhere to a standard of academic conduct, which demonstrates respect for themselves, their fellow students, and the educational mission of the University. All students are deemed by the University to understand that if they are found responsible for academic misconduct, they will be subject to the Academic Misconduct procedures and sanctions, as outlined in the Student Handbook." FIU's Code of Conduct will be applied for all assignments, projects, reports and exams (http://academic.fiu.edu/academic_misconduct.html). In particular, cheating and plagiarism will result in a grade of zero with no options to resubmit.

Cheating: The unauthorized use of books, notes, aids, electronic sources; or assistance from another person with respect to examinations, course assignments, field service reports, class recitations; or the unauthorized possession of examination papers or course materials, whether originally authorized or not. Any student helping another cheat may be found guilty of academic misconduct.

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Plagiarism: The deliberate use and appropriation of another's work without any indication of the source and the representation of such work as the student's own. Any student who fails to give credit for ideas, expressions, or materials taken from another source, including internet sources, is guilty of plagiarism. Any student helping another to plagiarize may be found guilty of academic misconduct.

Disability Policy

For information on resources for students with disabilities, see <http://drc.fiu.edu/>

Course References

Primary Text:

Montgomery, S.L., & Kumar, A. (2016). *A History of Science in World Cultures: Voices of Knowledge*. Routledge.

Mathematics:

Alexander, A. R. (2010). *Duel at dawn: heroes, martyrs, and the rise of modern mathematics*. Harvard University Press.

Davis, P. J., & Hersh, R. (1998). *The mathematical experience*. Houghton Mifflin Harcourt.

Karp, A., & Schubring, G. (2014). *Handbook on the history of mathematics education*. Springer.

Suzuki, J. (2009). *Mathematics in historical context*. MAA.

Science:

Alic, M. (1986). *Hypatia's Heritage: A History of Women in Science from Antiquity Through the Nineteenth Century*. Beacon Press.

Alioto, A. (1992). *A History of Western Science* (2nd ed.). Prentice-Hall.

Bodanis, D. (2005). *E=mc²: A biography of the world's most famous equation*. Bloomsbury.

Kuhn, T. S. (1970). *The Structure of Scientific Revolutions* (2nd ed.). U. of Chicago Press.

Marks, J. M. (1984). *Science and the Making of the Modern World*. Heinemann.

Shapin, S. (1998). *The Scientific Revolution*. U. of Chicago Press.

Select Articles/Chapters:

Alic, M. (1986). Hypatia of Alexandria. In *Hypatia's Heritage: A History of Women in Science from Antiquity Through the Nineteenth Century* (pp. 41-47). Beacon Press.

Calabrese Barton, K., & Yang, K. (2000). The culture of power and science education: Learning from Miguel. *Journal of Research in Science Teaching*, 37(8), 871-889.

Carra, F. (2008). Science in the Renaissance. In *The Science of Leonardo* (pp. 137-156).

Ancient Books

Davis, P. J., & Hersh, R. (1998). The mathematical landscape. In *The Mathematical Experience* (pp. 5-33). Houghton Mifflin Harcourt.

DeBoer, G. (2014). The history of science curriculum reform. In *Handbook of Research on Science Education Vol. 2* (pp. 559-578). Routledge.

Hodson, B. (2014). Teaching to transgress (Introductory Chapter). Routledge.

Kilpatrick, J. (2014). Mathematics Education in the United States and Canada. In *Handbook on the History of Mathematics Education* (pp. 323-334). Springer New York.

Principe, L. (2011). *The scientific revolution: A very short introduction* (Vol. 266). Oxford University Press.

Van Sertima, I. (1983). The Lost Sciences of Africa: An Overview. *Blacks in Science: Ancient and Modern*, 7 – 26.

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Tentative Schedule (may change depending on class needs)

Date	Topic	Major Due Dates*
January 8	Introduction to the course	Homework or RQ
January 10	What is science? What is math?	Homework or RQ
January 15	What is culture? Culture of math/science, paradigms	Homework or RQ
January 17	Classical period (Ancient Egyptians)	Homework or RQ
January 22	Classical period (Ancient Egyptians, Mesopotamians)	Homework or RQ
January 24	Classical period (Mesopotamians)	Homework or RQ
January 29	Lesson Planning with a historical/cultural perspective	Homework or RQ
January 31	Lesson Plan Example (Double helix)	Homework or RQ
February 5	Lesson Plan Example (Double helix)	Homework or RQ
February 7	Classical period (Greeks)	Homework or RQ
February 12	Classical period (Geocentrism, e.g. Pythagoreans, Aristarchus, Plato, Aristotle, Hipparchus, Ptolemy)	Lesson Plan Draft
February 14	Classical period (Greeks, e.g. Plato, Aristotle)	Homework or RQ
February 19	Classical period (Greco-Romans, e.g. Euclid, Archimedes)	Homework or RQ
February 21	Classical period (Greco-Romans, e.g. Ptolemy, Galileo, Hypatia)	Homework or RQ
February 26	Middle ages (Islamic Golden Age)	Homework or RQ
February 28	Middle ages (Islamic Golden Age, e.g. Al-Khwarizmi, Al-Kindi, Al-Razi, Ibn Al-Haytham, Ibn Sina)	Homework or RQ
March 5	Middle ages (End of middle ages, Renaissance)	Paper Draft
March 7	Scientific revolution (Geocentrism)	Homework or RQ
March 12	Spring break – no class	
March 14	Spring break – no class	
March 19	Scientific revolution (Heliocentrism, e.g. Galileo)	Homework or RQ
March 21	Non-western perspectives (Global perspectives)	Lesson Plan Final
March 26	Non-western perspectives (e.g. Indus and Yellow River Valleys, Africa, and “New World”)	Homework or RQ
March 28	Paradigm shifts (biology - Darwin and evolution)	Homework or RQ
April 2	Paradigm shifts (math - Euclidean and non-Euclidean geometry)	Homework or RQ
April 4	Paradigm shifts (physics – pre-classical, classical, and relativistic mechanics)	Homework or RQ
April 9	Equity issues emerging from socio-histories, educational implications	Homework or RQ
April 11	Presentations	Presentations
April 15	Presentations	Presentations
April 18	Presentations	Presentations, Professional Development Calendar
April 23	Final Class	Paper Final

*RQ - Reading Quizzes