The Mentored Scholarly Activity – Scholarship for Life-Long Learning

The School of Medicine's curriculum includes a four year longitudinal course requirement for all students to pursue and complete a mentored scholarly project. The MSA project culminates with a capstone presentation prior to graduation. The MSA project is aimed at fostering self-directed, life-long learning. Students will do an in-depth scholarly project, in an academic area of interest related to medicine or health care, with the mentorship of a faculty member. MSA requirements can also be satisfied through the successful completion of the MSTP program or the School of Medicine Research Track.

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For questions related to Phase IV MSA: You are welcome to contact us (Associate directors) directly, or email the MSA coordinator at SOM.MSA@ucdenver.edu. At least one of us will be available before and after lectures to talk to you, but you can also set up a time to meet with us individually. E-mails will be checked daily and answered within 24 hours during weekdays, but may not be answered on weekends. Please check the calendar regularly for session updates.

Goals:
- Encourage curiosity, innovation, and creativity and their translation into scholarly activity
- Prepare physicians for a life of self-directed learning
- Stimulate the learning of new methods of research and scholarship
- Develop analytical thinking and problem-solving skills
- Experience effective mentoring and learn to mentor others
- Integrate scholarship with clinical care

Learning Objectives:
- Display independence and collaboration
- Formulate a specific hypothesis or question
- Work effectively with a mentor
  - Critically review and analyze the literature on an important scholarly topic
- Develop an effective plan to complete a scholarly project
- Prepare a scholarly project with appropriate methods
- Log progress and reflect on the MSA project on your MSA plan form (Appendix A).
- Complete an acceptable paper and capstone presentation of the scholarly project

Thematic Areas: To best support students, we have defined five thematic areas of scholarship.
- Basic Science – Fundamental scientific discovery through laboratory research.
- Clinical Science – Patient centered research - clinical investigation and trials, translational research, behavioral research, and drug development.
- Epidemiology, Public & Community Health – populations as patients, international health, rural health, occupational and environmental health, infectious diseases, chronic diseases, health services research and health policy.
- Global Health - Understanding and applying public health and clinical decision making in low resource settings with vulnerable populations. (Only students in the Global Health Track can participate in an MSA project abroad. There are special requirements to travel abroad, please refer requirements to the Global Health Director).
- Bioethics, Humanities, Social Sciences & Education – the human side of medicine including ethics, law, medical anthropology and sociology, psychology, literature, art, history, education.

These thematic areas are not meant to be restrictive in any way; for example, an appropriate project might bridge two or more thematic areas, or might not clearly fall under any of the thematic areas.
Common Components of all Scholarly Projects
The following components are an important part of any scholarly project. They do not necessarily have to be followed in sequence.

- Meet with your Associate Director to explore potential projects and strategies
- Identify your general goals—what do you want to learn, where do you want to go, what kind of mentor would you like to work with?
- Meet with one or more potential mentors to refine your ideas
- Identify a question, need, or idea that you could explore and ultimately make a new contribution.
- Define objectives that are realistic and achievable.
- Demonstrate an understanding of the existing scholarship (both theory and methods) relevant to your project.
- Develop a protocol with a clear set of objectives and a work plan that will lead to meeting them.
- If human research subjects are involved, obtain COMIRB approval.
- Develop the necessary skills and support to do the work.
- Allocate the personal time and effort needed to complete the project on time.
- Apply the scholarly methods effectively.
- Modify the project objectives and methods in response to changes, learning and experience.
- In a report written in a style appropriate for your area of scholarship:
  - describe and analyze the results or products of your project;
  - critically evaluate your work in light of relevant evidence and indicate how it contributes to relevant fields of scholarship;
  - Identify areas for improvement, further study and exploration.
- Clearly communicate your work to others in the capstone presentation and in other forums.
- Consult with your mentor and Associate Director regularly for support and help in reaching your goals.

Group MSA Projects

It is acceptable for groups of students to work on MSA projects. These groups may be composed of students in a single class or may be spread out over several classes. The latter is particularly appropriate for projects that have a long lead time for administrative approval (e.g. international research) or that involve ongoing interventions (e.g. a school curriculum change). The first class may lay all the groundwork for the project and subsequent classes may then move to data collection and to expansion to other project goals.

If groups of students work on a project, a couple of points need to be kept in mind regarding MSA Plan Forms, the final paper, and capstone:

1) Teams of 2-4 students may do a Mentored Scholarly Project together. However, the proposed work and contributions of each student must be defined and approved.

2) Each student must independently submit an MSA Comprehensive Plan Form that defines their particular role in the project.
3) Each student should make his/her own scholarly contribution to the work. If you work as a group, be sure to include an acknowledgements section in the final paper that indicates each student’s contribution.

4) A single paper can be submitted to describe the work on a project that involves several students. This authorship of this paper should reflect the contributions of the participants. Each student author on the paper should complete the JAMA criteria for authorship form and attach it to the paper (Appendix D) (see web link http://jama.ama-assn.org/site/misc/auinst_crit.pdf). If a given student on a group project doesn’t meet the criteria for authorship on the group paper, that student may submit a separate paper. Each student on a group project will also submit a 1-2 page supplement that describes their role in more detail and describes what they have learned as a result of participation in the project (see Page 7 for more detail).

5) If a paper is published from a project that involves several students, that paper can be submitted to meet the requirements of the MSA. However, as described above, each student on such a paper will also submit a 1-2 page supplement that describes their role in more detail and describes what they have learned as a result of participation in the project. Same for final paper for all students on final paper.

6) A group of students in the same class can use the same physical poster for their capstone presentation. Each student will, however, present the findings to the reviewers separately. Since there are three poster sessions, a project that involves more than 3 students in a single year will need to prepare an additional poster so that each student has the opportunity to present the work independently.
Phase IV Course Requirements

- Submit first draft paper with mentor and Associate Director review and signature by December 14th. This can be done by email from mentor.
- Submit final 10-25 page MSA paper by February 1 (A first-author paper published in a peer-reviewed journal may substitute (see MSA Rubrics for Assessment Criteria)
- Present your work at your assigned poster session during the MSA capstone event in March (see MSA Rubrics for assessment criteria)
- Evaluate peer presentations at the MSA capstone event in March.

Draft and Final Paper

Papers will be double spaced, typed in 12 pt. Arial font and have 1 inch margins. Most papers will include the following components:

- Cover Page – Title of paper, your name, mentor’s name (Please make a cover page even if you are submitting a peer-reviewed published paper).
- Abstract
- Introduction
- Methods
- Results
- Limitations
- Conclusions
- References (minimum of 20)
- Acknowledgements
- Contributorship

Capstone Presentation

- Prepare and present a poster
- Present project to classmates and faculty during ICC in March
- Evaluate peer presentations during the sessions you are not assigned to present

Required only if your project includes human subjects:

- Colorado Multiple Institutional Review Board (COMIRB) – If your project involves human subjects you must complete COMIRB training/certification on line and plan ahead to submit your protocol as soon as possible. [http://comirbweb.ucdenver.pvt/portal/](http://comirbweb.ucdenver.pvt/portal/)
- IRB applications for students completing international research projects the summer between Phase I and Phase II must be submitted by March 15th. All others must be submitted by April 1st.
• All human subjects’ protocols must be reviewed by Dr. Prochazka prior to submission to COMIRB. If you are submitting a Global Health protocol, it must be reviewed by both Dr. Prochazka and the Global Health Director prior to submission to COMIRB.

NOTE:
Pathways for Mentored Scholarly Projects:
The MSA project is a 4 year pursuit. It is expected that students will spend an average of one-half day per week in Phase I & II exploring, reviewing literature, making correlations from coursework, meeting with Associate Directors, developing a hypothesis or question, meeting with potential mentors, developing appropriate methodologies for the project, developing an achievable plan, developing and keeping a plan form. There are several possible pathways to completing the MSA:

Pathway One: Front end loading – do the most intensive work on the project (i.e. background literature search and data gathering) during the summer between Phases I and II – complete and update during Phases III and IV.

Pathway Two: Slow and steady – does the project at a regular pace throughout Phases I and II, a little in Phase III and then finish in Phase IV.

Pathway Three: Back end loading – do preliminary work in Phases I, II and III – but do the most intensive work (data analysis and conclusions) in Phase IV.

Attendance: Sessions at which attendance is required will be so designated in Blackboard or communicated via e-mail to your UCDenver e-mail account. Otherwise you will be expected to organize your own schedule, with guidance from your Associate Director and mentor. See Appendix A for schedule. Please refer to Phase I Essentials Core General Information for full description of requirements.

• Failure to attend a required session will be considered a Professionalism issue:
  ▪ 1. 1st unexcused absence in a Phase – the Assistant Dean, Essentials Core Curriculum (Dr. Michaels) will contact the student, the situation will be discussed, and the student will be warned that a second infraction will result in filing a Professionalism Feedback Form.
  ▪ 2. 2nd or subsequent unexcused absence in a Phase – the student will meet with Dr. Michaels, who will file a Professionalism Feedback Form.
  ▪ 3. At any time during a Phase, if a second Professionalism Feedback Form is filed owing to a student’s unexcused absence at a required session, the student’s case will be referred to the Professionalism committee.

Having a negative impact on the small group learning environment, including arriving late for a session will be treated as a separate Professionalism issue.
Course Evaluations: Students will be required to complete online evaluations. Class representatives and class officers will meet with the course directors as necessary to provide feedback.

How will students be graded in the Mentored Scholarly Activity Course?
For full description of grading policy, please refer to the Phase I Essentials Core General Information.

The MSA is a Pass/Fail course. There are two major components to a student’s grade in the MSA course. 1) Each student will receive a grade (Pass/Fail) at the end of each semester based on their progress through the course requirements. 2) During Phase IV Fall the requirement is to complete a draft paper with mentor and Associate Director review with signature by December 14th. 3) During Phase IV Spring the requirement is to 1) submit a final 10-25 page MSA paper by February 1 (A first-author paper published in a peer-reviewed journal may substitute (see MSA Rubrics for assessment criteria). 2) Present your work at your assigned poster session during the MSA Capstone event in March (see MSA Rubrics for assessment criteria). 3) Evaluate peer presentations at the MSA Capstone event in March. If you do not complete the requirements for the two semesters in Phase IV you will not be able to graduate. Refer to Appendix A for schedule.

Grade Definitions:

PASS (P)
A student who completes the requirement for Phase I will receive a Pass (P). A student who does not complete the requirement will receive a Fail (F) and a recommendation will be made by the block directors to offer the student one chance at remediation (please see details under “Fail and Pass with Remediation”).

FAIL (F) AND PASS WITH REMEDIATION (PR)
At the end of a block a student whose does a not complete mandatory requirement will be given a grade of Fail (F). The Block Directors will notify the Associate Dean for Student Affairs and recommend that a student with a final grade of F be offered one chance at remediation. The Associate Dean of Student Affairs will notify the Student Promotions Committee, which makes the final recommendation. Block directors, in consultation with the Student Promotions Committee, will define the process for remediation with the student, referred to as the remediation plan (comprehensive exam, shelf exam, unit exams, etc.). Unless otherwise noted by the block directors, if the student completes the requirements on the remediation plan, the Fail (F) will be deleted from the transcript and replaced by a Pass with Remediation (PR), indicating the student has successfully passed the block following remediation. If the student does not complete the remediation plan, the Fail (F) will remain on the transcript, indicating the student has failed the block, and the Block Directors will recommend to the Associate Dean for Student Affairs that the student be referred to the Student Promotions Committee.
IN PROGRESS (IP)
A student who is unable to complete the requirements for a Block because of illness or other extenuating circumstance and who is in good academic standing in the Block at the time that grades are awarded (as defined by the block directors) will receive an In Progress (IP). When the student has completed the Block requirements, the In Progress (IP) is deleted from the transcript and is replaced by a grade of Honors (H), Pass (P), or Fail (F), whichever is appropriate. If the final block grade is a Fail (F), a recommendation will be made by the block directors to offer the student one chance at remediation (please see details under “Fail and Pass with Remediation”).

WITHDRAWAL (W)
A grade of Withdrawal (W) is given to a student who withdraws from a required course; a student may only withdraw from a required course with the permission of the Associate Dean of Student Affairs.

INCOMPLETE (I) –
A grade of Incomplete (I) may be used if the student has turned in the mandatory requirements, but the work is not complete. This grade reflects that a student has not successfully completed all of the requirements.

Resources available to MSA students

HEALTH SCIENCE LIBRARY—the MSA program has a librarian assigned for each of the 5 thematic areas who can help with research for the background sections of proposals and with systematic reviews. Librarians can assist with:
• Problem identification and focus
• Question formulation
• Search strategy
• Identifying resources for literature review
• Organizing and managing citations
• Manuscript style requirements
• Scouting journals for publication

MSA students can contact the librarian to schedule a FREE individual consultation. Most consultations are scheduled for an hour and provide training and help in customizing your research strategy for PubMed, Google Scholar, or other resources such as EMBASE (European and international medical journals), Cochrane Library (evidence based systematic reviews), genetic/molecular biology or legal/historical/ethics resources. After the initial consultation librarians are available via email, phone or in person for follow up. Contact:
Basic Science Research  Lynne Fox  (303-724-2121)
Clinical Research  John D Jones Jr  (303-724-2117)
Global Health  John D Jones Jr  (303-724-2117)
Humanities & Social Sciences  Lilian Hoffecker  (303-724-2121)
Public Health & Epidemiology  Ben Harnke  (303-724-2146)

Students can also contact the Library via the Ask Us! Link on the Library’s homepage. Please provide information on your research topic or identify your thematic area as part of your Ask Us! request.

Writing Center Resources:
The campus writing center is an excellent resource to help you with your rough and final draft papers. The writing center is available as follows:
- Health Sciences Library 1204, Anschutz Medical Campus
  - TF 10-6
  - Sun 2-8
- North Classroom 4014, Denver Campus
  - M-Th 9-6
  - F 9-2
- Online:  http://www.ucdenver.edu/academics/colleges/CLAS/Centers/writing/aboutUs/Pages/onlineConsultations.aspx
  - Every evening 6-10
- Drop-Box

BIOSTATISTICAL SUPPORT - The Research Consulting Laboratory is available without charge to MSA students. The RCL can help with study design, power & sample size calculations, data analysis and interpretation. You can make an appt. by calling 303-724-4619, rcl@ucdenver.edu. Please be sure to identify yourself as an MSA student.

MSA Mentor Expectations:
- Meet with students to explore potential scholarly projects
- Determine if you are the person to mentor the project
- Develop an agreement, including meeting/communication schedule, and work on your professional relationship
- Review student’s critical literature reviews
- Help the student develop a scholarly and doable project
- Review the student’s scholarly proposal
- Submit verification of progress with each plan form submission, rough draft and final draft papers (verification can be sent via e-mail to SOM.MSA@ucdenver.edu)
- Help develop and review the work plan and timing
- Communicate with the MSA Associate Director
• Review the student project and plan form
• Submit recommended grades to Associate Director
• Help the student gather, analyze and prepare for capstone presentation
• This is a 4 year project-- the mentor and student should work together for that entire period
• Always be attentive to the student’s rigor and professional development

Associate Directors will work with the mentor-student teams to provide ongoing support.
EXAMPLES of SCHOLARSHIP

Humanities:
In college you took a course in the History of the West that piqued your interest in frontier physicians. Dr. Bob Shikes gave a lecture on the history of the School of Medicine at the University of Colorado that really fascinated you. You have decided to do your mentored scholarly activity on frontier physicians. After discussions with Dr. Jackie Glover, Associate Director for the Humanities thematic area, you contact Dr. Shikes as a possible mentor. He gives you many references, including the names of several historians working in the history of medicine at the Downtown Denver and Boulder campuses. You meet with them.

An appropriate mentor is selected from among the interested faculty. You had no idea that there was so much written both about and by frontier physicians. With the advice of your mentor, and after reading many texts, including several survey texts, you have an idea of how to narrow down your topic. You decide to focus on woman frontier physicians. You discover that Dr. Sonya Erickson, faculty in OB/GYN, did an honors paper on this topic. You meet with her. You spend your time critically reading texts about frontier woman physicians, and reading primary sources. You are working from a very helpful on-line collection of information about women in medicine at the National Library of Medicine. Over the course of the four years, you produce a scholarly paper on Frontier Women Physicians that is thoroughly researched and includes sound critical analysis of major writings and themes. You present your paper at a national humanities meeting and submit it for publication.

Basic Science Research:
Your interests lie in the problem of infectious disease in the third world. Your idea is that learning more about the molecular biology of parasites will provide important information that could be used therapeutically. You look at the mentor list and find that Richard Davis, PhD in Pediatrics (Infectious Disease) is a basic scientist who studies RNA processing and protein translation in the parasitic nematode roundworm, Ascaris.

You go to Dr. Davis web site (http://www.ucdenver.edu/molbio/davissr.htm) and learn about his research. Dr. Davis states, “Nematodes infect 3 billion people worldwide, leading to considerable morbidity; they are a problem for livestock and domestic animals; and they result in billions of dollars in annual crop damage. The socioeconomic effects caused by these parasites are severe and present a major obstacle in facilitating medical and economic improvements in many parts of the world. A major goal of our work is to develop tools to facilitate the study of worm parasites in an effort to better understand parasite biology and pathogenesis with the long-term goal of identifying and developing drugs to novel parasite targets”. You read the scientific literature and learn about why the Ascaris system of protein translation different from humans. You contact him about a project and decide to work in his laboratory during the summer of phase 1 and continue during phase 2 in the afternoons.

You work as part of a team that includes graduate students and fellows. Your experiments help Dr. Davis to find a protein that is unique to worms that is used to process mRNA and without
the protein the worm cannot propagate. During Phase 3 you attend a meeting and present some of your work about this protein in the parasites. You also co-author a peer-reviewed paper on the subject published by Dr. Davis’s lab. Although you do not materially participate in the lab in most of phases 3 and 4, you follow the field and discover that a number of pharmaceutical companies are developing drugs against the protein you studied. You give a capstone presentation summarizing your work, how it fits into the work of Dr. Davis and the parasite field and the promise of drugs to prevent the disease.

**Epidemiology and Public Health:**
You read an article on the epidemiology of dengue and became interested in determining whether the viral infection will become prevalent in the United States, given that it is endemic on the Mexican side of the US-Mexican border.

You meet with your Associate Director and find out that the CDC in Ft. Collins has ongoing research in dengue, and that the Associate Director knows some of the researchers who regularly recruit students to help with research projects.

You visit with researchers at the CDC lab and are impressed with the opportunities. You are particularly interested in the possibility of doing an epidemiologic study of mosquito populations and dengue seroprevalence on the Mexican-US border. You get back in touch with your Associate Director and want to get started. The Associate Director advises that you contact Dr. Fly, a UCHSC faculty member who has ongoing research projects with the CDC in Ft. Collins, and has an interest in dengue surveillance in the southwestern United States. He looks like a good possibility for a mentor.

Dr. Fly contacts his colleague Dr. Bugg at CDC and learns about the surveillance projects planned for the next three years along the US-Mexican border, determines that you will be welcome to help with the research, and agrees to be your mentor. You prepare a proposal for participating in a project that involves setting mosquito traps in communities around Nogales, Arizona and analyzing mosquitoes for dengue viral RNA, and collecting blood samples from persons who live near the sampling sites and analyzing them for antibodies to the four serotypes of the dengue virus.

You launch the sampling program in the summer between phase 1 and phase 2 of medical school and are able to collect mosquito samples from over 100 locations, and blood samples from over 200 subjects. The samples are analyzed at the CDC lab over the subsequent year by other members of the research team, and the results are provided to you in the middle of phase 2. You work with Dr. Bugg to develop analytic datasets and conduct statistical analyses in the spring of phase 2, and continue to refine analyses in phase 3, while you are completing your clinical rotations. You find evidence that *Aedes egyptae* mosquitoes trapped in the US carry the virus and that rate of seropositivity in the US border communities correlate with the percentages of virus-positive trapped mosquitoes. These data suggest that more work need to be done to prevent the breeding of *Aedes egyptae* mosquitoes.
At the start of phase 4, you complete a draft report of your research, and refine it for final presentation over the next few months. You also work with your collaborators at CDC to complete a manuscript for publication.

Clinical Research:
Your interests are in cardiovascular disease and especially in stroke because a number of your family members have either had a stroke or are worried that they may develop one in the future. As you study your textbooks on cerebrovascular disease, you read about some interesting links between migraine headaches and strokes. One of the books points out that many patients with migraine headaches have also been found to have a patent foramen ovale and there are some data suggesting this may be important in the pathophysiology of migraine and stroke. In your meeting with the Associate Director, you are pointed to some of the potential mentors in the Cardiology Division of the Department of Medicine and in the Neurology Department. It turns out they are actively doing research on this issue.

After reviewing the potential mentors’ areas of interest, you meet with Dr. Smith since her research seems to be the most relevant to you. Dr. Smith is doing a clinical trial looking at the effects of PFO closure on migraine outcomes and she is also examining factors such as nitric oxide and cytokines in migraines. She agrees to work with you as a mentor and suggests some additional readings on the topic both in cardiology textbooks and in journal articles. As you learn more about the problem of nitric oxide and migraine, it becomes clear that there are some major gaps in the literature. One of the gaps is that no one has really pulled together all the data on the effect of transcatheter closure on nitric oxide levels and migraine frequency. So, at the end of Phase 2, you write a proposal for a systematic review. During Phase 3, you continue to meet periodically with Dr. Smith as your clinical work allows and you read about how to conduct a systematic review and meet with one of the Health Sciences Center librarians. At the start of Phase 4, you work steadily to conduct the systematic review and meet several times with Dr. Smith and the librarian to go over your progress and troubleshoot issues in the review. The review includes extensive searching of Medline and other on-line databases, retrieval of meeting abstracts, contacts with manufacturers of catheters to see if there are any unpublished studies on nitric oxide, and contacts with investigators of key studies to verify data or to obtain additional information about their research. Two of the main papers are written in Japanese, so you find a translator to help you extract the relevant data for your project. Based on this review, you are able to make a quantitative summary of the effect of catheter closure on nitric oxide. You, along with your mentor and the librarian, then write an abstract on this for a cardiology meeting during Phase 4. You prepare a draft of your capstone presentation by November of your 4th year and review it with your mentor and the Associate Director. In March you then present your project in a poster form and turn in the paper that is a written summary of your project and its findings.