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 cap-stone 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 the MSA:
You are welcome to contact any of the Associate Directors directly, or email the MSA coordinator or contact 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.

MSA Course Goals
• Demonstrate progress through the Phases and display independence and collaboration.
• Demonstrate ability to formulate a specific problem statement, question, hypothesis or aim.
• Demonstrate ability to work effectively with a mentor.
• Demonstrate ability to critically review and analyze literature on an important scholarly topic.
• Demonstrate ability to prepare a scholarly project with appropriate methods and develop a plan to complete the project.
• Demonstrate ability to synthesize and present results of a scholarly project.
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 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 students may do a Mentored Scholarly Project together.
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.
4) A single paper, published or unpublished, 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 on a group project will submit a 1-page supplement that describes their role in more detail and describes what they have learned as a result of participation in the project.
5) 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.

MSA Course Requirements and Due Dates

**Please note that all below due dates are tentative and subject to change.**

**Phase 1 (IDPT 5090):**
- Interest Form – August 30
- One-on-ones – October 15 – December 1
- Annual Student Research Forum – December 13
- Capstone Attendance – March 2
- Plan Form – April 17
- Online Research Module – May 15

**Summer Elective (IDPT 5091):**
- Abstract, Annotated Bibliography, and Presentation Materials Upload – July 22
- Work in Progress (WIP) – July 26-27 **Fulfills the Phase 2 WIP requirement**

**Phase 2 (IDPT 6090):**
- Abstract, Annotated Bibliography, and Presentation Materials Upload – November 1
- Work in Progress (WIP) – September 1 – November 1
- (Only for 2016-2017) Online Research Module – December 16

**Phase 3 (IDPT 7090):**
- Annual Student Research Forum – December 13
- Plan Form Update – May 2

**Phase 4 (IDPT 8090):**
- Draft Paper – December 16
- Final Paper – February 1
- Capstone Presentations – March 2

**Early Completion Option**
The Final MSA paper may be turned in at any time and students may present at an earlier Capstone. If they do this they still will be required to participate in their class’ Capstone as evaluators. This allows students increased flexibility to submit the final paper and complete the oral/poster presentation at any year-end Capstone event if project is completed prior to 4th year.
The MSA is a Pass/Fail course
Each student will receive a grade (Pass/Fail) at the end of each semester based on their progress through the course requirements. You must complete each component of the MSA requirements by the deadline to receive a passing grade.

Grade Definitions
The School of Medicine uses the following grades for the official transcript: Honors (H), High Pass (HP), Pass (P), Pass with Remediation (PR), Incomplete (I), In Progress (IP), Fail (F), and Withdrawal (W). The Block, Course and Clerkship Directors have the latitude to not use the full range of grades available.

Unless otherwise specified, “grades” once assigned become a permanent part of the student’s academic record and transcript. Incomplete (I) and In Progress (IP) are temporary grades which will be permanently replaced by one of the other listed grades.

<table>
<thead>
<tr>
<th>Grade</th>
<th>Definition</th>
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<tr>
<td>Honors (H)</td>
<td>A grade of Honors is given to a student whose performance is of a very high caliber. Total honor points are calculated as the number of credit hours with the honors grade and may be used to determine academic nomination of students for various awards and commendations.</td>
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<tr>
<td>High Pass (HP)</td>
<td>A grade of High Pass is given to a student whose performance clearly exceeds the Pass requirements but does not reach Honors level.</td>
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<tr>
<td>Pass (P)</td>
<td>A grade of Pass is given to a student whose performance meets the minimum requirements established by the Block, Course or Clerkship Director.</td>
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<tr>
<td>In Progress (IP)</td>
<td>A temporary grade of In Progress is given when a student is unable to complete the requirements for a Block, Course or Clerkship because of illness or other extenuating circumstances AND is considered to be passing by the Block, Course or Clerkship Director at the time the grade is given. For more detail, see 3.3.3 and 3.3.6.</td>
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<tr>
<td>Incomplete (I)</td>
<td>A temporary grade of Incomplete is given when a student has not successfully completed all of the Block, Course or Clerkship requirements at the end of the Block AND requires remediation as determined by the Block, Course or Clerkship Director in order to meet the minimum requirements of the Block, Course, or Clerkship. For more detail, see 3.3.3 and 3.3.6.</td>
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<tr>
<td>Pass with Remediation (PR)</td>
<td>A grade of Pass with Remediation is given to the student whose performance is initially below the passing standard (I or (F), but who demonstrates competency in the course requirements after remediation.</td>
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<tr>
<td>Fail (F)</td>
<td>A grade of F is given when a student’s performance is clearly below the passing standards of the Block, Course or Clerkship.</td>
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<tr>
<td>Withdrawal (W)</td>
<td>A grade of withdrawal is given when a student leaves a Block, Course, or Clerkship before being assigned a final grade AND requires approval by the appropriate faculty, course director, or Assistant or Associate Dean. In some cases, a student must be in “good standing” before being allowed to withdraw. For more detail, see 3.3.4.</td>
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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.
- 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.
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, and 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:

I. **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.

II. **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.

III. **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.

**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.**

**Narrative Comments and Assessment**
Narrative comments from individual MSA mentors will be obtained in Phase II and Phase IV. Narrative comments from MSA Directors will be submitted for each student’s Work In Progress session and for their initial draft of the MSA paper (required in Phase IV). This will be used to obtain faculty input and to jointly develop individual student goals to improve their skills.
Library Resources
The librarians can help MSA students with:

- Problem identification and focus (as far as helping with preliminary searching to identify whether a topic has been covered previously in the literature)
- Question formulations (asking answerable questions)
- Translating the question into a search strategy
- Identifying resources for literature review
- Organizing and managing citations and article reprints or other resources
- Accessing software for various research needs (such as SAS/SPSS) and referral to training resources
- Understanding manuscript style requirements
- Identifying opportunities for publishing or sharing research

Helpful information is available at:  http://hslibraryguides.ucdenver.edu/msa

- The easiest way to get to it is to go to the University webpage and search mentored activity.  The library page should show up in the middle of the results list.  Some sections of immediate interest: Finding a Mentor, Online Tutorials, recommended books (reference resources on how to do research), information on software resources for the research process, statistical resources, EndNote and information on MyNCBI for organizing references, and other advice for organizing and Electronic Reprint File.
- Please email John.Jones@ucdenver.edu for suggestions for improvement.

To make an appointment with the librarian:
Students should identify themselves as working on the MSA project when contacting the library.

Basic Biomedical Science Research, Global Health Research  John D Jones Jr, MSIS (303-724-2117)

Clinical Science Research  Kristen DeSanto, MSLS, MS, RD, AHIP (303-724-2121)

Bioethics, Humanities, Arts & Education Research  Lilian Hoffecker, PhD, MLS (303-724-2121)

Epidemiology, Public & Community Health Research  Ben Harnke, MLIS (303-724-2146)

Writing Center Resources
The campus writing center is an excellent resource to help you with your rough and final draft papers. To get more information or to make an appointment with the writing center, please visit here:  http://www.ucdenver.edu/academics/colleges/CLAS/Centers/writing/Pages/TheWritingCenter.aspx

Statistical Resources
The Colorado Biostatistics Consortium (CBC) has partnered with the MSA program to provide guidance on how to design and analyze your MSA research project. Through the MSA Consulting Clinics, the CBC will help you move beyond a general research question in order to craft a testable hypotheses. You will develop a research plan consisting of your study design details, the specific data to be collected, and the methods you will use to analyze your data. During these clinics, you will also receive assistance with implementing your analysis and interpreting your findings. Each clinic will be a mix of small group (2-3 individuals) and one-on-one interactions with biostatistics graduate students dedicated to answering your specific questions.

Registration is required, and must be done at least 48-hours in advance. To get more information or to sign up for a clinic with the CBC, please visit here:  http://www.ucdenver.edu/ACADEMICS/COLLEGES/PUBLICHEALTH/RESEARCH/CENTERS/CBC/RESOURCES/Pages/MSA.aspx
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.

EXAMPLES of SCHOLARSHIP

Basic Biomedical 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/davisr.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.

Bioethics, Humanities, Arts & Education:
In college you took a course in the History of the West that piqued your interest in frontier physicians. You read with interest The University of Colorado School of Medicine: A Millennial History edited by Drs. Henry Claman and Dr. Robert Shikes. 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. Tess Jones, a humanities scholar in the Center for Bioethics and Humanities, looking for possible mentors. She 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.

**Clinical Science 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.

**Public Health & Epidemiology:**
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 University of Colorado School of Medicine 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.