A Mountain-Focused Curriculum in Earth & Environmental Sciences for U. Central Asia

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Geography
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• Others: EOAS faculty supporters, other ugrad assistants, EOAS staff.
UN International Mountain Day, Dec 11, 2019

• 2019 Theme: Mountains Matter for Youth

• University of Central Asia
• Enabling youth to pursue undergraduate degrees in mountain-focused disciplines in Central Asian mountain regions.

Introduction

Post-secondary education is an important aspect of enabling mountain communities to become active agents of change towards resilience and sustainability.

When students study, research and participate in mountain or other communities, they can become active participants in transforming those communities towards sustainable futures within existing cultural and environmental contexts.

The curriculum development partnership between University of Central Asia (UCA) and University of British Columbia (UBC) is one of many stepping-stones towards achieving sustainable futures in mountainous Central Asia.
A university focused on development of mountain societies

- Established in 2000 as a private, English language, not for profit, secular university.
- Founded by international Treaty;
  - Kyrgyz Republic / Tajikistan / Kazakhstan
  - His Highness the Aga Khan
  - Ratified by the three respective parliaments,
  - Registered with the United Nations
- Focused on development of mountain societies.

**Mission**: To promote the social and economic development of Central Asia, particularly its mountain communities, by ...

- offering an internationally recognized standard of higher education, and
- enabling peoples of the regions to preserve their rich cultural heritage as assets for the future.

https://www.ucentralasia.org/About/Index/EN

Achievable How?

2. Partnerships!
   To quote, His Highness the Aga Khan at 2016 inauguration:

   "UCA is a valuable example of international cooperation for the future - not only here in the region, but also for people far beyond the region."

https://ucentralasia.org/Resources/Item/1252/EN
International Partners

- Establishing excellent degree programs as a STARTING point.
- Partnering is the key.

UCA structure

Undergraduate degree programs

- Computer science
- Communications & media
- Earth & environmental sciences
- Economics
- Business & management
- Engineering sciences
1 University, 3 countries, 3 campuses, 6 undergrad degree programs

- Triple the “bureaucratic” challenges ... but the focus on mountain communities and concerns units the 3 campuses.

- Research:
  - Mtn. Societies Research Institute
  - Inst. of Public Policy & Admin
  - Cultural Heritage & Humanities
  - Civil Society Initiative
  - Aga Khan Humanities Project

- School of Professional and Continuing Education
  
  [Link](http://www.ucentralasia.org)

[Link](https://www.youtube.com/watch?v=nDyCSWkz3pk)

UCA achievements to fall 2019:

**Undergraduate student profile**

- 81% from 3 host countries.
  - Remaining from Pakistan, Afghanistan, Russia, Iran, Syria, Kenya.
- 51% Women.
- 70% from small towns and rural areas.

**Research**

- 100+ publications from MSRI, IPPA, CHHU and CSI.

**School of Professional and Continuing Education**

- 143,000 learners (50% women) trained by the School of Professional and Continuing Education across 12 locations in Central Asia and Afghanistan.
- 1,700 civil servants trained in governance & public policy in Tajikistan, Kyrgyzstan & Afghanistan.

[Link](http://www.ucentralasia.org/About/Index/EN)
UBC / UCA partnership timeline

→ 2014: UCA’s EES concept.
2016: UBC approached; proposal developed.
Jan 2017: UCA & UBC sign agreement.
Funded by UCA / AKDN; “in kind” by UBC, EOAS, Geog.
Aug 2017: 10 Science Education Specialists (SES) hired.
Oct 2017: 3 UBC SES + Project Coordinator travel to UCA
Mar 2018: Review committee at UBC, EES prereq courses
May 2018: - Training: 3 UCA instructors travel to UBC;  
- Four UBC SES travel to UCA.
Sep 2018: 3 prerequisite courses are taught.
Jan 2019: Review committees, EES courses, at UBC.
May 2019: Training with EES teaching faculty, at UBC.
Sep 2019: First EES courses to be taught.
May 2021: First EES cohort graduates!

UBC visits to Central Asia

• Oct 2017 (4 team members):
  • Dushanbe and Khorog, Tajikistan
  • Mostly meet-and-greet ... students, faculty & contributors & colleagues

• May 2018 (4 team members):
  • Khorog (and Dushanbe a little)
  • Road trips
  • 3-day trip to “shadow” field work with an MSRI-sponsored community-based conservation study.

• Oct 2018 (3 team members):
  • Khorog – mostly geoscience, including some road trips
  • Bishkek, World Mountain Forum 2018
    • UBC poster on EES program development
    • Meet students & Mountain Studies academics / practitioners.
    • Meet MSRI, special focus on GIS courses.
    • Visit the Naryn campus

https://goo.gl/NKDj4g
Khorog Campus


UCA’s Khorog campus May 2018.

UBC course developers meet students & faculty, Khorog Campus Library, Oct 2017.


UCA Khorog campus interiors
Exploring geographical & cultural context

UBC course developers visit the Barsam Debris Flow, a large landslide in 2015, near Khorog.

Home-stay accommodation in the Pamir mts, during field trip exploring conservation research and mountain society life (May 2018).

Pamir Mountains: Afghanistan from Tajikistan.

The Tajik–Afghan Friendship Bridge

https://en.wikipedia.org/wiki/Tajik%E2%80%93Afghan_Friendship_Bridge
Origin and intentions of the EES degree

• **Choice of courses** – i.e. curriculum
  - Based on 2014 concept note, then adapted for practicality
  - Balance broad exposure versus narrower, more rigorous specialization.

• **The Central Asian context**: targeted sectors for graduates
  - Biodiversity
  - Energy
  - Fossil Fuel Industry
  - Mining and By-product Management
  - Environmental Assessments
  - Environmental Risks and Natural Disasters
  - Environmental Policy
  - Ecotourism
  - Agropastoralism / Sustainable Land Management
  - Climate Change
  - Water
  - Indigenous Human Ecology
Curriculum: implications for students . . .

• Students will work their way towards specific expertise (e.g. geologist, ecologist, etc.)

• Students will acquire appropriate knowledge / skills / attitudes to work and contribute in development & sustainable management of mountain regions and communities.

A five-year undergraduate pathway

**First year:** Preparatory Program - English, mathematics and science.

**Second year:** liberal arts in languages, history, philosophy, etc.

*Co-op opportunities*

**Third year:** prerequisites in math, physics, chemistry, biology

*Co-op opportunities*

**Fourth year:** specialization courses + minor choices

*Co-op opportunities*

**Fifth year:** specialization courses + minor choices

*Co-op opportunities*

https://www.ucentralasia.org/Admissions/UndergraduateProgramme/EN
EES courses: from fundamentals towards advanced topics

Chemistry
- Intro. geo. processes
- Intro geo. materials & resources
- Geochem.
- Seds, strat, hydrocarb.

Physics
- Surface processes
- Hydrology & hydrogeology
- Natural hazards
- Geodynamics
- Min/pet. & mined resources

Ecology / biology
- Climate change
- Mixed methods
- Ways of knowing
- Applied ecology
- Conserv'n Sci.

Int. geo. processes
- Intro GIS & Remote Sens
- Env &.devel. in mtns

Intro geo. materials & resources
- Hydrology & hydrogeology
- Natural hazards
- Geodynamics
- Min/pet. & mined resources

Hydrology & hydrogeology
- Adv. GIS & Remote Sens
- Envr & devel. assessment

Surface processes
- Mixed methods
- Broadly applicable

Natural hazards
- Envr & devel. in mtns
- Broadly applicable

Geodynamics
- Adv. GIS & Remote Sens
- Envr & develop. assessment
- Environ. govern.

Adv. GIS & Remote Sens
- Geo- & environ science synergies

Environmental impact assessment
- Broadly applicable

Environ. govern.

Geo- & environ science synergies
- Broadly applicable

Envr & devel. assessment
- Broadly applicable

Prerequisite science skills for BSc students.

Chemistry
- Intro. geo. processes
- Intro geo. materials & resources
- Geochem.
- Seds, strat, hydrocarb.

Physics
- Surface processes
- Hydrology & hydrogeology
- Natural hazards
- Geodynamics
- Min/pet. & mined resources

Ecology / biology
- Climate change
- Mixed methods
- Ways of knowing
- Applied ecology
- Conserv'n Sci.

Intro. geo. processes
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Intro geo. materials & resources
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Adv. GIS & Remote Sens
- Geo- & environ science synergies

Environmental impact assessment
- Broadly applicable

Environ. govern.

Geo- & environ science synergies
- Broadly applicable
Geoscience more advanced subjects

EES courses: from fundamentals towards advanced topics
The UBC connection

- **Sources for courses:** Undergraduate courses in UBC programs:
  - Geological Sciences, [https://www.eoas.ubc.ca/academics/ugrad/specializations-programs/geologicalsciences](https://www.eoas.ubc.ca/academics/ugrad/specializations-programs/geologicalsciences)
  - Environmental Science, [https://www.eoas.ubc.ca/academics/ugrad/specializations-programs/environmentalsciences](https://www.eoas.ubc.ca/academics/ugrad/specializations-programs/environmentalsciences)
  - Geography, [https://www.geog.ubc.ca/undergraduate/programs/](https://www.geog.ubc.ca/undergraduate/programs/)
  - Earth, Environmental & Geographic Sciences [https://eegs.ok.ubc.ca/undergraduate/](https://eegs.ok.ubc.ca/undergraduate/)

- **People:** listed at the end.
  - UBC professors and instructors
  - UBC undergraduate & graduate students
  - UBC geoscience education specialists
  - Several industry-based experts.

How is the EES degree unique?

- **UCA’s EES degree:**
  - Prerequisite courses are science, math, law, philosophy, language, etc.
  - 8 geoscience courses.
  - 7 environmental science / ecology courses.
  - 4 broadly applicable courses (GIS 1, GIS 2, Ways of knowing, research methods).

- **Example - UBC geology degree:**
  - Prerequisites are math, chem, physics and earth science.
  - 19 purely geoscience courses.

- **UCA’s degree is broadly equivalent in terms of number of courses …**
  - BUT resulting qualifications are less specialized, more broadly based.
A few words about pedagogy and learning strategies

- **Student-centric practices** based on experience and fundamentals of how people learn or “how learning works”.

- **Active learning**, including (ideally!) a balance of...
  - solo work with individual responsibility for learning
  - team, peer & group or “collective” learning scenarios
  - instructor guidance
  - instructor’s expertise *strategically* delivered to support activities
  - some lecturing, but none should be delivered as long, static presentations.
  - assessment based on a broad range of deliverables & actions, not purely on individual high-stakes sit-down exams.

- **Opportunities** for field-, lab- and community-based learning.
  - *These standards are required by UCA. Faculty are trained at UCA*

Facilitating active engagement with mountain issues

- Driven by UCA Core Literacies articulated in 2016.
- Courses derived from UBC courses.
- Adapted to incorporate Central Asian contexts.
  - Locations, environments, communities, case histories, etc.
Engaging in mountain issues – con’t.

Visits with local people, professionals, & organizations.

- Khorog state University
- AKAH: Aga Khan Agency for Habitat
- MSDSP: Mountain society Development Support Program
- MSRI: Mountain Societies Research Institute
- Central Asian Faculty Development Programme
- Mountain society development support program
- SPCE: UCA School of Professional & Continuing Education
  - Dushanbe office and facilities
  - Khorog director and facilities
- Wildlife management field work & community-based home-stays.
- ... Etc.

Research support by UBC undergraduates

- Summaries and resources about:
  - OBOR: China’s Belt and Road Initiative, and Influences on the Region.
  - also
    - natural hazards
    - energy use & availability
    - professional opportunities in EES
    - climate change
    - community conservancies
    - reference collections

- Six case(histories about environmental challenges in Central Asia were developed for the Mixed Research Methods course.
  - Students will develop their own research proposal & questions.
  - This student-generated content will empower student to be knowledge creators as well as knowledge users.

https://blogs.ubc.ca/eescourses/trip-summary/
Example Case History:

**Community-based conservancies and snow leopards**

- International organization *Panthera* works with Pamirs villages that are dealing with snow leopard / human conflicts [1].
- They also address illegal international trade in snow leopards in cooperation with authorities.
- After becoming familiar with conflicts around Snow Leopard habitat and population, students will create a research proposal.


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**Engaging in mountain issues – con’t.**

- Curriculum & course review committees include multinational experts.
- UCA’s commitment to Co-op opportunities for all students.
  - For > 45 Co-op partners in 5 Central Asian nations, see [https://ucentralasia.org/Academics/Coop](https://ucentralasia.org/Academics/Coop)
- UCA professors researching in their fields
  - Students will learn from people doing current, relevant research.
  - Facilitates the learning / research synergy, feasible only in research-focused universities.
- Other components
  - Prof. D. Rodgers of Idaho State U.; six months teaching & project support for geosciences.
  - Emerging scholarly relationships with partner institutions and organizations.
  - Central Asian Faculty Development Programme, including PhD. scholarships, in partnership with Cambridge University, UK and University of Alberta, Canada.
Concluding remark

“Bringing international higher education & research to mountain settings is challenging. However, post-secondary educated people are both more mobile and better able to support and engage with local mountain communities within global societies.”

Further information about UCA

https://www.ucentralasia.org
Course developers at UBC

1) Elizabeth Gillis:
   a. Introductory chemistry

2) Linda Strubbe:
   a. Introductory physics

3) Erica Jeffery:
   a. Introductory biology & ecology

4) Tara Holland:
   a. Environmental governance
   b. Science, impact & complexity of climate change
   c. Mixed research methods
   d. Ways of knowing

5) Brendan Hunt:
   a. Hydrogeology & hydrogeology
   b. Surface processes

6) Chris Kopp:
   a. Applied ecology
   b. Conservation science

7) Gill Green:
   a. Introductory GIS
   b. Advanced GIS

8) Lucy Porritt:
   a. Introduction to geological materials
   b. Minerals, petrology & mined resources

9) Marc Foggin:
   a. Environmental impact & risk assessment
   b. Environment & development

10) Ozlem Suleyman:
    a. Geochemistry
    b. Sedimentology and hydrocarbon resources

11) Phil Hammer:
    a. Introduction to geological processes
    b. natural hazards & risk management

12) Francis Jones:
    a. Geodynamics and structural geology

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23. Anais Fourmy
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30. Martyn Golding
31. Stuart Sutherland
32. Cecilia Campes

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University of Central Asia (UCA)

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Appendix: A Few Definitions

- **Lesson or "class"**: one classroom or lab session, usually 1hr, 1.5hrs or 3hrs.
- **Lecture**: A “stand and deliver” portion of a lesson. “Traditional” teaching involved 100% “lecture-based” lessons.
- **Lab**: a learning situation using equipment, materials, specimens, or other resources – not at desks with only computers or paper. (Exception: “computer labs” such as GIS courses may involve only computing facilities.
- **Assignment**: a specific task for students to complete out of class.
- **Assessment**: any method of determining a student’s degree of mastery. Could be a quiz or test, a written assignment, results recorded in a worksheet, a project or presentation, etc.
- **Inclass activity**: something students do either alone or with colleagues that is not just “listening” to the instructor. Usually well-structured and supervised, also usually with frequent check-points, discussions, etc.
- **Two stage quiz or exam**: students complete a solo “test” first, hand in results, then carry out some of that test again by discussion with colleagues. See for example [http://cwsei.ubc.ca/resources/files/Two-stage_Exams.pdf](http://cwsei.ubc.ca/resources/files/Two-stage_Exams.pdf)
- **Two stage review**: same procedure as two stage quiz, but used as a review of knowledge that was learned earlier or in a previous course.

DO TAKE TIME TO SKIM OR STUDY THE DOCUMENT “Course pedagogy overview & explanation.docx” IN THE “TEACHING-LEARNING HOWTO RESOURCES.”