Utilizing Collaboration to Create and Support Education for Sustainability

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What are the benefits of collaborating when using sustainability as an educational theme?
Teaching for a sustainable future:
Resources and examples of their use developed through a highly collaborative process

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A 5-year community effort to improve Earth literacy and build a workforce prepared to tackle environmental and resource issues

NSF’s STEP Center in Geoscience

InTeGrate supports integrated interdisciplinary learning about resource and environmental issues across the undergraduate curriculum to create a sustainable and just civilization.

What is InTeGrate?
Systems approach:

1. Any given action will have multiple outcomes or consequences;

2. Any desirable outcome will require multiple nudges or influencers.
What will position students to make sustainable decisions in the future?

Curricular materials that …

• Engage all students in a variety of settings
• Address grand challenges society is facing
• Use rigorous science
• Use best practices in learning
• Are adaptable and adoptable by instructors

How do we ensure that all of these conditions are met in the materials we develop?
1. Design of development teams

- Three instructors from three different institutions (and often from three different disciplines)
- Assessment consultant from assessment team
- Web consultant from web team
- Content area leader from leadership team
- Collaboration and consultation were built in

http://serc.carleton.edu/integrate
2. Goals are encoded in a design rubric

- **Guiding Principles**
- **Learning Objectives and Outcomes**
- **Assessment and Measurement**
- **Resources and Materials**
- **Instructional Strategies**
- **Alignment**

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<table>
<thead>
<tr>
<th>Guiding principles (Must score 15/15)</th>
<th>Points</th>
<th>Score</th>
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<tbody>
<tr>
<td>Course/module addresses one or more geoscience-related grand challenges facing society</td>
<td>3</td>
<td></td>
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<tr>
<td>Course/module develops student ability to address interdisciplinary problems</td>
<td>3</td>
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<tr>
<td>Course/module improves student understanding of the nature and methods of geoscience and developing geoscience habits of mind</td>
<td>3</td>
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<tr>
<td>Course/module makes use of authentic and credible geoscience data to learn central concepts in the context of geoscience methods of inquiry</td>
<td>3</td>
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<td>Course/module incorporates systems thinking</td>
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<thead>
<tr>
<th>Learning objectives (Must score 13/15)</th>
<th>Points</th>
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<tbody>
<tr>
<td>Learning objectives describe measurable geoscience literacy goals</td>
<td>3</td>
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<tr>
<td>Instructions and/or rubric provide guidance for how students meet learning goals</td>
<td>3</td>
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<tr>
<td>Learning objectives and goals are appropriate for the intended use of the course/module</td>
<td>3</td>
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<tr>
<td>Learning objectives and goals are clearly stated for each module in language suitable for the level of the students</td>
<td>3</td>
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<tr>
<td>Learning objectives and goals address the process and nature of science and development of scientific habits of mind</td>
<td>3</td>
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<tr>
<th>Assessment and Measurement (Must score 13/15)</th>
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<tbody>
<tr>
<td>Assessments measure the learning objectives</td>
<td>3</td>
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<tr>
<td>Assessments are criterion referenced</td>
<td>3</td>
<td></td>
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<tr>
<td>Assessments are consistent with course activities and resources expected</td>
<td>3</td>
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<tr>
<td>Assessments are sequenced, varied, and appropriate to the content</td>
<td>3</td>
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<tr>
<td>Assessments address goals at successively higher cognitive levels</td>
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<tr>
<th>Resources and Materials (Must score 15/15)</th>
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<tbody>
<tr>
<td>Instructional materials contribute to the stated learning objectives</td>
<td>3</td>
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<tr>
<td>Students will recognize the link between the learning objectives, goals and the learning materials</td>
<td>3</td>
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<tr>
<td>Instructional materials should be sufficiently diverse and at the depth necessary for students to achieve learning objectives and goals</td>
<td>3</td>
<td></td>
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<tr>
<td>Materials are appropriately cited</td>
<td>3</td>
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<tr>
<td>Instructional materials are current</td>
<td>3</td>
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<tr>
<td>Instructional materials and the technology to support these materials are clearly stated</td>
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<tr>
<th>Instructional Strategies (Must score 15/15)</th>
<th>Points</th>
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<tbody>
<tr>
<td>Learning strategies and activities support stated learning objectives and goals</td>
<td>3</td>
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<tr>
<td>Learning strategies and activities promote student engagement with the materials</td>
<td>3</td>
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<tr>
<td>Learning activities develop student metacognition</td>
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<tr>
<td>Learning strategies and activities provide opportunities for students to practice communicating geoscience</td>
<td>3</td>
<td></td>
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<tr>
<td>Learning strategies and activities scaffold learning</td>
<td>3</td>
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<tr>
<th>Alignment (Must score 5/6)</th>
<th>Points</th>
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<tbody>
<tr>
<td>Teaching materials, assessments, resources and learning activities align with one another</td>
<td>3</td>
<td></td>
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<tr>
<td>All aspects of the module/course are aligned</td>
<td>3</td>
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**Total**: 85
Guiding principles

• Address one or more Earth-related grand challenges facing society
• Develop students’ abilities to address interdisciplinary problems
• Improve students’ geoscientific thinking skills
• Make use of authentic geoscience data
• Develop students’ systems thinking skills
The Rest of the Rubric

• Drawn from high-impact practices and research on learning

• Based on a backward design model*
  – Identify the desired results (learning outcomes)
  – Determine how you will know that students have met the outcomes (assessment)
  – Develop the learning experiences and activities that will give students practice

*Wiggins and McTighe, 1999
InTeGrate Authored Modules and Courses

The Wicked Problem of Global Food Security

Students explore the very factors that cause food insecurity (including climate, socio-economic, and physical) through readings, lecture, case studies, and geospatial analysis using ArcGIS Online...

CONTINUE READING ➤

Climate of Change: Interactions and Feedbacks between Water, Air and Ice

Students analyze short-term climate variability resulting from atmosphere-ocean-ice interactions. The module promotes awareness of...

CONTINUE READING ➤

Natural Hazards and Risks: Hurricanes

Students explore how hurricanes connect the ocean-atmosphere-terrestrial systems and society. Students evaluate how hurricane hazards and risks have...

CONTINUE READING ➤

Human's Dependence on Earth's Mineral Resources

Students examine where products they use come from and what it took to produce them. Students learn about rocks and minerals, methods of...

CONTINUE READING ➤
Systems approach:

1. Any given action will have multiple outcomes or consequences;

2. Any desirable outcome will require multiple nudges or influencers.
Program Design: Laying the Foundation for Tomorrow's Sustainability Workforce

Models of Program Level Change
Bringing geoscience to a diverse range of disciplines, institutions, and networks

16 institutional or cross-institutional teams across the country have embarked on implementation efforts to use InTeGrate materials and approaches to reach programmatic goals including: recruiting and supporting diverse learners, teaching about the Earth across the curriculum, connecting geoscience to societal issues, preparing teachers to teach Earth Science, and supporting transfer between 2 year and 4 year programs and to the workforce. The teams have provided detailed information about what they did, why, and how it worked as a way of providing models for others interested in combining learning about the Earth with societal issues. Learn about the challenges and successes of individual programs, common elements across programs, and how they set about making and supporting change.
Implementation Programs

InTeGrate’s work with its implementation programs has resulted in the development of 16 models of ways to bring geoscience to a diverse range of disciplines, institutions, and networks. This page can help others who are interested in applying some aspect of these implementation to their own context find information about how they might do so.

Lessons Learned

Many of the implementation programs worked to address similar or related issues in their contexts. This pages draw together lessons learned in these areas of high overlap among the programs.

Recruit and Support Diverse Learners
Teach Earth Across the Curriculum
Build Connections to Strengthen K-12 Teaching - coming soon
Support Transitions to Workforce, Transfer, and Careers
Make Change Happen
The Next Generation of STEM Teacher Preparation in Washington Education for Sustainability (EfS)

Kathryn Baldwin, Eastern Washington University
Anne E. Egger, Central Washington University
Tamara Holmlund Nelson, Washington State University Vancouver

This work is supported by a National Science Foundation (NSF)
DUE – 1625566 Western Washington University
DUE – 1625218 Seattle Pacific University
DUE – 1625224 Eastern Washington University
DUE – 1625048 Washington State University Vancouver
DUE – 1625176 Central Washington University
The Next Generation of STEM Teacher Preparation in Washington (NextGen WA)

- 12 x Four-Year Colleges & Universities—producing >90% of STEM teacher graduates in Washington State
- Two-Year College STEM Faculty
- Western Governors University
- K-12 Educators
- Businesses---Google, Code.org
- Govt. Orgs---OSPI, PESB, ESDs, PNNL
- NGO’s—MESA, Pacific Science Center, Washington LASER, WA-STEM, WA-ToToS, WA-ToToM, Compass 2 Campus
NextGen STEM WA

Working Groups:

– Clinical Practice and Induction
– Computer Science Integration [into teacher education]
– Pedagogical Content Knowledge
– Education for Sustainability (EfS)
– Engineering Integration [into teacher education]
– Math and STEM
Guiding Questions and Key Components of Education for Sustainability (EfS) Working Group

• What does EfS involve/include?
• **How do we incorporate EfS into teacher preparation?**
• How do our programs conceptualize EfS as a social justice /equity practice?
• How do we incorporate EfS as an integrative theme?
• How do we develop EfS programs that support inclusive and diverse recruitment, retention, and future placement of teachers?
EfS Vision Statement

• In order to create a thriving, sustainable, equitable society, all the graduates of Washington’s Teacher Preparation Programs are have participated in meaningful learning experiences across their university experience that build their capacity to use culturally responsive teaching in conjunction with deep understandings of ecological, social, economic sustainability and how to integrate this knowledge and habits of mind into K-12 curriculum.
Why Education for Sustainability (EfS) in K-12 Teacher Prep?

– Meeting Washington teacher competencies and Washington state standards

– Teacher prep is the ideal time to train teachers to integrate sustainability into the curriculum and to “rebundle” NGSS standards to address EfS

  • Reciprocal awareness:

    – NGSS – Use momentum of NGSS to elevate
      • Earth science
      • Sustainability
How to Incorporate EfS into Teacher Education?

• Top down – Environmental and Sustainability Education (ESE) Add-On Endorsement
  – Currently 6 teacher prep programs in WA offer the endorsement

• Bottom up – Integrate EfS across curriculum
  – Based on state competencies for teacher preparation and the Washington State Environmental and Sustainability Education Standards
NextGen STEM EfS Working Group
Next Steps

• Explore additional existing EfS resources
• Analyze examples and models of EfS
• Pilot EfS curriculum and models among working group members
• Plan and present professional development about EfS for regional teams of STEM Educators
• Evaluate and improve EfS professional development
Preservice K-8 Teachers Engage in a Middle School Outdoor Education Program Partnership

Kathryn Baldwin – Eastern Washington University
Lance Potter – Eastern Washington University
Eli Holm – Cheney Middle School
Kat Hall – The Lands Council
Brian Walker – US Fish and Wildlife Service
Partnership
Project Timeline

1. Initial conversations Fall 2015
2. Planning EWU & Cheney Middle School (CMS) Fall 2015
3. Finding a partner Winter 2016
5. Creating the plan Fall 2016
6. Site preparation by USFWS Fall 2016
7. 1st School Session Watersheds Fall 2016
8. 2nd school session Ecology Fall 2016
9. Out in the field at last! Tree Planting Fall 2016
10. Next Steps Phase 2 Water Quality Testing Spring 2017
Initial conversations
Fall 2015
Finding a partner
Winter 2016
Project Objectives

• Improve the environmental literacy of preservice teachers as a result of an outdoor education curriculum.
• Create and/or increase sense of environmental stewardship of preservice teachers as a result of an outdoor education curriculum.
• Provide practical experience for preservice teachers in experiential outdoor science education
• Preservice teachers can take that experience into their careers and be advocates for outdoor education in their schools
Project Objectives

• Provide cross-curricular outdoor education experience for seventh graders studying life science, Washington geography and history, math, language arts, and visual arts.

• Increase students’ awareness, knowledge and appreciation of their local environment.

• Meet Washington state science standards in environmental and sustainability education
Project Objectives

- Increase the capacity of environmental educators in the region
- Restore and revitalize watersheds in the region
- Engage with local schools providing opportunities for outdoor experiences
- Expose students to the outdoors
- Empower students with relevant knowledge and skills
- Encourage students to apply their experiences to become responsible environmental stewards
Lands Council Partners with USFWS

- Ongoing partnership working with private landowners to restore riparian areas near Turnbull National Wildlife Refuge to relieve pressure on the Refuge
- Partners for Fish and Wildlife Objectives:
  - Reestablish natural biological communities and ecological processes
  - Promote citizen and community based stewardship efforts for fish and wildlife conservation
  - Protect the integrity of and provide benefits to National Wildlife Refuges
Participants

- 150 7th graders
- 7 EWU preservice teachers
- 6 middle school teachers/administrators
- 2 university professors
- 2 middle school parents
- 3 non-profit/government facilitators
- 1 land owner
Materials

- Enviroscape model and supplies
- Shovels
- Gloves
- Portable toilets
- 600 native trees species
EWU preservice teachers explore point and nonpoint pollution with CMS 7th graders.
Exclosures and ground prep for wetland area

Holes pre-dug for native trees
Weather Causes Change of Plans

2nd school session with all 150 students
Out in the field at last!
Tree Planting
Fall 2016

EWU Preservice Teachers Ready to Go!

Field Instruction - The Lands Council

Planting Demonstration by USFWS
Out in the field at last!
Tree Planting
Fall 2016

Kids at work
Positive Outcomes

• Enthusiastic partnership created
  – Teacher buy-in high
  – Strong lines of communication established
  – Strong relationships being formed
  – Students excited and learning
  – Preservice teachers learn on the “job”
  – About 600 trees planted
• Return in the spring to test water quality and do site maintenance
• Tree species identification
• Species loss analysis and replanting as needed
• Family night presentations at the middle school
• Plan for sustainable partnership
Discussion

• What are some collaborations that you already engage in that support Education for Sustainability?

• How can we use collaboration to support sustained change?
THANK YOU!