EDUCATION FOR SUSTAINABILITY WORK GROUP REPORT

February 28, 2014

UNIVERSITY OF MARYLAND
sustainability
council

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EXECUTIVE SUMMARY

As a charter signatory of the American College and University Presidents' Climate Commitment, the University of Maryland (UMD) set an ambitious goal to educate all students about sustainability. UMD is progressing toward that goal through its broad array of degree granting programs, living-learning programs, and initiatives such as the Sustainability Advisors and Chesapeake Project. However, the following evidence suggests the university may have a long way to go before all students can demonstrate understanding of sustainability concepts and exhibit sustainable behaviors:

- **UMD students earned an average score of 66% on a recent assessment of sustainability knowledge**. The average score of a representative sample of students at Ohio State University was 4% higher than the UMD students' score.

- **UMD earns only 20.6 out of 40 points available in the Academics category of the Sustainability, Tracking, Assessment and Rating System (STARS)**, which the Princeton Review, Sierra Club, and Association for the Advancement of Sustainability in Higher Education use to evaluate college and universities' education for sustainability activities.

- **Approximately 38% of students enroll in a sustainability-focused course while at UMD**. Studies show that a student may need to take at least one sustainability-focused course to improve his/her ability to comprehend sustainability issues.

In January 2013, at the request of the University Sustainability Council, Provost Rankin approved the creation of an Education for Sustainability Work Group to develop and recommend actions that will move the university closer to its goal of educating all students regarding fundamental sustainability challenges affecting the region and the world. After a year of work, this 23-person work group offers the following report and set of recommendations to provide a roadmap for the university to get much closer to – perhaps even reach – its goal. Recommendations include:

1. **Incentivize the development of new sustainability courses, especially General Education courses.**

2. **Integrate sustainability in a future revision of the General Education program.**

3. **Integrate sustainability into other high level academic initiatives including the Academy of Innovation & Entrepreneurship programs and the First Year Innovation & Research Experience.**

4. **Identify an individual within the Provost's Office who will serve a lead role on implementing the above action items.**

5. **Conduct a Sustainability Literacy Assessment every three years.**

6. **Identify Living Lab projects for course integration.**

7. **Improve signage at existing campus sustainability project sites.**

BACKGROUND

University Sustainability Council Work Groups

The University Strategic Plan established a goal for the University of Maryland to "become a national model for a Green University." UMD is making significant progress toward that goal but much work remains to integrate sustainability into the core of campus operations, teaching, and service.

In the fall of 2011, the University Sustainability Council reviewed progress on the University's Climate Action Plan, trends in selected campus sustainability metrics, and UMD's expected performance on the Sustainability Tracking, Assessment, and Rating System (STARS). This review revealed the need for leadership and focused work in several priority areas. The Council, chaired by the Vice President for Administration and Finance, approved the creation of the following campus-wide work groups to develop recommended goals, plans and strategies:

- Sustainable Buildings and Energy Sources (completed work in spring 2013)
- Sustainable Water Use and Watershed Protection (completed work in fall 2013)
- Education for Sustainability (completed work in fall 2013)

Education for Sustainability

"As we destroy nature, we will be destroyed in the process. There's no escaping that conclusion … The time to equip everyone, everywhere with the knowledge and skills to change our global predicament is not just upon us, it has passed." – David Orr,
Paul Sears Distinguished Professor of Environmental Studies and Politics at Oberlin College

Transformation of the physical campus is underway but it should be matched with transformation of the curriculum. The Education for Sustainability Work Group aims to make sustainability a learning outcome of the holistic student experience. Students in every discipline should have an appreciation for the role their discipline can play in the transition to a sustainable society. Principles of sustainability should resonate in lessons students learn in and out of the classroom and in every interaction with the campus environment (i.e. buildings, transportation, food, etc.). Once all graduates understand how they can contribute to improving our global condition, then the University of Maryland will truly emerge as a national model for a green university.

Work Group Objectives

Objective 1: Identify Core Competencies for Sustainability and then develop corresponding Sustainability Learning Outcomes.

Objective 2: Map-out the programs that currently provide opportunities for undergraduate students to develop competencies related to the Sustainability Learning Outcomes.

Objective 3: Recommend strategies to make sustainability a learning outcome of the holistic student experience so that all undergraduate UMD students may be able to demonstrate fundamental knowledge of sustainability issues and exhibit sustainable behaviors.

Objective 4: Consider how the recommendations influence UMD's performance on the Sustainability Tracking, Assessment, and Rating System (STARS).

Work Group Membership

David Cronrath, Professor and Dean, Architecture, Planning, & Preservation (Chair)
Bill Dorland, Professor, Physics and Director, Honors College
Bryan Quinn, Director of Technical Operation, Electrical and Computer Engineering
Carol Rogers, Professor of Practice, Journalism
Dean Chang, Assistant Vice President, Innovation and Entrepreneurship
Don Milton, Professor and Director, Maryland Institute of Applied Environmental Health
Erin Schlegel, Community Director, Resident Life
Jen Shaffer, Assistant Professor, Anthropology
Jess Belue Buckley, Graduate Student, Education
Jim Riker, Director, Beyond the Classroom
Kate Richard, Undergraduate Student, English and Environmental Science & Policy
Lisa Kiely, Assistant Dean, Undergraduate Studies
Mark Arnold, Director of Faculty Initiatives, Office of the Provost
Mark Stewart, Senior Project Manager, Office of Sustainability
Martha Geores, Associate Professor, Geography
Marybeth Shea, Instructor, English
Melissa Carrier, Assistant Dean, Business
Nina Harris, Assistant Dean, Public Policy
Psyche Williams-Forson, Associate Professor, American Studies
Ray Weil, Professor, Environmental Science & Technology
Robb Krehbiel, Graduate Student, Conservation Biology and Sustainable Development
Sally DeLeon, Project Manager, Office of Sustainability
Steve Fetter, Associate Provost

CURRENT STATUS OF EDUCATION FOR SUSTAINABILITY AT UMD

Assessment of Sustainability Knowledge

Throughout North America and around the world, institutions of higher education struggle to adequately assess students' understanding of sustainability concepts. To date, no single assessment has emerged as the standard for measuring sustainability knowledge, however, researchers at the University of Maryland and Ohio State University recently co-developed an "Assessment of Sustainability Knowledge" so that the higher education community could get a bit closer to having such a standard.

The UMD/OSU assessment tests students' basic understanding of sustainability issues including climate change, habitat loss, responsible consumerism, economics, and social justice. The researchers conducted the assessment with large, random samples of undergraduate students at each institution in March and April of 2013. The results showed significant knowledge gaps among students at both institutions but, particularly troubling for UMD, students at this university scored on average 4% lower than Ohio State students did across all three domains of sustainability knowledge:

Survey Domain	OSU	UMD
Environmental	65%	62%
Social	76%	73%
Economic	69%	65%
Total Score	70%	66%

The full assessment, including the UMD students' responses to each question, is included in Appendix A. Here are some of the apparent knowledge gaps uncovered by the assessment:

Only **58%** of UMD students could identify **an effect of global climate change**.

Only **54%** of UMD students could identify **the most common cause of pollution of streams and rivers**.

Only **49%** of UMD students identified **"reducing consumption" as a greater step toward sustainability than "recycling" or "buying products labeled 'eco' or 'green'."**

Only **46%** of UMD students could identify **the greatest pressure leading to the degradation of the Chesapeake Bay's ecosystem**.

Only **42%** of UMD students could **put a list of common activities in order of largest to smallest environmental impact**.

Only **37%** of UMD students could identify **the leading cause of the depletion of fish stocks in the Atlantic Ocean**.

Internal Review of Education for Sustainability Activities

The work group reviewed literature and conducted two brainstorming sessions to identify the knowledge and skills (or "core competencies") people may need to implement solutions to sustainability challenges. The group then considered how well UMD's existing curriculum equips students with those competencies. Next, the work group transformed the competencies into learning outcomes and attempted to determine how many undergraduate students currently participate in activities that may address those learning outcomes. The following is a brief summary of that work.

Core Competencies for Sustainability

Based on a literature review and insights of work group members, the work group developed a rough set of "core competencies for sustainability" and then compared them with the existing General Education (Gen. Ed.) learning outcomes at UMD. Several competencies are already addressed in Gen. Ed. but around 60% of the core competencies do not appear to be present in the Gen. Ed. curriculum at this time.

Strong Overlap with Gen Ed:

- Social and cultural sciences
- Society-economy interactions
- Possibility, probability, desirability of future developments
- Written and oral communication
- Cultural competence

Modest Overlap with Gen Ed:

- Social justice
- Across time and space
- Visioning and goal setting
- Understand types of problems and solutions
- Conflict resolution
- Social movements
- Collaboration

No Overlap with Gen Ed:

- Environmental sciences
- Health sciences
- Economics
- Sustainability principles, targets, thresholds
- Environmental justice
- Health equity
- Intergenerational equity
- Happiness
- Society-environment-economy interactions
- Tipping points and feedback loops
- Lifecycle analysis
- Inertia and path dependency
- Risk and precaution
- Adaptive management
- Adaptation and mitigation
- Leadership
- Civil discourse

Sustainability Learning Outcomes

Since the core competencies for sustainability are not specific or measurable, the work group transformed the competencies into learning outcomes, matching the style and format of existing Gen. Ed. learning outcomes. The work group approved the following six sustainability learning outcomes in September 2013.

Sustainability is commonly defined as "meeting the needs of the present without compromising the ability of future generations to meet their own needs." [1] The University of Maryland is committed to being a national model for a green university [2] and preparing all students to help create a more sustainable world. [3] Toward this goal, the Education for Sustainability Work Group of the University Sustainability Council recommends further integrating sustainability into existing academic programs and campus life so that all students earning an undergraduate degree from the University of Maryland will be able to:

1. *Describe how sustainability relates to environmental issues, social justice, and economic development.*

2. *Explain how natural, economic, and social systems interact to foster or prevent sustainability. [4]*

3. *Evaluate how an individual's choices and activities impact the environment and, as a result, affect the health and well-being of everyone. [5]*

4. *State a long-term vision for individual happiness and societal well-being and explain how existing norms contribute to or diminish this vision.*

5. *Demonstrate an ability to collaborate and communicate effectively across academic disciplines and with diverse stakeholders. [6]*

6. *Apply their knowledge of sustainability to their behaviors as consumers, citizens, and/or leaders.*

[1] World Commission on Environment and Development (a.k.a. the Brundtland Commission), 1987
[2] University of Maryland Strategic Plan, 2008
[3] American College and University Presidents' Climate Commitment, 2007
[4] Cal Poly General Education Sustainability Learning Objective
[5] San Francisco State University General Education Sustainability Learning Objective
[6] Already addressed throughout UMD's General Education Program

The work group used these learning outcomes to identify academic programs and courses that may already give students a solid grounding in sustainability (see next section). The work group also recommends that these learning outcomes be included in a future revision of the Gen. Ed. program (see Recommendations section).

Current Experiences that Address the Sustainability Learning Outcomes

The work group attempted to determine which curricular and extracurricular experiences might already address the sustainability learning outcomes. Since not all programs have learning outcomes and the outcomes that do exist do not match perfectly with the new sustainability learning outcomes, the work group made some assumptions about which programs and courses to include and exclude from its analysis. See Appendix B for lists of the programs included in our analysis of Immersive Learning Experiences.

Immersive Learning Experiences

- Majors

  Approximately **5% of undergraduate students are enrolled in a major** that may address several sustainability learning outcomes. These majors include Agricultural & Resource Economics, Anthropology, Architecture, Atmospheric & Oceanic Sciences, Environmental Science & Policy, Environmental Science & Technology, Geographical Sciences, and Supply Chain Management.

- Minors

  Approximately **1.4% of undergraduate students are enrolled in a minor** that may address several sustainability learning outcomes. These minors include Environmental Economics & Policy, Global Poverty, Resource & Agricultural Policy in Economic Development, and Sustainability Studies.

- Living-Learning Programs

  Approximately **1.8% of undergraduate students are enrolled in a living-learning program** that may address several sustainability learning outcomes. These programs include Beyond the Classroom and College Park Scholars – Environment, Technology, and Economy.

- Sustainability-Focused Courses

  Approximately **38% of undergraduate students are enrolled in a course** that may address several sustainability learning outcomes. Around 50 courses in 21 different departments made the list but a more thorough analysis of syllabi for these courses would be needed to determine which ones adequately address the learning outcomes.

Touch-Point Experiences

This university is rich in experiences that introduce students to sustainability issues in and out of the classroom. "Touch-point" experiences include educating incoming students about sustainability through the Sustainability Advisors program, encouraging students to recycle in residence halls, and introducing students to sustainability issues in courses revised through the Chesapeake Project. These touch-points reinforce sustainability learning and broaden awareness of sustainability issues, so they contribute meaningfully to the general education for sustainability of all UMD students.

We estimate that approximately 100% of undergraduate students have at least three touch-point experiences with sustainability programs over four years at UMD. This achievement speaks to the university's outstanding commitment to integrate sustainability into campus operations and student behavior, however, these touch-point experiences alone probably do not allow students to develop the competencies needed to be aware of global sustainability issues and the behaviors they may exercise to mitigate environmental and associated impacts.
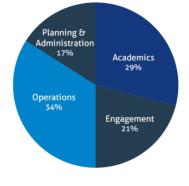
UMD's Performance on STARS

The Princeton Review, Sierra Club, and Association for the Advancement of Sustainability in Higher Education each use the Sustainability Tracking, Assessment, and Rating System (STARS) to evaluate the sustainability activities of colleges and universities. STARS 2.0 was released in August 2013 and includes four categories of evaluation criteria:

- Academics
- Engagement
- Operations
- Planning and Administration

Academics is the second largest category (after Operations) in terms of the number of points available in STARS. The following is a summary of the points available in Academics and an estimation of how UMD performs on STARS 2.0.

STARS 2.0 Point Allocation

Planning & Administration 17%
Academics 29%
Operations 34%
Engagement 21%

*UMD currently earns **20.6 out of 40** points available in the Academics category*

Academics: Curriculum (AC) Credits

AC1 Academic Courses   *Points Available: 14*   ***Est. UMD performance: 5***

Part 1: Institutions earn the maximum of 8 points for Part 1 of this credit if 20 percent or more of all courses offered by the institution are sustainability courses and/or courses that include sustainability. Incremental points are awarded based on the percentage of course offerings that are sustainability courses and/or courses that include sustainability. (*Est. UMD performance: 1 out of 8*)

Part 2: Institutions earn the maximum of 6 points for Part 2 of this credit when 90 percent or more of academic departments or their equivalent offer at least one sustainability course or course that includes sustainability. Incremental points are available based on the percentage of academic departments that offer courses with sustainability content. (*Est. UMD performance: 4 out of 6*)

AC2 Learning Outcomes   *Points Available: 8*   ***Est. UMD performance: 1.6***

Institution's students graduate from degree programs that include sustainability as a learning outcome or include multiple sustainability learning outcomes. Sustainability learning outcomes (or the equivalent) may be specified at: Institution level (e.g. covering all students), Division level (e.g. covering one or more schools or colleges within the institution), Program level, or Course level.

AC3 Undergraduate Program   *Points Available: 3*   *UMD performance: 3*

This credit recognizes institutions that have formal, undergraduate-level degree programs focused on sustainability. Several programs including Environmental Science and Policy qualify, so maximum points are already attained.

AC4 Graduate Program   *Points Available: 3*   *UMD performance: 3*

This credit recognizes institutions that have formal, graduate-level degree programs focused on sustainability. Several programs including Sustainable Development and Conservation Biology qualify, so maximum points are already attained.

AC5 Immersive Experience   *Points Available: 2*   *UMD performance: 2*

Institution offers at least one immersive, sustainability-focused educational study program. The program is one week or more in length and may take place off-campus, overseas, or on campus. Several programs including Engineers Without Borders qualify, so maximum points are already attained.

AC6 Sustainability Literacy Assessment   *Points Available: 4*   *UMD performance: 2*

Institution conducts an assessment of the sustainability literacy of its students. The sustainability literacy assessment focuses on knowledge of sustainability topics and may also address values, behaviors and/or beliefs. UMD must track a cohort over three years to earn full points for this credit.

AC7 Incentives for Developing Courses   *Points Available: 2*   *UMD performance: 2*

Institution has an ongoing program or programs that offer incentives for faculty in multiple disciplines or departments to develop new sustainability courses and/or incorporate sustainability into existing courses or departments. The Chesapeake Project qualifies, so maximum points are already attained.

AC8 Campus as a Living Laboratory   *Points Available: 4*   *Est. UMD performance: 2*

Institution is utilizing its infrastructure and operations for multidisciplinary student learning, applied research and/or practical work that advances sustainability on campus in at least one of the following areas: Air and Climate; Buildings; Food; Energy; Grounds; Purchasing; Transportation; Waste; Water; Coordination, Planning and Governance; Diversity and Affordability; Health and Wellbeing; Investment; Public Engagement. This credit includes substantive work (e.g. class projects, thesis projects, term papers, published papers) that involves active and experiential learning and contributes to positive sustainability outcomes on campus.

Improving Performance on STARS

There are several ways UMD can improve its performance on STARS Academics credits such as increasing the number of sustainability courses offered on campus and integrating sustainability into General Education. Recommendations presented in the next section include strategies that will help the university maximize its score on third-party assessments while presenting other homegrown solutions to enhance student learning for sustainability.

RECOMMENDATIONS FOR IMPROVING EDUCATION FOR SUSTAINABILITY AT UMD

In order to ensure that all undergraduate students at the University of Maryland are educated about sustainability and to help the university strengthen its status as a national leader in sustainability, the Education for Sustainability Work Group recommends the following actions:

1. **Incentivize the development of new sustainability courses, especially General Education courses.**

   - The Office of the Provost should provide incentives to faculty who develop new sustainability-focused Gen. Ed. courses. Incentives could take the form of stipends and/or course-release to provide time to develop new curricula. Sustainability fits particularly well in the following Gen. Ed. areas: I-Series, History and Social Sciences, Humanities, Natural Sciences, Scholarship in Practice, Understanding Plural Societies, and Cultural Competence.

   - The Office of the Provost should encourage faculty who teach courses in the Sustainability Studies Minor to classify their courses as Gen. Ed. Several courses that currently count toward the Minor fit well in various Gen. Ed. areas but the faculty who teach those courses have not yet applied for Gen. Ed. classification.

   - The Office of Sustainability should encourage the development of sustainability-focused/related Gen. Ed. courses through the Chesapeake Project. Faculty who participate in this annual workshop already commit to integrating sustainability into at least one of the courses they teach. Workshop facilitators could offer additional support to faculty who wish to get Gen. Ed. classification for their courses.

   - The Office of Sustainability should also encourage participation in the Chesapeake Project among academic departments that do not yet have sustainability-focused/related courses. Approximately 50 of UMD's 150 academic departments currently offer a sustainability-focused/related course. Recommendations listed above and recruitment from under-represented departments for participation in the Chesapeake Project will increase that ratio.

2. **Integrate sustainability in a future revision of the General Education program.**

   - The Office of the Provost (and other appropriate campus bodies) should integrate the Sustainability Learning Outcomes in a future revision of the General Education program. Sustainability is a theme that could be explored through courses in a number of Gen. Ed. areas, especially I-Series, History and Social Sciences, Humanities, Natural Sciences, Scholarship in Practice, Understanding Plural Societies, and Cultural Competence. Gen. Ed. courses that address at least three of the sustainability learning outcomes could be tagged with an "S" and, eventually, students could be required to complete at least one sustainability-tagged Gen. Ed. course (ex. DSHS-S, DSSP-S, DSNS-S, SCIS-S, etc.)

3. Integrate sustainability into other high level academic initiatives including the Academy of Innovation & Entrepreneurship programs and the First Year Innovation & Research Experience.

- A representative of the Office of the Provost should meet with program directors to discuss ways the programs could help students build competencies related to the sustainability learning outcomes. The representative and program directors should also explore opportunities for students to develop and implement Living Lab projects that would help the university achieve its sustainability goals (see Recommendation #6).

4. Identify an individual within the Provost's Office who will serve a lead role on implementing the above action items.

- The Office of the Provost should identify an individual who will be responsible for implementing recommendations #1-3 above. This person should report to the University Sustainability Council on progress toward these actions one year after initiation and annually thereafter.

5. Conduct a Sustainability Literacy Assessment every three years.

- The Campus Assessment Working Group (or other appropriate unit) should conduct a Sustainability Literacy Assessment every three years to track and analyze how an undergraduate cohort's understanding of sustainability changes from their freshmen to senior years. Results from the assessment should be shared with the University Sustainability Council.

6. Identify Living Lab projects for course integration.

- The Office of Sustainability should work with campus partners to identify experiential learning projects that engage students in developing solutions to real campus sustainability challenges. These projects may be related to the following categories specified in the STARS credit on Campus as a Living Laboratory: Air and Climate; Buildings; Food; Energy; Grounds; Purchasing; Transportation; Waste; Water; Coordination, Planning and Governance; Diversity and Affordability; Health and Wellbeing; Investment; and Public Engagement.

7. Improve signage at existing campus sustainability project sites.

- The Office of Sustainability should work with campus partners to develop educational signage for LEED Certified buildings, stormwater management projects, and other significant sustainability projects on campus. Doing so will clearly demonstrate to students, staff, faculty, and visitors that the campus is becoming a true Living Lab for sustainability.

CONCLUSION

Government, industry, aid organizations, and other groups of people around the world are looking to institutions of higher education to create sustainable solutions to environmental, societal, and economic challenges. Between 2006 and 2013, more than 680 American colleges and universities answered that call by signing the American College and University Presidents' Climate Commitment (ACUPCC), pledging to eliminate their carbon footprints and educate all students for a sustainable future. The University of Maryland, a charter signatory of the ACUPCC, has made great progress toward both goals but cannot yet say it is adequately preparing all undergraduate students with the basic knowledge and skills to address and mitigate environmental impacts associated with world population growth and climate change. The recommendations presented in this report provide a roadmap for the university to get much closer to – perhaps even reach – its goal of educating all students about sustainability.

APPENDIX A: ASSESSMENT OF SUSTAINABILITY KNOWLEDGE

1. What is the most common cause of pollution of streams and rivers?
   a. Dumping of garbage by cities
   b. **Surface water running off yards, city streets, paved lots, and farm fields**
   c. Litter near streams and rivers
   d. Waste dumped by factories
   e. Don't know

   UMD CORRECT-RESPONSE RATE: **54%**

2. Ozone forms a protective layer in the earth's upper atmosphere. What does ozone protect us from?
   a. Acid rain
   b. Climate change
   c. Sudden changes in temperature
   d. **Harmful UV rays**
   e. Don't know

   UMD CORRECT-RESPONSE RATE: **87%**

3. What is the name of the primary federal agency that oversees environmental regulation?
   a. **Environmental Protection Agency (the EPA)**
   b. Department of Health, Environment, and Safety (the DHES)
   c. National Environmental Agency (the NEA)
   d. Federal Pollution Control Agency (the FPCA)
   e. Don't know

   UMD CORRECT-RESPONSE RATE: **86%**

4. What is the primary benefit of wetlands?
   a. Promote flooding
   b. **Clean the water before it enters lakes, streams, rivers, or oceans**
   c. Keep the number of undesirable plants and animals low
   d. Provide good sites for landfills
   e. Don't know

   UMD CORRECT-RESPONSE RATE: **69%**

5. Which of the following is an example of sustainable forest management?
   a. Setting aside forests to be off limits to the public
   b. **Never harvesting more than what the forest produces in new growth**
   c. Producing lumber for nearby communities to build affordable housing
   d. Putting the local communities in charge of forest resources
   e. Don't know

   UMD CORRECT-RESPONSE RATE: **68%**

6. In the U.S., what do we currently do with the nuclear waste generated by nuclear power plants?
   a. Use it as nuclear fuel
   b. Sell it to other countries
   c. Dump it in landfills
   d. **Store and monitor the waste**
   e. Don't know

   UMD CORRECT-RESPONSE RATE: **52%**

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7. Which of the following is the most commonly used definition of sustainable development?

   a. Creating a government welfare system that ensures universal access to education, healthcare, and social services

   b. **Meeting the needs of the present without compromising the ability of future generations to meet their own needs**

   c. Setting aside resources for preservation, never to be used

   d. Building a neighborhood that is both socio-demographically and economically diverse

   e. Don't know

UMD CORRECT-RESPONSE RATE:

74%

8. The wealthiest 20% of people in the U.S. own approximately what percent of the nation's privately held wealth?

   a. 20%

   b. 35%

   c. 50%

   d. **85%**

   e. Don't know

UMD CORRECT-RESPONSE RATE:

68%

9. Over the past 3 decades, what has happened to the difference between the wealth of the richest and poorest Americans?

   a. **The difference has increased**

   b. The difference has stayed about the same

   c. The difference has decreased

   d. Don't know

UMD CORRECT-RESPONSE RATE:

82%

10. Higher levels of education generally lead to...

    a. Lower levels of voter turnout

    b. **Greater annual earnings**

    c. Larger family size

    d. Higher self esteem

    e. Don't know

UMD CORRECT-RESPONSE RATE:

84%

11. Many economists argue that electricity prices in the U.S. are too low because…

    a. **They do not reflect the costs of pollution from generating the electricity**

    b. Too many suppliers go out of business

    c. Electric companies have a monopoly in their service area

    d. Consumers spend only a small part of their income on energy

    e. Don't know

UMD CORRECT-RESPONSE RATE:

61%

12. Which of the following countries has now passed the U.S. as the biggest emitter of the greenhouse gas carbon dioxide?
    a. **China**
    b. Sweden
    c. Brazil
    d. Japan
    e. Don't know

UMD CORRECT-RESPONSE RATE:

73%

13. Which of the following is a leading cause of the depletion of fish stocks in the Atlantic Ocean?
    a. **Fishermen seeking to maximize their catch**
    b. Reduced fish fertility due to genetic hybridization
    c. Ocean pollution
    d. Global climate change
    e. Don't know

UMD CORRECT-RESPONSE RATE:

37%

14. Which of the following is the most commonly used definition of economic sustainability?
    a. Maximizing the share price of a company's stock
    b. **Long term profitability**
    c. When costs equal revenue
    d. Continually expanding market share
    e. Don't know

UMD CORRECT-RESPONSE RATE:

48%

15. Which of the following is the primary reason that gasoline prices have risen over the last several decades in the U.S.?
    a. Growing percentage of gas stations owned by large corporations
    b. Increasing oil discoveries overseas
    c. Higher rates of state and federal gasoline tax
    d. **Increasing global demand for oil**
    e. Don't know

UMD CORRECT-RESPONSE RATE:

77%

16. What are the potential effects of global climate change?
    a. **Loss of habitats**
    b. Less severe weather
    c. Loss of ozone layer
    d. Decrease in sea level
    e. Don't know

UMD CORRECT-RESPONSE RATE:

58%

17. Living in Maryland, we see signs about entering the Chesapeake Bay Watershed or about "Saving the Bay." Which of the following is the greatest pressure leading to the degradation of the Bay's ecosystem?
    a. Dredging for sand
    b. Litter that flows from streams and rivers into the Lake
    c. **Application of fertilizer on lawns and farms**
    d. Gas-powered boats
    e. Don't know

18. Imagine you are one of the many fishermen who rely on the fish you catch from Lake Erie as your main source of income. The Fisherman Council determined that each fisherman must limit his/her catch to 5 tons per year to maintain the fishery. You decide to catch 6 tons of fish this year.

    What could be the results of your decision?
    A.   You make more money this year than you would have if you caught 5 tons of fish
    B.   You make less money this year than you would have if you caught 5 tons of fish
    C.   The total number of fish that are available to catch each year could decrease
    D.   Fishermen, including you, could go out of business

    a. B, C, and D, but not A
    b. B and C, but not A or D
    c. A and C, but not B or D
    d. **A, C, and D, but not B**
    e. Don't know

19. The most significant driver in the loss of species and ecosystems around the world is...
    a. Overhunting/overharvesting
    b. **Conversion of natural spaces into human developments (farmland, cities, etc.)**
    c. Acid rain
    d. Breeding of animals in zoos
    e. Don't know

20. Which of the following is the best example of environmental justice?
    a. Urban citizens win a bill to have toxic wastes taken to rural communities
    b. The government dams a river, flooding Native American tribal lands to create hydro-power for large cities
    c. **All stakeholders from an indigenous community are involved in setting a quota for the amount of wood they can take from a protected forest next to their village**
    d. Multi-national corporations build factories in developing countries where environmental laws are less strict.
    e. Don't know

21. Of the following, which would be considered living in the most environmentally sustainable way?
    a. Recycling all recyclable packaging
    b. **Reducing consumption of all products**
    c. Buying products labeled "eco" or "green"
    d. Buying the newest products available
    e. Don't know

22. What factors influence the human population's impact on Earth?

    A. Size of the population
    B. Amount of materials used per person
    C. Use of technology that lessens our impact

    a. **A, B, and C**
    b. A and B, but not C
    c. B and C, but not A
    d. A, but not B or C
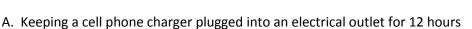   e. Don't know

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23. Using resources, like fossil fuels, can create economic growth. However, future generations may be disadvantaged if the current generation overuses these resources. Which of the following principles can we follow if we do not want to disadvantage the next generation?

    a. **Renewable resources such as fish, soil, and groundwater must be used no faster than the rate at which they regenerate.**
    b. Nonrenewable resources such as minerals and fossil fuels must be used up quickly to encourage the development of renewable substitutes.
    c. Pollution must be emitted at current levels so that natural systems can maintain the ability to absorb them, recycle them, or render them harmless
    d. None of the above are true
    e. Don't know

24. The best way to support a local economy, such as the economy of College Park, is to buy goods (groceries, clothing, toiletries, etc.)…

    a. At large chain stores that may employ workers from the local community
    b. Online from discount retailers
    c. **From stores that sell locally-produced goods**
    d. From second-hand/thrift stores
    e. Don't know

25. Which of the following statements about water is true?

    a. Globally, water for personal use such as washing dishes, doing laundry, and bathing is the major user of water resources.
    b. **Globally, freshwater reserves (aquifers) are used faster than they are replenished.**
    c. Floods and severe weather will increase the availability of clean drinking water.
    d. Because water is a free and abundant resource, it is not a major concern for most countries.
    e. Don't know

26. Imagine that we had to pay for all the costs associated with the goods we use every day.
    What would go into calculating the true costs of a product?

    a. The cost of raw materials to make the product
    b. The cost of environmental damage caused by production
    c. The coast of health care for employees who manufacture the product
    d. **All of the above**
    e. Don't know

27. Put the following list in order of the activities with the largest environmental impact to those with the smallest environmental impact:

A. Keeping a cell phone charger plugged into an electrical outlet for 12 hours
B. Producing one McDonald's quarter-pound hamburger
C. Producing one McDonald's chicken sandwich
D. Flying in a commercial airplane from Washington D.C. to China
    a. A, C, B, D
    b. D, A, B, C
    c. D, C, B, A
    d. D, B, C, A
    e. Don't know

28. Workers around the world face a variety of social injustices, including low wages, poor working conditions, and lack of access to education. To help improve conditions for these workers you can:
    a. Support corporations that do not allow workers to join labor unions
    b. Buy the newest products to keep factories around the world open
    c. Purchase products from companies that conduct business in a socially responsible manner
    d. Support large corporations because they generally have more money to pay their workers
    e. Don't know

APPENDIX B: IMMERSIVE LEARNING EXPERIENCES FOR SUSTAINABILITY

The following list contain the academic programs and courses the work group considered as immersive learning experiences for sustainability, which means that these programs/courses may allow students to develop competence in at least three of the six sustainability learning outcomes. Since not all programs have learning outcomes and the outcomes that do exist do not match perfectly with the new sustainability learning outcomes, the work group made some big assumptions about which programs to include and exclude from its analysis. We readily admit that the following analysis is imperfect and may include some programs that do not truly address the sustainability learning outcomes, and may exclude some programs that do.

Notes about this data:

1. Evaluation of how each program addresses the Sustainability Learning Outcomes is based on the best judgment of Office of Sustainability staff and feedback from program directors.
2. Enrollment is based on fall 2012 data unless otherwise noted.
3. All enrollment numbers are converted to annual enrollment.
4. Total undergrad student enrollment in fall 2012: 26,538

MAJORS	
Annual Enrollment:	*335*
Assumed Incidence of Double-Majors:	*1%*
Adjusted Annual Enrollment:	*332*
Percentage of Undergrads Enrolled:	*5.0%*
Program	Enrollment
Agricultural and Resource Economics	40
Agricultural and Resource Economics: Agribusiness	52
Anthropology	143
Architecture	188
Atmospheric and Oceanic Science	23
Environmental Sci & Pol-Biodvrsity & Conserv Bio	8
Environmental Sci & Pol-Earth Surface Proc	2
Environmental Sci & Pol-Env Economics	8
Environmental Sci & Pol-Env Politics & Policy	61
Environmental Sci & Pol-Env Restoration & Mgmt	13
Environmental Sci & Pol-Global Environmental Change	3
Environmental Sci & Pol-Land Use	19
Environmental Sci & Pol-Marine & Coastal Mgmt	11
Environmental Sci & Pol-Policy	42
Environmental Sci & Pol-Science	66
Environmental Sci & Pol-Society & Env Issues	12
Environmental Sci & Pol-Soil, Water & Land Rsrcs	8

Environmental Sci & Pol-Wildlife Ecology & Mgmt	54
Environmental Sci & Tech Undecided	30
Environmental Sci & Tech: Ecological Tech Design	88
Environmental Sci & Tech: Environmental Health	37
Environmental Sci & Tech: Natural Resources Mgmt	29
Environmental Sci & Tech: Soil & Watershed Science	10
Geographical Sciences	54
Geographical Sciences: GIS & Computer Cartography	87
Supply Chain Management	252

MINORS	
Annual Enrollment:	*93*
Assumed Incidence of Double-Minors:	*1%*
Adjusted Annual Enrollment:	*92*
Percentage of Undergrads Enrolled:	*1.4%*
Program	Enrollment*
Environmental Economics and Policy	10
Global Poverty	7
Resource and Ag. Policy in Economic Development	102
Sustainability Studies	252

Enrollment data from fall 2013

LIVING-LEARNING PROGRAMS	
Annual Enrollment:	*242*
Assumed Incidence of Double-Enrollment over 4 years:	*1%*
Adjusted Annual Enrollment:	*240*
Percentage of Undergrads Enrolled:	*3.6%*
Program	Enrollment*
Beyond the Classroom	92
CP Scholars - Environment, Technology, Economy	150

Enrollment data from fall 2013

SUSTAINABILITY-FOCUSED COURSES	
Annual Enrollment:	*3,108*
Assumed Incidence of Double-Enrollment over 4 years:	*20%*
Adjusted Annual Enrollment:	*2,486*
Percentage of Undergrads Enrolled:	*37.5%*

Program	Enrollment
AGNR300 Introduction to Sustainability	170
AGNR499P Study Abroad: Sustainability and Leadership: Grassroots Technologies Empowering Quechua Communities in Peru	0
ANTH266 Changing Climate, Changing Cultures	60
ANTH298E Anthropological Applications to Sustainable Development	0
ANTH468L Conservation and Indigenous People in Latin America	8
AOSC123 Causes and Implications of Global Change	32
AOSC401 Climate Dynamics and Earth System Science	32
AOSC433 Atmospheric Chemistry and Climate	60
AOSC446 Earth, Life, and Sustainability	0
AOSC458R Atmospheric Ocean Science: Earth, Life and Sustainability	25
ARCH170 Introduction to the Built Environment	570
ARCH271 People, Planet and Profit: Building Sustainable Places	0
ARCH289I-Smart Growth goes to School	18
ARCH418M Selected Topics in Architectural Technology: Measuring Sustainability	60
ARCH461 Sustainability in Architecture	24
AREC200 The Chesapeake Bay Ecosystem: Intersection of Science, Economics and Policy	40
AREC240 Introduction to Economics and the Environment	135
BGMT289A Social Enterprise: Changing the World through Innovation & Transformative Action	55
BMGT468V Transformative Action: Effective Methods of Social Change	0
BMGT468W Social Innovation Practicum	0
BSCI205 or 215: Global Sustainability: A Biologist's Perspective	40
BSCI361 Principles of Ecology	142
BSCI363 The Biology of Conservation and Extinction	80
CPSP118E College Park Scholars First-Year Colloquium I: Environment, Technology and Economy	80
ENCE215 Engineering for Sustainability	135
ENCE310 Introduction to Environmental Engineering	125
ENCE411 Environmental Engineering Science	42
ENST314 Fisheries Management and Sustainability	40
ENST452 Wetland Creation and Restoration	35
ENST489W Field Experience: Sustainability in Urban Watersheds	30
GEOG123 Causes and Implications of Global Change	0
GEOG330 As the World Turns: Society and Sustainability in a Time of Great Change	50
GEOG331 Introduction to Human Dimensions of Global Change	50
GEOG415 Land Use, Climate Change, and Sustainability	70

GEOG498B Topical Investigations: Social Ecological Systems	9
GEOL120 Environmental Geology	320
HONR278F Toward an Adaptable Reusable and Living Architecture	20
INAG123 Introduction to Sustainable Agriculture	25
INAG248 Topics in Sustainable Agriculture	20
LARC451 Sustainable Communities	0
LARC461 People and the Environment	20
LARC489G/452 Green Infrastructure & Community Greening	0
MIEH210 Environmental Justice	0
PHIL209C Heated Debates: Philosophy of Climate Change	59
PLSC289I Greening Cities: Who Wins, Who Loses, and Who Cares	57
PLSC425 Green Roofs and Urban Sustainability	65
PUAF289 Cross-Examining Climate Change	0
SOCY305 Scarcity and Modern Society	120
UNIV325 Beyond the Classroom Seminar I: Civic Engagement and Social Change in a Global Context	120
URSP250 The Sustainable City: Exploring Opportunities and Challenges	65