

Geography, E-Learning and a Course in Peatland Ecosystems and Climate Change Science

Jay Samek¹, David Skole¹, Rony Teguh², Hendrik Segah² and Siti Maimunah³

¹Michigan State University, 1405 S. Harrison Rd., Rm 101, East Lansing, MI 48823 USA

²University of Palangka Raya, Kampus UPR Tunjung Nyaho, Jl. Yos Sudarso Palangka Raya 73112, Central Kalimantan, Indonesia

³Muhammadiyah University of Palangkaraya, Jl. RTA Milono KM 1, 5, Langkai, Pahandut, Kota Palangka Raya, Kalimantan Tengah 73111, Indonesia

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Abstract: The proximity of universities to specific environments or ecosystems creates advantages for developing e-learning courses. E-learning and advances in internet technologies also help to shrink the gap between more remote and less remote universities. Using the example of a recently developed e-learning course on Peatland Ecosystems and Climate Change Science, we explore the impacts of geographic location, advances in ICT, the use of Bahasa Indonesia (as opposed to English), and Indonesian scholarship in an e-learning course. We analyze this through a review and description of the on-line course, comparison to other relevant and thematically related e-learning systems available to users, and from a survey questionnaire to a limited number of participants.

1 INTRODUCTION

Geography matters. The location of something, where it is on the Earth, is important. Where this something is in relationship, in proximity, to other things is also important. For example, a city that is close to an area's natural resources and is also located at a port has an advantage in terms of economic trade, imports and exports, over an inland city that is far from these natural resources. Technological advances and infrastructure development, like roads and rails, can shrink or reduce the relative advantage of the port city over the inland city. In similar fashion, a University's location impacts its relative advantage or disadvantage to other Universities.

This paper explores the role of geographic location, technological advances, e-learning and digital information in shrinking the divide between Universities located in hinterlands (or in developing countries) and those located near Capital cities (or in developed countries). We discuss this through the lens of a recently developed five-module, on-line course on Peatland Ecosystems and Climate Change Science. The course was developed through a collaborative effort by Michigan State University (MSU), the University of Palangka Raya (UPR), and Muhammadiyah Uni-

versity of Palangka Raya (UMP) as part of an activity funded by the USAID LESTARI program. The course demonstrates the value and utility of thematic content (in this case the Peatland Forests) related to locality and proximity of the on-line course developers (UPR and UMP) in Central Kalimantan. Proximity supports the first-hand knowledge and expertise beneficial to delivering high quality educational material.

2 RESEARCH METHODS

We explore the ideas regarding influence of proximity, ICT advances, the use of Indonesia scholarship and Bahasa Indonesia language in leveling the playing field between remote and less remote higher learning opportunities through (1) a review and description of the on-line course, (2) comparison to other relevant and thematically related e-learning systems available to users, and (3) analysis of a survey questionnaire to a limited number of participants (n = 31). This is a descriptive analysis method based on observations rather than a correlational, quasi-experimental or experimental research designed paper.

3 BACKGROUND

Industry 4.0, or the fourth industrial revolution, is the term-of-art given to the current realities of automation and data exchange in manufacturing technologies. The term encompasses several areas specific or related to information and communications technology (ICT), such as cyber-physical systems, the internet of things, and cloud computing (Henning et al., 2013)(Lasi et al., 2014)(Hermann et al., 2016)). The societal impacts resulting from the various technological advances of Industry 4.0 are numerous (Bauer et al., 2015) and include changes to education and learning (Baygin et al., 2016)(Huba and Kozák, 2016).

In today's world access to information and data via the internet and mobile platforms is itself a revolution. Smart phones, tablets, laptops computers, high-speed Wi-Fi and fiber optics, data storage capacity tied to database software and servers; these are simply a few of the technologies rapidly changing people's ability to access data and information. We can review how advances in nanotechnologies have transformed information processing and storage (Goodnick et al., 2018), or the changes mobile cloud computing have made on Big Data applications (Stergiou and Psannis, 2017) or the advances in wireless and Internet-of-Things (IoT) enable networks (Jan et al., 2019) to understand the transformative changes in internet technologies over the past quarter century. A paper published by Deryn Watson thirteen years ago in 2006 titled "Understanding the relationship between ICT and education means exploring innovation and change" provides an appropriate description of the changes in internet technologies (Watson, 2006).

"In 1985 having micro-computers in schools was still relatively novel... Twenty years later the landscape is dominated by PCs and laptops, mobile technology, the Internet and Worldwide Web—a digital world of interconnectivity. The hardware is relatively cheap, with virtually unlimited memory, power and connectivity devices."

These advances and the democratization of data and information have emerged to also support e-learning (Fry, 2001)(Arkorful and Abaidoo, 2015). [Defining e-learning is an on-going debate within the community (Arkorful and Abaidoo, 2015) and is beyond the scope of this paper.] We note that e-learning models can be quite diverse (e.g. synchronous or asynchronous) and the terminology quite varied (e.g. learning management systems, blended learning, flipped classrooms, massive open online course or MOOC, etc.).

The course developed by MSU/UPR/UMP is affil-

iated with the universities but taking the course does not require matriculating or registering with the university nor is the course transcriptable. Our Peatland Ecosystems and Climate Change Science on-line course, therefore, more closely resembles a MOOC course – in that it is free and open to the public.

There are numerous, similar e-learning opportunities available in the related areas of forest ecology, forest management and climate change. The UN-REDD Programme, which is a United Nations Collaborative Programme (FAO, UNDP, UNEP) in Reducing Emissions from Deforestation and forest Degradation (REDD+) in developing countries, hosts the REDD+ Academy and offers two free on-line courses: (1) the Fundamentals of REDD+ and (2) Advancing on REDD+. The World Bank Group manages the on-line Open Learning Campus which serves as a clearing house for a variety of e-learning content (archived webinar, Bite+, community of practice, data visualization, facilitated eLearning, game/interactive, infographic, knowledge note, MOOC and podcast). A search on the key words climate change and forests returned 720 results, of these, only four are MOOCs and three are facilitated eLearning. A search on the World Bank Group's Open Learning Campus with the key words peatland forests returned 32 results, none of which were MOOCs or facilitated eLearning. HarvardX is an on-line resource that offers free courses from Harvard University. A key word search for climate change and forests did not return any results, nor did the search for peatland forests. A key word search for climate change resulted in 63 results and a search for forest resulted in eight results.

Learning material in non-English languages is also limited. The Peatland Ecosystems and Climate Change Science on-line course is more than 90% Bahasa Indonesia. The World Bank Group's Open Learning Campus has some courses offered in Spanish, French, Portuguese, the HarvardX platform in French, Chinese and Spanish, and the two UN-REDD REDD+ Academy courses, according to the website, will be available in Spanish and French in May/June 2019, however, there are no courses related to climate change and forests through these three resources available in Bahasa Indonesia.

Notable in Indonesia too is the Ministry of Research, Technology and Higher Education's (RISTEKDIKTI) emphasis and support for developing e-learning capacity throughout the country. RISTEKDIKTI Minister Nasir called for an increased enrollment rate in e-learning in Feb 2019. In March 2019, Secretary General of Kemenristekdikti, Ainun Na'im, conveyed the importance of developing ICT infrastructure related specifically to the benefit of

universities and e-learning. E-learning is not completely new to Indonesia, though it is in its infancy. In May 2018, RISTEKDIKTI Minister Nasir formally launched the Ministry's hybrid learning system named Sistem Pembelajaran Daring (SPADA) Indonesia. SPADA offers open lectures and open courses on a wide range of educational topics. The on-line platform, IndonesiaX has been operational since 2015 and began offering courses from HarvardX starting in 2016 (Post, 2016). To date, however, IndonesiaX only offers one course related to the topic of environment and none specifically about peatland forests or climate change.

4 ON-LINE COURSE ON PEATLAND ECOSYSTEMS AND CLIMATE CHANGE SCIENCE

The five-module on-line course developed by MSU/UPR/UMP uses Moodle, an open source, course management system learning platform. The course is deployed using the Moodle platform from an Amazon Web Services node in Singapore. The course is focused on Peatland Ecosystems and Climate Change Science, topics of great importance to the province of Central Kalimantan, Indonesia (Fig. 1). Approximately 95% of the learning material in the course is in Bahasa Indonesia and most of the required literature for the five modules are authored by Indonesian scientists (Table 1). The module contents draw on a variety of digital resources: You Tube streaming videos, scientific publications in PDF format, active websites with media content and tools, Google Earth, etc. (Table 2). The course is essentially a mash-up in ICT terminology.

Access to the on-line course is through one of two portals hosted at UPR and UMP. Log-in credentials are required.

The five-module course is designed as an asynchronous learning environment. Students or learners may go at their own pace through the course. There are specific learning objectives and learning outcomes for each module. The modules can be completed in any order. Each module is estimated to take between 8 – 12 hours. Modules include quizzes, accessible only after specific content has been viewed, that require a passing grade. The quizzes are multiple choice, true/false, and matching type questions. Each module has a 50-question final exam that is accessible only after the module quizzes have been successfully passed. A learner can access a module Certificate of Completion when the exam is passed. If all five module ex-

ams are successfully passed the learner can access a Course Certificate of Completion.

The target learner group for the course includes advanced university undergraduate students, university graduate level students and provincial and district level professionals at government institutions and NGOs working in the field of forestry, natural resource management or similar areas.

5 SYMPOSIUM SURVEY RESULTS

The course was launched recently at a USAID LESTARI Symposium, HIGHER EDUCATION IN THE 21ST CENTURY: ON-LINE COURSES AND UTILIZING THE SUITE OF INTERNET TECHNOLOGIES TO ENHANCE LEARNING OPPORTUNITIES, in Palangka Raya, Central Kalimantan held 25 April 2019. Most of the audience were local to Palangka Raya. Three individuals came from Aceh Province and three people came from Jakarta. We conducted a brief survey at the symposium and had 31 respondents. The survey consisted of the following four questions:

1. *E-learning and on-line courses will have a*
2. *Greater and greater role to play in higher education learning in the near future.*
3. *The best future path for higher education in Indonesia is . . . ?*
4. *I feel that the USAID LESTARI LMS Course on Peatland Ecology and Climate Change Science is useful and appropriate for . . . ?*
5. *I would like to see an LMS Course deliver material and content on this topic.*

The first two questions in the survey were intended to help us gauge the general tenor and acceptance among our audience of e-learning in general and asynchronous models specifically. The third question provided some insight as to the level of user and whether our course content matched our intended user target level. The last question has provided information on the topics that are of most interest for additional content or new courses among our respondents.

The results of the survey (Figure 4) show, at least in our symposium audience (n = 31), that nearly all, 96%, agree or strongly agree that e-learning and on-line courses will have a greater and greater role to play in higher education learning in the near future. Nearly two-thirds (65%) strongly agree. All respondents feel that on-line courses or a mix of on-line and traditional

classroom courses are the best path forward for higher education in Indonesia. More than two-thirds (71%) feel it should be a mix of on-line and traditional classroom courses, while a little less than one third (29%) feel that on-line courses with an instructor are the best path forward. No respondent chose traditional classroom only or chose on-line course without an instructor. This last choice bodes poorly, in the case of the MSU/UPR/UMP on-line course, which is an asynchronous, no instructor course.

Authors and Publication	
• Agus, Fahmuddin, and IG Made Subiksa. "Lahan Gambut: Potensi untuk pertanian dan aspek lingkungan." Balai Penelitian Tanah dan World Agroforestry Centre (ICRAF), Bogor (2008).	
• Mirmanto, Edi, Ruddy Polosakan, and Herwint Simbolon. "Ekologi Hutan Gambut Ditaman Nasional Tanjung Puting, Kalimantan Tengah* [Ecological study of peat forest in Tanjung Puting National Park, Central Kalimantan]." Berita Biologi 5, no. 3 (2000).	
• Limentit, Suwiti H. "Pemanfaatan lahan gambut dan permasalahannya." CIMITROP Universitas Palangka Raya (2006).	

Figure 1: Indonesian authors and publications used in the Course (partial list).

Digital Content	URI
YouTube Videos	<ul style="list-style-type: none"> • https://youtu.be/DA_TPIe50M • https://youtu.be/2agD3dK18s
Web Site Content	<ul style="list-style-type: none"> • https://id.wikipedia.org/wiki/Siklus_karbon • https://www.griha.nx/resources/9885 • http://www.aifor.org/line-toolbox/wp-content/uploads/capri/ate/03/03_03.htm • https://issuu.com/mf3/docs/150513_policy_brief_perhutanan_sesi • http://ditjenpti.mesthik.go.id/krcsi/index.php/aksi
On-Line Tools	<ul style="list-style-type: none"> • http://www.ei-for.org/line-toolbox/wp-content/uploads/capri/ate/02/02_02.htm • https://ditjenpti.mesthik.go.id/krcsi/index.php/profil-provinsi • http://signsmart.mesthik.go.id/v2-1/ • http://182.253.338.338/

Figure 2: List of URLs for digital resources used in the course (partial list).

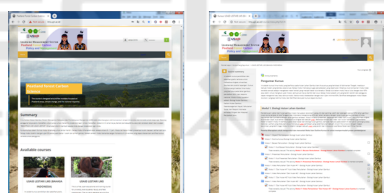


Figure 3: On-line Course on Peatland Ecosystems and Climate Change Science.

The respondents seem split regarding the target audience for the MSU/UPR/UMP on-line course. While nearly all felt that the content was not suited toward senior high school students (only 5%) the remaining five categories of user types were identified almost equally (18% for four categories and 23% for university faculty and staff). This may be a result of the respondents having little or no actual time for themselves reviewing the course material and only receiving a short preview of its content during the symposium talks and brief live demonstration. It is likely that with additional time for users to log in and work through the modules we would see a narrowing of the user type in one direction or another; that is toward professionals and higher-level students or toward lower level students. We will continue to seek review of the course content in order to understand

the utility of the material for the audience we intent to target.

Survey Questions	%
<i>E-learning and on-line courses will have a greater and greater role to play in higher education learning in the near future</i>	
Strongly Agree	65 %
Agree	29 %
Disagree	6 %
<i>The best future path for higher education in Indonesia is ...</i>	
Traditional classroom courses	0 %
On-line courses without instructors	0 %
On-line courses with instructors	29 %
Mix of traditional and on-line courses with and without instructors	71 %
<i>I feel that the USAID LESTARI LMS Course on Peatland Ecology and Climate Change Science is useful and appropriate for ...</i>	
Senior year high school students	5 %
Level S1 students	18 %
Level S2/S3 students	18 %
Government staff in natural resources	18 %
NGO staff in natural resources	18 %
University lecturers and staff	23 %

Figure 4: List of URLs for digital resources used in the course (partial list).

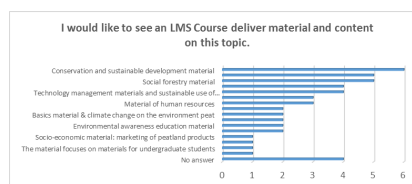


Figure 5: Survey Question 4.

Responses to the final survey question, which was open ended, do indicate an interest in the current course content (biodiversity, social forestry, climate change, environmental policy, etc.) and a desire for specific thematic areas that could either be a part of a current course module or be developed as a stand-alone module or even an entire course (Figure 5). The range too is from basic science or fundamental information (e.g. environmental awareness education material, basic material and climate change on the environment peat) to applied information and content (e.g. technological management materials and sustainable use of peat, marketing of peatland products). We see in these responses the idea that e-learning courses and content can be useful to students during their educational year and to professionals who are working directly in the field of natural resource management, sustainable forestry and the like.

6 DISCUSSION: E-LEARNING, GEOGRAPHY AND ENVIRONMENTAL ECOSYSTEMS

We return now to our first statement, geography matters. It is without question, partly due to historical developments, that universities in proximity to the capital city, Jakarta, or on Java, as well as to other large provincial capital cities in Indonesia (Surabaya, Medan, Semarang, etc.) receive an unequal share

of resources and benefits than universities in or near smaller cities and less populated provinces in Indonesia. The city of Palangka Raya is ranked well below the top 20 in terms of population. This is not a judgement statement, only a fact. And while Palangka Raya is not one of the larger provincial capitals, it is in one of the most environmentally and ecologically important areas, not only in Indonesia, or Southeast Asia, but in the world. The vast extent of peatland soils and the remaining orangutan habitat of Central Kalimantan are of nearly unequal importance in terms of climate change and biodiversity (Wibowo, 2009)(Mustari et al., 2010). Universities located in Palangka Raya are, therefore, quite literally uniquely positioned with respect to these vital ecological and environmental areas. Faculty and staff focused on climate change, biodiversity, peatland forests and ecosystems, who work at Palangka Raya universities, have the advantage over others simply by their location, their proximity to these ecosystems. This is not to say that experts from abroad or from other Indonesian universities or government agencies don't exist. They do exist (Rieley et al., 2008)(Dharmawan, 2014)(Wibowo et al., 2016) and they often gain their expertise through collaboration with faculty and staff at the universities in Palangka Raya. Geography matters. Location and proximity are important.

The faculty and staff at universities in Palangka Raya are uniquely positioned to develop material and teach subjects related to the peatland ecosystems through a variety of academic disciplines: soil science, hydrology, land use and land cover change, climate science, forestry, biodiversity, social science (livelihoods), economics (including valuation of ecosystem services), geo-spatial science, etc. Faculty at Harvard, or UN-REDD and World Bank scientists are certainly capable of developing content for e-learning on peatland ecosystems – particularly if they have conducted research in these areas. However, the advantage of a group of faculty members from multiple disciplines and multiple local universities to develop a complete course that includes more than one academic discipline is unmatched.

Language is an integral part of culture. Bahasa Indonesia is the national language of Indonesia. Academic courses at universities are predominantly taught in Bahasa Indonesia. E-learning content can come from a great variety of sources and in many languages. There are numerous infographics related to the carbon cycle and climate change science and most of these are in English. However, through technological advances in automatic language translation on-line and in internet content now delivered in multiple languages, Bahasa Indonesia versions can be found. For

example, Indonesia Wikipedia is in Bahasa Indonesia and has a very thorough entry on climate change or perubahan iklim. Considering the number of academic faculty and research scientists at Indonesian universities and working in Indonesian government agencies, there is a wealth of information related to peatland ecosystems and climate change science published in Bahasa Indonesia. Using these materials in an e-learning course, theoretically, should mean more access by Indonesian students and professionals, since language would not be a barrier. Utilizing the expertise of faculty and staff at the universities in Palangka Raya to identify quality publications and material for the e-learning course is also important and extremely beneficial.

E-learning and the technologies that support it are helping to shrink the divide between universities located in less populated areas and those in more resource-rich, highly populated areas. E-learning and advances in new technologies are also supporting a more self-reliant Indonesian academic structure that doesn't need to rely as much on information developed outside of Indonesia. The course developed through collaboration between MSU, UPR and UMP far surpasses the content available through other on-line sites (UN-REDD, World Bank Group, HarvardX) and nearly 100% of it is in Bahasa Indonesia. Delivering content and material on subject matter that is in a university's backyard is an equalizer in terms of resource advantages. That students or learners don't require residency at a university in Palangka Raya in order to take the course, because it is on-line, reduces the proximate advantage of universities closer to more populous cities or to the nation's capital.

7 CONCLUSION: THE FUTURE OF E-LEARNING AND ENVIRONMENTAL ISSUES

Climate change is a real and present threat to people in all countries. The peatland area of Kalimantan, Indonesia store very significant quantities of carbon in soils and in biomass. Peatland forest are some of the most biodiverse ecosystems on Earth and are home to certain endemic species found nowhere else. Sustainable use and management of the resources in Kalimantan require special consideration of ecosystem services (such and carbon storage and biodiversity) balanced with economic development.

Information related to the environmental significance of peatlands in Kalimantan is easily accessed and available to anyone with an internet connection

and e-device. You Tube videos and Ted Talks deliver valuable content related to many academic areas including the environment and climate change. Search Google Scholar for publications of peatland ecosystems and climate change, or in Bahasa Indonesia ekosistem lahan gambut dan perubahan iklim, and you will have enough reading material to last many days. Start a search on Wikipedia for the term carbon cycle, follow all the related links in the text and the fifty plus references, links to further reading and external links and one can learn a great deal on the topic, self-taught. A disciplined, resourceful and motivated individual can do this. However, there is a great deal of poor, bad and even fake data circulating on the internet. Climate deniers post reports on-line that are fraught with misinformation, fallacious and illogical arguments, and made-up data. Weeding through the good from the bad can be mystifying if not frustrating. Such information can also influence young learners who are only beginning to develop their critical thinking skills. These are significant challenges.

University faculty and staff who develop e-learning courses and the content are, at the very least, in a position to identify quality material available for e-learning. Faculty and staff from universities that are in or near to an ecosystem that is the focus of an e-learning course are in key positions to identify and create high quality content. E-learning courses related to environmental issues can help students or learners remain focused on material that is significant and accurate and guide the student or learner through a logical process in learning the information. This is the opposite of the random-walk approach that often starts with a simple google search, and which may or may not lead to significant learning of correct information.

Creating content in the local language and utilizing research developed by local scientists and researchers enables a greater potential for students whose first language is not English to learn and acquire knowledge on important environmental issues. Indonesia has a rich history of scientific and academic excellence whereby a large number of publications written in Bahasa Indonesia are available in digital formats. This is a great advantage in developing e-learning courses and reaching students and learners in Indonesia.

The opportunities for universities in Indonesia to develop e-learning courses in Bahasa Indonesia, focused on their proximate environmental, social, economic, or other fundamental academic areas is now boundless. Less well-known academic institutions that are located in or near some important or significant area should take advantage of their geography and expertise to develop e-learning courses. Imag-

ine a future, not too distant from now, with e-learning courses in Indonesia on (1) The Environmental and Social Impacts of Tourism or (2) High-Risk Areas, Climate Change, Adaptation and Mitigation or (3) Fisheries, Coastal Ecosystems, Policy and Management. The future is bright. Indonesian universities, even in remote areas, through e-learning and internet technologies can lead the way forward to this bright future of higher learning in Indonesia.

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