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The knowledge of Bengkulu University's forestry students of tree diversity in their campus

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Abstract. *Wiryono, Nurliana S. 2011. The knowledge of Bengkulu University's forestry students of tree diversity in their campus. Nusantara Bioscience 3: 98-103.* Indonesia is rich in plant diversity which has provided daily human needs for millennia. Knowledge of diverse plants and their uses is part of ecological knowledge essential for the survival of humanity. However, rapid deforestation has reduced plant diversity and caused the loss of traditional ecological knowledge. Furthermore, the increased availability of electronic entertainment has alienated young people from nature, causing further loss of ecological knowledge. The objective of this study was to know the ability of Bengkulu University's forestry students to identify trees growing in the campus by local names and their genera. Knowing the name of trees growing in our environment is an indicator of concern for biodiversity. Results showed that forestry students had low ability to identify trees by local names and even lower by genera. Second-semester students could identify fewer trees than the higher-semester students, and the knowledge was not affected by student's gender or profession of students' parents. This low appreciation of plant diversity among young generation will have negative implication for biodiversity conservation efforts. Students should be brought closer to nature by increasing outdoor education.

Keywords: concern for biodiversity, botanical knowledge, forestry students.

Abstrak. *Wiryono, Nurliana S. 2011. Pengetahuan mahasiswa kehutanan Universitas Bengkulu terhadap keragaman pohon di kampusnya. Nusantara Bioscience 3: 98-103.* Indonesia kaya akan keanekaragaman tumbuhan yang telah memenuhi kebutuhan manusia sehari-hari selama ribuan tahun. Pengetahuan tentang tumbuhan yang beragam dan kegunaan mereka adalah bagian dari pengetahuan ekologi penting untuk kelangsungan hidup manusia. Namun, deforestasi yang cepat telah mengurangi keanekaragaman tumbuhan dan menyebabkan hilangnya pengetahuan ekologi tradisional. Selanjutnya, peningkatan ketersediaan hiburan elektronik telah mengasingkan kaum muda dari alam, menyebabkan hilangnya pengetahuan ekologi lebih banyak lagi. Tujuan penelitian ini adalah untuk mengetahui kemampuan mahasiswa kehutanan Universitas Bengkulu untuk mengidentifikasi pohon yang tumbuh di kampus dengan nama lokal dan genus. Mengetahui nama pohon yang tumbuh di lingkungan merupakan indikator kepedulian terhadap keanekaragaman hayati. Hasil penelitian menunjukkan bahwa mahasiswa kehutanan memiliki kemampuan yang rendah untuk mengidentifikasi pohon dengan nama lokal dan bahkan lebih rendah lagi dengan nama genus. Mahasiswa semester kedua dapat mengidentifikasi pohon lebih sedikit dibanding mahasiswa dengan semester yang lebih tinggi, dan pengetahuan itu tidak terpengaruh oleh jenis kelamin atau profesi orang tua. Hal ini menunjukkan rendahnya apresiasi keanekaragaman tumbuhan di kalangan generasi muda yang akan memiliki implikasi negatif bagi upaya konservasi keanekaragaman hayati. Mahasiswa harus dibawa lebih dekat dengan alam dengan meningkatkan pendidikan di luar ruangan.

Kata kunci: kepedulian terhadap keanekaragaman hayati, botani pengetahuan, mahasiswa kehutanan.

INTRODUCTION

Having vast tropical rain forest, Indonesia is rich in plant diversity which provides economic, ecological and cultural benefits to human. People in rural areas have good knowledge of local plants and utilize them to fulfill their daily need. Rural communities in Kandang Village, Bengkulu, used 113 species (Sunesi and Wiryono 2007), in Enggano Island, Bengkulu, 99 species (Arianto 2008), in villages near Gunung Halimun National Park, West Java 243 species (Rahayu and Hirada 2004), in Kabaena Island, Central Sulawesi 65 species (Rahayu and Rugayah 2010).

Our plant diversity, however, is threatened by rapid deforestation occurring in Indonesia with a rate between one and two million hectares per year (FWI/GFW 2001; Mas'ud et al. 2007). In the last 30 years, much of species-rich tropical rain forests outside Java have been replaced by monoculture plantations. The loss of natural forest in the tropic has not only reduced plant diversity but also caused the loss of people's knowledge of plants and their uses (Ramirez 2007). The knowledge of plants and their uses is an essential part of ecological knowledge which is acquired by societies through long and intensive interaction with nature in search for food and other needs (Pilgrim et al. 2008). For millennia human has relied on plant diversity

for fulfilling their daily need, so the loss of plant diversity and the consequent loss of ecological knowledge threats the survival of human (Aiona et al. 2007). Conserving plant diversity and local knowledge of plant uses is, therefore, essential for the survival of humanity.

Conservation of plant diversity, however, will not succeed unless people appreciate plant diversity. Unfortunately, economic development has a negative impact of reducing direct contact between people and nature, resulting in lower appreciation of plant diversity. A study in South Sulawesi showed negative correlation between income and knowledge of plant uses among villagers (Pilgrim et al. 2007). Furthermore, the increased availability of electronic entertainment in developed countries has shifted the love of nature among the people into the love of electronic entertainment (Pergams and Zaradic 2006, 2008). The low familiarity with nature among young generation is reflected in the low ability of students to identify plants in their surrounding (Wagner 2008; O'Brien 2010). The alienation of young students from nature may also occur in Indonesia because of the increased accessibility to electronic entertainment and the disappearance of natural vegetation.

The objective of this study was to know the ability of Bengkulu University's forestry students to identify trees in the campus. Their knowledge of tree names in their environment is an indicator of their concern for plant diversity, a prerequisite for the success of biodiversity conservation efforts.

MATERIALS AND METHODS

Site study

This study was conducted in May 2011 in the campus of the University of Bengkulu, in Bengkulu City, Indonesia. This year, University of Bengkulu's campus ranked fourth as the best green campus in Indonesia. More than one hundred species of trees are found in the campus (Arianto and Susatya 2009). Some trees are native species growing naturally, but many more are introduced species artificially planted in managed landscape.

Respondents

Eighty-three forestry students of Bengkulu University (50% of all forestry students) who were available during the period of study were interviewed to identify photographs of 50 species of trees found in the campus of Bengkulu University. The use of photographs to test the knowledge of plant names have been done in other studies (Setalaphruk and Price 2007; Pilgrim et al. 2008). The respondents consisted of male and female students, between 19 and 23 years old. They came from Bengkulu and the surrounding provinces, and only one came from Java.

Selection of tree species

The selection of tree species was based on their abundance and frequency either in the university campus or Bengkulu city. Most of the selected species are abundant or frequently found. There was an exception, though. Neem tree (*Azadirachta indica*) is not abundant and only occasionally found, but it was selected because it is often used as traditional herbal medicine for malaria, a prevalent disease in Bengkulu. The selected species are not all indigenous in Bengkulu or even in Indonesia, but most of them have been grown in Indonesia for centuries. For example, *Mangifera indica* was originally from Indo-Burma and introduced to many South East Asia countries 1500 years ago (211.114.21.20/tropicalplant/index.jsp). The objective of this study was not to test the students' knowledge of indigenous species but to know their concern for plant diversity as indicated by their ability to identify trees in their environment. If students are not interested in plants we can assume that they are not interested in traditional ecology either.

Exotic conifers were not selected because Indonesians call them *cemara* (casuarinas). Only *Casuarina equisetifolia* was selected because it is an ubiquitous and abundant species in Bengkulu city's beach forest, the most well-known tourist destination in Bengkulu city. Of the closely related species that have similar Indonesian names, only one was selected. For example, *Michelia alba* (white *cempaka*) and *Michelia champaca* (yellow *cempaka*) were represented by *M. alba*, while *Acacia mangium* (broadleaf *acacia*) and *Acacia auriculiformis* (narrow leaf *acacia*) were represented by *Acacia mangium* because *M. alba* and *A. mangium* are more abundant than their closely related species.

Data collection

Each selected species was photographed, showing its easily recognizable features, and in some cases its location in the campus. During interview most students recognized where the trees are located. Several photos were downloaded from the internet (www.natureloveyou.sg and www.hear.org/starr/images/?o=plants) to provide better pictures. To ensure that the photographs were recognizable, pictures of each species were shown to several faculty members who know the species before they were used during interview. Then, the pictures were put in an album to be shown to respondents. Each species was represented by two or more photos, except for coconut (*Cocos nucifera*) and mast tree (*Polyalthia longifolia*), each of which was represented only by one photograph because of their distinctive architectures. Each respondent was asked to mention the local name and the genus of each species. For *Michelia alba* the respondent was considered correct if he or she mentioned just *cempaka* and for *Acacia mangium*, mentioning *akasia* was considered correct. The question on genera was asked because forestry students from the second semester have taken botanical courses and are expected to be familiar with scientific names.

Data analyses

Data were tabulated, and the mean and standard deviation were calculated based on gender, length of study and profession of parents. The percentage of students correctly identifying the trees by their local names and genera were also calculated.

RESULTS AND DISCUSSION

The ability of students to identify trees

University of Bengkulu's forestry students could identify between 10 to 40 tree species (out of 50) by their local names, with an average of 24.7. The ability of students to identify the genera of trees was much lower, ranging from 0 to 16 genera with an average of 5.6. The ability to identify trees varied greatly among students from the same semester, same gender and parent's profession as shown by the relatively large number of standard deviation compared to the mean (Tables 1). No statistical test was conducted, but the data showed that the second-semester students could identify fewer trees than those of the higher semesters, both by their local names and by their genera (Table 1).

Table 1. The ability of students to identify trees correctly, based on length of study, gender, and profession of students' parents

	The average number and SD of trees identified correctly by students	
	By Local names	By Genera
Length of study (semester)		
Second	18.9 ± 5.6	1.4 ± 1.3
Fourth	24.1 ± 4.8	4.6 ± 3.0
Sixth	28.4 ± 7.3	6.5 ± 5.9
Eighth	26.9 ± 4.4	9.6 ± 4.0
Tenth or higher	28.7 ± 5.1	8.3 ± 3.9
Gender		
Male	25.4 ± 7.4	6.0 ± 5.3
Female	23.6 ± 5.0	5.0 ± 3.7
Profession of students' parents		
Government officials*	24.6 ± 6.5	6.5 ± 5.2
Farmers	24.0 ± 7.2	4.0 ± 3.6
Entrepreneurs	26.2 ± 6.8	6.2 ± 5.1

Note: *This category consisted mostly of civil servants, but also included three persons who were a policeman, a soldier, and a retired person.

It is understandable that the second-semester students knew fewer tree species than their seniors because the seniors had taken more courses that require tree identification in the field such as dendrology (a course that trains student in tree identification), forest ecology, forest inventory and silviculture. But it is disappointing that even senior students could identify, on the average, only less than 60% of trees by their local names, and only 12% by their genera. They had taken field works requiring tree identification and, in several occasions, were involved in planting and maintenance of the campus trees. Their relatively low ability to identify trees suggests that they have little interest in studying tree names in their environment although during interviewed, 60% of respondents said so. Most of them recognized the trees in the photos which they could not identify the name. With the increase of computer availability and internet access in campus, students may spend more time with the computer than interacting with trees in the campus' park (Table 2). In the U.S. and Japan, there was evidence for a fundamental and pervasive shift away from nature-based recreation, most likely caused by the increase of electronic entertainment (Pergams and Zaradic 2008). In general, technologically oriented societies has drastically lost practical knowledge of nature (Atran et al. 2004).

The result of this study is similar to those in similar studies in the United States. Wagner (2008) found that college students in South Carolina had little ability to name plant species in their environment. In another study, Atran et al. (2004) found that American students from Northwestern University identified tree and bird species only at the life-form level ('tree', 'bird'), while people of Itza' Maya, native to Guatemala who practice agriculture, hunting, and fishing, could identify plant and animal species at more specific levels.

Alienation from nature is one plausible reason for the low ability of young generation to identify trees in their environment. If interaction with nature remains high, the knowledge of plants among the youth can be maintained. In a small village in Thailand, where people still practiced hunting and gathering wild food, the children maintained ability to identify wild species of plants and animals used as food (Setalaphruk and Price 2007). In the US, a group of elementary school students could identify only 33.7 ± 6.8% of 60 plants presented in the slide show, but after short botanical activities outdoor, the same students could identify 55.3 ± 15.6% (Cooper 2008). Increased interaction with nature apparently increased the ability of those children to identify plant species.

Another plausible reason for the low ability to identify trees among forestry students is the lack of field guides for tree identification. Serious books such as Backer and Bakhuizen van den Brink (1963), and van Steenis et al. (1981) are available in libraries, but these books are not easy to use. Good knowledge of plant morphology is needed to use these books. But this drawback can be overcome by the availability of websites providing photographs of plants and their names. Any student interested in trees may access these websites and will be able to identify many trees usually found in parks and streets.

Profession of parents didn't affect the ability of Bengkulu University's forestry to identify tree species (Tables 1). It was assumed that students from farming background had better knowledge of plants. If the knowledge of plants is an indicator of intensity of interaction with nature, then the results of this study implied that students from farmer families did not experience more intensive with interaction with nature than students with other backgrounds. Another possible reason is that most farmers have monoculture plantation (rice, oil palm or rubber), so their children have little experience with various tree species.

The knowledge of plants among forestry students was not affected by gender either. In the community of Tzotzil Maya in the Highlands of Chiapas, Mexico, women had better appreciation of tree species than men. Apparently, the effect of ongoing cultural changes has led men, but not women, away from intimate contact with nature (Atran et al. 2004). In Way Kambas, Lampung, Sumatra, male respondents had better score in identifying wildlife species than the females (Nylus et al. 2003). What affects knowledge of nature is certainly not gender itself, but the intensity of interaction with nature.

Table 4. The percentage of trees correctly identified by students

Indonesian names	Scientific names	Percentages of students correctly identify		Origin of species
		Local names	Genera	
Kelapa	*Cocos nucifera* L.	100	16	Coastal regions of tropical Asia and Pacific
Nangka	*Artocarpus heterophyllus* Lamk	99	10	Probably in Ghats, western India
Belimbing	*Averrhoa carambola* L.	99	1	Not clear, either tropical America or South East Asia
Durian	*Durio zibethinus* Murr.	99	65	From Sri Lanka to New Guinea India
Mangga	*Mangifera indica* L.	99	45	Indo-Burma
Alpukat	*Persea americana* Mill	99	6	Central America
Rambutan	*Nephelium lappaceum* L.	96	4	Untraceable
Jengkol	*Pithecellobium jiringa* (Jack.) Prain ex King	93	6	South East Asia
Manggis	*Garcinia mangostana* L.	92	7	Maybe Malay Peninsula
Sirsat	*Annona muricata* L.	86	4	Tropical America
Kedondong	*Spondias dulcis* Soland ex Park.	86	1	From Melanesia through Polynesia
Sawo	*Achras zapota L.*	84	0	South America
Jati	*Tectona grandis* L.f	80	40	India, Myanmar, Laos
Akasia/ mangium	*Acacia mangium* Willd.	78	75	The Moluccas, New Guinea, Northern Australia
Cemara laut	*Casuarina equisetifolia* J.R.& G.Forst.	77	20	South East Asia, northern, southern Australia, Melanesia, Polynesia
Kapok randu	*Ceiba pentandra* (L.) Gaertn.	77	25	Tropical America
Pace, mengkudu	*Morinda citrifolia* L.	77	0	South East Asia
Jarak pagar	*Jatropha curcas* L.	69	2	Central America
Lamtoro	*Leucaena leucocephala* (Lamk) de Wit.	66	2	Central America
Jambu bol	*Syzygium malaccense* (L.) M. & P.	65	0	Malaysia, Vietnam, Indonesia
Blimbing wuluh/besi	*Averrhoa bilimbi* L.	63	0	Not clear, either tropical America or South East Asia
Melinjo	*Gnetum gnemon* L.	61	28	South East Asia, north to Assam, east to Fiji
Sengon	*Parasierianthes falcataria* (L.) Nielsen	60	28	The Moluccas, New Guinea, the Bismarck Archipelago, Solomon Island
Jambu monyet/mete	*Anacardium occidentale* L.	60	0	South America
Beringin	*Ficus benjamina* L.	54	29	South, South East Asia, Solomon Islands, Australia
Kersen, cheri	*Muntingia calabura* L.	51	0	Tropical America
Mahoni	*Swietenia macrophylla* King	51	27	Central and South America
Cempaka putih	*Michelia alba* D.C.	47	19	Cultivated in tropical and subtropical countries
Sungkai	*Peronema canescens* Jack.	46	19	Indonesia, Malaysia
Ketapang	*Terminalia catappa* L.	43	23	India, South East Asia, Northern Australia, Polynesia
Flamboyan	*Delonix regia* (Bojor ex Hook.) Rafin	35	12	Madagascar
Asam jawa	*Tamarindus indica* L.	34	1	Maybe Africa
Kalpataru	*Hura crepitans* L.	29	2	America
Kayu gadis	*Cinnamomum parthenoxylon* (Jack) Meissn	25	13	South East Asia
Kemiri	*Aleurites moluccana* (L.) Willd.	20	2	Tropical Asia to Polynesia
Johar	*Cassia siamea* Lamk.	20	2	Burma and Thailand
Pulai	*Alstonia scholaris* (L.) R. Br.	19	14	South Asia, South East Asia, Northern Australia, Solomon Islands
Laban	*Vitex pinnata* L.	7	6	South East Asia
Trembesi	*Samanea saman* (Jacq.) Merr.	6	1	South America
Waru	*Hibiscus tiliaceus* L.	6	2	Tropical Asia and Africa
Glodogan tiang	*Polyalthia longifolia* (Sonnerat) Thwait.	5	0	India and Sri Lanka
Angsana	*Pterocarpus indicus* Willd.	4	7	South East Asia, Northern Australia, Pacific
Kendidai	*Bridelia monoica* (Lour.) Merr.	4	0	Southeast Asia
Bunga tanjung	*Mimusops elengi L.*	2	0	Asia and Pacific
Matoa	*Pometia pinnata* J.R. & G. Frost.	2	0	South East Asia, Fiji, Samoa
Nilau	*Commersonia bartramia* (L.) Merr	2	1	Malaysia, Indonesia, New Guinea, Australia
Saga, Adenanthera	*Adenanthera pavonina* L.	1	0	South Asia, Southeast Asia, Solomon Islands
Balik angin	*Mallotus paniculatus* (Lamk.) M.A.	1	0	South, Southeast Asia, Northern Australia
Krei payung/ filisium	*Filicium decipiens (*W&A) Thwait.	0	0	Sri Lanka
Mimba	*Azadirachta indica* A.Juss.	0	0	Indo-Pakistan Subcontinent

Identifiableness of trees

Coconut (*Cocos nucifera*) was the most easily identified species by its local name. Although coconut was represented only by a photograph of the whole tree from a distance, all students correctly identified it by its Indonesian name. Some factors may be responsible for the high familiarity of students with coconut. First, this species is widely distributed across the country especially in lowland areas near the beach such as Bengkulu city. Second, its extremely large fruits are distinctive among palm trees' fruits. Third, it is a versatile species. Almost all parts of this species have direct benefit to man. As most people hold anthropocentric view of nature, we can easily appreciate the value of a species if it has direct use values (Callicot 2005).

Other species which could be identified by more than 80% of students were mostly fruit trees Personal experiences in handling and eating fruits enable students to identify fruit trees correctly. Eight-three percents of respondents said they had experience of harvesting fruits. Non-fruit tree species correctly identified by 80% of respondents were teak (*Tectona grandis*). Although it is not native to Sumatra, teak has been widely planted in Sumatera and is mentioned in many forestry textbooks because this species produces high-quality wood which can be used for many purposes (Soerianegara and Lemmens 1994). Students could identify teak from its extremely large leaves and its architecture.

No students could identify two species, neem tree (*Azadirachta indica*) and fern tree (*Filicium decipiens*). It is understandable that they could not identify *A. indica* because this species is not common in campus or in Bengkulu city, but it is disappointing that students didn't able to identify *Filicum* either. Although it is not native to Indonesia, *Filicium* has been introduced to Indonesia for many decades as ornamental and shade trees (Backer and Bakhuizen van den Brink 1963, 1965, 1968) and has distinctive leaves. In the University of Bengkulu's campus, *Filicium* is abundant.

Raintree (*Samanea saman*) which is now favored by Indonesian President to be planted nation-wide and is found in great number in campus were identified only by 6 % students. Native to tropical America *S. saman* was introduced in Java in 1878 (Becker and van De Brink, 1963) and has been distributed across the country. Other species found very frequently in campus and along the main streets of Bengkulu city, angsana tree (*Pterocarpus indicus*) and Spanish cherry (*Mimusops elengi*), even got lower score, 4%, and 2% respectively.

Ironically, indigenous tree species, *Bridelia monoica*, *Mallotus paniculatus*, and *Commersonia bartramia*, were identified only by less than 5% students. These three species are pioneers which grow naturally in open areas in the campus as well as outside. This data indicates that students have little interaction with natural vegetation. In the U.S., college students (Wagner 2008) and elementary students (Cooper 2008) could identify fewer wild plants than the planted ones in a managed landscape.

Implication for biodiversity conservation

Knowing the names of plants is just the elementary level of ecological literacy. To survive in nature, a community must know more than just the names of plants but also their ecology, nutritional values, pharmaceutical values and other characteristics relevant to human needs. While old people in rural areas maintained good knowledge of local plants, the young generation who are alienated with nature may not inherit this essential knowledge. The loss of familiarity with nature will impair the community's ability to interact with the environment sustainably (Atran et al. 2004).

With rapid deforestation and other habitat degradation, it is imperative that we conserve biodiversity for the sustainability of human life. Ecological literacy is essential for the success of conservation effort (Pilgrim et al. 2008). The low ability of forestry students to identify trees in their surrounding is, therefore, a discouraging sign for biodiversity conservation because this low ability is an indicator of low ecological literacy. It is likely that students from other departments, especially social sciences, know tree names even less than forestry students because, unlike forestry students, they don't get courses requiring tree identification and are not involved in the planting and maintenance of trees in the campus.

To prevent the loss of ecological knowledge among young generation, we must bring back students closer to nature through increasing outdoor education. Researches indicate that students participated in well planned outdoor activities related to biodiversity returned home with more positive attitude toward environment (Dillon et al. 2006). To give more comprehensive understanding of biodiversity, we can integrate traditional ecological knowledge (TEK) into the mainstream scientific ecology courses (Kimmerer 2002). Unlike conventional scientific ecological knowledge which is supposed to be value-free, TEK is value-laden, including environmental ethics. The integration of TEK will bring new ecological insight and cultural framework for environmental problem solving such as biodiversity conservation.

CONCLUSION

The low ability of forestry students to identify trees in their environment is a clear indicator of diminishing interaction with nature among young generation. To ensure the success of biodiversity conservation efforts students must be brought back closer to nature through increasing outdoor education. Unless young generation has good appreciation of biodiversity, we cannot prevent further loss of biodiversity which may endanger our survival on the rapidly changing earth.

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