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## Research Paper

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**Research Paper**

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**Teachers' Assessment of Biology Education in Comparison to Other Areas of Science in Lower Secondary Schools of Japan  
- A Case Study -**

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This research aims to analyze characteristics of a relative prioritization of physics and chemistry in comparison to biology in lower secondary schools of Japan. Analysis is conducted in regard to instructional time, curriculum content and the impact of the last education reform. It is based on the results of a questionnaire for teachers of Science ('Rika') of grades 7-9 that collected 68 samples from 27 public schools. This study identifies biology as an area of science with less instructional time and content than physics and chemistry in teaching practice. In grades 7 and 8, respectively, 82% and 91% of teachers estimate that instructional time for biology might be less than recommended in teachers' manuals. Sixty-six percent of teachers state that biology is the area of science that has less content than physics and chemistry. These and other tendencies outlined by the present research may be common for the majority of schools in Japan and have international analogues.

**Key words:** *biology curriculum, biology in science teaching, Japanese lower secondary school, teachers' assessment*

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**INTRODUCTION**

The 21st century is referred to as 'the era of biology' (Johnson 2008; National Research Council 2009). However, it is unclear whether systems of school education worldwide are prepared for a challenge of promoting biology education. In particular, if they place an equal emphasis on this area of science in comparison to others. When an education system is balanced between the various science disciplines, they have similar characteristics in regard to instructional time, amount of content, its particularity and updates, *etc.* This kind of balance ensures a successful development of biology and of the whole system of science teaching and learning.

Publications on Japanese biology and environmental education cover a wide range of topics

including curriculum analysis (Kato 2011), development of teaching materials (Watanabe 2011; Naekawa 2012), teachers' education (Hotta and Chiba 2012; Matsumori *et al.* 2012), international comparison (Katayama 2010; Chong and Ikezaki 2011), policy evaluation and perspectives (Nakamichi 2008; Hatogai 2010), attitudes and ethics (Suzuki, 2007; Yamamoto 2012; Yamaya and Suzuki 2012), and others. International research provides a significant number of manuscripts investigating the state of biology education in National Standards and teaching practices in different countries (Beyer *et al.* 2009; Donnelly and Sadler 2009; Roseman *et al.* 2010; Cepni and Kara 2011; Nargund-Joshi *et al.* 2011; Geilsa and Graca 2012; Hasson and Yarden 2012; Long 2012; Park and Chen 2012; Semali and Mehta 2012; Vedder-

Weiss and Fortus 2013; Bostan 2013).

In 2009-2012, school science education in Japan experienced a reform that resulted in a number of structural changes, a revision of curricula and an increase of instructional time for Science (MEXT 2008).

Neither Japanese nor foreign authors have been focused on the following research objectives before or after the reform: (1) if in Japan all areas of school science (physics, chemistry, biology, Earth science) have equal characteristics in relation to instructional time and content in National Standards and teaching practices; (2) if there are more and less ‘prioritized’ (emphasized) areas of science, and the reasons and consequences of this phenomena.

An analysis of areas of science in terms of their ‘importance’ (factual prioritization) is essential, especially in an education system where science is taught as one subject till upper secondary school level. This kind of study would contribute to the understanding of a wide range of characteristics and issues in education, including reasons for students’ attitudes, performance, scientific literacy, and so on. Moreover, such phenomena as ‘primary’ (more prioritized) and ‘secondary’ (less prioritized) areas of science in school education might exist at the global (international) scale and therefore have major consequences in terms of general knowledge of biological phenomena.

This study examines the position of biology in Japanese lower secondary schools (grades 7-9) in terms of its priority among areas composing the subject Science. The goal of the research is to contribute to the development of life science education by advancing the present body of knowledge in it, and by establishing the basis for a further international comparison of its practices through studying them in the schools of Japan.

In Japan, there are two types of schools: public and private. This survey targets only public ones because of their significantly greater number and more

‘general’ approaches in science education in contrast to private schools that may offer rather specialized curricula.

The study uses mixed methods to address three objectives:

Objective 1: to compare instructional time allotted to biology and other areas of science (physics, chemistry and Earth science) officially (in teachers’ manuals, guidebooks, *etc.*) and in practice in lower secondary schools of Japan.

Objective 2: to compare the curriculum content of biology and other areas of science in the National Curriculum Standards and in practice.

Objective 3: to evaluate the impact of 2009-2012 reform of the National Curriculum Standards (‘The Course of Study’) on biology in comparison to physics, chemistry, Earth science, *i.e.* to identify recent tendencies in the development of science education in Japan.

Objectives 1 and 2 inquire whether biology is ‘equal’ to other areas of science in the two most fundamental characteristics: instructional time and content. Objective 3 inquires about the degree of impact of the last reform on areas of science, *i.e.* if all of them are emphasized equally by the reform.

## RESEARCH METHODOLOGY

Methods for objectives 1-3 include an analysis of primary data obtained by a survey conducted using a questionnaire for lower secondary school teachers of Science (subject ‘Rika’), and secondary data obtained by the review of the National Curriculum Standards (called ‘The Course of Study’ in Japan), the Curriculum Guidelines, manuals for school teachers, Japanese and international publications.

The questionnaire consisted of 22 questions and was structured as follows:

1. Personal background and experience (8 questions);
2. Teaching practices in areas of science curricula (8 questions);

### 3. General assessment of school science education in Japan (6 questions).

In this paper, respondents' answers on 13 questions out of 22 are presented. Questions regarding respondents' personal background included the following: the grade(s) which respondents were teaching at the time when the survey was conducted, years of teaching experience, and the major (the main area of study when they were in higher educational institutions).

Two approaches were used to determine instructional time allotted to biology and other areas of science (Objective 1). Firstly, a review and analysis of teachers' manuals that are published in Japan by textbook publishing companies were conducted. There was no significant difference in main characteristics of teachers' manuals published by different publishers while all of them are based on Courses of Study established by the Ministry of Education, Culture, Sports, Science and Technology of Japan (MEXT). In this research, a series of teachers' manuals published by Dainippon Tosho (Dainippon Tosho 2012 a, b, c) were reviewed and analysed, because those were the most commonly used ones in the schools where the survey was conducted. According to them, total instructional time is almost equally divided between the four areas of science.

After this stage of analysis, respondents were asked about their factual practices in science teaching by the questionnaire.

Questions inquiring about the instructional time were as follows:

Question a: If 'Science' was to be divided into 4 areas (physics, chemistry, biology, Earth science), is there a difference in factual instructional time between the areas in general? If there is, place the areas of science according to their instructional time in practice from 1 (the least) to 4 (the most).

Question b: Indicate the percentage of instructional time for each area of science in teachers'

manuals and in practice (by grade).

Question c: Indicate areas of science for which you experience a deficiency of instructional time (by grade).

Question d: Indicate areas of science consuming more instructional time than designated in teachers' manuals (by grade).

Question e: Indicate areas of science for which instructional time increase or reduction might be recommended (by grade).

Questions inquiring about the content (Objective 2) were as follows.

Question f: If 'Science' was to be divided into 4 areas (physics, chemistry, biology, Earth science), is there a difference in the amount of content between the areas in general? If there is, place the areas of science according to the amount of content from 1 (the least) to 4 (the most).

Question g: Indicate areas of science for which new content might be recommended (by grade).

Question h: Indicate areas of science for which more detailed content might be recommended (by grade).

Question i: Indicate areas of science for which an increase in the number of experiments might be recommended (by grade).

Concerning the impact of the reform (Objective 3) there was one question as follows: 'Indicate areas of science that experienced the most substantial changes caused by the last reform in education (2009-2012) by grade.'

Schools selected for the survey were located in areas with varying population density, from some rather rural locations in Yamanashi Prefecture (Yamanashi and Kofu cities), to others located in the most highly populated areas of the country, such as the Ota Ward of Tokyo Metropolis. Schools were selected randomly. Principals and teachers were contacted by various means of com-

munication (e.g. e-mail, postal, telephone, in person) and asked to participate in the survey. Commonly, a questionnaire required from 15 to 20 minutes to complete. From October to December 2012, the questionnaires were administered to 87 teachers of 34 schools. Sixty-eight answer sheets from 27 schools were received till the determined deadline (December 1, 2012). Therefore, the response rate was 78%. The student population taught by the participants was estimated by them as 13 145. Among schools that participated in the survey, five were located in Yamanashi prefecture (three in Kofu City and two in Yamanashi City). Other twenty-two schools were located in various areas of Tokyo Metropolis (9 wards and 7 cities).

Teachers were asked to answer questions for all grades and areas of science regardless of their teaching statuses in the time when the survey was conducted. Also they were asked to leave any question that they did not wish to answer, blank. All participants were informed that the results of the survey would be used for publications in the area of educational research and further studies.

## RESULTS

### 1. Characteristics of the respondents

Distribution of the respondents by the grade(s) taught in the time of the survey (September through November 2012) were as follows: teachers of grade 7 (n=11; 16%); teachers of grades 7 and 8 (n=8; 12%); teachers of grades 7 and 9 (n=4; 6%); teachers of grade 8 (n=18; 26%); teachers of grade 9 (n=17; 25%); teachers of

grades 8 and 9 (n=8; 12%); teachers of grades 7, 8 and 9 (n=2; 3%).

Teaching experience of the respondents is presented in Table 1.

According to the subjective self-assessment, distribution of the respondents by their major was as follows:

agriculture: n=6 (9%); biology: n=19 (28%); chemistry: n=18 (27%); Earth science: n=7 (10%); engineering: n=2 (3%); environmental sciences: n=5 (7%); physics: n=15 (22%). Four teachers (6%) claimed to have two majors. However, the majority of the teachers who participated in the survey (94%) had one major, which is common in Japan. Although having one major, lower secondary school teachers in Japan teach the four areas of science (physics, chemistry, biology and Earth science) composing the course of Science, often in two or all three grades.

### 2. Comparison of instructional time for biology and other areas of science in grades 7-9 in teachers' manuals and in practice

#### *Teachers' manuals and practice*

Comparison of allocation of instructional time between areas of science in teachers' manuals (TM) and in practice of the respondents is presented in Table 2. The data presented in Table 2 correspond to question b) of 'Research methodology'. In grade 9, an accurate partition of the instructional time is impossible, as approximately 25% of topics are interdisciplinary topics and research projects.

**Table 1. Teaching experience of the respondents**

Teaching experience (years)	<1	1-5	6-10	11-15	16-20	21-25	26-30	over 30
Number of Teachers	9	14	12	4	10	4	11	4
Percentage	13	20	18	6	15	6	16	6

**Table 2. Instructional time for areas of science in teachers' manuals (TM) and in practice by grade\***

Area of science	Grade	Instructional time (%)		Number of Teachers (%)		
		TM	Teaching practices**	More than in TM	As in TM	Less than in TM
Physics	7	27	25-35	32	18	50
	8	23	20-30	97	0	3
	9	28	25-35	---	---	---
Chemistry	7	25	20-35	41	50	9
	8	26	25-35	41	3	56
	9	27	23-33	---	---	---
Biology	7	27	19-30	9	9	82
	8	30	20-30	0	9	91
	9	23	17-27	---	---	---
Earth Science	7	21	15-30	45	0	55
	8	21	15-30	59	3	38
	9	22	20-30	---	---	---

\* Answers (n=62)

\*\* Instructional time for areas of science in practice. For example, teachers of grade 7 estimate instructional time for biology in practice to vary between 19% and 30%.

As shown in Table 2, in grades 7 and 8, 82% and 91% of respondents, respectively, allotted less time to biology than that prescribed in the teachers' manuals, while they allotted more time to physics and chemistry than prescribed in the manuals. While teachers evaluate variation of instructional time for physics and chemistry in practice from 35 to 20%, in the case of biology it is from 30 to 17%.

In Table 2, assessment of instructional time for areas of science by grade is presented. Next, respondents were asked if there was a difference in instructional time between areas of science in general. If the answer was positive, respondents were

asked to rate areas of science from 1 (the least) to 4 (the most) according to their instructional time (Question a) of 'Research methodology'. So, for example, if physics is rated as '1', it is the area of science with the least instructional time. Answering this question, forty-nine respondents out of 68 reported a difference in instructional time depending on the science field. Others (19) reported no such difference, *i.e.* they allotted instructional time equally between all areas of science. The results are presented in Table 3.

**Table 3. Areas of science according to their instructional time from 1 (the least) to 4 (the most) in practice\***

Place	Number of Teachers (%)			
	Physics	Chemistry	Biology	Earth Science
1	4	14	28	70
2	21	19	37	12
3	56	32	26	4
4	19	35	9	14

\* Answers (n=49)

Shaded areas indicate the highest percentage in each column.

As shown in Table 3, 9% of teachers state that biology is the field with the most instructional time, for physics it is 19%, and for chemistry it is 35%. In contrast, 28% of teachers claim that biology is the field with the least instructional time, while for physics and chemistry it is 4% and 14% respectively. Approximately 70% of respondents evaluate Earth science as the area with the least instructional time; 37% - biology as number 2; 56% - physics as number 3; and 35% - chemistry as the area with the most instructional time (highlighted by shaded areas).

Tables 2 and 3 show that factual instructional time in grades 7-9 of Japanese schools differs from that recommended by the teachers' manuals. This deviation might be caused by the imbalanced content, teachers' perception of science fields, for example, assessment of their complexity or importance for students' future, *etc.* There was no tendency for teachers to allot more time to teaching the area of science related to their majors.

When teachers experience a lack of time for instruction in science topics, they may reallocate teaching hours between topics and disciplines. However, if there are 'priority' disciplines or topics in science education, *i.e.* certain areas are considered to be 'more important', teaching hours may be reallocated in their favour independently of time deficiency for other areas.

#### ***Areas of science with the deficiency of instructional time***

Teachers' evaluation of the deficiency of instructional time for areas composing Science in grades 7-9 of Japanese schools (Question c) of 'Research methodology') is shown in Table 4.

As shown in Table 4, more teachers report that they experience a deficiency of instructional time for physics, chemistry and Earth science than for biology in grades 7-9. In particular, while 14% of teachers of grades 7-9 report to have not enough time for instruction in biology, in other areas of science it is 41, 59 and 39%, respectively.

Table 4 highlights the deficiency of instructional time that may be caused by various reasons, such as teachers' assessment of their own skills in science instruction, perceived level of complexity of science areas for students, *etc.* However, it is crucial to understand how teachers evaluate the allocation of instructional time 'officially', *i.e.* in National Standards, teachers' manuals, *etc.* Therefore, respondents were asked if factual instructional time in classrooms exceeded that prescribed by teachers' manuals.

#### ***Areas of science requiring more instructional time than prescribed***

Table 5 shows the number of respondents stating that the instructional time for certain areas of science in practice exceeded that recommended by teachers' manuals (Question d) of 'Research methodology'.

**Table 4. Deficiency of instructional time in science by grade (multiple selection)\***

Grade	Teachers who feel the deficiency of instructional time (%)			
	Physics	Chemistry	Biology	Earth Science
7	22	29	4	20
8	20	25	10	18
9	14	29	6	16
<b>Overall</b>	<b>41</b>	<b>59</b>	<b>14</b>	<b>39</b>

\* Answers (n=49)

**Table 5. Areas of science consuming more instructional time than designated in teachers' manuals (multiple selection)\***

Grade	Teachers who consume more instructional time than recommended (%)			
	Physics	Chemistry	Biology	Earth Science
7	36	29	10	0
8	19	39	7	0
9	16	36	3	0
<b>Overall</b>	<b>52</b>	<b>77</b>	<b>16</b>	<b>0</b>

\* Answers (n=31).

As shown in Table 5, 52% and 77% of teachers state that physics and chemistry consume more instructional time than in teachers' manuals. In the case of biology only 16% of respondents give this statement. It means that instruction in physics and chemistry requires additional hours more often than instruction in biology. Therefore, teachers appear to reallocate instructional time between areas of science, *i.e.* use that prescribed for biology for teaching physics and chemistry.

***Areas of science where instructional time increase or reduction might be appropriate***

Teachers' evaluation of areas of science which might require additional instructional time or its reduction (Question e) of 'Research methodology' is presented in Table 6.

An increase of instructional time for at least one areas of science in at least one grade was recommended by 39 teachers. Accordingly, a reduction of instructional time was recommended by 22 teachers. So if, for example, a teacher recommended to reduce the instructional time for grade 7 physics and for grade 8 chemistry, it was counted as a single 'decrease' answer (it is approximately 5% of the 22 respondents) for both grade 7 Physics and grade 8 Chemistry. 'Increase' answers were counted in the same manner, but there were 39 respondents. Accordingly, the percentage of 39 respondents was calculated. So, if the same person answered 'increase the time' for one area and 'reduce the time' for another, these were counted as two separate answers.

**Table 6. Areas of science in grades 7-9 for which the increase or reduction of instructional time might be appropriate (teachers' assessment, multiple selection)**

Grade	Increase (teachers %)*				Reduction (teachers %)***			
	Ph	Ch	Bi	ES	Ph	Ch	Bi	ES
7	33	41	21	33	18	9	27	18
8	36	33	21	10	14	14	23	32
9	21	49	13	21	32	9	14	23

\* Answers (n=39)

\*\*\*Answers (n=22)

Ph – physics, Ch – chemistry, Bi – biology, ES – Earth science

As shown in Table 6, teachers identify physics, chemistry and Earth science as areas of science which require additional instructional time to a higher degree than biology in all grades of lower

secondary school, with the exception of biology and Earth science comparison, grade 8. For biology a reduction in instructional time is suggested to a higher degree than in physics and chemistry,

with the exception of biology and physics comparison in grade 9. However, according to teachers' manuals for grade 9 science, biology has 23% of instructional time which is less than for physics and chemistry. Also, the results highlight respondents' general preference to increase time for chemistry in all grades than to decrease it ('increase': 41%, 33%, 49%; 'decrease': 9%, 14%, 9%, respectively). The same pattern is observed in relation to physics in grades 7 and 8 ('increase': 33% and 36%; 'decrease': 18% and 14%, respectively). Although, in grade 9 it is the opposite: teachers may prefer to decrease physics' instructional time. For Earth science, there is a stronger preference to increase instructional time in grade 7 (33%), to decrease it in grade 8 (32%), and an equal preference to increase and decrease in grade 9 (21% and 23% respectively). For biology, almost equal number of respondents would prefer to increase and decrease instructional time in all grades ('increase': 21%, 21%, 13%; 'decrease': 27%, 23%, 14%, respectively).

### 3. Curriculum content for biology in comparison to other areas of science in the National Curriculum Standards and in practice in Japanese lower secondary schools

In regards to the content of biology in Science, analysis was conducted using four parameters: 1) amount of content; 2) areas of science requiring

new content; 3) areas of science requiring more detailed content; 4) areas of science requiring an increase in the number of experiments.

#### *Amount of content*

When answering Question f) of 'Research methodology', twenty-four respondents out of 68 reported that areas of lower secondary school science differ in terms of the content. Distribution of areas of science according to their content from 1 (an area with the least amount of content) to 4 (an area with the most amount of content) is presented in Table 7.

Teachers identify biology as the area of science that has less content than physics and chemistry. While 4% of teachers state that biology is the field with the most content, for physics it is 33%, for chemistry it is 42%. Approximately 79% of respondents identify Earth science as the field with the least amount of content; 58% - biology as number 2; 42% - physics as number 3; 42% - chemistry as the field with the most amount of content (highlighted by shaded areas).

#### *Areas of science requiring new or more detailed content*

Teachers' assessment of the necessity for new or more detailed content for lower secondary school science is presented in Table 8. The data shown in Table 8 is teachers' responses to the Questions g and h of 'Research methodology'.

**Table 7. Content for areas of science from 1 (the least) to 4 (the most) (teachers' assessment)**

Place	Amount of content (teachers %)			
	Physics	Chemistry	Biology	Earth Science
1	8	4	8	79
2	17	17	58	8
3	42	37	30	0
4	33	42	4	13

\* Answers (n=24).

Shaded areas indicate the highest percentage in each column.

Teachers state that chemistry requires new content to a higher degree than biology in grades 7 and 8 (44% and 40% comparing to 13% and 33%, respectively). Though, in grades 8 and 9 biology requires new content more than physics and Earth science. At the same time, the respondents evaluate physics, chemistry and Earth science as areas of science which require more detailed content to a higher degree than biology in all grades of lower secondary school with the exception of biology and Earth science comparison, grade 8.

#### *Areas of science requiring an increase in the number of experiments*

Summary of teachers' opinions concerning the areas of science which require an increase in the number of experiments (Question i) of 'Research methodology' is presented in Table 9.

The respondents evaluate biology as the field that requires an increase in the number of experiments to a higher degree than others in grades 7-9. Apparently, teachers are not as satisfied with present biology experiments as with those in physics and chemistry.

**Table 8. Areas of science requiring new or more detailed content by grade (teachers' assessment, multiple selection)\***

Grade	New content (teachers %)*				More detailed content (teachers %)**			
	Ph	Ch	Bi	ES	Ph	Ch	Bi	ES
7	13	44	13	31	50	25	9	16
8	20	40	33	7	44	31	16	9
9	13	35	35	17	29	42	10	19

\* Answers (n=16, grade 7; n=15, grade 8; n=23, grade 9)

\*\* Answers (n=44, grade 7; n=45, grade 8; n= 52, grade 9)

Ph – physics, Ch – chemistry, Bi – biology, ES – Earth science

**Table 9. Areas of science requiring an increase in the number of experiments (teachers' assessment, multiple selection)**

Grade	Fields requiring an increase in the number of experiments (teachers %)			
	Physics	Chemistry	Biology	Earth Science
7	18	21	32	29
8	14	25	36	25
9	13	21	34	32

\* Answers (n=38, grade 7; n=44, grade 8; n=38, grade 9)

#### **4. Assessment of the impact of 2009-2012 reform on science teaching in Japan**

Various aspects of school science reform (the revision of the Course of Study) that happened in Japan in 2009-2012 have been addressed and analysed (Arani and Fukaya 2010; Gordon *et al.* 2010; Hatogai 2010; Nakamichi 2010). The reform's methodological platform, structural aspects, quantitative and qualitative characteristics were described by these researchers. However, teachers'

assessment of the reform's impact on areas composing Science has not been conducted yet. Therefore, as a part of this survey the respondents were asked what fields experienced 'the most substantial change' in terms of curriculum with the reform.

More teachers of all grades identify physics and chemistry as the areas that experienced 'the most substantial' changes with the last reform in contrast to biology and Earth science (Table 10).

**Table 10. Impact of the education reform of 2009-2012 on areas of science (teachers' assessment, multiple selection)**

Grade	Areas of science (teachers %)			
	Physics	Chemistry	Biology	Earth Science
7	37	41	14	8
8	36	30	23	11
9	20	56	14	10

\* Answers (n=51, grade 7; n=53, grade 8, n=57, grade 9)

## DISCUSSION

### *Survey analysis*

The results of the survey indicate that biology instructional time in lower secondary schools is less than recommended by teachers' manuals, *i.e.* it is reduced by teachers in favour of physics and chemistry. Accordingly, its content is reduced (partly taught superficially or not taught). Therefore, biology is relatively less prioritized than physics and chemistry in the teaching practice of some Japanese lower secondary schools, while no differences were determined in National Curriculum Standards or teachers' manuals. In order to identify, if this tendency is present in the majority of public and private secondary schools in the country, the same research should be conducted on a larger scale (a larger number of respondents from different areas).

The explanation of a reallocation of teaching hours in favour of physics and chemistry might be that these areas require and consume more instructional time than designated, as indicated by the survey's participants.

Teachers identify the following reasons of this situation:

- (1) Physics and chemistry underwent more substantial changes than biology during the education reform of 2009-2012, as shown in Table 10;
- (2) They became more difficult for students as a result of the reform, and are more difficult for students than biology in general, as suggested

by respondents through personal communication.

Teachers suggest more detailed content for physics and chemistry, while for biology they do not. In contrast, for biology they suggest new content and an increase in the number of experiments. It means that teachers evaluate the present curricula in physics and chemistry as not detailed enough. This may be one of the reasons why they are complex for students' comprehension. Two other reasons are mentioned above. As a result, instruction in physics and chemistry consumes more time than recommended. Instead, the content of biology is detailed enough, so it does not require additional time and even allows its reduction, till new content and more experiments are introduced into this area.

It is unclear whether the present situation in science education is a consequence of the reform, because teachers also state that physics and chemistry are in general more complex disciplines for students. Therefore, to identify if the tendency of prioritization of these two areas of science over biology is an emerging and temporary phenomenon (the result of the reform), or a long-existing and continuous trend, further research is needed. For example, a similar survey after a certain period of time may provide an answer. However, other social and economic issues, such as teachers' and students' attitudes and perception of science education, characteristics of the secondary and higher education system, entrance examination procedures, pedagogical education, requirements of the

labour market, and others, have to be taken into account.

Findings of the survey may find proof in international research data. In particular, TIMSS project (The Trends in International Mathematics and Science Study) highlights an issue relevant to its results.

### ***TIMSS analysis***

The Trends in International Mathematics and Science Study (TIMSS) is one of two major international projects for educational comparison and assessment. The project presents a set of data, and, in particular, 'an average percentage of students taught TIMSS science topics' up to and including grade 8 by areas of science (physics, chemistry, biology, Earth science, and environmental science). According to TIMSS 2003 and 2007, the percentage of Japanese students who were taught TIMSS biology topics is 39% and 32% in comparison to an international average of 70% and 66%, respectively. The figures in physics (68% in 2003; 67% in 2007) and chemistry (80% in 2003; 81% in 2007) are higher or close to the international average. Over 40% of TIMSS biology topics in both 2003 and 2007 were not included in the Japanese curriculum through grades 1-8 (Martin et al. 2004, 2008). When analysing this data, some characteristics of Japanese education are to be considered. In Japan, a number of topics concerning the human body and its processes are a part of a separate subject (Physical Education). Therefore, they may not be taught as biology topics. However, TIMSS reports might have outlined a relative prevalence of physics and chemistry over biology in Japanese schools in terms of the implemented curriculum. This assumption finds linkage to the results of the present study.

### ***Consequences of the present position of biology in Japanese school science***

Assessment of educational policies and practices is known to be a particularly complex matter because of their long-lasting outcomes, various

stakeholders and issues involved, and arising controversies. Japan is one of the top countries in students' performance in science according to PISA (Program for International Student Assessment) and TIMSS (Trends in Mathematics and Science Study) (PISA 2006; Martin *et al.* 2008, 2012). Because of this, its education system is often evaluated as 'highly effective'. However, the questions used for students' assessment in both projects in general replicate basic experiments which are a part of most curricula worldwide, though Japanese schools have better resources for conducting them than the majority of participating countries. Also, Japanese science curricula are more focused on the experimental part of curricula rather than on the theoretical one, while other countries might have a different approach.

While PISA and TIMSS evaluate science knowledge of the general student population and include basic problems, International Science Olympiads include a more advanced scientific content and examine a small group of top-performing students. In 2006-2012, Japanese teams each consisting of 4 students won 5 gold medals in biology (3 of which were awarded in 2011) and 8 in chemistry. In physics, a team of 5 students won 10 gold medals during this period of time (IBO 2012; IChO 2012; IPhO 2012). Therefore, Japan in Science Olympiads may have a relatively lower performance in biology than in chemistry and physics. However, an assessment of these results is complex as it involves various issues. For example, students' performance may depend on the translation of test problems which are often more extensive in biology than in other areas of science (Matsuda, personal communication, 2012).

There is a substantial difference between Japanese and top performers' figures in all areas of science. In biology, China, USA and Chinese Taipei have won 26, 27 and 20 gold medals in 2006-2012, respectively (IBO 2012).

While exact causes of a relatively lower performance of Japanese students in biology Olympiads are to be studied, the present issues of biology education might be linked to it.

Other possible consequence of the situation with biology in Japan might be the scientific literacy of Japanese adults. Organization for Economic Co-operation and Development (OECD) states that it is the lowest among participants. According to some researchers, in biological concepts it is lower than in other areas of science (National Science Foundation 2006).

## CONCLUSIONS

This study found a substantial difference between science curricula designated for lower secondary schools in Japan and implemented in them. Biology is given a lower priority in comparison to physics and chemistry in teaching practices of grades from 7 to 9, while there is no such tendency in either National Standards or teachers' manuals. As a result, the system of factual science education may be rather unbalanced, and it may have negative consequences in various areas, such as education, science, economy, and others. It is unclear if prioritization of physics and chemistry is a result of the last reform of science education, and if this tendency is present in the majority of schools in Japan. To clarify these issues a further research is necessary. However, this study contributes to the present body of knowledge about biology education in Japan by analysing a previously overlooked tendency.

Respondents of this survey identified the areas for development not only in biology, but in the whole system of school science education in Japan, such as a deficiency of instructional time, quantity and particularity of content, improvements in regard to science experiments, and others. In this regard the present survey also makes a contribution into the development of Japanese science education, especially if these issues will be studied and

addressed by educators and officials.

A presence of 'primary' (more prioritized) and 'secondary' (less prioritized) areas of science in school education will undoubtedly influence a wide range of educational issues in a country where such tendency is observed. The survey establishes a basis for an international comparison of the disposition of priorities in science education conducted in Japan, while it does not identify if the Japanese tendency is a unique, or an international one.

## REFERENCES

- Arani, M. R. S. and Fukaya, K. (2010) Japanese National Japanese National curriculum standards reform: integrated studies and its challenges. In: Zajda, J. (Ed.), *Globalization, Ideology and Education Policy Reforms*, 63-78. Springer
- Beyer, C. J., Delgado, C., Davis, E. A. and Krajcik, J. (2009) Investigating teacher learning supports in high school biology curricular programs to inform the design of educative curriculum materials. *Journal of Research in Science Teaching* **46**: 977-998.  
doi: 10.1002/tea.20293
- Bostan, C.-G. (2013) Research about importance of natural sciences given to Romanian curriculum. *Procedia - Social and Behavioral Sciences* **76**: 110-118.
- Cepni, S. and Kara, Y. (2011) Aligning large-scale examinations to the curriculum guidelines: student selection examination and Turkish biology curriculum. *Procedia - Social and Behavioral Sciences* **15**: 3222-3226.
- Chong, Z. and Ikezaki, K. (2011) Practical research on the environmental consciousness and behavior of students in Gullin, China and Tokyo, Japan. *The Bulletin of Japanese Curriculum Research and Development* **34** (2): 21-30.
- Dainippon Tosho Henshubu. (2012a) *Rikanosekai*

- 1-nen Kyoushiyou Shidoushyo* [World of Science for 7th Grade: Teachers' Manual]. (In Japanese). Dainippon Tosho, Tokyo.
- Dainippon Tosho Henshubu. (2012b) *Rikanosekai 2-nen Kyoushiyou Shidoushyo* [World of Science for 8th Grade: Teachers' Manual]. (In Japanese). Dainippon Tosho, Tokyo.
- Dainippon Tosho Henshubu. (2012c) *Rikanosekai 3-nen Kyoushiyou Shidoushyo* [World of Science for 9th Grade: Teachers' Manual]. (In Japanese). Dainippon Tosho, Tokyo.
- Donnelly, L. A. and Sadler, T. D. (2009) High school science teachers' views of standards and accountability. *Science Education* **93**: 1050–1075. doi: 10.1002/sc.20347
- Geilsa, B. and Graca, C. (2012) Working Conditions of School and Teacher Training in Science: A Study with Teachers of Biology of Bahia, Brazil. *Procedia - Social and Behavioral Sciences* **55**: 57-61.
- Gordon, J.A, Fujita, H., Kariya, T. and LeTendre, G. (Eds.). (2010) *Challenges to Japanese Education: Economics, Reform, and Human Rights*. Teachers College Press, New York.
- Hasson, E. and Yarden, A. (2012) Separating the research question from the laboratory techniques: Advancing high-school biology teachers' ability to ask research questions. *Journal of Research in Science Teaching* **49**: 1296–1320. doi: 10.1002/tea.21058
- Hatogai, T. (2010) From the present Course of Study to the new Course of Study. (In Japanese). *Japanese Journal of Biological Education* **51**(special issue): 5-8.
- Hotta, N. and Chiba, K. (2012) Female pre-service teachers' concerns and attitudes toward common animals, especially insects. (In Japanese). *Japanese Journal of Biological Education* **52** (4): 152-164.
- Johnson, D. H. (Ed.). (2008) *The Meaning of Life in the 21st Century. Tensions among Science, Religion and Experience*. iUniverse, Bloomington IN.
- Katayama, N. (2010) Organisms appearing in elementary school science textbooks “Japanese and Korean cases”. In: Diong, C. H. and Kim, M. (Eds.), *Book of Abstracts: Biology Education for Social and Sustainable Development, 23rd Biennial Conference of the Asian Association of Biology Education*, 43-44. National Institute for Education, Singapore.
- Kato, M. (2011) A research on change of descriptions about “Conservation of living things” based on high school biology textbooks in Japan. (In Japanese). *Japanese Journal of Biological Education* **52** (3): 84-95.
- Long, D. E. (2012) The politics of teaching evolution, science education standards, and *Being a creationist*. *Journal of Research in Science Teaching* **49**: 122–139. doi: 10.1002/tea.20445
- Martin, M. O., Mullis, I. V. S., Gonzales, E. J. and Chrostowski, S. J. (2004) *TIMSS 2003 International Science Report*. TIMSS & PIRLS International Study Center, Lynch School of Education, Boston College. <http://www.timss.org/>
- Martin, M. O., Mullis, I. V. S., Foy, P., Olson, J. F., Erberber, E., Preuschoff, C. and Galia, J. (2008) *TIMSS 2007 International Science Report*. TIMSS & PIRLS International Study Center, Lynch School of Education, Boston College. <http://www.timss.org/>
- Martin, M., Mullis, I. V. S., Foy, P. and Stanco, G. M. (2012) *TIMSS 2011 International Results in Science*. TIMSS & PIRLS International Study Center, Lynch School of Education, Boston College. <http://www.timss.org/>
- Matsumori, Y., Kawakami, S., Nakazawa, M., Makita, A. and Sakuma, T. (2012) Investigation of preservice elementary and lower-secondary school teachers' experience and knowledge of biological implements in a

- school science textbook. (In Japanese). *Japanese Journal of Biological Education* **52** (4): 179-192.
- Naekawa, H. (2012) The clay teaching materials to understanding of the initial developmental stages of amphibian embryos and fate-map. (In Japanese). *Japanese Journal of Biological Education* **52** (4): 193-200.
- Nakamichi, T. (2008) Transition of curriculum guidelines for biology education in Japan. (In Japanese). *Japanese Journal of Biological Education* **48** (1-2): 43.
- Nakamichi, T. (2010) The new course of study for biology education at lower secondary school: Focus on evolution. (In Japanese). *Japanese Journal of Biological Education* **51**(Special Issue): 111-117.
- Nargund-Joshi, V., Rogers, M. A. P. and Akerson, V. L. (2011) Exploring Indian secondary teachers' orientations and practice for teaching science in an era of reform. *Journal of Research in Science Teaching*, **48**: 624–647. doi: 10.1002/tea.20429
- National Research Council. (2009) *A New Biology for the 21st Century*. The National Academies Press, Washington DC.
- Park, S. and Chen, Y.-C. (2012) Mapping out the integration of the components of pedagogical content knowledge (PCK): Examples from high school biology classrooms. *Journal of Research in Science Teaching* **49**: 922–941. doi: 10.1002/tea.21022
- Roseman, J. E., Stern, L. and Koppal, M. (2010) A method for analyzing the coherence of high school biology textbooks. *Journal of Research in Science Teaching* **47**: 47–70. doi: 10.1002/tea.20305
- Semali, L. M. and Mehta, K. (2012) Science education in Tanzania: Challenges and policy responses. *International Journal of Educational Research* **53**: 225-239.
- Suzuki, A. (2007) Attitudes of Japanese Students in Relation to School Biology. PhD thesis, University of Glasgow, Glasgow.
- Vedder-Weiss, D. and Fortus, D. (2013) School, teacher, peers, and parents' goals emphases and adolescents' motivation to learn science in and out of school. *Journal of Research in Science Teaching* **50**: 952–988. doi: 10.1002/tea.21103
- Watanabe, S. (2011) An observation of the vascular bundle as an inquiring activity – Development of teaching materials and method using the toluidine blue staining. (In Japanese). *Japanese Journal of Biological Education* **52** (1-2): 1-12.
- Yamamoto, Y. (2012) Awareness of environmental ethics among high school students: focusing on ecological environments. (In Japanese). *Journal of Research in Science Education* **53** (2): 343-358.
- Yamaya, H. and Suzuki, M. (2012) Study on the sex differences and regional differences of the idea of life in science education. (In Japanese). *Journal of Research in Science Education* **53** (2): 359-36.

## WEBSITES

- IBO (International Biology Olympiad). (2012) <http://www.ibo-info.org/ibo-results-and-awards> <accessed 29/01/2013>
- IChO (International Chemistry Olympiad). (2012). <https://acswebcontent.acs.org/icho2012/about-icho.html> <accessed 30/09/2015>
- IPhO (International Physics Olympiad). (2012) <http://ipho.phy.ntnu.edu.tw/index.html> <accessed 30/09/2015>
- MEXT (The Ministry of Education, Culture, Sports, Science and Technology of Japan) (2008)

*Chugakkou Gakushuu Shidou Youryou Kaisetsu, Rika-hen* [Guidelines of the Course of Study for Lower Secondary Schools – Science]. (In Japanese).

[http://www.mext.go.jp/component/a\\_menu/education/microdetail/icsFiles/afield-file/011/01/05/1234912\\_006.pdf](http://www.mext.go.jp/component/a_menu/education/microdetail/icsFiles/afield-file/011/01/05/1234912_006.pdf) <accessed 29/01/2013>

National Science Foundation (NSF) (2006) <http://nsf.gov/statistics/seind06/pdf/c07.pdf> <accessed 31/01/2013>

PISA 2006 Science competencies for tomorrow's world

<http://www.oecd.org/pisa/pisaproducts/pisa2006/pisa2006results.htm> <accessed 28/01/2013>

## Abstracts of the Papers Presented at the 25th Biennial Conference of the AABE

The 25th Biennial Conference of the AABE was held at Cristal Crown Hotel, PJ (close to the University of Malaya), Kuala Lumpur, Malaysia, from 13th to 16th October, 2014. The conference was organized by the Organizing Committee for 25th AABE Conference 2014, Kuala Lumpur, which consists of four members: Professor Dr. Esther Gnanamalar Sarojini Daniel (Chair, University of Malaya, AABE Director), Professor Dr. Carolina Lopez (Co-Chair, University of Malaya), Mr. Thiagarajan Nadeson (Co-Organizer, WWF), and Ms. Nor Shidawati Abdul Rasid (Co-Organizer, WWF).

The main theme of the Conference was “Biology Education and Research in a Changing Planet.” There were five sub-themes: (1) Biology Education in an X, Y, Z World; Assessment beyond Examination, (2) Creating the Next Generation of Biology Teachers, (3) The Endangered Planet – How Can Biology Education Help?, (4) Seeing the Living World in a New Light – Technology in Biology Education, and (5) Research in Biology.

Nearly 150 people from ten countries including outside of the Asian region attended (Figure 1). There were five plenary lectures, four country reports, 32 oral presentations and 34 poster presentations. In addition, three workshops were presented.

The Best Poster Presentation Awards were given



Figure 1 The attendants of the AABE25

to the following papers:

**Nitchamon Thamaragsa Warut U-Kong, Piyanat Sejjant & Ruttaporn Chundet:** Expression of Yeast Metasl Accumulation Gene (*CCCI*) in Tobacco and *Torenia*;

**Chin Chee Keong, Chew Bee Lynn & Sreeramanan Subramaniam:** Elucidating Structure of Protocorm-like Bodies of *Dendrobium* Orchid through Light and Electron Microscopy;

**Takahiro Yamanoi:** Development of Teaching Materials about Insect Morphology and the Adaptive Significance of Ant Mimicry with a Comparison of Ants and Ant-mimic Spiders.

*The Book of the Abstracts of Papers* was published and provided to the attendants of the conference. The following abstracts are reprinted from the book.

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### <Sub-theme 1: Biology Education in an X, Y, Z World; Assessment beyond Examination>

#### Students' Knowledge on Climate Change: Implications on Interdisciplinary Learning

Brenda F. Caranto<sup>1)</sup>, Arnold D. Pitpitunge<sup>2)</sup>

<sup>1)</sup>Holy Angel University, <sup>2)</sup>Philippine Science High School, Philippines

Perceptions on climate change provide opportunities for the development of interdisciplinary learning opportunities. Knowledge level of the students on the climate change concepts, impacts and adaptation were

investigated through the use of stratified random sampling. Two hundred thirty (230) high school students answered a multiple-choice test on climate change. Results show that students have moderate level of knowledge and hold misconceptions on climate change basic concepts, impacts on different systems and adaptations strategies. The results could provide information for integration of climate change in the new curriculum and for the use of interdisciplinary strategies in teaching. The aspects of climate change can serve as central theme of different disciplines such as biological, phys-

ical and social sciences. In teaching the complex science of climate change, interdisciplinary approach is essential in dealing with the interrelationships of the different aspects especially climate change impacts and adaptation strategies. Climate change provides interdisciplinary learning opportunities for K-12 students.

*Keywords: Climate change, interdisciplinary learning, knowledge level*

*Prof. Brenda F. Caranto, Holy Angel University, Angeles City, Pampanga, Philippines*

### **An Evaluation of Knowledge and Attitudes towards Reproductive Health among Biology Non-Majors at the University of the Philippines Diliman Extension Program in Pampanga**

**Penelope Santiago-Nalo**

*University of the Philippines, Philippines*

In December 2012, the President of the Philippines signed into law the Reproductive Health Bill, which, when implemented, both the National and Local Government will shoulder the responsibility in providing 'age-and-development-appropriate' reproductive health education to public school students. In preparation for the full implementation of the law in providing appropriate Reproductive Health Education, this paper aimed to evaluate the knowledge and attitude towards Reproductive Health among Biology Non-Majors at the UPDEPP. Instead of using the traditional ways of teaching, where the teacher gives lectures and exams being the tool of evaluation, a different approach was applied. Peer teaching was encouraged. Students were assigned groups and were tasked to formulate ways on how to disseminate information about Reproductive Health. They came up with different creative ways such as production of commercials, round table discussions, brochures and primers. Different topics were tackled which include Family Planning, Use of Contraception, and STDs. Not only were the students' information about the topics, but their reactions were also noted. The whole process has been worthwhile, challenging the students to think out of the box. The approach has proved to be effective in assessing the depth of the students' knowledge about Reproductive Health, making it easier for the teacher to identify

the youngsters' misconceptions and to catch the students' interests. This also showed ways on how to handle the topics and leaving a lasting impression to students. The results of this approach will thereby be a guide in preparation for providing an appropriate Reproductive Health Education.

*Keywords: Evaluation of knowledge, peer teaching, Reproductive Health*

*Prof. Penelope Santiago-Nalo, University of the Philippines Diliman Extension Program in Pampanga, Philippines*

### **Exploring the Relationships on Climate Change Conceptions, Biology Attitude and Achievement of College Students**

**Erwin P. Elazegui**

*Technological University of the Philippines, Philippines*

Climate change is a major environmental issue that is now popular in socio-political and educational contexts. Biology education has received special attention because it is an important tool for understanding, protecting and conserving the environment. The study explored the relationships on college students' conceptions of climate change, their attitude towards biology and their achievement. The study was descriptive in nature and involved the collection of qualitative data from 94 students randomly selected at the Technological University of the Philippines-Manila. It provides data on the state of climate change literacy of students. Climate Change Test (CCT) and the Biology Attitude Questionnaire (BAQ) were used as research instrument. Results showed that most of the students (93%) have positive attitude towards biology. Results of the CCT revealed that students are knowledgeable (84%) on basic concepts of climate change. It also verified whether their understanding of climate change is related to their attitude towards biology and their achievement. Student scores in CCT and BAQ reveal a negligible  $r=-0.046$  not significant negative correlation while student achievement and CCT scores has 0.106 very low correlation. Research findings will serve as baseline information on the integration of climate change in tertiary level biology education.

*Keywords: Achievement, attitude, biology education, climate change conceptions, college students*

*Prof. Erwin P. Elazegui, College of Science, Technological University of the Philippines, Manila, Philippines*

### **Is Gallery Walk an Effective Teaching and Learning Strategy for Biology?**

**Chin Chee Keong, Khor Kwan Hooi, Teh Tiam Kian**  
*Institut Pendidikan, Malaysia*

A teacher may use gallery walk as a strategy to allow students to share their work with peers and to examine learning materials in the classroom. In this study, A-level biology students were divided into 4 groups to present information about cardiovascular diseases. Students' feedback on gallery walk as an alternative teaching and learning strategy was collected in a form of simple questionnaire. 71.4% of students could understand the lesson they need to present before their friends and equal percentage of students understood the lesson presented by their friends, indicating that gallery walk could be a suitable learning strategy for factual lessons like cardiovascular diseases. This strategy was found to be interesting for learning to 66.7% of the students. However only 28.6% of the students agreed that gallery walk strategy was more effective than teacher's didactic method of presenting the lesson and 66.6% of the students hope to learn biology lessons with similar strategy. We conclude that what students found to be interesting may not necessarily be effective for learning biology, and argue that didactic approach to teaching biology could still be very relevant even for the Y and Z generation of learners.

*Keywords: Biology education, changing education, gallery walk*

*Prof. Chin Chee Keong, Institut Pendidikan Guru Kampus, Tuanku Bainun 14000 Bukit Mertajam, Pulau Penang, Malaysia*

### **Kitchen PCR: An Experimental Program to Experience Plant Genetic Diversity at the DNA Level**

**Nobuaki Asakura, Rie Kikuchi**  
*Kanagawa University, Japan*

The maintenance of biological diversity (biodiversity) is an important global issue, particularly in environmental conservation where an understanding of biodiversity is becoming increasingly important. While morphological and ecological diversity is relatively well understood by most people, genetic diversity is less well known. We developed a simple practical program called 'Kitchen PCR' to communicate the con-

cept of genetic diversity. Kitchen PCR essentially consists of three steps: Crude DNA extracts were prepared by homogenizing the plant materials in a Tris buffer, and the *psbA-trnH* intergenic region of the plastid genome was amplified by PCR. The amplified DNA fragments were visualized by gel electrophoresis and stained with ethidium bromide or Fast Blast DNA stain. Marked differences in the amplified DNA fragments of the experimental plants were observed. Kitchen PCR provides a simple method for demonstrating the concepts of genetic diversity and for introducing students to molecular biological techniques.

*Keywords: Genetic diversity, plants, plastid genome, polymerase chain reaction (PCR), psbA-trnH intergenic region*

*Prof. Nobuaki Asakura, Kanagawa University, Yokohama, Japan*

### **Why do School Students' have Misconceptions about Life Processes?**

**Narendra D. Deshmukh**

*Homi Bhabha Centre for Science Education, TIFR, India*

School level biology in India from primary to high school focuses on topics such as; living, non-living, cell, human body, health and hygiene, diversity of living organisms, life processes, agricultural practices and animal husbandry, and ecosystem. Biology helps students to understand the environment and expects students to develop awareness, positive attitude, scientific temper, and scientific method, conservation of natural resources, values and skills. From life processes, students develop an understanding of basic structure and functions and their inter-relationship. A variety of researches on students' understanding of biology concepts show that students possess misconceptions of many concepts that are basic to a thorough knowledge of biology and leave secondary school with a distorted view of biological objects and events. In this research, students and teachers ideas about life processes were collected via open-ended questionnaire, interviews and textbook analysis. The data were used to develop the Concept Based Objective Tests. The researcher analyzed the rationale behind the misconceptions in life processes among students and teachers; and found that misconceptions in life processes among students and

teachers vary in nature, consequence and tenacity. The most important reason observed for these difficulties is the close relationship of various biology concepts, sub-concepts and units with each other. Researcher found that in the textbook the explanation of these concepts is abstract, complex, incomplete, ill-structured and erroneously interpreted. The study also found that the various biological processes are taught independently, and that there is a need to help students to understand the inter-relationship among the concepts and sub-concepts.

*Keywords: Concept based objective test, life processes, school science, students' misconceptions*

*Prof. Narendra D. Deshmukh, Homi Bhabha Centre for Science Education, TIFR, Mumbai, India*

### **Profiling Tertiary Students' Attitudes towards Biology**

**Erwin P. Elazegui<sup>1,2)</sup>, Zenaida D.R. Los Baños<sup>2)</sup>, Eufrecina Jean D.R. Ramirez<sup>2)</sup>**

*<sup>1)</sup> Technological University of the Philippines, <sup>2)</sup> Centro Escolar University, Philippines*

The study presents a profile of the attitudes of freshmen students in Biology at the Centro Escolar University-Manila. The study was also conducted to examine the relation between attitudes towards Biology and students' achievement. A total of 95 students took part in the study and they were selected by a random sampling technique. A 30-item Biology Attitude Questionnaire (BAQ) was used as research instrument. Items in the BAQ are divided into six dimensions: interest, career, importance, teacher, difficulty and the use of equipment in biology lessons. Results showed that students' interest correlate moderately in their career (0.472) and importance of biology (0.412). Low correlation was obtained on the dimensions: biology teacher (0.392), difficulty of biology lessons (0.351) and the use of equipment in biology (0.042). Most of the students (78%) have positive attitude towards learning biology. Likewise, correlation tests reveal a negligible  $r = -0.19$ , not significant negative correlation exist between students attitude and achievement in Biology. Tertiary level biology education should focus on a wider range of biological experiences so that students could realize that the ideas learned in biology classroom are relevant

and useful to their life outside of school.

*Keywords: Biology attitude questionnaire, biology education, students' achievement, tertiary students*

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### **Environmental Science Issues for Higher Order Thinking Skills (HOTS) Development: A Case Study in the Philippines**

**Lea C. Garcia**

*University of the Philippines Rural High School UPLB, Philippines*

Analyzing environmental issues is an expression of how one should love and protect the Mother Earth. A significant manifestation is this case study of six grade 7 Filipino students whose thinking skills were determined when they analyzed local environmental issues. The study also aimed to describe the students' thinking processes before and after discussion on the topics, identify the teaching strategies most useful in analyzing environmental issues, and summarize their awareness on the status of the Mother Earth. A single group design was used with a pretest-posttest instrument having three to four open-ended questions on four local environmental issues which was administered to the students. Interviews were also conducted to verify their analysis. Intervention strategies used in class discussions were lecture discussion, film showing, Power-Point presentation, small group discussion, concept mapping, and role-playing. Results reveal improvement on the critical thinking abilities of the students when they analyzed environmental issues. They used different critical thinking skills, along Freedman's model of critical thinking strategies. Improvement was noted in the posttest as more concepts, ideas and reasons were observed in the students' analysis. The most useful teaching strategy was role-playing. This was followed by film showing and PowerPoint presentation.

*Keywords: Case study, critical thinking skills, local environmental issues, open-ended questions, thinking skills*

*Prof. Lea C. Garcia, University of the Philippines Rural High School UPLB, College, Lagana, Philippines*

## **Academic Performance and Student-related Factors of Biology Students in the Special Science Program of the Marcial O. Ranola Memorial School**

**Padre Marlyn Oserin**  
*Aquinas University, Philippines*

Academic achievements of students are affected by carried factors and researchers in science education have identified a variety of these factors. Student attitudes and beliefs are shaped by student classroom experiences. This study investigated what specific learning styles are most important, the impact of student's attitude towards science on students' sustained interest in science over time with proficient study habits and skills, and further examined the relationship between student-related factors and their academic performance and understanding of science. Survey data instruments used were adaptation of the Kolb's learning style, Suydam Trueblood Attitude Scale, and expage.com study habits and Virginia study skill checklist. The results were interpreted by using frequency count, percentage and weighted mean. The students had a highly satisfactory and outstanding academic performance in Biology and have varied learning styles, attitudes towards science and study habits. The degree of the relationship of student-related factors and academic performance was determined by statistical tools: chi-square test, Cramer's coefficient c, and contingency coefficient values. It was found out that there was no significant relationship between the student-related factors and the academic performance among the students in Special Science Program. Thus, the study gives clearer emphasis of the teachers' style vis-à-vis students' learning styles that affect students' academic performance should be studied. Also, Guidance Programs may use the data for comprehensive guidance services that would help the students in the Special Science Program sustain their interest in science. Likewise, further study on other factors that may affect academic performance in Special Science Program should be conducted and the Special Science Education Program be enhanced in response to other students' needs to produce globally competitive students.

*Keywords: Academic performance, attitudes, beliefs, biology*

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## **Problem-Based Learning: Effects on Critical and Creative Thinking Skills in Biology**

**Jason A. Orozco<sup>1</sup>, Rosanelia T. Yangco<sup>2</sup>**

*<sup>1</sup> Colegio de San Juan de Letran and Centro Escolar University, <sup>2</sup> University of the Philippines, Philippines*

This study investigated the effects of Problem-Based Learning on critical and creative thinking skills of second year high school biology students. One class was exposed to instruction with problem-based learning (PBL) while the other class was exposed to conventional instruction (Non-PBL). Analysis of scores reveals that students exposed to instruction with Problem-Based Learning (PBL) have higher posttest mean scores in the Critical Thinking Skills Test and Creative Thinking Skills Test than those who are exposed to instruction without Problem-Based Learning. In addition, critical thinking skill is a significant positive predictor of creative thinking skill. It is recommended that teachers use the PBL approach in biology classes; that school administrators provide teacher trainings and seminar/workshops and procure equipment in support of the PBL approach.

*Keywords: Creative thinking skills, critical thinking skills, problem-based learning*

*Prof. Jason A. Orozco, Biological Sciences Department, School of Science and Technology, Centro Escolar University-Manila, Philippines*

## **Web-based Pre-lecture Activities: Effects on Student Concept Understanding and Self-regulation Skills in Biology**

**Jericca Alzate, Rosanelia Yangco, Felipe Del Castillo**  
*Philippine Science High School, Philippines*

The study determined the effects of web-based pre-lecture activities on concept understanding and self-regulation skills of high school students in Biology. A quasi-experimental research design using the pre-test-posttest design was employed. The experimental group had web-based pre-lecture activities which include reading online articles and watching animations while the control group had non-web-based pre-lecture

activities devoted to reading their textbook. Based on the findings, web-based pre-lecture activities can augment concept understanding and enhance the self-regulation skills of students. Hence, it is recommended that teachers use web-based pre-lecture activities in Biology to further develop the concept understanding and enhance the self-regulation skills of students.

*Keywords: Biology, student concept understanding, web-based*

*Professor Jericca Alzate, Philippine Science High School-Diliman, Quezon City, Philippines*

### **Utilizing Picture Gaming Apps as Pre-Assessment Tool and Firm up Activity for K12 Class**

**Christine May A. Torres**

*Columban College, Inc. Philippines*

As backed up by many theories, pictures, illustrations, and graphic organizers are found to be very useful tools in teaching. They promote critical thinking and deeper analysis of certain topics or lessons. Furthermore, in the advent of tabs and pad technology, different gaming apps are available for download in the World Wide Web, including picture games. Since it was found to be an addicting and motivating activity, this workshop deals with using the said tools in the pre-assessment and firm up activity of selected topics in Grade 7 and Grade 8, particularly in the concept of Living Things and Their Environment. The workshop will demonstrate the use of the concepts of selected gaming apps such as 4 Pics 1 Word, 2 Pics 1 Word, and Guess the Word in diagnosing the prior knowledge and firming up the students in selected topics of Living Things and Their Environment done in a game simulation strategy. Initially, it was found to be an effective activity because by doing so, students' participation in the discussions increased as it prompts curiosity and interest, and even challenges the students. The said activity is being recommended to be used not only in Science but also in other subjects. In addition, the author highly recommends exploring the usage of trending apps to capture students' interest in the subject matter.

*Keywords: Assessment tool, K-12, picture gaming apps*

*Prof. Christine May A. Torres, Columban College, Inc. – Barretto, Olongapo City, Philippines*

### **Opinions of Japanese University Students about Issues of Bioethics: Comparison between Nursing Students and Other Students**

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In this study, we compared nursing students' and other students' opinions about issues of bioethics: "genetic diagnosis," "amniotic fluid examination," "organ transplantation and brain death," and "pre-implantation genetic diagnosis." Our questionnaire was conducted from July 2012 to April 2014. The results are as follows: Firstly, 66% (143 of 217) of nursing students and 72% (194 of 270) of other students were positive toward "genetic diagnosis." Secondly, 62% of nursing students and 71% of other students were positive toward "amniotic fluid examination." Thirdly, on "organ transplantation and brain death," 79% of nursing students and 79% of other students approved "conditional promotion" or "promotion." So, the majority of the students were positive toward "genetic diagnosis," "amniotic fluid examination," and "organ transplantation." Finally, on "pre-implantation genetic diagnosis" which is to treat the first child who is suffering from "Fanconi anemia," 41% of nursing students and 33% of other students approved "conditional restriction," that is, "We should not expect the second young child to become the means of the treatment." Furthermore, 32% of nursing students and 34% of other students approved "restriction or "negation." Overall it was found that 73% of nursing students and 67% of other students had negative opinions. In addition, 82% of nursing students and 39% of other students had interest in bioethics. Our study showed that nursing students had more interest in bioethics than other students, and they tended to have more careful thoughts. We were led to conclude that nursing students were more conscious of bioethics' relations with their future careers.

*Keywords: Bioethics, biology education, genetic diagnosis, organ transplantation and brain death, preciousness of life*

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### **Development of Experimental Teaching Material for Understanding the Central Dogma – Visualization of Transcription and Translation *in vitro* -**

**Takeshi Katayama<sup>1,2)</sup>, Hidenori Hayashi<sup>2)</sup>, Kazuyuki Takai<sup>2)</sup>, Tomio Ogasawara<sup>2)</sup>, Yaeta Endo<sup>2)</sup>**  
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In the most updated Japanese high school curriculum, concept of the central dogma has been studied at the first or second grade in the first chapter of “Basic Biology,” and suitable experimental teaching materials should be invented for a wide range of students to understand this essential concept of 21st century biology. Previously, only students who selected “Biology II (Advanced Biology)” might have studied the concept, and could carry out experiments including transformation of *E. coli* at only limited high schools with enough facilities. Therefore, we developed experimental teaching material based on the wheat-germ cell-free protein synthesis systems. Since wheat seeds are foodstuff and the processes include only enzymatic reactions *in vitro*, the material is free of bio-hazard and ethical issues. This teaching material is composed of two visualization steps. The first step visualizes the transcription using an RNA specific dye. The second step visualizes the translation by luminescence from “Green Fluorescent Protein (GFP)” synthesized by wheat-germ cell-free systems. We introduced this teaching material in high school biology classes, and confirmed that this experiment was effective for understanding the concept of the central dogma. We have written this teaching material in the experimental section of a Biology textbook for Japanese high schools. In Japan, this teaching material has become an experimental kit. In addition, this experimental kit is now commercially available with exceptions. We expect that all students in the world to be able to understand the central dogma presented in this material.

*Keywords: Central dogma, high school Biology Curriculum, visualization*

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### **An Experiment Using the Seaweed, *Mastocarpus yendoi* Masuda et Yoshida, for Teaching Photosynthesis in Japanese Junior High School Biology**

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In the Course of Study for Japanese Junior High Schools, there has been no topic about seaweeds for the last twenty years. However, we are considering that junior high school students should learn about seaweeds to promote their understanding of both diversity and uniformity of photosynthetic organisms as well as to foster an inquiring mind in science study. Although it is not difficult to collect fresh seaweeds in most parts of Japan, it is not easy to maintain the photosynthetic activity of collected seaweeds for several days in a school laboratory. Therefore, practical reports on experiments for teaching photosynthesis using seaweeds at the secondary level have scarcely been presented. At the AABE 16 (1996), we reported the usefulness of *Mastocarpus yendoi* Masuda et Yoshida, a Japanese common red seaweed, as a material for teaching photosynthesis, because the seaweed could easily be kept fresh even in a classroom. Since then, one of the authors has carried out lessons to teach photosynthesis of algae with an experiment using this seaweed at junior high schools for 13 years. In the present paper, in addition to the methods of preserving the photosynthesis activity of the seaweed, the details of the experiment implemented and its effectiveness on students' understanding of photosynthesis will be reported.

*Keywords: Biology, junior high schools, photosynthesis, seaweed*

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### **The Case Study of Professional Development Available for Biology Teachers in Timor-Leste**

**Hong Juneuy**

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The aim of this study is to analyze professional devel-

opment for biology teacher in Timor-Leste by Korean science teacher. The purpose of the Korean science teachers who participated in Timor-Leste science teacher seminar (professional development) was as follows: to provide support for science teachers in Timor-Leste and to encourage their own development; to effectively share their skills and talents as science teachers. Many teachers said it is necessary to localize experimental materials and utilize appropriate language. Furthermore, before we finalize the Korea-Timor-Leste science teachers' seminar system, we need a precise understanding of the curriculum, correct data regarding the state of education in Timor-Leste and knowledge about what science teachers in Timor-Leste need. Science teachers in Timor-Leste who participated in the seminar mostly began their career within the past 10 years and are secondary school teachers rather than primary school teachers. What they expected from the seminar was to enhance their professional ability. When they participated in the seminar, they had some difficulty in the areas of language (due to double translation), finance and distance. Nevertheless our study shows that science teachers in Timor-Leste will be able to manage their own professional development.

*Keywords: Professional development, science teachers, Timor-Leste*

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### **Development of Teaching Materials about Insect Morphology and the Adaptive Significance of Ant Mimicry with a Comparison of Ants and Ant-mimic Spiders**

**Takahiro Yamanoi, Rina Osaka, Takaya Oikawa,  
Keiko Matumoto**  
*Hakuoh University, Japan*

It has been reported in much of the previous research that many primary school students do not have an adequate understanding of insect morphology (especially the position of six legs) even after learning about insects in the third grade. Although the new Course of Study in Japan (MEXT 2008) requires the cultivation of evolutionary thinking such as biodiversity and

commonality of organisms for science classes in primary schools, teaching materials with this perspective have hardly been developed. So, this study aimed at the development of teaching materials about insect morphology and evolutionary thinking by comparing ants and ant-mimic spiders. Science classes with the teaching materials were conducted in two primary schools. A comparison of pre-and post-test scores revealed that the teaching material proposed in this study enhanced the students' understanding of the position of six legs on an insect's body. Also, our movie edited to explain the adaptive significance of ant-mimicry offered a valuable opportunity for the students to think from an evolutionary perspective.

*Keywords Biodiversity, elementary school, evolution, new Course of Study*

*Prof. Takahiro Yamanoi, Faculty of Education, Hakuoh University, Tochigi, Japan*

### **The Ehime University International Internship Program in Education in the Philippines: Teaching Biology Abroad**

**Heiwa Muko, Manabu Sumida**  
*Ehime University, Japan*

Ehime University started an international internship program in education in 2008. The Japanese students of this university carry out their teaching practice in English at the University of the Philippines Integrated School (UPIS). The objectives of this program were to:

- provide opportunities for Japanese students to observe and gather information about the education system in the Philippines;
- have students observe lessons in public and private schools in the Philippines;
- design lesson plans to develop teaching materials and to carry out their teaching practice in English at UPIS;
- experience the Filipino culture, food, transportation and city life;
- strengthen the network between the faculty members and students of Ehime University and the University of the Philippines, College of Education.

This program covers different subjects (Art, home

economics, social studies, science, math and so on) in different grade levels. For six years, 14 science teaching practices have already been conducted in the program and five of them were about Biology (Create your own dream insect, Sensory stimulation and reaction, What happened in the mouth? Protein synthesis experiment, and Optical illusion). This presentation shows the case of teaching biology about “Optical illusion” at a high school. We will discuss about reasons and problems of selecting biological contents for teaching in a different cultural setting.

*Keywords: International internship, teaching biology, university students*

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### **Biology Teacher Should Be a Good Communicator...The Part of Next Generation Biology Teachers**

**Nirankush V. Khubalkar**  
**L.A.D. College for Women, India**

In most Indian universities and colleges, biology teaching these days, at the undergraduate level, is a mere rhetoric. The Existing Scenario in Imparting Quality Education in Biology And Why it is so?: There are many factors or considerations/limitations or rules and regulations responsible for the almost chaotic scenario these days – We can say it is a *vicious circle* – the selected *teachers* and the *teaching*. The *students*, the various supporting teaching aids to generate at least some interest are all missing/non-available from the place of learning (college/university/institute). The scene for post-graduation institutions is more-or-less the same. So, the biggest issue is how do we produce the Next Generation of Biology Teachers. Another disturbing factor is “The mentality of parents and society” expecting their wards to be doctors or engineers. To improve upon the Existing Situation – *A teacher has to be a good communicator* to be the *next generation teacher* able to reach out the students, generate interest in them and desire to learn. For this, one has to keep abreast with the recent advances, and evolve strategies to make the subject more interesting. The mode of communication has to be effective and easy. In this

paper, I am presenting one experimental setup I have developed from routinely available glassware in any laboratory, and carry on a good quality experiment to demonstrate easily the effect of temperature as well as pH on the catalytic property of some enzymes, including catalase by water-displacement method. The experiment may be utilized for other such enzyme tool.

*Keywords: Communicator, new experimental setup, next generation of biology teachers*

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### **Mentoring Using Colleague Investigation and SNS for Biologically Gifted Students**

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The purpose of this study was to examine educational implications of mentoring using colleague investigation and SNS for biologically gifted students, who investigated animal behaviors of spider, *Ariadna lateralis*. *A. lateralis* usually make their home in the ground unlike the other spiders which spin spider-webs. Making holes in the ground to observe the flat spider-web is good for mid-term observation on animal behavior for young students for science experience. *A. lateralis* can be fostered with mealworm in a small plaque cage. Determining differences between initial stage and later stages of the animal's behavior need long-term observation. *A. lateralis* cages were allocated to students for long-term observation. Once in a month the results and the process of each student's observations were monitored when students attended a laboratory meeting at the Gifted Students Institute adjacent to the University. During these visits, the students and the authors made a SNS site for reporting results and the observation process. On this SNS site, many photos and comments were posted. With this process, interesting results were acquired on scientifically gifted student education.

*Keywords: Animal behavior, Ariadna lateralis, biologically gifted student, colleague investigation, mentoring, SNS*

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## Development of the STEAM Program for Biologically Gifted Students

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The purpose of this paper was to report the development of the STEAM programs for biologically gifted students, and to examine educational implications. The Steam program is based on science education, which integrates science, technology, engineering, mathematics and liberal arts. Basically, STEAM education aims to improve students' interest in science. The SYEAM program could enhance students' understanding of and interest in science and technology, cultivate STEAM literacy, and be capable of problem solving. STEAM education emphasizes self-oriented process of inquiry and activities and focuses on enhancing their abilities of solving problems in everyday life. Using STEAM programs have positive effectiveness on the science education for scientifically gifted students.

*Keywords: biologically gifted students, science education, STEAM (science, technology, engineering, mathematics, and liberal arts)*

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## Implications of Educational Programs of Science Core Schools in South Korea

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The purpose of this paper was to examine educational implications of Science Core Schools in South Korea. Science Core Schools were planned to designate 100 schools among ordinary high schools, which were expected to enhance science education, and to lead high schools for future-oriented science education. The major purpose for establishing Science Core School is to

innovate a science-based core curriculum in general high schools with software (educational courses and activity related to sciences), hardware (science practical classrooms and resource center) and human-ware so that students will be better prepared to pursue natural sciences and engineering majors at universities. The goal of Science Core School is to develop students' scientific literacy to be informed citizens and their scientific knowledge and attitude to be top-quality science-related professions in the future society based on further advanced science and technology. Curricula for science core and general courses are divided and implemented in the 11th grade. There are over 45% of courses taken in mathematics and science in total credits. The performance is being examined through assigning Science Core Schools as "research schools." Science Core Schools are obliged to report their basic and specialized tasks to monitor the administration status and performance.

*Keywords: Future-oriented science education, high school, science Core School*

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## Exploring Trends in Biology Education Assessment Techniques in Australia

Anne Wallis

Deakin University, Australia

Traditionally patterns of assessment in science have been non-practical in nature. Although learning in biology is often laboratory-based, the traditional assessment method used in biology education is the examination. Using exams as the dominant tool to assess student progress results in skills such as memorizing content and completing low level questions becoming the focus rather than the skills student gain through practical application of biological concepts. The aim of the work presented in this paper is to determine the current trends in biology assessment at the tertiary level in Australia. It presents the results of an investigation into the methods of assessment being adopted in biology units taught at university and discusses the extent to which examinations, practical assessments and other forms of assessment are being used to assess understanding of biological concepts and their application.

*Keywords: Assessment, biology education, learning and evaluation*

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### <Sub-theme 2: Creating the Next Generation of Biology Teachers>

#### **The Effect of Concept Cartoon as Instructional Material and Formative Assessment Tool in Teaching Evolution and Diversity on the Achievement of Freshmen College Students**

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The purpose of this study is to investigate the effect of concept cartoon as instructional material and formative assessment of learning tool in teaching evolution and diversity in tertiary level. Design of this study is pre-test, post-test experimental design. The sample of this study is 90 freshmen college students of Quezon City Polytechnic University (QCPU). In both control (n=45) and experimental (n=45) groups, lessons in evolution and diversity were presented according to the outcomes based learning approach. Concept cartoon was used as instructional material and formative assessment tool in the experimental group. Pre-test and post-test were given to students to determine if the use of concept cartoon as instructional material can improve student achievement. Independent sample *t*-test results showed that there is no statistically significant difference between control and experimental groups with respect to students' achievement before the treatment. Paired sample *t*-test showed statistically significant difference between pre-test and post-test scores for both experimental and control group. When post-test scores of experimental and control group were compared, results revealed statistically significant difference between experimental and control group with respect to their achievement. As conclusion, integration of concept cartoon in the teaching of evolution and diversity resulted in a significant improvement in the academic achievement of students in tertiary level.

*Keywords: Achievement, biology education concept cartoon, formative assessment tool, instructional mate-*

*rial*

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### **The Mentor Teachers' Tacit Knowledge on Anatomy of Silkworms**

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According to some reports on Asian higher education, tacit knowledge played a vital role in scientific research and education. However, the role of tacit knowledge in science experiments in Japanese secondary education has not been sufficiently researched. The author analyzed mentor teachers' tacit knowledge required for student practice on "Making preparations for microscopic observation." In the study, the mentor teachers' tacit knowledge was extracted by recording and interviewing. It is thought that interviewing could have beneficial effects on extracting the specific knack for a method, the author tried to extract mentor teacher's tacit knowledge on "Anatomy of silkworms." This presentation reports the methods of extracting the teacher's tacit knowledge and new results.

*Keywords: Anatomy, interviewing, silkworm, teachers' tacit knowledge*

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### **Primary School Teachers' Attitudes towards Using ICT for Teaching Biology Courses**

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The impact of ICT on human life has been steadily increasing, including in the field of biology education. The aim of this study was to determine the primary school teachers' attitudes towards using ICT for teaching biology courses. The research sample consisted of 150 primary school teachers who are studying the subject of biology for undergraduate studies at one of the educational institutions in Malaysia. Information and communication technology attitudes questionnaire

(IAQ) comprising 28 items was used as a data collection tool. Cronbach's alpha for the scale was calculated to be 0.87. The data analysis were made by t-test and ANOVA. The results of teachers attitudes were divided into five categories; the positive influence of ICT, the negative influence of ICT, advantages of ICT, disadvantages of ICT and ICT used in teaching biology courses. Totally, the primary school teachers have positive attitudes towards using ICT for teaching biology. Moreover, their attitudes did not different on age, but different on gender and courses. These results have implication for biology lecturer preparation, especially in the areas of teaching different gender and courses.

*Keywords: Biology courses, ICT, primary school teacher*

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### **Tertiary Education of Evolutionary Biology in Asia**

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“Nothing in Biology makes sense except in the light of evolution” (Dobzhansky, 1973). As evolution underpins all branches of biological sciences, it is believed that evolutionary biology should constitute a major component of the biology curriculum in tertiary education. The present study surveys the biology curricula of universities in Asia, Europe and North America in light to compare the teachings of evolutionary biology between the three regions. Based on the list of universities provided in the Times Higher Education World University Rankings in 2013-14, this survey compares all the 40 Asian universities that offer undergraduate programmes in general biology to the same number of universities each randomly selected from Europe and North America from the same list. It was found that only ~70% of the Asian universities offer a course with evolutionary biology as a major component, while ~90% of the European universities and all the North American universities surveyed offer such courses. Moreover, whereas this type of courses is compulsory in about 20% of the Asian universities, it is mandatory in the biology programmes for over 50% of the univer-

sities in the other two regions. These results lead us to hypothesize that Asian universities are currently lagging behind their European and North American counterparts in educating their biology students in the area of evolutionary biology.

*Keywords: Asia, biology curriculum, evolution, tertiary education*

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### **Philosophical Applications in Concepts Representation of Biology Teachers in Secondary Schools of Iligan City, Philippines**

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The main purpose of this study is to capture the kind of concept representation utilized in the teacher's lesson leading to students' conceptual understanding and value transformation. This examined philosophical applications on different biology concepts by the teacher through classroom discourses. The research looked into how Metaphysics, Epistemology, Logic and Ethics were utilized by the teachers during lesson representations. The four levels of extent of Values Integration namely Knowing, Understanding, Valuing and Acting in increasing levels were also used as reference in philosophical application. Seven science teachers-respondents were asked about perceptions on philosophy of teaching, goals of science teaching and views on values integration, followed by classroom observations in their classes. This study is qualitative in nature utilizing phenomenological analysis by means of interviews, journal writing, interview guide platform and observation of classroom discourses. Observations on classroom discourses were done for a period of one to two weeks. Students' conceptual knowledge and conceptual understanding on the selected specific topic were asked through pre-test and post-test concept maps. The qualitative data utilized quasi-experimental pre-test-posttest design which were subjected to a paired t-test. Results suggest that although the teacher-respondents have their own perceptions on the philosophy of science teaching, the representation of their

concepts through classroom discourses showed that mostly, they applied Metaphysics and Epistemology only, less on Logic and least on Ethics. In terms of Values Integration, most teacher-respondents have reached the Knowing, Understanding and Valuing levels only and least also on Acting level. Furthermore, there is significant difference in students' achievement during pre-and post-test in the form of concept mapping. Although teachers applied their philosophies in classroom teaching, students have different levels of understanding and represented their ideas in different ways as what were shown in their concept maps.

*Keywords: Biology, concept representations, philosophy*

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### **Development of Teaching Material Which Treats the Influence of Alien Species, and Introducing It as a Biology Class Activity**

**Fumiya Hisano, Takayuki Sato**  
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Alien species often affect native species. For example, alien species rob foods and habitat from native species, and native species become their food source. We developed a biology class activity by our creating and introducing a new teaching material which focuses upon the influence of alien fishes upon native fishes. The characteristics of both types of fish are similar, including food sources and habitats. The teaching material includes a dice, cards and some papers which show seasonal ponds. Students decide the necessary needs for the fishes by a dice. As alien fishes act faster than native fishes, alien fishes snatch foods and habitats from native fishes. Furthermore, alien species eat the eggs of native fishes. So, it is difficult for native fishes to survive the season and to reproduce the next generation. It was found that in using the teaching material, students can simulate seasonal change of alien and native fishes' population into separate patterns. In the thirty trials conducted with teaching material, we often got the pattern that all native fishes cannot survive and are destroyed completely. Another pattern was that native fishes population decreases because they are

affected by alien species. It was found that students can understand the influence of alien fishes. At the end of the class activity, students discuss the releasing of alien species to nature by humans. Through the class activity, students can study the influence of alien species by practical experience, and they can enhance their ability of thinking about environment by themselves.

*Keywords: Biology class activity, influence of alien species, teaching materials*

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### **Survey of Undergraduate Students' Misconceptions about Molecular Biology**

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In the topic of Molecular Biology at undergraduate level, the students first learn 'structure and chemical nature' of nucleic acids, viz. DNA and RNA and RNA-types. This is followed by learning about DNA replication, Transcription and Translation in Prokaryotic organisms. At a subsequent level, the students learn about these phenomena of fundamental importance among Eukaryotes. At this stage, the students also learn about post-transcriptional events such as cleavage, splicing, addition of specific sequences to the primary transcript (RNA) and post-translational changes leading to formation of functional protein. Control of Gene Expression is an important component in the study of Molecular Biology. To understand the mechanism controlling gene expression in simplicity, usually a well-studied model of Operon, such as *lac* operon in *E. coli*, is included in the syllabus. Using this example, concept of Constitutive and Inducible/Repressible genes is learnt by the student and also, Positive and Negative control mechanisms of gene expression are learned about. At the next step, the student learns about more complex mechanisms of gene expression with the help of *trp* operon and ultimately 'Attenuation' mechanism is learnt by the student. In this study researchers found that, an undergraduate student holds misconceptions about: Promoter, Operator, Inhibitor (Repressor) gene and its product (Repressor protein), Role of Inducer (ex. Allolactose), and Attenuation as a mechanism of gene

repression in prokaryotes alone. In general, due to these misconceptions or lack of clarity of concepts the students consider 'Gene Expression' as a difficult topic and often avoid studying it further. Extension of this perception is that 'Molecular Biology' as a whole is considered to be out of intellectual grasp by the students. The researchers also found that undergraduate students often do not develop meaningful connections among concepts, but rather they learn to memorize information and reproduce that information as presented. The details about study and results are discussed in the paper.

*Keywords: Gene expression, molecular biology, students' misconceptions, undergraduate biology*

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### **Construction of Biology Class Activities by Exploiting Scientists and Their Life; Investigation of the Effectiveness in Curriculum of Lower Secondary Schools**

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There are some advantages, when science teachers exploit the history of science in their class activities. Therefore, we constructed and investigated teaching strategies which advanced the learning content of lower secondary school biology. First, we analyzed the Japanese Course of Study and science textbooks in order to grasp the present situation of how past scientists were included in biology class activities. Next, we arranged the results and investigated situations of class activities. From the above, we decided our plan and constructed teaching strategies. The result of our analysis of science textbooks, showed that here were some teaching units which included past scientists in the biology field. These scientists were Carl von Linné, Tomitaro Makino, Robert Hooke, Charles Darwin, Gregor Mendel, Shinya Yamanaka, and so on. However, there was no past scientist included in the teaching unit "The Kind of Animals" in the textbooks. This is one of the topics for which we constructed teaching strategies. We thought that Jean Lamarck should be included, because he had constructed the base of classification. If teachers included him in the teaching unit, students can enhance

their interest in animal classification, and they can study this particular teaching unit in a smooth manner to the next teaching unit which was "Succession and Evolution of Living Things." We believe that our teaching strategies had some effect on the students. The students could understand the learning content from the aspect of how scientific knowledge developed by connecting with past scientists' achievements. They could also understand the learning content in greater depth through vicarious experience of past scientists' activities. Their attitude of inquiry was probably raised by knowing past scientists' abilities and skills.

*Keywords: Biology class activities, curriculum, past scientists*

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### **Cooperative Activities on Science Education in Natural Science Museum, Aquarium and Zoo: Development of Hands-on Goods/Resources for Science Communication by Graduate Students**

**Kiyoyuki Ohshika**

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In the New Japanese Science Curriculum, the emphasis is for teachers to utilize the natural educational facilities to teach science effectively and practically. There are many natural educational facilities such as science museum, natural history museum, aquarium, botanical garden and zoo in Japan. Each facility has many attractive and effective exhibition materials and living things, and many school kids visit them every year. They have original activities and programs for kids, and perform them both in a formal and informal educational style. However, it is difficult and problematic for teachers to take students to these facilities during school time or school hours, because of their curriculum and other systems in school. In addition, another problem is that many teachers do not know the original activities in these facilities and how to apply them to the curriculum. In this research, I have created and practiced a new graduate course in science education to enhance the abilities for applying the materials in those facilities to science classes. In this course, graduate students have visited six facilities connected to biology education

areas; aquariums, science museums and zoos. They received a commentary about the exhibition displays and the educational programs from the academic staff or curators for a half day. Based on this knowledge, they have developed hands-on resources that the staff in these facilities could use for educational activities or programs which are easy to understand and to explain to kids. Through this course, graduate students have come to understand how to utilize the facilities and how to communicate the scientific knowledge using hands-on resources/goods.

*Keywords: Aquarium, science communication, science museum, scientific ability, zoo*

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### **A Study on Innovative Teaching Learning Methods for Undergraduate Biology Course**

**Sneha Gogte, Ch. Jyothi, D. Srikala**  
*St. Ann's college for Women, India*

Higher education is critical to India's aspirations of emerging as a major player in the global knowledge economy. This era is Science driven by need and study of Biology is thus very crucial, while role of Biology teachers is more challenging in making the subject interesting and awareness driven. Education in Biological sciences has been mainly a classroom setting which facilitates transfer of information from teacher to learner. Sciences both pure and applied need a basic component of experiential learning for conceptual understanding and assimilation. The study presents evaluation of innovative teaching practices used as a move towards quality enhancement for Biology course. The analysis of the responses indicated Hands on training as effective way for learning which evoked interest in understanding the subject in depth. Projects gave opportunity for positive interdependence among the team members and this method was useful in improving interest, inquisitiveness and interactive learning among learners. It reinforces the saying "I hear I forget I see I remember I do I understand."

*Keywords: Biology education, experiential, innovative, hands on training, projects*

*Prof. Sneha Gogte, St. Ann's college for Women, Hyderabad, Telangana, India*

### **<Sub-theme 3: The Endangered Planet – How Can Biology Education Help?>**

#### **Limnological Study of Esteros de Paco and de Concordia**

**Glorina P. Orozco, Ma. Stella Tolentino**  
*Far Eastern University, Philippines*

Estero de Paco and its tributary, Estero de Concordia, were studied to determine their ecological status. Physicochemical parameters of the esteros investigated were: turbidity, temperature, salinity, clarity, turbidity, EC, pH, DO, BOD, TN, TP, and oil and grease. Average values of these parameters generally fell under Class D or worse than Class D water quality criterion indicative of a highly stressed state of water body. Biological parameters studied include phytoplankton, zooplankton and fishes. Three species of fishes were found in both esteros studied namely: *Gambusia affinis*, *Rasbora maculata* and *Rasbora* sp. *Gambusia affinis* (mosquito fish) is the dominant fish in both esteros. In the plankton study, only three groups of phytoplankton were observed in the two esteros namely: Cyanophyta, Chlorophyta and Bacillariophyta. There were nine identified genera of phytoplankton from Estero de Paco and 12 from Estero de Concordia. For the zooplankton, twenty genera were observed in both esteros: Seven genera from Estero de Paco and 13 from Estero de Concordia. The Community indices used all indicated a highly degraded environmental condition in the esteros. A high dominance value was evident indicative of an imbalance in species representation among the algae. The Shannon Weiner and Evenness indices showed low plankton diversity indicative of a stressed condition of the estero waters that limited the kinds and abundance of species that can establish there. Pearson's *r* Correlation was used in this study to assess the correlation of different physicochemical parameters with the biological parameters. In general, both phytoplankton and zooplankton have similar trend of correlation with all the physicochemical parameters. Fishes have similar low correlations with most of the physicochemical parameters of Estero de Paco. However, in Estero de Concordia, fishes showed similar trend and exhibited high positive correlation with most of the physicochemical parameters. Furthermore, correlation of the parameters in Estero de Concordia was relatively high

compared to that of Estero de Paco. This may be probably due to the stressed ecological condition of Estero de Paco possibly due to the synergistic effects of the dredging activities, oil spill and heavy pollution in the estero.

*Keywords: Biological parameters, esteros, limnological study, physicochemical parameters,*

*Prof. Glorina P. Orozco, Far Eastern University, Manila, Philippines*

### **Environmental Assessment of Caluangan Lake: A Basis for a Proposed Strategic Management Plan**

**Joyce B. Lanuza**

*Evangelista National High School, Philippines*

This study assessed the present environmental condition and practices of the community surrounding Caluangan Lake, Oriental Mindoro, Philippines. Descriptive quantitative and qualitative researches were employed in the study. As a quantitative part, the present environmental condition in terms of physical, chemical and biological and the environmental practices in terms of agricultural, industrial and domestic were determined. Differences on the environmental practices among the communities were also determined. Meanwhile the qualitative part used phenomenological design. The respondents of the study were the residence of the six communities surrounding Caluangan Lake, *i.e.* Baruyan, Canubing 1, Tawagan, Masipit, Mahal na Pangalan, and Wawa. Overall the mixed approach included ocular inspection, laboratory tests, survey, and interview. A self-made questionnaire on environmental practices was administered composed of three parts such on agricultural, industrial, and domestic. Meanwhile, an interview was done to verify the result of the survey and the environmental condition. The following are the findings: a) color and turbidity of water did not meet the standard level while the temperature and odor are at normal condition, b) pH of water was at normal level and classified as basic, c) dissolved oxygen did not meet the standard level for Class C and was classified as Class D (industrial water), d) the salinity level is very high which classifies the water as saline while the amount total dissolved solids did not meet the required normal condition, e) total hardness, amount of sodium

and chloride and sulfates did not meet the standard condition, and f) iron, zinc and manganese are at normal condition. Meanwhile, fishes caught were dominantly migratory fish while the amount of fish 'catch' and catch per unit effort was lower than the average normal fish 'catch' in the lake. In addition, the communities surrounding Caluangan Lake are dominantly into agriculture. There was domestic environmental pollution and degradation resulting from average domestic activities which could have influenced the physical, chemical and biological condition of the lake. There were significant differences in the environmental practices of Caluangan Lake communities in particular with agriculture but not in the industrial and domestic dimensions.

*Keywords: Environmental assessment, environmental condition, environmental practices, strategic management plan*

*Prof. Joyce B. Lanuza, Evangelista National High School, Evangelista, Naujan Oriental Mindoro, 5204, Philippines*

### **The Species Diversity and Assessment of Marine Molluscs in Coral Reefs from Sattahip District, Chonburi Province, Thailand**

**Kitithorn Sanpanich<sup>1)</sup>, Teerapong Duangdee<sup>2)</sup>**

*<sup>1)</sup> Burapha University, <sup>2)</sup> Kasettsart University, Thailand*

The study of species diversity and assessment of marine molluscs in coral reefs from Sattahip District, Chonburi Province had been carried out. 200 species were recorded and had been classified in Class Bivalvia 105 species and Class Gastropoda 95 species. The abundance was as follows: 113 species (Jan Island), 106 species (Jorakhe Island) and 93 species (Juang Island), respectively. From assessing of marine molluscs in coral reefs, the dominant species which were found more than 90% of the total populations in the study area were *Begonia semiorbiculata*, *Chama* sp., *Spondylus* sp., *Mancinella echinata* and *Angaria delphinus*. The average richness was  $20.94 \pm 1.56$  sp./m<sup>2</sup> and the average abundance was  $9.54 \pm 1.22$  ind./m<sup>2</sup>. The highest abundance of molluscs occurred at the coral reef along the east of Jorakhe Island followed by the coral reefs at Nang-rong Beach and the west of Jorakhe Island, respectively. The highest species richness was at Nang-rong Beach ( $25.42 \pm 1.73$  sp./m<sup>2</sup>) whereas the

lowest was at  $(15.09 \pm 1.62 \text{ sp. /m}^2)$ . The comparison of the mean of abundance from the common and very common groups showed that Nang-rong Beach was not different from the east of Jorakhe Island, but different from the west of Jorakhe Island significantly ( $P < 0.05$ ). This study would be the database for the further ecological study and monitoring of coral reef molluscs in the future.

*Keywords: Assessment of mollusc, diversity, marine mollusc, Gulf of Thailand*

*Prof. Kitthorn Sanpanich, Burapha University, Chonburi, Thailand*

### **The Mongolian Dinosaur Fossil Exhibition for High School Biology**

**Yuji Hirose**

*Osaka Prefecture Education Center, Japan*

In order to cultivate PISA type academic ability, a lesson expansion for the Osaka Prefecture Education Center High School was done in cooperation with Osaka Prefecture Education Center and Osaka Museum of Natural History. The students visited a Mongolian dinosaur fossil exhibition, and examined skeletal preparations of living mammals while utilizing a work-sheet designed for this museum activity. Comparing the skeletal structures of mammals and a dinosaur's fossils, the students developed their ideas about how the dinosaur lived. In cooperation with the Education Center, a teacher designed and carried out three steps of learning activities; 1) prior study on evolution with a textbook, 2) activity in the museum, and 3) the presentation of results. To introduce the three step activity into the annual syllabus of biology, the teacher needed to reorganize the unit of biology and the theme of museum activities, and had to cultivate the students' academic ability for the presentation of results. Academic information and preparation of the specimens, etc. was done by the curators of the museum. The students developed logical thinking by observing specimens of the museum, then presented and discussed their ideas while utilizing the tablet type terminals. The Natural History Museum is a place where academic information and specimens are accumulated, and is also a place where amateur naturalists, and activists of NPOs gather. When high school students are given a

chance to participate in the activity, the museum may function as a place for lifelong learning and the study of our endangered planet.

*Keywords: Exhibition, museum, PISA, worksheet*

*Prof. Yuji Hirose, Department of Science Education, Osaka Prefecture Education Center, Osaka, Japan*

### **Expression of Yeast Metal Accumulation Gene (CCCI) in Tobacco**

**Nitchamon Thamaragsa, Warut U-Kong,  
Piyanat Setjant, Ruttaporn Chundet**

*Maejo University, Thailand*

Contamination of heavy metals in soil and water is the problems that cause harmful to living organisms. Heavy metal accumulation in plant cells is one approach which can reduce the level of heavy metals contamination. In this research, the genes involved in metal accumulation within the cells of yeast or *CCCI* gene was studied. The aim of study was to be applied for the heavy metal treatment by plants or phytoremediation. This gene was isolated from yeast cells and was cloned into the vector that used for gene transfer in plants. Then, *CCCI* gene was transferred into tobacco. The result showed that *CCCI* gene was inserted into tobacco and this gene was expressed in mRNA levels. The heavy metal ion accumulation in tobacco is studying. The further results can be used in plant improvement for heavy metals contaminated soil and water treatment.

*Keywords: CCCI, ion accumulation gene, tobacco*

*Prof. Nitchamon Thamaragsa, Maejo University, Sansai, Chiangmai, Thailand*

### **Improvement of Dengue Mosquitoes Control Programs through Research and Education**

**Rhea Jane Pescador-Mallari<sup>1,2</sup>,  
Catherine Genevieve B. Lagunzad<sup>1</sup>**

*<sup>1</sup>Ateneo de Manila University, <sup>2</sup>Subic Bay Metropolitan Authority- Ecology Center, Philippines*

A huge budget has been allocated to health programs by government and private institutions worldwide to look for the best prevention and mitigation measures against dengue outbreak. Most efforts in the Philippines have been channelled towards the eradication of mos-

quitoes that serve as vector of the Dengue virus, yet the number of cases of Dengue virus infection continued to rise over the past decade. This study showed that the conduct of scientific research to understand mosquito autogenous behavior and reproduction can generate important information that can help in controlling the spread of the disease. *Aedes albopictus*, one of two species of mosquitoes that transmit the Dengue virus in the Philippines, was analysed for autogeny expression. Results of the study revealed that these mosquitoes are capable of laying eggs and reproducing in the absence of a blood meal. Hence, existing control measures to eliminate these vectors may no longer be effective. This observation may serve as basis in the development of a vector control program that is science-based, and thus prove to be more appropriate and cost-effective.

**Keywords:** *Aedes albopictus*, controlling dengue vectors, dengue virus

**Prof. Rhea Jane Pescador-Mallari, Biology Department, Ateneo de Manila University, Quezon City, Philippines**

### **Optimization of PCR Condition for Potentially Novel Species of Lipolytic Bioluminescent Bacteria Isolated and Purified from Selected Philippine Epipelagic Organisms**

**Emmanuel D. Delocado, Kimberly H. Carrillo, Ronie J. Calugay**

*Ateneo de Manila University, Philippines*

Known as an archipelago with among the highest biodiversity on the planet, the Philippines has a tremendous potential as a source of bioluminescent organisms. The study aspired to isolate, purify and cultivate symbiotic BLB from 23 possible freshwater and marine host organisms; to screen the isolates for lipase activity, and; to optimize the PCR conditions for 16S rRNA gene amplification for future determination of molecular phylogeny. Swabs were taken from scales, eyes, and gut of marine and freshwater fish samples collected from two natural environs (Davao and Batangas) and three wet markets (in Navotas, Malabon, and Quezon City). Marine fish samples *Ralstelliger brachystoma* (hasa-hasa), *Ralstelliger kanagurta* (salay-guinto), and *Selariodes laptolepis* (alumahan) were determined to harbor BLB which were characterized as

Gram-negative, comma-shaped, and circular colony. BLB from *R. brachystoma* and *S. laptolepis* have blue luminescence while BLB from *R. kanagurta* have green luminescence. To date, there is minimal or no literature documenting bioluminescent activity from these species. Preliminary test for potential lipolytic activity was also done using olive oil as the substrate. Optimum annealing range of the universal primers was determined to be from 52.2 to 52.8°C. Literature claims that optimization of PCR conditions for novel species is difficult. Thus, these initial data may serve to generate the PCR optimum conditions to generate 16S rRNA gene amplicons to be used for future molecular identification and phylogenetic analysis of Philippine symbiotic BLB. Potential applications of this study include biodiversity sustainability, biosensor for water pollution and blood cancer detection.

**Keywords:** Biodiversity, bioluminescent bacteria, PCR, *Ralstelliger brachystoma*, *Ralstelliger kanagurta*, *Selariodes laptolepis*

**Prof. Emmanuel D. Delocado, Ateneo de Manila University, Quezon City, Philippines**

### **Bicol's Tree of Life: *Canarium ovatum* As Potential Source of Anti-cancer Compounds**

**Lilibeth A. Cajuday, Jocelyn E. Serrano, Daile Meek S. Membreve**  
*Bicol University, Philippines*

*Canarium ovatum* pulp oil (COPO) was evaluated for possible anti-angiogenic effect in the duck (*Anas platyrhynchos*) embryos using chorio-allantoic membrane (CAM) assay. In the study, 0.2 ml COPO at 25, 50 and 75% concentrations and corn oil as vehicle control were administered *in ovo* at day 3 of incubation using a modified windowing technique. Results revealed a significant inhibition ( $p = 0.05$ ) in blood vessel formation in all the COPO treated samples in a dose dependent manner compared to the vehicle control group. The embryos treated with the highest dose COPO (75%) exhibited much reduction in primary and tertiary blood vessel count. Indications of blood vessel obstruction in the vascular area of primary, secondary and tertiary blood vessels were manifested in terms of the incidence of ghost vessel, hyperemia and petechial hemorrhage. The findings confirm the anti-angiogenic

activity of *C. ovatum*. Further studies are warranted to determine its active components, the possible mechanism of action, and therefore establish its potential as an anticancer agent.

**Keywords:** *Anas platyrhynchos*, anti-angiogenic, *Cannarium ovatum*, chorio-allantoic membrane assay, pulp oil

**Prof. Lilibeth A. Cajuday**, Biology Department, College of Science, Bicol University, Legazpi City, Philippines

### **The Effects of *Brassica oleracea* L. var. *capitata* L. Extract on the Sperm Quality of *Mus musculus***

**Benilda Ramos-Butron<sup>1)</sup>, Marliza A. Ariñas<sup>2)</sup>,  
Jamee Lorraine M. Dela Rosa<sup>2)</sup>,  
Gilbert H. Dipaculangan Jr.<sup>2)</sup>**

<sup>1)</sup> Philippine Normal University; <sup>2)</sup> Our Lady of Fatima University, Philippines

The study aimed to determine the effects of red cabbage (*Brassica oleracea* L. var. *capitata*) in 15%, 30% and 60% concentrations compared to a negative control on the sperm quality of *Mus musculus*. The study made use of an experimental design utilizing a randomized block design to assign the 20 10-week-old male imprinting control region mice to treatments. After 30 days of administration of the extract through oral gavage, the left and right internal cauda epididymis with vas deferens were dissected to release the sperm cells. Sperm quality which includes mobility, count and morphology were observed. Using Median Sign Test Two-Sample Case and Kruskal-Wallis H test at the level of significance of 0.05 with 2 degree of freedom showed that there is significant difference in sperm mobility and sperm count between the experimental and control groups, and the experimental concentrations tested. The results of the study provided a potential use for a common plant, red cabbage, as a possible product for increasing sperm count and mobility which affects viability of a sperm. This may be a baseline resource for pharmaceutical industry to identify active compounds of the extract that has positive effects to sperm quality for development of medicines or enhancers.

**Keywords:** *Brassica oleracea* var. *capitata*, pharmaceutical industry, red cabbage, sperm quality

**Prof. Benilda Ramos-Butron**, Faculty of Science, Technology

and Mathematics, College of Teacher Development, Philippine Normal University, Taft Avenue, Manila, Philippines

### **The Importance of “AABE and Biological Education” – To Save the Biodiversity of This Planet –**

**Tomoko Kaga**

Osaka Kyoiku University, Japan

In the present paper, the change of the environment, the protection of endangered species, the evasion of fish extinction, the cultivation of edible fish are reported. Moreover, the importance of “AABE and Biology Education” is also discussed. While the forests in the world decreased by 52,000 km<sup>2</sup>/year for the last ten years, forest increased by 22,400 km<sup>2</sup>/year in Asia (FAO, 2010). This is a result by efforts of large-scale afforestation by Asian nations. It is also a result of efforts of AABE which has appealed for “the decade education for sustainable development through quality science education.” On the other hand, endangered species is on the verge of extinction by excessive poaching. Protection of the marine organisms is important like forest conservation. Before marine organisms are exterminated, it is necessary to protect the marine organism biodiversity. We have to maintain the diversity of the marine organisms as an inheritance for the future. In order to compensate shortage of fishes, it is necessary to make full use of the technology of biology and to make an effort to cooperate and cultivate fishes of endangered species.

**Keywords:** Biodiversity of marine organisms, cultivation of edible fish, earth environment, endangered species, forest area

**Prof. Tomoko Kaga**, Osaka Kyoiku University, Osaka, Japan

### **Biomass Production of *Spirulina platensis* in Medium Containing Effluent from Para Rubber Sheet Manufacturing Process**

**Pairote Wongputtisin, Udomluk Sompong**

Maejo University, Thailand

Effluent obtained from Para rubber sheet processing contains many chemical components; *i.e.* ammonia, nitrite, nitrate, phosphate, sugar, protein and other organic compounds. Thus, it was subjected to be applied

as nutritional source for microbial media. After pH, hardness and suspended solids of effluent were treated using NaOH, lime and soda ash. A possibility of the treated effluent for algal *Spirulina platensis* biomass production was studied. The results revealed that growth of *S. platensis* decreased when standard culture medium was supplemented with a higher ratio of effluent. At 20% (v/v) substitution of effluent yielded an acceptable algal biomass comparing to at the other ratio. Moreover, it was found that specific growth rate (Day<sup>-1</sup>) and doubling time (Day) of *S. platensis* when cultured in 20% (v/v) substituted medium were at  $0.09 + 0.012$  and  $8.0 + 1.6$ ; respectively, while those when cultured in standard medium were  $0.15 + 0.008$  and  $4.57 + 0.25$ ; respectively. However, crude protein content of single cell proteins obtained from both medium were not different ( $p > 0.05$ ).

**Keywords:** Biomass, Para rubber sheet effluent, single cell protein, *Spirulina platensis*.

**Prof. Pairote Wongputtisin, Maejo University, Sansai, Chiangmai, Thailand**

### **Feeding Effects of Viable *Croceitalea* sp. on the Fertility, Climbing Index and Mortality Rate of *Drosophila melanogaster* and Its Potential As a “Bio-insecticide”**

**Emerita C. Simeon, Joshua Earl B. Ferrer, Aina Mariel N. Fuentes, Jearick P. Gloria, Lara Michelle C. Perez, Edward A. Quinto**  
*University of Santo Tomas, Philippines*

Chemical insecticides are harmful and pose health risks to the ecosystem. There is a need for biological, environmental-friendly and less toxic insecticidal agents. This study searched for soil bacteria which can be utilized as an alternative to unsafe chemical pesticides. Five bacterial strains were isolated from the soil root region of *Gynura* sp. (Purple Passion) and were coded: A, D3, F1, F2, and F6. Phenotypic characteristics and 16S rRNA gene sequencing were used to identify the isolates. The feeding of the bacterial isolates on *Drosophila melanogaster* and its effects on the ratio of male and female flies, their climbing index, fertility and mortality rate after several generations was analyzed using one-way ANOVA. F2 identified as species of *Croceitalea* induced the production of the most number

of female flies and the conspicuous absence of male flies. These results showed statistically significant difference in sex ratio indicative of induced sex linked recessive lethality. There was also an increased mortality rate of 42.11% among female flies and 37.50% among male flies for isolate F1; 31.13% among female flies and 55.0% among male flies for isolate A; and 33.85% increase among male flies mortality for isolate D3. Bacterial isolates F2, A, F1, and D3 have the potential to be applied as bio-insecticidal agents since they increase the mortality rate by a substantial percentage compared to the negative control. The “New Biology” can promote a “Green Science” characterized by the use of environment-friendly and resource sustainable biological agents for the control of agricultural pests.

**Keywords:** Bio-insecticide, chemical insecticides, ecosystem, Green Science, New Biology

**Prof. Emerita C. Simeon, Department of Biological Sciences, College of Science, University of Santo Tomas, Espana, Manila, Philippines**

### **<Sub-theme 4: Seeing the Living World in a New Light – Technology in Biology Education>**

#### **Elucidating Structure of Protocorm-like Bodies of *Dendrobium* Orchid through Light and Electron Microscopy**

**Chin Chee Keong<sup>1</sup>, Chew Bee Lynn<sup>2</sup>, Sreeramnan Subramaniam<sup>2</sup>**  
<sup>1</sup>*Institute of Teacher Education;*  
<sup>2</sup>*Universiti Sains Malaysia, Malaysia*

Research in biology may involve observation of the ultrastructure of living organisms. Electron microscopy is far more superior in comparison to light microscopy in terms of magnification and resolution. In this study, scanning electron microscope was used to study the morphology of orchid protocorm-like bodies (PLBs), whereas light microscope was used to study the anatomy of the PLBs. Stomatal pores with clear defined guard cells were observed with scanning electron microscope under 500X magnification. Histological analysis revealed cellular storage vacuoles in eight-micrometre-thick sections of PLBs. Elucidation of PLBs structure of orchid provides qualitative data to further understand the developmental stages of *Den-*

*drobium* orchid.

*Keywords:* *Dendrobium* orchid, electron microscopy, morphology, protocorm-like bodies

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### **Microscopic Observation of Microorganisms on Pickles ~ How to Observe Prokaryotes and Eukaryotes in the Same Field of View ~**

**Teiko Nakamichi**

*Tokyo Institute of Biology Education*

In our new biology curriculum enforced in 2012, “Unity and Diversity” is emphasized in connection with evolution. To compare the cell structures of prokaryotes and eukaryotes is very useful for understanding the diversity of living beings. For this purpose, I propose observing microorganisms on pickles with a microscope. In this activity, students can observe prokaryotes like lactobacillus and eukaryotes like yeast on pickles in the same field of view. In addition, if they include observation of the cells of pickled material, they may recognize the difference in size of prokaryotic cells (bacteria cells) and two kinds of eukaryotic cells (yeast cells and plant cells). Though, in Japan, we can get many kinds of Japanese pickles at markets, we can prepare pickled materials by ourselves using the following method. (1) Put saline solution in a small zip-lock bag; (2) Add several thin slices of a vegetable like cucumber; (3) Leave it until microorganisms increase in number. The preparation of a specimen is as follows: (1) Put a small piece of the material on a glass slide, and spread out the juice; (2) Hold it at a gentle slant for a while, until glass slide dries; (3) Quickly pass the slide over a flame to fix the microorganisms; (4) Add a drop of methylene blue solution, and seal it with a cover slip. This observation will provide an opportunity for further inquiry study. For example, when students use different concentrations of saline, they can observe different microorganism flora.

*Keywords:* *Microscopic observation, microorganisms, pickles*

*Prof. Teiko Nakamichi, Tokyo Institute of Biology Education, 2-3-16 Chiyoda, Kashiwa-City, Chiba, Japan*

### **Use of Technology in Classroom for Implementing Remedial Module of Overcome School Students’ Misconceptions**

**Narendra D. Deshmukh**

*Homi Bhabha Centre for Science Education, TIFR, India*

Biology is taught as a scientific discipline in secondary schools across the world. Educating for social and sustainable development within the biology curriculum is an area of much interest globally, providing great opportunity for the incorporation of new content, new teaching approaches and new collaborations among biologists and educators around the world. The study of William and Abraham (1995) exposed that the use of computer and video as a part of classroom activities is motivating, and allows students to learn, communicate, and share their knowledge and understanding in a wide variety of ways and treatment with technology decrease misconceptions. More than six years research by the author has revealed that both students and teachers hold misconceptions about certain biological concepts. This research also found that, language, teachers, textbooks are the main causes for students’ misconceptions. To rectify the misconceptions amongst students, research based remedial material is very crucial. It can help teachers and students to overcome misconceptions and other barriers of understanding. The researcher had used technology for implementation of remedial modules in the classroom. The ‘PowerPoint Presentation’ is a great way to support a lecture, focus attention on a topic or visualize complicated concepts. It provides ways to create and share dynamic presentations with the audience. The features such as animations, sounds, hyperlink capabilities help in creating an engaging story. Once the attention of students is captured, learning is facilitated. Thus, PowerPoint presentations were developed using its multimedia features for the concepts involved in each of the module. Similarly the use of video provides richness of information with clarity and explicitness not possible with words or still pictures alone. Many of the life processes cannot be observed in real life, but they can be presented to the students using video. Scientists can be seen performing the experiments. Thus, the researcher searched for video clips and selected the relevant ones to be shown to the students. The results of the study showed that the

use of technology in implementation of remedial material is significantly effective for rectification of students' misconceptions.

*Keywords:* Remedial module, school science, students' misconceptions, technology

*Prof. Narendra D. Deshmukh, Homi Bhabha Centre for Science Education, TIFR, Mumbai, India*

#### <Sub-theme 5: Research in Biology>

### **Bioassay Guided Isolation and Evaluation of the Angiosuppressive and Toxicity Effects of Small Non-polar Molecules from *Syzygium samarangense* Merr. & Perry Leaves**

**Maria Kenosis Emmanuelle G. Lachica<sup>1)</sup>,  
Abigail B. Sulit<sup>1)</sup>, Dennis D. <sup>2)</sup>**

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*Syzygium samarangense* is known to have analgesic, anti-inflammatory, and anti-cancer compounds, but insufficient information on the toxicity levels and the angiosuppressive potential of the *S. samarangense* leaf extract have yet to be studied. The crude dichloromethane extract of *S. samarangense* was subjected to gradient solvent, exhaustive, and isocratic elutions, affording 15 crude fractions and two pure compounds, ursolic acid and lupeol. Median lethal concentration (LC<sub>50</sub>) was determined through Brine Shrimp Hatchability and Lethality assays. Chorioallantoic membrane (CAM) assay was used to confirm the angiosuppressive effect of the extract. Very low toxicity levels were observed in **2B** (LC<sub>50</sub>=0.01 48h post treatment), **3B** (LC<sub>50</sub>=0.057 12-48h post treatment), and **4B** (LC<sub>50</sub>=0.04 12h post treatment, LC<sub>50</sub>=0.006 24-36h post treatment, LC<sub>50</sub>=0.004 48h post treatment). CAM administered with these extracts were observed to have decreased microvascular branch point densities (BPD) and increased intercapillary distances (ICD), indicative of angiosuppressive effects. During angiogenesis, there is an increase in BDP as new blood vessels sprout from pre-existing vasculature, which also results to a decrease in ICD to maximize the surface area covered by the vasculature. It was determined that **2B** (9:1 acetone in DCM), **3B** (8:2 acetone in DCM), and **4B** (7:3 acetone in DCM) have the highest potentials for angiosuppression, which may be a possible pathway for an-

ti-tumorigenesis.

*Keywords:* Angiogenesis, Brine Shrimp assay, CAM assay, median lethal concentration, triterpenes

*Prof. Maria Kenosis Emmanuelle G. Lachica, Ateneo de Manila University, Loyola, Quezon City, Philippines*

### **Transformation of rice (*Oryza sativa*) cultivar Taichung 65 mediated by *Agrobacterium tumefaciens***

**Chotipa Sakulsingharoj, Kanokwan Phanlumpak,  
Poonsri Inta Saengtong Pongjaroenkit,  
Varaporn Sangtong**  
*Maejo University, Thailand*

Transformation efficiency of japonica rice cv. Taichung 65 using *Agrobacterium tumefaciens* was investigated. Mature rice seeds were cultured on N6D medium for callus induction. Scutellum-derived calli were transformed with *Agrobacterium* strain AGL1, harboring binary vector pCAMBIA 1305.1 which contains *gusA* as a reporter gene and *hptII* as a selectable marker gene. After co-cultivation, it was found that calli showed transient expression of *gusA* gene. The transformed calli were selected on medium containing hygromycin and cefotaxime for 2 cycles of 2 weeks each. Then hygromycin-resistant calli were regenerated to plantlets. PCR analysis confirmed the presence of *gusA* and *hptII* genes in the genome of transgenic rice plants. Transformation efficiency of Taichung 65 in this study was %. The results will be useful to establish transformation system for studies of gene function and genetic improvement of rice varieties.

*Keywords:* *Agrobacterium*, callus, rice, transformation  
*Prof. Chotipa Sakulsingharoj, Program in Genetics, Faculty of Science, Maejo University, Sansai, Chiang Mai, Thailand*

### **Diversity of Holothurians in Northern Cebu, Central Philippines: Basis Laboratory and Field Guides Production**

**Serapion N. Tanduyan, Berenice T. Andriano**  
*Cebu Technological University, Philippines*

Sea cucumbers are very valuable resource where they are the target animals by the collectors for food and for other purposes. Extraction of the resource was great

and a declined catch was felt by the gleaners. Hence, this study was conducted to find out the species diversity in Camotes Island and Bantayan Island for possible conservation and sustainability purposes. Camotes Island is composed of four municipalities namely: San Francisco, Poro, Tudela and Pilar. Bantayan Island is composed of three municipalities namely: Sta. Fe, Bantayan and Madridejos. Field collection was done in the field during the day and night and an interview guide was used to gather socio-economic data. Morphometric, calcareous ring and spicules analyses were made to determine species of sea cucumbers in Northern Cebu. Results show that there are 38 species of sea cucumbers found in Camotes Island and Bantayan Island belonging to four families namely: Holothuriidae (29 species), Stichopodidae (five species), Synaptidae (three species) and Phyllophoridae (four species). There were ten species which are high commercial importance; 14 are commercially important and 14 are less commercially important.

*Keywords: Diversity, Holothurians, Northern Cebu, Philippines*

*Prof. Serapion N. Tanduyan, Cebu Technological University, San Francisco, Cebu, Philippines*

### **Database Establishment of Abundance and Age Distribution of Ecologically Important Tree Species**

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Emily Anne C. Malong<sup>3)</sup>, Elmie G. Amurao<sup>4)</sup>,  
John Angelo B. Almazar<sup>5)</sup>**

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An average of 15 typhoons every year visits Pangasinan making the communities along the coastal area vulnerable to huge waves and floods. Since coastal vegetation provides the first line of defense against these natural hazards, understanding the importance of coastal flora and the conservation of these biological resources and protection of their habitats is a priority. LGU officers and staffs revealed that no data on the vegetation of Lingayen, Pangasinan is available. The availability of data has been a problem of the research-

ers, environmental and coastal managers to recommend policy for coastal ecosystem management. To reduce the impacts of natural hazards such as typhoons is to have a readily accessible environmental data. The study aimed to establish a database on abundance and age distribution of ecologically important tree species. The generated data were used in the preparation of a brochure and may serve as baseline data for future researchers and the conservation initiatives and monitoring program for habitat management and restoration.

*Keywords: Coastal ecosystem management, coastal vegetation, field based analysis, database*

*Dr. Catherine Genevieve B. Lagunzad, Ateneo de Manila University, Loyola, Quezon City, Philippines*

### **Evaluating Philippines Plant Extracts *Basella alba* Linn, *Melicope triphylla* (Lam.) Merr., *Quisqualis indica* Linn, and *Shorea contorta* Vidal for Toxicity against Human Colon, Lung Breast Cancer Cell Lines and a Non-cancer Hamstar Cell Line**

**Jessel Lejarde, Sonia D. Jacinto**  
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This study investigated the cytotoxic activity of crude and partitioned extracts of leaves from *Basella alba* Linn (Basellaceae), *Quisqualis indica* Linn (Combretaceae), bark from *Shorea contorta* Vidal (Dipterocarpaceae), and crude extracts from bark of *Melicope triphylla* (Lam.) Merr. (Rutaceae) against selected human cancer cell lines such as colon carcinoma (HCT-116), lung adenocarcinoma (A549), and breast cancer cell line (MCF-7), and a non-cancer cell line, the Chinese hamster ovarian (AA8), employing the MTT assay. The mean IC<sub>50</sub> values of the crude and ethyl acetate partitions of *S. contorta* showed toxicity to HCT-116 and MCF-7 cells, following the value for toxicity established by the National Cancer Institute, USA (NCI). However, the extract had no cytotoxic effect to AA8 non-cancer cells. *B. alba* crude extract was cytotoxic to MCF-7 cells while its ethyl acetate partition was active against HCT-116 cells. Both the *Q. indica* crude extract and ethyl acetate partition were active against HCT-116 and MCF-7 cells. *M. triphylla* crude extract had a high activity on A549 and MCF-7. *S. contorta* and *Q. indica* were not toxic to the

non-cancer cell line, AA8, following NCI value. *S. contorta* showed very high IC<sub>50</sub>s. Isolation of the cytotoxic compounds is the next step.

Keywords: *Basella alba*, Cytotoxicity, *Melicope triphylla*, MTT assay, *Quisqualis indica*, *Shorea contorta*

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### **Geometric Morphometric Analysis of Leaf Shape Variation in Species of *Coffea* (Rubiaceae): *Coffea canephora* Pierre ex. A. Froehner, *Coffea liberica* Bull. and *Coffea excelsa* A. Chev.**

Mikel Ryan B. Lorenzo<sup>1</sup>, Merab A. Chan<sup>2</sup>

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In the Philippines, the National Coffee Research, Development and Extension Center (NCRDEC) has a wide range of studies to improve the production in coffee farming and the quality of coffee in the country, paying particular attention to *Coffea canephora*, *Coffea liberica*, and *Coffea excelsa*. However, quantifiable morphometric data on leaf shape are not available to assess variations amongst the three economically important species of *Coffea*. The study aimed to use geometric morphometric analysis to quantitatively assess leaf shape variation on the three *Coffea* species using landmark-based geometric morphometrics. Two hundred eighty three (283) specimens were collected from the NCRDEC. Twenty one (21) landmarks were described and digitized using tpsDig v. 1.40. The principal component analysis (PCA) of landmark data was executed using Paleontological Statistics (PAST) v. 1.90 and visualization of shape variation was performed using thin-plate spline (TPS) deformation grids. The 60.28% total variance of the Principal Components (PC1 and PC2) showed a value of variation among the three species. PCA loadings suggest geometric significance of the outermost parts of the leaf blade, the petiole and the leaf apex. Visualization of the shape of the leaves compared to the mean shape of all samples demonstrated a distinct variation between *C. canephora* and *C. excelsa*.

Keywords: *Coffea*, geometric morphometrics, PCA,

*thin-plate spline*, landmarks

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### **Cytotoxic Activity of Plants Found in the Philippines, *Ficus pseudopalma* Blanco, *Antidesma pleuricum* Tulasne, and *Swietenia macrophylla* King, against Selected Human Cancer Cell Lines In Vitro**

Nelvie Fatima Jane A. Soliven, Sonia D. Jacinto

University of the Philippines, Philippines

Chemotherapy is the primary strategy utilized in dealing with cancer, one of the world's deadliest diseases. However, most drugs available are not highly specific to cancer cells, which can also acquire resistance to drugs eventually. Thus, finding natural compounds for development of better drugs for cancer chemotherapy is a fast-developing and promising field. This study is an attempt to find such plant products by screening three species for Cytotoxicity against selected human cancer cell lines. Through 3-[4,5-dimethylthiazol-2-yl]-2,5-diphenyltetrazolium bromide (MTT) assay, the crude ethanol, hexane, and ethyl acetate extracts of *Ficus pseudopalma* were shown to have significant cytotoxic effects on human colon carcinoma (HCT-116), breast carcinoma (MCF-7), adenocarcinoma human lung alveolar basal epithelial (A549) cancer cell lines, as well as non-cancer Chinese hamster ovary cell line (AA8). Ethanolic extract of *Swietenia macrophylla* and ethanolic and hexane extracts of *Antidesma pleuricum* showed no toxic activity to the three cancer cell lines.

Keywords: Anti-cancer drugs, cancer, chemotherapy

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### **Morphological and Physical Characterization of Selected Philippine Varieties of Adlay (*Coix lacryma-jobi* L.)**

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Data for grain and seed characteristics are not available for Adlay (*Coix lacryma-jobi* L.) in the Philippines. Pulot and Tapol are the varieties that are commonly cultivated and used as food source. Hence, the study was conducted to examine and compare the grain and seed morphological and physical properties of Pulot and Tapol. Results showed that the prominent spermoderm pattern of Pulot and Tapol is simple reticulate with wavy walls while their starch granule shape is round and polygonal. Furrows are evident on the surface of the grains on both varieties. Grain shape for both varieties is circular. The study revealed that the sizes of starch granules, seed weight, grain and seed length, grain and seed width are statistically different on Pulot and Tapol. Grain weight and husk/seed weight ratio are not statistically different on two varieties. Based on the findings, Pulot and Tapol varieties have comparable morphological characteristics. Their physical traits revealed features which may be a useful tool in distinguishing Pulot and Tapol. Further studies are needed to be conducted to validate the variation of Pulot and Tapol in terms of their morphological and physical characters.

*Keywords: Grain and seed characterization, spermoderm pattern, starch granules*

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### **The Calatagan Mangrove Project: Plant and Macroscopic Species Diversity, Isolation and Characterization of Soil Bacteria, and Community and Local Government Assessment for Sustainable Mangrove Management**

**Antoniette Marie C. Guerrero, Jocelyn Aquino, Jemillie De Leon, Isabel Neri, Stephanie Velasquez, Catherine Genevieve B. Lagunzad**  
*Ateneo de Manila University, Philippines*

To assess the ecological importance and biodiversity of “Ang Pulo” Calatagan Mangrove Forest Conservation Park in Barangay Quilitisan, Batangas, several studies were conducted. This study aimed to determine species density and dominance of the common mangrove plant species and their leaf morphology, identify the diversity of the microbial and macroscopic organisms in dry and

wet mangrove soil, and assess the community and local government participation towards a sustainable mangrove management. Five 10 x 10 plots of both wet and dry areas were utilized to collect samples for plant, soil, and macroorganisms. Results showed that *Avicennia marina* exhibited species dominance, soil samples contained microorganisms that are generally gram negative and all non-acid-fast, validating that there were no recorded serious illnesses in the area. Macroorganisms were more diverse in the dry than wet areas. This study proves a good interaction between the community and the local government is well-established for proper mangrove management.

*Keywords: Batangas, community-based project, ecology, mangrove, soil bacteria, species diversity*

*Prof. Antoniette Marie C. Guerrero, Ateneo de Manila University, Loyola, Quezon City, Philippines*

### **Isolation and Screening of Cellulase Producing Microorganisms and the Study Some Characteristics of Enzymes**

**Somkid Deejing, Duangpen Dittamart**  
*Maejo University, Thailand*

The cellulase producing microorganisms were isolated from soil, compost, cow dung, decaying wood and microbial activator. One hundred and sixty isolates of bacteria, seven isolates of actinomyces, and 12 isolates of fungi were obtained. Additional 73 bacteria isolates used in this study were a collection of Microbiological laboratory of Maejo University and one was obtained from Thailand Institute of Scientific and Technological Research (TISTR). Sixteen fungi from TISTR were included. The primary screening of cellulase production of bacteria was done on agar medium. Thirty five selected bacteria, seven actinomyces and 12 fungi were determined for cellulase activity in CMC broth. Among these microorganisms, *Aspergillus foetidus* TISTR 3159 showed most efficient cellulase producer and its enzyme activity in the crude sample was found to be 0.053 U/ml (specific activity 0.323 U/mg protein). The growth and cellulase production of *A. foetidus* TISTR 3159 in CMC broth showed highest cellulase activity 0.051 U/ml (specific activity 0.340 U/mg protein) for 84 h. The substrate specificity of crude en-

zyme from *A. foetidus* TISTR 3159 on various substrates was also examined. It showed highest enzyme activity 0.053 U/ml and specific activity on CMC 0.324 U/mg protein.

*Keywords:* cellulose, cellulolytic microorganisms, isolation, screening

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### **Antifungal Activity of Some Medicinal Plants and Their Interactive Effects with Antibiotic on Some Species of *Candida* Causing Candidiasis**

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Ana Patricia Ramos**  
*Cavite State University, Philippines*

A study was conducted to evaluate the in vitro antifungal activity of selected medicinal plant extracts against clinical isolates of *Candida* species, determine the phytochemicals present in various medicinal plant extracts with antifungal activity, and analyze the type of interaction exhibited by combinations of plant extracts and antifungal compound for treatment of candidiasis. Thirty plant samples were extracted and used in the preparation of dichloromethane (DCM), methanol, decoction and crude extracts. These extracts with and without combination of antibiotic were tested against three species of *Candida* (*C. albicans*, *C. parapsilosis*, *C. krusei*) using disk diffusion assay. The methods of Cannell (1998) and Roopashree *et al.* (2008) were adopted to identify the general phytochemical groups present in the plant extracts. Results showed that potential activities depend on the method of extraction and the solvents used. Five out of 30 DCM extracts inhibited *C. albicans* mildly; 13 showed antifungal activity against *C. parapsilosis*; and 25 extracts demonstrated growth inhibition of *C. krusei*. More plant samples using DCM as solvent inhibited *C. krusei* than *C. parapsilosis* and *C. albicans*. Qualitative phytochemical analyses revealed the presence of various compounds in the extract. Combinations of plant extracts and antibiotic resulted to different types of interaction: antagonism, additive or synergism.

*Keywords:* Antagonism, antifungal, candidiasis, synergism

*Prof. Yolanda A. Ilagan, Cavite State University, Indang, Cavite, Philippines*

### **Changes in Blood Chemistry and Hematology Indices of *Capoeta capoeta gracilis* in Relation to Age, Sex and Geographic Location**

**Hossein Khara, Fateme Yousefzadeh**  
*Islamic Azad University, Iran*

Measurement hematology and blood serum biochemical parameters of *Capoeta capoeta gracilis* with regard to age, sex and geographic location was the main purpose of this work. There was no gender effect on hematology and blood serum biochemical parameters. Blood samples were collected from 1, 2, 3, and 4-year-old specimens (n=20 for each age). Sodium and potassium concentrations suggested significant differences among ages. The amount of white blood cell, red blood cell, hemoglobin and eosinophile revealed significant differences between two locations (Siahrood and Talar Rivers). These data provide a baseline range for blood constituents of *C. capoeta gracilis* with regard to age, sex and geographic location. This information may prove to be useful in monitoring the health of field-collected *C. capoeta gracilis*.

*Keywords:* Age, *Capoeta capoeta gracilis*, hematology parameters, location, sex

*Prof. Hossein Khara, Department of Fishery, Faculty of Natural Resource, Islamic Azad University - Lahijan Branch, Lahijan, Iran*

### **Osmoregulatory Capabilities of Zander (*Sander lucioperca*) Fingerlings in Different Salinities of the Caspian Sea Water**

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<sup>1</sup> *Inland Water Aquaculture Research Center, Kharazmi University, 2* *International Research Institute of Sturgeon Fish Dr. Dadman, Iran*

Osmoregulation capabilities of two size groups (1 g and 2 g) of zander, *Sander lucioperca*, fingerlings were investigated survival rate, plasma osmolarity, sodium (Na<sup>+</sup>), chloride (Cl<sup>-</sup>) ion concentrations and cortisol level within 0, 6, 24, 72 and 240 h. after abrupt transfer from freshwater to 7‰ and 12‰ salinity. Also, some

hematological parameters were measured at 240 h. The plasma osmolarity and ion ( $\text{Na}^+$ ,  $\text{Cl}^-$ ) concentrations increased immediately after the transference to 7‰ and 12‰ salinity, reaching maximum at 72 h. in 1 g and at 24 h. in 2 g fingerlings, and significantly decreased at 240 h., while the freshwater control group maintained almost constant during 10 days which showed lower than the salinity groups. The pattern of cortisol level changes was similar in two size groups after exposure to different salinities and it reflected stress of handling. There were not any significant differences between hematological values of two salinity treatment groups than the freshwater control at 240 h. The result showed, not only 2 g zander fingerlings acted better than 1 g in faced with salinity but also the fingerlings weighing 1 g could survived and tolerate Caspian Sea water salinity up to 12‰. It is suggested that the release of zander weighing from 1 g would help to restock management of this species in the southern parts of the Caspian Sea.

*Keywords: Caspian Sea, cortisol, osmoregulation, salinity, Sander lucioperca, size, zander*

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### **Comparison of Chemical Compositions and Fatty Acids Profile of Cultured Common Carp (*Cyprinus carpio*) and Silver Carp (*Hipophthalmichthys molitrix*)**

**Sarah Jorjani, Afshin Ghelichi, Hossein Jorjani**  
*Islamic Azad University, Iran*

Chemical composition and fatty acid profile of fillets from cultured common carp (*Cyprinus carpio*) and silver carp (*Hipophthalmichthys molitrix*) were assessed. Ten farmed common and six silver carp were purchased from the fish ponds in Gonbad- Golestn Province (Iran). Fish were cultured in a semiintensive manner in poly-culture system with natural feeding in the pond without commercial feeding. No significant difference was detected between common carp and silver carp in total lipid, crude protein, moisture, and ash contents ( $p \geq 0.05$ ). In our investigation the major Fatty acids identified in common carp were C18:1 $\omega$ -9, C18:2 $\omega$ -6 and C:16:1, respectively and the most plentiful fatty acids in silver carp were C20:4  $\omega$ -6,

C18:1 $\omega$ -9 and C16:1 respectively. The results of statistical analysis showed the total amount of SFA in *C. carpio* does not have any significant difference with its amount in *H. molitrix* ( $P < 0.05$ ). MUFA contents in common carp was higher than silver carp ( $p \leq 0.05$ ); on the contrary, PUFA content was significantly higher in silver carp than common carp ( $p \leq 0.05$ ). PUFA/SFA and  $\omega$ -3/ $\omega$ -6 ratio in silver carp was significantly higher than that of common carp ( $p \leq 0.05$ ).  $\omega$ -3 content in silver carp was significantly higher than common carp ( $p \leq 0.05$ ). No significant differences were found in the total content of  $\omega$ -6 fatty acids between both species ( $p \leq 0.05$ ). However, since PUFA, PUFA/SFA and  $\omega$ -3/ $\omega$ -6 ratios and  $\omega$ -3 in silver carp were significantly higher than those in common carp, therefore, it can be concluded that silver carp is more favorable compared to cultured common carp. Of course, it is noteworthy that the mentioned ratios in silver and common carp were very far from recommended amounts. The results obtained from the present study may verify high nutritional value of both fish.

*Keywords: Chemical composition, common carp, fatty acid profile, silver carp*

*Prof. Sarah Jorjani, Department of Fisheries, Islamic Azad University, Azadshahr Branch, Azadshahr, Iran*

### **Effect of Decreasing Dietary Protein with Optimum Levels of Methionine on Hematological and Biochemical Parameters of Rainbow Trout (*Oncorhynchus mykiss*)**

**Afshin Ghelichi, Abootaleb Ghafari Bai, Sarah Jorjani**  
*Islamic Azad University, Iran*

A study was conducted to determine if balancing diets on available amino acid would result in equal performance with a reduction in total protein level. An 60-days feeding experiment was conducted to evaluate the methionine and supplementations to reduce dietary protein in rainbow trout feeds (initial weight of  $101.51 \pm 4.12$  g, mean  $\pm$  SD) reared in indoor flow-through and aerated tanks. Three amino acid test diets (Treatment 1: 40% CP, Treatment 2: 30% CP and 1% methionine, Treatment 3: 30% CP and 2% methionine) were formulated. Each diet was randomly assigned to two tanks. The red blood cells count, hematocrit, hemoglobin, plasma protein, albumin, and triacylglycerol

content were not significantly affected by dietary methionine levels ( $P > 0.05$ ). However, white blood cells count, plasma cholesterol and glucose concentration showed significant differences among these treatments ( $P < 0.05$ ). In conclusion, dietary crude protein content of diets for rainbow trout can be reduced from 40 to 30% by supplementing methionine with no negative effect on haematological and biochemical parameters.

**Keywords:** *Haematological parameters, methionine, reduce dietary protein, rainbow trout, serum biochemical parameters*

**Prof. Afshin Ghelichi, Department of Fisheries, Islamic Azad University, Azadshahr Branch, Azadshahr, Iran**

### **Identification of *Usnea* spp. and *Ramalina* spp. Collected from Selected Sites of the Provinces of Batangas, Laguna and Mt. Province and Assessment of Its Antibacterial Properties**

**Krystle Angelique Santiago, Carmela Magpile, Dawn Clara Magdalena, Neil Franz Paguirigan, Maria Jesusa del Rosario, Edenille Alcaraz**  
*Far Eastern University, Philippines*

Lichens, being a good source of natural products, are known prolific sources of bioactive secondary metabolites. However, lichens remain underexplored. This study, therefore, takes a closer look at the taxonomy and bioactivities of fruticose lichens in the Philippines. A total of 106 lichen specimens were collected from Batangas, Laguna and Mt. Province and were identified as belonging to the genera *Usnea* and *Ramalina* using conventional morphological and biochemical analyses. From the 106 specimens, 30 lichens were extracted using acetone and were tested against *Staphylococcus aureus*, *Escherichia coli* and *Salmonella typhi* using paper disk diffusion assay. Results showed that crude extracts were active against Gram-positive bacteria. Furthermore, 22 lichen acids were detected using Thin Layer Chromatography. Based on this study, lichens can be tapped as potential source of novel metabolites. In addition, this study may fill in the gap of lichen biodiversity in the Philippines.

**Keywords:** *Antibacterial, elevation, fruticose, secondary metabolites*

**Prof. Krystle Angelique Santiago, Far Eastern University, Manila, Philippines**

### **Screening Alcohol- and Acid-Tolerant Microorganisms for Rice Vinegar Production**

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*Maejo University, Thailand*

Vinegar is mainly used as an ingredient. Rice vinegar was developed as value-added rice products. Vinegar is made from fermentation of alcohol by microorganisms. To develop rice vinegar production, alcohol- and acid-tolerant microorganisms were explored. From the results, twenty-five strains as acid-producing microorganisms were isolated from fruits, flowers, honeys and wines in Chiang Mai, Thailand. The isolated strain (from oranges) could produce high acid concentration and was identified as *Acetobacter tropicalis*. This strain was then investigated acid and alcohol tolerance. *A. tropicalis* could survive in the medium containing acetic acid and alcohol concentration of 15% (v/v) and 14% (v/v), respectively. Furthermore, *A. tropicalis* was used to produce rice vinegar from rice wine by shaking flask cultivation. The optimal conditions for rice vinegar production were: rice wine with 8.0% (v/v) ethanol, aeration with 140 rpm at 30°C. These conditions could produce 2.71% w/v acid concentration. Adding acetic acid 1.0% (v/v) in the culture medium could induce *A. tropicalis* to enhance acid production during cultivation.

**Keywords:** *Acetic acid, alcohol, fermentation, rice vinegar*

**Prof. Chatamas Maneewong, Department of Biotechnology, Faculty of Science, Maejo University, Chiang Mai, Thailand**

### **Molecular Cloning and Phylogenetic Analysis of Abaca (*Musa textilis* Nee) Resistance Gene Analog**

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Some plants are susceptible to diseases while others defend themselves against pathogens through the action of specific resistance genes. This response usually involves a specific interaction between a host R gene and a pathogen avirulence gene. In this study, a puta-

tive R gene of BC2 abaca lines that are resistant to abaca bunchy top virus (ABTV) disease was cloned, verified, sequenced and characterized. Sequence analysis revealed significant alignments with nucleotide binding site (nbs) disease resistance genes. Further analysis using Blastx indicated high homology with the nbs – leucine rich repeats (NBS-LRR) disease resistance protein. Motif analysis of the 218 amino acid sequence showed four main motifs – ATP/GTP-binding site or P-loop, N-myristoylation, casein kinase II phosphorylation and N-glycosylation site. Phylogenetic analysis of abaca RGA against its monocot orthologues revealed significant clustering (84 – 100 bootstrap values) with RGAs of *Musa balbisiana*, *M. Acuminata*, *Musa* ABB group and *M. paradisiaca*. Currently, the mechanism of resistance of our developed resistant abaca breeding lines against ABTV is not yet elucidated. Our results shed the first account of the RGA structure of abaca and its phylogenetic grouping. These results will provide valuable information in understanding the molecular defense mechanism of resistant abaca lines to the dreaded pathogen (ABTV) of this economically valuable fiber crop in the country.

*Keywords: Cloning, fiber crop, Musa, phylogenetics, resistance gene analog*

*Prof. Orlex B. Yllano, Institute of Plant Breeding, Crop Science Cluster, College of Agriculture, UPLB, Laguna, Philippines*

### **The Study on Ability of Neem Tree Extract to Protect *Amaranthus* Seedlings from Ultraviolet Radiation-Induced Physiological Damage**

**Isaac Ekow Anyidoho, Tan Fui Ching**

*Malaysia University of Science and Technology, Malaysia*

Climate change is the gradual and progressive change in the weather pattern and condition over a region due to little or no rain, poor or too much sunshine and several causes from either human effects or natural effects. Not all living organisms in the area of plants are doing poorly however, the most affected all over the world is vegetable production which is one of needed crops for human consumption, and in some areas of the world, its cultivation has reduced or stopped for other crops to take their place. The depletion of the ozone layer may

expose crops to excessive UV radiation in the ecosystem, which could affect plant physiological growth and yield. This study intends to investigate whether neem extracts can be the solution to mitigate the physiological damage in crop plants caused by exposure to radiation. A constant temperature of 25°C, 16 hours light and 8 hours darkness cycle will help establish whether crude neem tree plant extracts can protect a one week old *Amaranthus* seedlings from UV-A light induced physiological damage and as to whether such crude extract from different parts of the neem plant (leaves, green-seeds, roots) may differ in their abilities to protect the seedlings.

*Keywords: Amaranthus, antioxidant, Azadirachta indica, crude extract, ecosystem, ozone layer, physiological, ultraviolet radiation,*

*Prof. Isaac Ekow Anyidoho, Malaysia University of Science and Technology, Selangor, Malaysia*

### **Supplemented Effects of Vascular Endothelial Growth Factor during in vitro Maturation of Porcine Cumulus Oocyte Complexes and Embryos Produced by Somatic Cell Nuclear Transfer**

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<sup>1</sup> *Chungbuk National University, South Korea,*

<sup>2</sup> *Patuakhali Science and Technology University, Bangladesh*

The aims of the present studies were to examine the effects of vascular endothelial growth factor (VEGF) on porcine cumulus oocyte complexes (COCs) and embryos produced by somatic cell nuclear transfer (SCNT) at different developmental stages. In the first study, the effect of VEGF during *in vitro* maturation (IVM) of porcine COC and subsequent developmental ability after IVF and SCNT were evaluated. The results from these experiments indicated that maturation rates among the different VEGF concentrations were not significant. In the second study, the cleavage rate was significantly higher when SCNT embryos were cultured with VEGF during the whole culture period than the late stage, but there was no significant difference between the control and the early stage culture period. The blastocyst formation rate was significantly higher at the late stage culture period with VEGF than at the

early stage culture period, but there was no significant difference in the total cell number between the groups. In experiment 3, VEGF mRNA expression was detected in all the developmental stages of SCNT embryos, but the expression level varied according to the developmental stage. VEGF receptor, KDR mRNA was detected in all stages SCNT embryos. However, flt-1 mRNA was not expressed in all embryonic stages of SCNT embryos. In conclusion, the present study suggested that supplementation of VEGF during IVM may enhance the developmental potential of porcine *in vitro* produced embryos and also it was suggested that VEGF supplementation at the late embryonic stage improved the developmental potential of SCNT preimplantation porcine embryos through its receptors and may assist to improve embryonic stem cell development.

*Keywords:* flt-1 mRNA, KDR mRNA, VEGF

*Prof. Dibyendu Biswas, Department of Medicine and Surgery, Faculty of Animal Science and Veterinary Medicine, Patuakhali Science and Technology University, Bangladesh*

### **Enhanced Photosynthetic Pigments in the Leaves of Mercury-exposed *Eichhornia crassipes* (Mart.) Solms.**

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*Eichhornia crassipes* (Mart.) Solms. plants were grown in Hoagland's hydroponic solutions modified with Hg(NO<sub>3</sub>)<sub>2</sub> to come up with 0.1 and 1.0 ppm treatment solutions in order to examine specific cellular and biochemical mechanisms involved in the tolerance of this plant exposed to these mercury treatments. This study assessed the responses of chloroplast pigments, viz., carotenoids and total chlorophyll. The enzymatic and non-enzymatic antioxidant systems were also evaluated. The ICP-AES analyses revealed varying Hg<sup>2+</sup> levels in the young and mature leaf tissues, with greater amounts of Hg<sup>2+</sup> found in the tissues of the young leaves. The chlorophyll a, chlorophyll b, carotenoids and total chlorophyll levels showed a significant increase in these young leaf tissues while a decrease in their levels was observed in mature leaf tissues compared to the

control plants. These results provide evidence pointing to the protective role of increased chlorophyll and carotenoid levels on the photosynthetic machinery of young *E. crassipes* leaves in the presence of Hg<sup>2+</sup>.

*Keywords:* Chlorophyll levels, mercury tolerance, photosynthetic pigments

*Prof. Jocelyn E. Serrano, Department of Biology, College of Science, Bicol University, Legazpi, Philippines*

### **Proximate Composition of Mango (*Mangifera indica* L.) and Honeydew (*Cucumis melo*) Wastes Fermented with Mono-culture of Probiotics *Lactobacillus* Species**

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Universiti Sains Malaysia, Malaysia

The proximate composition of waste products derived from mango and honeydew were determined. Further, the present study was undertaken to evaluate two agro-waste materials, as low-cost substrates to grow lactobacilli species through fermentation. The proximate analysis was conducted and the extent of variation in water content, protein, lipid, ash and fibre and carbohydrate content of both wastes were studied. The results obtained show that the water content of mango and honeydew was 82.85% and 89.77%, respectively. The dry matter in the products of mango and honeydew estimated was 17.15% and 10.23%, respectively. The protein content of mango and honeydew was 0.68% and 0.50% respectively. Mango possesses lipid (1.54%), ash (2.66%) and fiber (3.32%), while honeydew waste contains lipid (0.09%), ash (0.71%) and fiber (0.81%). Finally, carbohydrate content was 8.95% and 8.12% from mango and honeydew, respectively. pH was decreased from 6.0 to 4.0 due to the organic acid synthesis. Viable count was approximately 10<sup>8</sup> CFU/mL. Nutritional analysis suggests that mango and honeydew waste products possess energy-rich content that could be the cheapest and valuable bio-resource to cultivate probiotics lactobacilli for the production of bioactive metabolites.

*Keywords:* Honeydew waste, *Lactobacillus* sp., mango waste, nutritive value, proximate analysis

*Prof. Hassan Pyar, School of Pharmaceutical Sciences, Universiti Sains Malaysia, Penang, Malaysia*

### **Selection of Low-cost Culture Medium for the Production of Bacterial Protease for Application in Para Rubber Manufacturing**

**Augchararat Klongklaew, Pairote Wongputtisin**  
*Maejo University, Thailand*

Protease enzyme produced from *Bacillus* sp., isolated from northern Thai fermented food, has been accepted for its ability in degradation of rubber allergens. Protease treated-latex can be used in the production of several medical rubber products, i.e. surgery glove, condom, feeding tube, etc. However production cost of this protease was considered as the main cost of medical rubber products manufacturing. Therefore, the aim of this study was to select low-cost medium for protease production instead of Nutrient broth (NB), a commercial culture medium. The results showed that *Bacillus* sp. could grow in soybean meal (SBM) and skim milk medium similar to NB. Moreover, protease could be produced at 52.2, 31.1, 25 Unit/ml with the specific activity at 16.41, 9.08 and 8.16 in NB, SBM and skim milk medium, respectively. However, SBM was selected in this study because its Unit cost was lower than the others. Ability in degradation of rubber elongation factor (REF), a major allergenic protein in Para rubber latex, by protease produced in SBM medium was tested. It was found that REF was degraded completely similar to that produced by NB. Thus, SBM could be used as an effective low-cost culture medium for protease production.

*Keywords: Bacillus sp., low-cost culture medium, Para rubber latex, protease*

**Prof. Augchararat Klongklaew, Maejo University, Chiang Mai, Thailand**

### **Urban Gardening Program in Feu-Pabahay Village, Quezon City: A Campaign to Combat Climate Change**

**Myrna P. Quinto, Cynthia B. Mintu, Marites B. Sangel, Alfredo Alvarez, Ruby D. Olipany**  
*Far Eastern University, Philippines*

The FEU – Gawad Kalinga Pabahay Village Project is a community outreach program on housing and development at Madrigal Estate in Barangay San Antonio, San Francisco Del Monte, Quezon City, Philippines.

The rationale of this program is based on the premise that environment and socio-economic issues are closely interlinked and that one can be tackled with the aid of the other. Urban gardening by itself is a very beneficial activity. It improves the quality of health and environment in the city by providing locally produced food which is otherwise transported from long distances using precious fossil fuels that generates greenhouse gases and pollution. Urban gardening also adds to the urban greenery, reducing the paved surface of the city, and improving the visual and psychological conditions for resident. Growing plants in pots or other containers, rather than in ground is the methodology used in the study. The recipients were encouraged to utilize recyclable materials, which lessens the solid waste products in the environment. As a result of the project, the members of the community were motivated and willing to propagate plants. The project revealed that an active community participation in urban gardening supports the campaign in combating global warming and climate change.

*Keywords: Baseline data, climate change, socio-economic status, urban gardening*

**Prof. Myrna P. Quinto, Biology Department, Far Eastern University, Manila, Philippines**

### **Diversity and Phylogenetic Analysis of Fungal Endophytes from Selected Philippine Mangroves**

**Carlo Chris S. Apurillo<sup>1)</sup>, Lei Cai<sup>2)</sup>,  
Thomas Edison E. Dela Cruz<sup>3)</sup>**

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Mangrove ecosystems are biodiversity “hotspots” for fungi. These mangrove fungal endophytes are known sources of metabolites with potential anticancer properties. In this study, fungal endophytes were isolated from four mangrove hosts collected in Leyte and Samar, Eastern Philippines: *Sonneratia alba*, *Rhizophora* sp., *Aegiceras floridum*, and *Avecinnia* sp. A total of 73 fungal strains were reported from these host mangroves. Highest colonization rate was reported in *Avecinnia* sp. Twenty-four fungal isolates were then characterized using combined morphological techniques and mul-

ti-gene analysis, e.g. ITS, Cal, His, GAPDH, Tef, Tub, ApMAT and ACT. Phylogenetic positions of the isolated fungal endophytes were inferred using maximum likelihood and Bayesian inference. Results showed that only *Valsa brevispora* was isolated from *S. alba* collected in Leyte. Interestingly, the same host mangrove from Samar was host to *Guignardia mangiferae*, *Marasmiellus palmivorus*, and *Aspergillus nidulans*. Differences in fungal species composition were thus noted between same host mangroves from different sites. In addition to *S. alba*, *Rhizophora* sp. from Leyte was host to *Aspergillus oryzae* and *Diaporthe* sp. while the same mangrove from Samar was host to *Phaeosphaeriopsis musae*, *Pestalotiopsis adusta*, *Xylaria cubensis*, *Diaporthe siamensis*, *Cytospora rhizophorae*, and *Diaporthe* sp. The mangrove *Aegiciras floridum* harboured *Verticillium nigrescens* while *Collectotrichum fruticola*, *C. queenlandicum*, and *C. tropicale* were isolated from *Avicennia* sp. This same mangrove is also host to a potentially novel species of *Diaporthe*. Although fungal endophytes are known to exhibit host specificity, in this study the same species of mangrove are actually hosts to different fungal endophytes.

*Keywords:* Colonization rate, mangrove fungi, multi-gene phylogeny, species diversity

*Prof. Carlo Chris S. Apurillo, Philippine Science High School-Eastern Visayas Campus, Leyte, Philippines*

### **Valuing Microhabitat Preferences of Anurans: Insights from Species Sampled from Three Key Biodiversity Areas of Mindanao, Philippines**

**Elsa May D. Baron<sup>1,2</sup>, Alma B. Mohagan<sup>2</sup>**

<sup>1</sup> San Pedro College, <sup>2</sup> Central Mindanao University, Philippines

This study focused on 1) determination of the species composition of anurans in three key biodiversity areas: Mt. Hilog-Hilog, Mt. Tagub-Kampalili, and Lake Sebu; 2) identify preferred microhabitats of each species; 3) assess whether there are overlaps in microhabitat use among species; 4) determine maintenance activities associated with each microhabitat category; and 5) determine if a relationship between species composition and the number of microhabitat occur. Twenty-one species were documented from the seen sites repre-

senting six families. This represents 20% of the total currently known Philippine anuran species. A total of 461 individuals of anurans were accounted in this study. Fifty-seven percent of the species were documented from a transitional montane forest site. A distinct pattern of species richness was not evident but species richness might be higher in higher elevation sites. Fourteen of the total species recorded are endemic species and majority of which are Mindanao faunal region endemics. Also, eight of the species are currently listed under the vulnerable category of International Union for Conservation of Nature. Majority of the species were found to occupy at least two of the three microhabitat categories. Overlaps in use were also observed for several species. Common activities related to microhabitats include foraging, refuge for protection, and activities related to reproduction. The Chi-Square Test for Independence reveals that varying number of microhabitats and species composition is independent of each other. This is considered a result of the wider elevational distribution of the species as well as differences in terms of reproductive requirements of various frogs.

*Keywords:* Diversity, endemism, frogs, microhabitat utilization, niche

*Prof. Elsa May D. Baron, Arts and Sciences Department, San Pedro College, Mindanao, Philippines*

### **DPPH Radical Scavenging Activity, Total Phenolics, and Antimicrobial Screening of Selected Medicinal Pteridophytes**

**Dorothy A. Antesa, Yasmin A. Griño**

*Notre Dame of Marbel University, Philippines*

An enormous species of medicinal plants worldwide are traditionally used, and in most cases, no scientific studies have been done to prove their efficiency. Pteridophytes are just some of these plants. This study was conducted to evaluate the folkloric therapeutic claims of ten selected Philippine medicinal pteridophytes by determining the phytochemical, antioxidant, and antibacterial activities of the leaf extracts. Quantitative screening of the phytochemicals showed that alkaloids, saponins, flavonoids, and tannins were present in their leaf extracts. DPPH free radical scavenging assay was used to determine the antioxidant activity. All of the

extracts exhibited different extent of antioxidant activity. Among the plant samples tested, *Blechnum orientale* methanolic leaf extract had the greatest antioxidant activity while *Lycopodium cernuum* had the least. The percent DPPH Radical Scavenging ranged from 3.49 µg/ml to 32.05 µg/ml. The total phenolic content (TPC) of the leaf extracts showed large variations, between 77.44±0.37 and 413.52±1.42 mg GAE/g extract. The extracts arranged in decreasing values of TPC are *B. orientale* > *D. linearis* > *O. pistillaris* > *P. vitatta* > *N. biserrata* > *D. esculentum* > *C. contaminans* > *A. nidus* > *L. cernuum* > *P. scolopendria*. The TPC of the investigated extracts is shown to be positively correlated with the antioxidant activity (IC<sub>50</sub>). Antibacterial activity was evaluated using Kirby-Bauer method. Eight extracts inhibited the growth of *Bacillus subtilis*, seven inhibited *Escherichia coli*, four inhibited *Pseudomonas aeruginosa*, and six inhibited *Staphylococcus aureus*. These pteridophytes could be potential rich resources of natural antioxidants and could be developed into functional food or drug for prevention and treatment of diseases caused by oxidative stress.

*Keywords:* Antioxidants, DPPH Radical Scavenging, pteridophytes

*Prof. Dorothy A. Antesa, Natural Science – Math Department, Notre Dame of Marbel University, Philippines*

### **Marine Plant Resources in Beach Resorts in Pacijan Island, Central Philippines**

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*Cebu Technological University, Philippines*

Pacijan Island is noted to be one of the tourist destinations in Camotes Islands because of its beach resorts. Plants have been a component of its beach resorts namely: Star Beach, Bakhaw Beach, Sunset Vista Beach, Santiago Beach, Bano Beach Resort, Harbor View, Sea Side Beach, Puertobello Bay and Mahaba Beach. Hence, their study therefore needs to be done as to the status, composition and abundance. This study used the transect quadrat method laid in the beach re-

sorts to determine its richness, species composition, occurrence and conditions. People's perception on the condition of the beach resorts was also taken using an interview guide. Results show that there are 10 species of seagrasses found in the beach resorts in Pacijan Island belonging to two families: Hydrocharitaceae (5) and Potamogetonaceae (5) where *Cymodocea rotundata* and *Halophila ovales* dominate the 9 beach resorts in Pacijan Island. Macroalgal components show that there are 27 species of algae distributed throughout the 9 beach resorts belonging to 3 divisions which are Chlorophyta (11), Paeophyta (10), Rhodophyta (6). People's perceptions on the condition of beach resorts shows that more catch are taken from the beach resorts compared to the present. Depletion of seagrasses and algae was felt especially in Santiago Beach resort due to dredging as a way of gleaning. There are more gleaners today than the past. Beach sizes differ according to activities of the waves. Many flocked into settlements in beaches unlike before that they are less inhabited. Problem on garbage disposal segregation was not properly followed by the beach users and harassment of foreigners to some beach owners and personnel was felt.

*Keywords:* Beach resorts, Pacijan Island, plant resources

*Prof. Serapion N. Tanduyan, Cebu Technical University, San Francisco, Cebu, Philippines*

### **Successful Protection against Canid Predation on Little Penguins (*Eudyptula minor*) in Australia Using Maremma Guardian Dogs**

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*Federation University Australia, Australia*

The Little Penguin (*Eudyptula minor*) is the world's smallest penguin. It lives in coastal environment along southern Australia and New Zealand and breeds on and dunes and rocky outcrops of islands and mainland sites where it can be safe from predation. Little Penguins have bred on Middle Island, Warrnambool on the Victorian coast in Australia for at least 60 years. In 1999 a survey found 342 active penguin burrows and a population of over 500 adult penguins breeding on the island.

The colony was then subjected to intense predation by the introduced Red Fox (*Vulpes vulpes*), so that by 2005 only four birds were recorded arriving on the island to breed. Fox control methods proved ineffective and the colony seemed doomed to extirpation. However, since introduction of Maremma guardian dogs to the island in 2006, there has been an apparent cessation of fox predation of the islands' seabirds. This has facilitated a steady increase in the number of penguins breeding on the island. Data on the colony's recovery are presented as well as a description of critical factors in this successful community wildlife management process.

*Keywords: Little Penguin, Maremma Guard Dogs, predation, Red Fox*

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### **Biodiversity of Antimicrobial Producing Actinomycetes in Coastal Marine Sediments**

**Rattapanorn Srivibool<sup>1)</sup>, Trisukon Mali<sup>2)</sup>,  
Rawiwan Watanadilok<sup>1)</sup>**

*<sup>1)</sup> Burapha University, <sup>2)</sup> Naresuan University, Thailand*

Costal mangrove sediments were collected and isolated for antimicrobial producing actinomycetes. The study areas were in Chachoengsao, Chonburi, and Nakhon Si Thammarat Provinces. Out of 12 samples, 5 from Chachoengsao and Chonburi, and 7 from Nakhon Si Thammarat gave a total of 102 isolates, 47 from Chachoengsao and Chonburi, and 55 from Nakhon Si Thammarat. It was found that 7 actinomycetes recovered from Chachoengsao and Chonburi were active to either *Candida albicans* or Methicilin-resistant *Staphylococcus aureus* (MRSA) tested while there were 27 active isolates from those recovered from Nakhon Si Thammarat. By chemical analysis of wall diaminopimelic acid and sugar pattern including morphological studies revealed that the active isolates were moderately diverse in genera level and were more diverse in species level from both areas.

*Keywords: Actinomycetes, antimicrobial, mangrove sediment*

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### ***Agrobacterium*-mediated Genetic Transformation of *Hevea brasiliensis***

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Panarin Preechawattanakon, Phopgao Buddharak**  
*Maejo University, Thailand*

A protocol for callus induction and *Agrobacterium*-mediated genetic transformation was established for *Hevea brasiliensis* using young seed as explants. Young seed explants were cultured on woody plant medium (WPM) supplemented with kinetin (0.5 mg/l to 4.0 mg/l), and 2,4-dichlorophenoxyacetic acid (1.0 mg/l). Callus initiation was observed in WPM supplemented with 2.0 mg/l kinetin and 1.0 mg/l 2,4-dichlorophenoxyacetic acid. *H. brasiliensis* callus derived from young seed was transformed with *Agrobacterium tumefaciens* strain LBA4404 harboring the binary vector, pStart, pBI121 and pBInMYB containing the sequence coding for neomycin phosphotransferase (*nptII*) as the selectable marker gene,  $\beta$ -glucuronidase (GUS) as the reporter gene. Transformation frequencies of 60% (pStart), 55% (pBI121) and 65% (pBInMYB) were achieved. The transgenic of *H. brasiliensis* was shown by transient GUS expression, their ability to survive in the selection medium. This transformation system can be used to introduce genes of interest into *H. brasiliensis* lines for genetic improvement.

*Keywords: Callus, genetic transformation, GUS assay, Hevea brasiliensis*

*Prof. Ruttaporn Chundet, Program of Biotechnology, Faculty of Science, Maejo University, Chang Mai, Thailand*

### **Antioxidant and Anti-inflammatory Mediated Mechanism in Thermal Wound Healing by Gel Containing Flower Extract of *Butea monosperma***

**Sakharwade**  
*LAD College Nagpur, India*

Burn injury produces reactive oxygen species which cause inflammatory consequences in the exposed tissue. Antioxidant components widely used to scavenge reactive oxygen species as well prevents the inflammatory consequences. The objective of the present study was to evaluate thermal wound healing activity of gel containing the flower extract of *Butea monosperma*

(FEBM). Fifty adult, male Wistar-albino rats were divided into five groups of 10 animals (5 animals each for 10-day and 20-day trial periods). A burn wound was induced on the back side of all the rats. The respective burned areas in all groups of animals were treated with blank (control), standard Silver Sulphadiazine (SSD), gels of flower extract of *B. monosperma* (0.5, 1, and 1.5%). After 10- and 20-day trial periods, the rats were sacrificed and the wound samples were collected for determination of lipid peroxidation and histopathological examinations. The results of treated wound found to heal much faster compared to control. The significant effect on wound closure was observed with 1.5% gel at 20th day which was comparable with SSD. The result of lipid peroxidation indicated the anti-lipid peroxidation activity of gels containing FEBM. Results also showed in vitro free radical scavenging activity and anti-inflammatory activity which may be due to presence of flavonoids and thus FEBM provide the beneficial effects in the acceleration of wound healing. In conclusion, topical applications of gels FEBM are effective in healing of burn related skin wounds in the rat model.

*Keywords: Burn wound, Butea monosperma, gel, flavonoids, oxidative stress and inflammation*

*Prof. Sakharwade, LAD College Nagpur, Ramnagar, Nagpur, India*

### **Waste Management Practices of Science Laboratories among Higher Education Institutions in Davao City: Basis for a City-wide Waste Management Enhancement Program in Science Laboratories**

**Mitchelle S. Perez**

*San Pedro College of Davao, Philippines*

The primary aim of the study was to determine the waste management practices of science laboratories of higher education institutions (HEIs) in Davao City. Mean was the statistical tool used to determine the level of waste management practices in the profile of wastes being generated by science laboratories of HEIs in Davao City in terms of biodegradable wastes, non-biodegradable wastes, and of residual wastes. T-test was used to determine the significant difference in the level of waste management practices when ana-

lyzed by the type of school laboratory: biology and chemistry laboratory. The instrument used in the study was patterned from the Rhode Island University – Assessment Questionnaire which was used in assessing the status of waste management practices in science laboratories in that State. The questionnaire was modified to include only the items relevant to the study, was validated and tested for its reliability. These were the mean ratings for each of the indicators of the level of waste management practices of science laboratories in HEIs: Science laboratories of HEIs in Davao City generate 63.8 kg of wastes per week, or the equivalent of 3.2 tons of wastes per annum, with biology laboratories contributing 32.8 kg per week, or 1.71 tons per annum, and chemistry laboratories contributing 31.0 kg per week, or 1.61 tons per annum. On the type of wastes being generated, biodegradable wastes 22.8 kg per week and residual wastes 19.1 kg per week. The overall mean rating for level of waste management practices in science laboratories of HEIs in Davao City was 3.15 or moderate. The mean rating by laboratory is 3.17 for biology laboratory and 3.12 for chemistry laboratory. On the indicators of waste management practices, the mean scores were 3.41 for handling of laboratory wastes at source; 3.36 for storage of laboratory wastes; 3.18 for collection of laboratory wastes and 2.64 for final disposal of laboratory wastes. Based on the mean rating of waste management practices when analyzed in terms of biology laboratory and chemistry laboratory showed that the overall computed t-value was 3.091 with the corresponding probability value of 0.002 at  $\alpha=0.05$  level of significance. Therefore, the null hypothesis for sub-problem 3 was rejected.

*Keywords: Higher education institutions, science laboratories, waste management*

*Prof. Mitchelle S. Perez, Arts and Science Department, San Pedro College of Davao, Davao City, Philippines*

### **Honey Collecting with the Aeta in Quezon Province, Philippines**

**Pedro Jose L. de Castro**

*Manuel S. Enverga University Foundation, Philippines*

This study is to find the causes of livelihood vulnerabilities of the Aetas in southern Quezon and to find out possible ways to reduce their susceptibilities through

assessment involving combination of social and economic factors; ethnographic; and melissopalynology. Traditional honey collecting is still strictly done during dry season when most of the flowering plants are in bloom which usually starts from the months of August and May. The Aeta collect honey from the endemic species of honeybees such as *Apis bereviligula* Maa and *Apis cerana* Fabricius. One of the key issues is that honey is the most sought-after by-product of honeybees. Honey is collected using traditional smoker which prohibits sustainable honey production since it can displace and even a number of bees along with queen. With the excessive smoke and inadequate honey-extracting practices, honey affects the commercial quality of the product in the market. Of the significant floral species which constitute valuable sources of nectar and pollen from the early August and predominantly during the dry season in the month of May, a total of twenty-five pollen types from twenty-three families were identified. This paper defines pragmatic action plans that “bridge from the future back to the present” and aligns the traditional honey collecting of the Aeta vis-à-vis additional livelihood options through honey collecting, environmental education in community-based approach using a module suited to their practices and beliefs, and viable resource enhancement plan which would result to increase crop yield and income.

*Keywords: Aeta, honey, honey collecting, native honeybees*

*Prof. Pedro Jose L. de Castro, College of Arts and Sciences, Manuel S. Enverga University Foundation, Lucena City, Philippines*

### **Bioarts: An Environmental Integration Model**

**Crisostomo C. Canencia**

*Cebu Technological University, Philippines*

Peri-urban bio-integrated farming employed a sound integration between selected crops, poultry animals, fishes, and earthworms in a 300 m<sup>2</sup> backyard and the wood, metal painting and pottery arts. It used a S.E.C.U.R.E.D practices for the maximum maximization of time, energy, material resources and saved a lot of money. The S is referred to site selection. It considered the water supply, topography, nearness to market,

availability of materials, cheap skilled labor, access to transportation, free from flood, drainage system, type of soil, vegetation, and the peace and order. E: establishment process required sequential of activities to be done on plan, design and layout of the farm, procurement of materials, stocks establishment, production and management, harvesting and marketing; C: conservation of rain water; U: utilization of rain tree (*Semania saman*) fallen leaves; R: reuse, recycle, reduce and redesign; E: entrepreneurship and D: Do-It-Alone. The study showed it conserved 400 m<sup>3</sup> rainwater for four years operation, thus it saved 8,000 pesos of using from commercial waterworks system. It also showed that it utilized 14.4 m<sup>3</sup> of using garden soil and it saved 28,600 pesos. The 4 Rs saved 12,567.25 pesos from the cost of ready-made materials at an amount of 15,530. And the Do-It-Alone saved 18,104 from the 198,499 development cost and 53,850 from 96,000 expenses on the arts. The study further showed that it provided 27% return of investment of the BIOARTS.

*Keywords: Farming, S.E.C.U.R.E.D practices, water*  
*Prof. Crisostomo C. Canencia, Cebu Technological University-Barili Campus, Cebu, Philippines*

### **Environment and Water Treatment**

**N. Ben Tahar, H. Mimoun**

*University M'hamed Bougara, Algeria*

It is often said that water is not necessary to life ... “Water is simply life.” It is from these waters that life emerged. As living bodies were transformed into structures more complex and sophisticated, they left the marine environment to reach the earth, drawing water most of their physical constitution. On the ground water that's life. Water is also critical in manufacturing processed in any industry. Water use in a production unit has been greatly reduced by cutting waste and by technological advances. The restrictions go beyond just saving water they require for recycling in the circuits and fire service and water for extra cooling. In most processes, the water can act either as reactive as a solvent or as an agent used to carry cold or heat. In each specific case of use, it is essential to know the water quality. Indeed, the natural water that is to say the water in the rough may contain harmful substances which could have adverse consequences on equipment or

chemical reactions. So, we must recognize all these substances to adjust their content in the water before assigning it to a particular purpose. The legislation also imposes constraints on the content of water discharged into carbon compounds and suspended solids. There are also standard on nitrogen excretion. Subsequently, the water having participated in any manufacturing process must be either recycled or released into the wild. But this water may contain pollutants, so harmful, which may render it unusable without prior treatment

or dangerous for the environment. Water should be purified as for recycling for the waste. It is in this context that we have considered the treatment of industrial waste water. We have prepared four types of adsorbents that we used in a laboratory facility for the treatment of waste water from the Cheese Boudouaou. The results are satisfactory.

*Keywords: Environment, treatment of water*

**Prof. N. Ben Tahar, University M'hamed Bougara, Boumerdes, Algeria**

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### Publication

A book, ***Biology Education for Social and Sustainable Development***, was published in 2012 by Sense Publishers, Rotterdam, Netherlands. Some papers presented at **the 23rd Biennial Conference of the AABE** which was held in Singapore in October 2010 were compiled in this book by the co-organizers of the conference, Dr. Mijung Kim and Dr. C. H. Diong. You can refer to the abstracts of these papers in **the sixth volume of the *Asian Journal of Biology Education*** (2012).

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### From the Editor-in-Chief

The eighth volume of the *Asian Journal of Biology Education* (AJBE) contains one research paper and the abstracts of the presented papers at the 25th Biennial Conference of the AABE, which was held in Kuala Lumpur, Malaysia, from 13th to 16th October, 2014.

I still have some articles contributed from the AABE members and others. These articles are in the reviewing process and may be included in the next issue which will possibly be published in 2017. The next issue will include the abstracts of papers presented at the 26th Biennial Conference of the AABE which will be held probably in Mumbai, India, in September, 2016.

Everyone can contribute their research paper, practical report, or the report on biological resources to AJBE. So, I would like to ask the readers to contribute their articles to this journal. The articles contributed to AJBE last year have been reviewed by the following persons as well as the Editorial Board members: Dr. Raman Anantanarayanan (Charles Sturt University, Australia), Dr. Eduardo Lobo Alcayaga (University of Santa Cruz do Sul, Brazil), Professor Kim Kyoung-ho (Gongju National University of Education, Korea), Dr. Megumi Okazaki (Tokyo Gakugei University, Japan), Prof. Morakot Sukchotiratana (Chiang Mai University, Thailand), Dr. Merle C. Tan (UP NISMED, Philippines), Dr. Kunio Umeno (Japan University of Economics, Japan), Dr. Robert Wallis (Federation University Australia, Australia) and Professor Takahiro Yamanoi (Hakuoh University, Japan). I am very thankful to them for their efforts to review the articles.

**Dr. Nobuyasu Katayama**