

Integrating 'Learning Together' with outdoor science activities

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ABSTRACT

Outdoor science activities incorporating field studies have increasingly been given due emphasis by curriculum developers and educators. "Science Across Asia Pacific" (SAAP), part of "Science Across the World" (SAW) is an exemplary international programme which encourages students' involvement in science learning via field studies and project-based learning to enhance their awareness of the interaction of science and technology with the environment and society. This article provides a draft outline on how outdoor science activities could be taught via the integration of "Learning Together" approach. In brief, the outdoor field studies activities could be implemented in five steps, i.e. (1) Teacher Preparation (determining the site and focus of field study, teaching aids, objectives, required skills and activities needed); (2) Preparation of outdoor field study (revision of related concept and students' existing skills, discussion on what needs to be recorded, preparation of worksheets and activity sheets, dividing class according to "learning together" groups with briefing on various roles); (3) Outdoor field study (implementation of activity as planned, gathering of data and related materials, managing the performance of learners); (4) Activity after field study (group activities for 'learning together' or group project work as an extension activity via the production of report or chart with group presentation) and (5) Conclusion (discussion of the learning outcomes to consolidate new concepts learned, and other related issues to enhance awareness on environmental issues).

INTRODUCTION

In recent years, there has been considerable interests and research into the use of various alternative modes of delivery in teaching and assessing science learning. These modes of delivery place major emphasis on the use of innovative teaching-learning activities or student-centred learning strategies such as Cooperative Learning, Constructivist and Active Learning approaches. Inherent in these approaches is the construction of knowledge by the learners rather than transferred from teacher to student. Emphasis is also made on the use of multiple sources of information, ranging from the indoor activities such as the use of Information and Communication Technology (ICT) to outdoor activities like institutional visits and field studies. Various alternative modes of teaching and assessment of science learning include learning contract, project or resource-based learning, practical tasks, investigative field work, field studies, and the list goes on. This article provides an exemplary lesson on how outdoor science activities could be taught via the integration of "Learning Together" approach.

INTEGRATING LEARNING TOGETHER WITH OUTDOOR SCIENCE ACTIVITIES: RATIONALE AND PROCEDURES

Nature and the environment remain the most powerful and extensive resources despite the changing world in this era of information and communication technology (ICT). Therefore, outdoor science activities that engage children to carry out various field studies become one of the best ways for children to learn about science and the environment. If properly planned, outdoor field studies give meaning to the world around them and inculcate positive attitudes as well as values towards nature and the environment. Well-organised and carefully selected activities during outdoor field studies also sharpen children's observation and enhance their scientific skills. More importantly, children will be engaged in not only psychomotor (*hands-on*) but cognitive (*minds-on*) and affective (*hearts-on*) activities.

Research has shown that integrating Cooperative Learning strategies such as Johnson's Conceptual approach "Learning Together" with science indoor or outdoor activities will result in more active science learning to take place. The "Learning Together" approach also trains students to be good group members in fulfilling their roles, thus mastering social skills required in Cooperative Learning (Johnson and Johnson, 1989). Children learn through their senses during outdoor science activities. Such sensory experiences help children develop a natural curiosity towards their surroundings and become creative and critical thinkers.

In "Learning Together" groups, specific tasks are given to students in which each group member is assigned a role such as reader/coach/translator, reporter/recorder/secretary, observer/information officer/paraphraser, experimenter/investigator/measurer, checker/questioner/analyst, resource manager/consensus seeker/motivator, etc. The product, such as a report or worksheet, could be the result of cooperative group effort.

During the field trip, students focus on their task (activity) as well as their role. Individual accountability increases as each student has a specific duty to perform. Moreover, the self-esteem of the students may improve, especially if the teacher knows the abilities of his students well and assigns duties that are within their capabilities. For post outdoor science activities, students of the "Learning Together" group will work together to discuss and reinforce what they have learned during the studies.

Planning and preparing educational field studies : procedures and general precautions

Before planning an outdoor science activities involving field studies, specific objectives and scientific skills must be clearly defined. These activities are not difficult to plan if the teacher visits and familiarise himself with the area prior to the study. The students should adequately be informed of exactly what is expected of them in terms of content materials and expected behaviour.

Adequate briefings on dress code as well as health and safety precautions must be provided. For examples, they could be advised to dress with casual but protective clothing such as jeans, pants, sport shoes, rubber shoes, knee socks, etc. It might also help to brief students on other essential things that they could bring like camera, video recorder, drinking water and fast food such as bread, biscuits, etc. They should be reminded to observe time, follow instructions of group leader(s) or regulations given in the place of visit or vicinity and always be in groups to avoid any miscommunication or unpleasant incidents.

The teacher could also brief the students on the nature trail code to help preserve the environment for the future and to ensure that the environment is not damaged by the outdoor activities. The following is the outline example of the Malaysian Nature Society (MNS) Nature Trail Code :

"Stay on established trails...Do not litter. If there are proper receptacles for rubbish, use them; otherwise carry the rubbish along...Keep trails and camp grounds clean at all times...Do not start fires...Do not relieve near fires, streams or any water sources (When camping, always bring a spade or small shovel and use it)... Know some first aid and always bring a first aid kit... Bring along medication for own allergies. Always notify leader of any possible allergies and what the leader must do in case of an accident or emergency... Never go into the forest alone. Always inform someone as to where you are going and when you expect to be back. Report the return... If police permits are required, apply for them in advance. Otherwise inform the nearest police station before going into the forest and let them know when we return...Do not leave graffiti anywhere...Do not disturb, kill or remove any plant or animal..."
(MNS, 1998).

When planning field studies, the key is "simple and easily recorded examples". It is not advisable to get lost in too much detail. Look for and direct student's attention towards patterns. Consider and try to explain the obvious phenomena, such as, why is this found here and not there? It is also through environmental education that we can focus students' attention on the influence of Man on the environment.

Planning outdoor science activities usually involves the following 5 steps of instructional activities with suggested sequence of planning and implementation (excerpted from an exemplary Primary 5 science lesson on “Living Together”):

Instructional steps or sequence	Possible Teacher Activity	Possible Student Activity
<p>1. Teacher Preparation</p> <ul style="list-style-type: none"> - Decide on the area and focus of the outdoor science activities - Prepare and gather teaching aids - Identify the specific instructional objectives - State the scientific skills and thinking skills required of students for the field study - Identify the relevant activities to fulfill the objectives 	<ul style="list-style-type: none"> • Identify specific instructional objectives, scientific and thinking skills] • Decide on area and type of community. • Go on a familiarisation trip. • Plan relevant activities. • Arrange for transport and consent forms • Gather necessary resources such as worksheets and video tape on "Learning Together" 	<ul style="list-style-type: none"> • Review and understand the procedure of “Learning Together”. Assist teacher to prepare the role cards for reader/coach/translator, reporter/recorder/secretary, observer/information officer/paraphraser, experimenter/investigator/measurer, checker/questioner/analyst, resource manager/consensus seeker/motivator, etc.
<p>2. Preparation of outdoor science activities</p> <ul style="list-style-type: none"> - Revise concepts and skills previously learnt which are related to the field study - Discuss what students should look for and what they have to record - Issue instruction sheets and worksheets and familiarise the students with them - Divide the class into their respective Expert teams and Learning Together groups - Brief students on their assigned roles 	<ul style="list-style-type: none"> • Direct discussion to a revision of community concepts. • Issue worksheets and familiarise students with them. • Divide the students into groups according to their Learning Together teams. • Give instructions such as the things to bring and the desired behaviours or social skills to be mastered during the field trip. 	<ul style="list-style-type: none"> • Review concepts learnt on “habitats and communities” [“Summary of the concepts to be introduced” in the exemplary Primary 5 science lesson given below] • Understand the respective tasks or roles to be taken by each cooperative group member. • Work in groups to discuss what they should look for and what they have to record
<p>3. Outdoor science activities (via "Learning Together")</p> <ul style="list-style-type: none"> - Carry out activities according to plan - Collect data and relevant materials - Monitor students' progress 	<ul style="list-style-type: none"> • Direct students' attention to relevant materials. • Monitor and check that meaningful data is recorded and collected and that students act with respect for the environment. 	<ul style="list-style-type: none"> • Perform the science activities incorporating field studies using the activity and record sheets given by teacher (Refer to <i>Activities 1 to 3</i>)
<p>4. Post Outdoor Science Activities and/or Project Work (Extension activities)</p> <ul style="list-style-type: none"> • Group Activities via “Learning Together” <ul style="list-style-type: none"> - Sort, analyse and display data or materials collected from the trip. - Record principles and ideas gained. • Production of reports or charts • Group Presentation 	<ul style="list-style-type: none"> • Facilitate discussion on important points. Indicate methods for data display. • Form groups and discuss about the different communities. • Guide students in finding suitable references (books and websites) for information on other communities. • Direct production of charts on different communities as a project. • Organise seminar-type group presentation 	<ul style="list-style-type: none"> • Discussion and sharing of results in Learning Together activities. • Recording ideas such as <ul style="list-style-type: none"> - the pond & tree communities - the living conditions in the pond and tree habitats - the number of species of plants in an area. - Form and work within a group Search for information on the different communities assigned • Produce a chart featuring the organisms and conditions in the respective habitats • Group presentation

(continued)

<p>5. Conclusion</p> <ul style="list-style-type: none"> • Discuss major findings to reinforce new concepts learnt (using Cooperative Learning structures "Round Robin" and Constructivist approach "Concept map"). • Discuss issues to raise the awareness of the effects of Man's interference with the environment. 	<ul style="list-style-type: none"> • Focus discussion on human involvement to reinforce students' appreciation of the effect of Man's activities on the environment. 	<ul style="list-style-type: none"> • Summarise major findings <ul style="list-style-type: none"> - The pond and tree communities. - Interdependence between organisms and their habitat - Living conditions in habitats • Discuss how Man is part of the community and how he can easily change his environment. • Record these ideas.
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(Adapted from DOENZ, 1980)

Sample Lesson Plan on Integrating "Learning Together" with outdoor science activities

Topic	:	Living Together
Subtopics	:	(i) Living in Communities (ii) The Living Conditions in a Habitat
Level	:	Primary 5
Duration	:	3 hours

General objectives: To teach science concepts related to "Living Conditions in a Habitat" and scientific/thinking/metacognitive skills via investigative practical work

Specific learning objectives:

At the end of the lesson, pupils should be able to master the following skills:

(i) Scientific process/thinking and Manipulative skills

Cognitive domain:

- To identify the important environmental factors influencing the lives of the organisms present in the community.
- To measure and record environmental conditions using apparatus such as data loggers (temperature and light intensity) and palmtops.
- To estimate the number of species of plants using the line transect method
- To describe some forms of interdependence among populations in habitats

Psychomotor domain:

- To handle data loggers and other scientific apparatus correctly

(ii) Metacognitive/social skills

Affective domain:

- To develop positive attitudes such as care and concern for the environment
- To develop social skills and sense of responsibility in the respective roles assigned
- To obtain the spirit of cooperation and intimacy through field studies

Summary of the concepts to be introduced in the lesson:

- A habitat is the place where a population can find everything it needs to live and reproduce.
- A community consists of all the populations living together in a habitat.
- The populations in a community are interdependent.
- The community living in one habitat is different from that in another community.
- The condition in a habitat depends on environmental factors such as temperature, amount of moisture and light as well as type of soil.

Resource materials: Activity and Record Sheets 1 to 3

Purpose of each activity and suggested students' role for "Learning Together":

Activity and Record Sheet 1: Living Conditions in a Habitat

This activity encourages students to identify the important environmental factors that affect the lives of organisms with hands-on activity to measure and record environmental living conditions.

Activity and Record Sheet 2: Habitat

This activity encourages students to collect information on the habitat, its features and describe the interdependence between the organisms and their habitat using a concept map.

Activity and Record Sheet 3 : Plant Transect

This activity encourages students to learn to find out the number of species of plants in the specified area as a method for population study.

Students with their respective roles in "Learning Together" are to follow the instructions given in the respective *Activity sheet* (Activity 1 to 3) and then record their data for these activities in the respective *Record sheets* (Activity 1 to 3). For example, students who are assigned as "reader" will read the instruction to lead group's activity, "observer" and "investigator" will collaborate in the main investigation activities and communicate findings whereas "reporter" will record the observations made with "checker" give final checking through of data recorded.

CONCLUSION

More and more people are learning to enjoy our natural world. The teaching of science incorporating the use of outdoor science activities incorporating investigative field studies and cooperative learning has also gained an increased attention of the curriculum planners and science educators. As exemplified in this article, through cooperative group field work, it is expected that the students will enjoy their outdoor field activities and achieve optimum science learning outcomes.

Realising the importance of exposing students to outdoor science teaching and learning activities as well as to inculcate positive attitudes and values towards nature through science/technology/society (STS) and environmental education (EE), many projects and programmes have been initiated by various institutions and training providers to supplement the needs of the existing curriculum in various educational systems. An example is the Science Across Asia Pacific (SAAP), part of Science Across the World (SAW) international programme to encourage contacts among schools students to broaden their understanding of global scientific and environmental issues, thus raise their awareness of the ways in which science and technology interact with society, industry and environment.

Three books have been published in SAAP through various workshops under the cooperative efforts of BP-RECSAM. The topics are namely "Drinking water, What do you eat? Using energy at home" (Book 1), "The impact of global warming, Renewable energy, Tropical forest, Domestic waste" (Book 2), "Plants in our lives, Diseases : cause, cure and care, Acid rain over Asia Pacific, Disappearing wetlands" (Book 3). The recently published SAW global topics are "Chemistry in our lives" (available both in print form and on-line), "Biodiversity" and other new topics are also available on-line (please refer <http://www.scienceacross.org>). The topics provide points for discussion and analysis on the

Exchange Forms with other participating schools with regards to the data or information collected from the investigative field studies or project work. The method of exchanging information could be in the form of mailing, fax, e-mail or the Internet using the SAW web pages. Through the participation of SAAP/SAW project, it is anticipated that the students' scientific literacy and technological capability will be enhanced and thus making the learning of science more fun and meaningful.

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Activity 1: Living Conditions in a Habitat

Activity sheet 1

You should be able to Living Conditions in a Habitat

- identify the important environmental factors that you should be able to:
 - (a) identify the important environmental factors that affect the life of organisms either living in the habitat and record environmental conditions using appropriate assigned data loggers (temperature and light sensors)
 - (b) read and record environmental conditions using appropriate assigned data loggers (temperature and light sensors) and make qualitative observations
- When appropriate, such as data loggers (temperature and light sensors) and make qualitative observations should be made of the factors under consideration, otherwise you should make qualitative observations

Record sheet 1

Record sheet 1

Activity 1 : Living Conditions in the _____ (Habitat)
Activity 1 : Living Conditions in the _____ (Habitat)

Group _____
 Group _____

Temperature	Air										
	Air										
	Soil										
	Soil										
	Water										
	Water										
Moisture	Rainfall										
	Rainfall										
	Humidity										
	Humidity										
	Soil Water		Saturated		Moist		Dry				
	Soil Water		Saturated		Moist		Dry				
Light	pH										
	pH										
	Intensity										
	Intensity										
Soil	Variation										
	Variation										
	Porosity										
	Porosity										
Other Factors	Type		Sandy		Clayey		Loamy		Muddy		Rocky
	Type		Sandy		Clayey		Loamy		Muddy		Rocky
Other Factors											
Other Factors											

Activity Sheet 2

Activity 2 : The _____ Detective

You should be able to:

- identify and name some plants and animals that live *either* in the :
 - (a) tree *or*
 - (b) pond as assigned
- collect information on the habitat and its features
- describe the interdependence between the organisms and their habitat using a concept map

You may draw or take pictures of any species of plants and animals that you see.



Activity 2



he

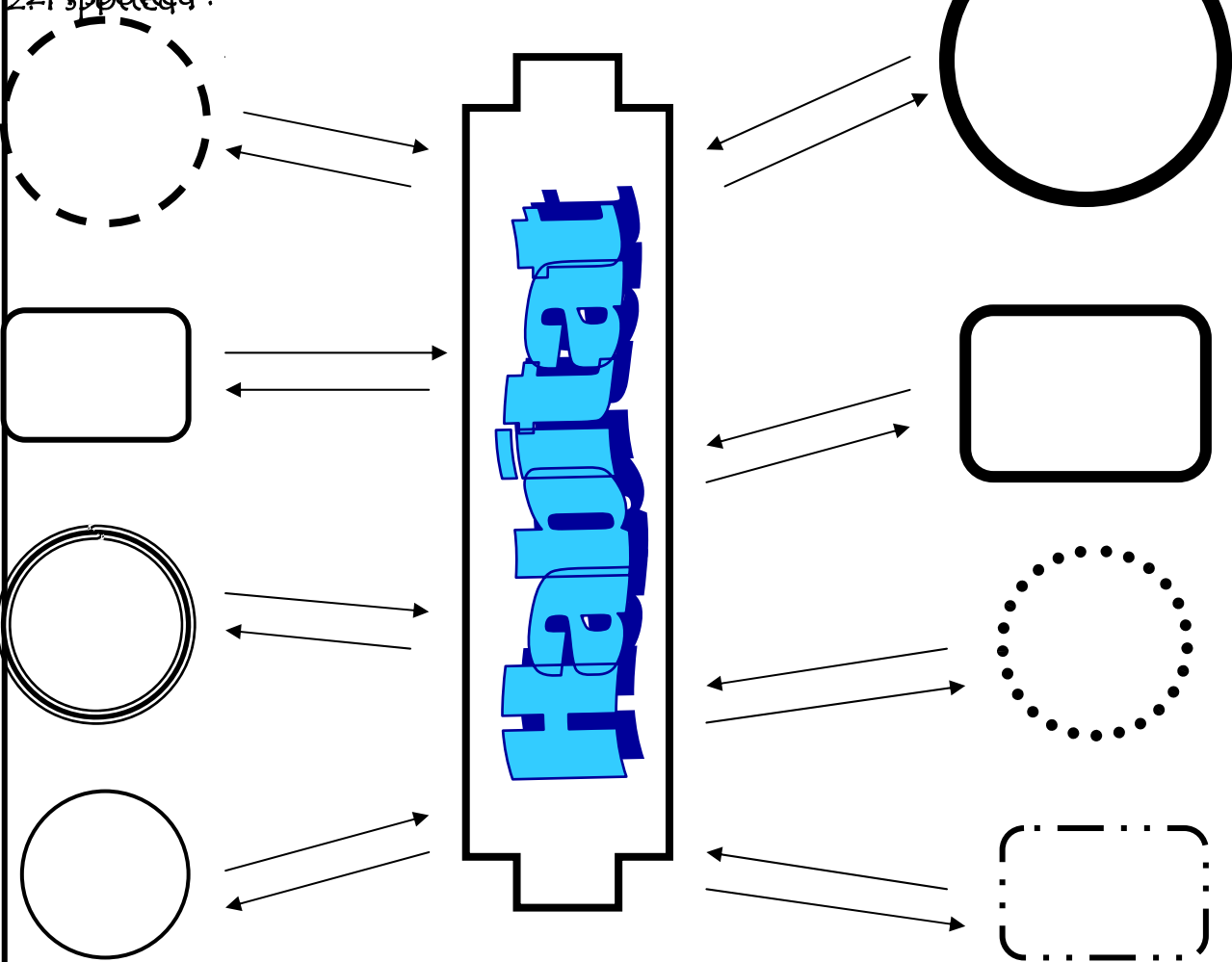
Detective



Group _____

1. The _____ habitats

2. I spotted:



Key

- Interdependence between the organisms and the habitat
- ← Interdependence between the organisms and the habitat



Activity 3 : Plant Transect

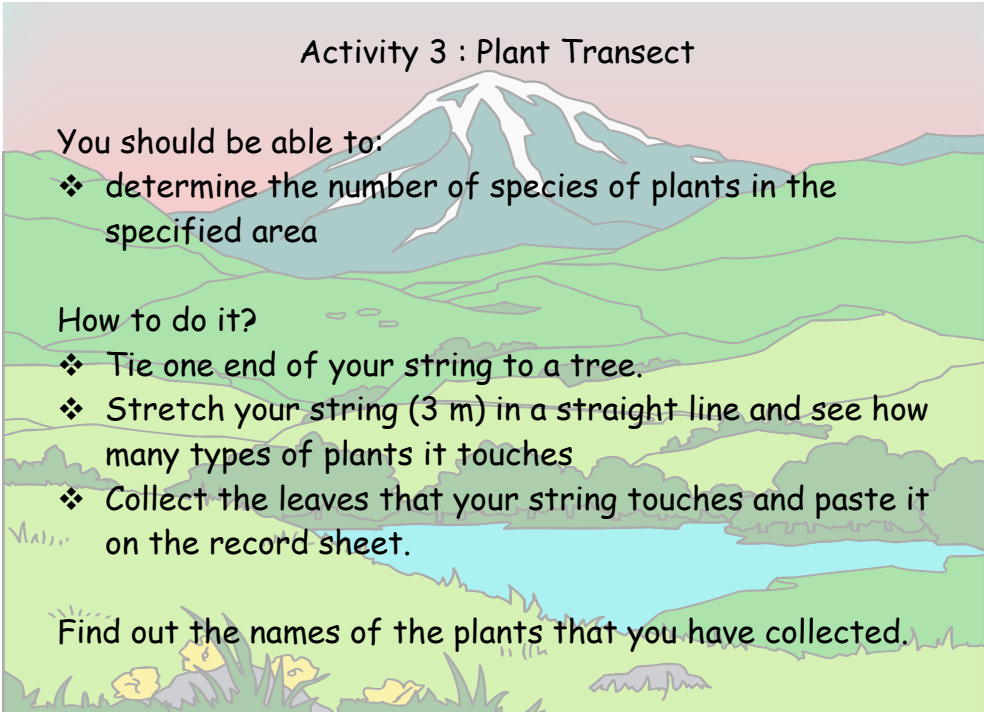
You should be able to:

- ❖ determine the number of species of plants in the specified area

How to do it?

- ❖ Tie one end of your string to a tree.
- ❖ Stretch your string (3 m) in a straight line and see how many types of plants it touches
- ❖ Collect the leaves that your string touches and paste it on the record sheet.

Find out the names of the plants that you have collected.




Record sheet 3

Group _____

Plant Transect

Activity 3

<p><i>Plant</i></p> 						
<p><i>Name</i></p>						

