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DESCRIPTION OF SCIENCE EDUCATION AT BASIC EDUCATION LEVEL

Va Vuthy

Department of Curriculum Development

Ministry of Education, Youth and Sport

EXECUTIVE SUMMARY

Science and technology education has contributed immensely to human progress and to the development of modern society. The application of scientific knowledge continues to furnish powerful means for solving many challenges facing humanity including food security, diseases and health, environment and pollution and also fighting against the poverty. This caused to have emerged that science has to be a compulsory school subject for all school students at general education level where usually begin from grade 1 to 12. This article aim to describe a brief history of educational development implemented in the Cambodian education system from the past to the present; specifically from the period after the country was freed from the killing field regime in 1979. The information used in this paper was drawn from available resources. The content coverage of the article includes historical background of Cambodian education development, curriculum standard, instruction, implementation, teaching methodology and examinations. The teacher training program and national strategic plan for education as well as education law toward science education in Cambodia is also covered. Recommendation to enhance the quality of science education by retrain science teachers with continuing supports on the implementation is suggested. Examinations should conduct to motivate the application of scientific knowledge.

BACKGROUND OF CAMBODIAN EDUCATION

Historically, Cambodia has journeyed through a period of political and economic instability because of internal strife, civil unrest and its immediate consequences. It was only in 1991 when the Paris Peace Accord was signed among the warring factions and the United Nations Transitional Authority in Cambodia (UNTAC) was sent to organize universal election that some stability could be enjoyed by the general public. The development of education is very much influenced by the changing patterns of the social, political and economic environment of the country. The Cambodian education within mentioned period was definitely affected by the changes in social political scenario.



The earliest period of education was the traditional education period of pre-colonial rule which started before 1863. This was followed by education in the colonial period, specifically education under the French rule from 1863 until 1953. Cambodia achieved its independence in 1953. After independence, there were various governments beginning with the monarchy of Prince Norodom Sihanouk, who was the king and the head of government from 1953 to 1970. Education during this period followed the colonial system of education where most of the subjects taught in schools were in the French language. In 1970, Cambodia was declared a republican state under the name of the Khmer Republic, lasting until 1975. There was no change in the system of education. The syllabi, the language of instruction, examinations and other features of the education system followed the education of the previous government. However, Cambodianization or Khmerization, which was an increased use of the Khmer language in teaching instruction, was already introduced.

From 1975 to 1979, the Khmer Rouge and their government, Democratic Kampuchea (DK) came into power. The Khmer Rouge government is also known as the Killing Field government or the Pol Pot government. During this period, the system of education ceased to operate because schools, higher education institutions and other institutions of education were officially closed down. Indeed during the Khmer Rouge period there was much destruction and civil unrest.

In 1979, the Heng Samrin regime took over the government. This new government, the People's Republic of Kampuchea (PRK), took the responsibility of rebuilding the country, especially its education system. Schools were reopened to all children; teachers were recruited; new textbooks and syllabi were introduced and administration of education was formalized. External assistance especially from the Vietnamese government helped the Cambodian government to rebuild the education system. During this period with regard to education, the focus was to meet infrastructure needs and to build more education facilities which were quite inadequate. In 1989, the People's Republic of Kampuchea (PRK) was renamed the State of Cambodia (SOC) although the government did not change. However, new policies were introduced including privatization of the economic sector. The government gradually accepted the fact that in order to develop the country, assistance from non-communist countries is necessary. The change in political and economic policies influenced changes in education. Therefore, instructional hours in schools were increased; a new curriculum at primary school level was introduced and a new examination system for schools was also introduced.

In 1993, the State of Cambodia once again came under constitutional monarchy rule as a result of a peace agreement signed by contesting groups in Paris in 1991. Under this agreement there was to be a universal free and fair election to elect a government of the people to be headed by a Prime Minister although the Head of State remains with the monarchy. Under this government, social, economic and



political policies were changed again. With specific reference to education, this period saw the beginning of major reforms in education. Besides the introduction of a new curriculum and an increase in the schooling years for primary school children, the methods of teaching were also changed.

CURRICULUM STANDARD

Once again in late 2004, the government has officially approved a comprehensive curriculum to be implemented nationwide from 2005 until 2009. According to this new framework of curriculum development, vocational and academic streaming is introduced. The purpose is to give more opportunities to students to increase their specializations through a greater choice of subjects thereby widening their knowledge and skills. The school system introduced since then is divided into basic education and post basic education. Basic education is in three stages which include primary grades 1 – 3, primary grades 4 – 6 and lower secondary grades 7 – 9. Post basic or upper secondary is also in two stages, grade 10 and grades 11 – 12. At the beginning level of primary, there are five subjects and it is splitting to six and then seven subjects at second stage of primary and secondary level. Instructional hours allocated for each subject is shown a decrease for social sciences while an increase is shown in sciences.

CURRICULUM INSTRUCTION

The primary grades 1 – 3 an integration of science and social science including art education is made for three hours per week. In percentage, it is estimated about 12 percent of total instructional hour above mentioned subject. The separation between science and social science is consequently made from the primary grades 4 – 6 to secondary level. Specifically, science for primary grades 4 is allocated about three hours per week while an increase into four hours at the primary grades 5 – 6 and six hours at secondary 7 – 10. In percentage, it is estimated about 20 percent of total instructional hour at the secondary level for science subject. The content of science listed cover physics, chemistry, biology and earth and environmental studies.

CURRICULUM IMPLEMENTATION

The process of teaching and learning is closely related to the process of curriculum development while curriculum development can be defined as a process of planning learning opportunities and the assessments required to measure the extent of achievement of the opportunities being used. Learning becomes a reality only when teachers implement it with real students in the classrooms. Teachers must always be aware of the plan of a good curriculum and know how to implement it in the classroom. In this context, qualified teachers therefore play a significant role in achieving educational objectives by carrying out the actual process of teaching



students. Curriculum implementation is the process that translates the planned curriculum into classroom practice. In many countries including Cambodia, textbooks are considered the main or primary curriculum materials and teachers act as the vehicle to translate the curriculum into classroom activities. Although information and communication technology (ICT) can do much more to help learners learn, teachers are still central to the learning processes. Teachers continue to play a key role in facilitating active learning environments through various approaches. Teaching and learning, with teachers playing a central role, is regarded as very important in Cambodia.

In the early stages of Cambodian educational development, schooling emphasized learning of facts. Without well equipped classrooms and few teaching materials including textbooks, teachers played a very active role in transferring knowledge to students. Students were generally passive. Students watched and listened to the teachers and participated more passively in the learning processes. However, now, interactions between teachers and students have improved, with reactions from students being more positive whereby they are actively involved in reading and working with manipulative materials.

TEACHING METHODOLOGY

In developing countries like Cambodia where educational resources are limited, the following scenario about teaching and learning process prevails. Textbooks are found to be inadequate and overloaded with facts. Library facilities are not fully operative. Teaching aids are scarce, class sizes are big, and teaching time is limited. Although instruction occurs in many forms, the most acceptable and most popular is still through teachers, using much of the time talking and asking questions verbally. Traditionally, students are used to learning through memorization of facts written in textbooks. Teachers taught the chalk and talk method and teachers dominate classroom activities. At the wake of the twenty first century, where society is faced with an information explosion, learning by drill and memorization is no longer sufficient. Like many countries, Cambodia struggles with competing priorities, particularly how to modernize teaching methodology through restructuring the teacher training programs and renewing the school curriculum. Teachers are trained to adopt the new approach of the *learner-centered-instruction* which attends to the learner's individual needs, differences and abilities as well as sharing responsibility for learning with the students. The document issued by the Inspectorate Committee of Cambodia provides further explanation that the *student-centred learning* is an approach which allows students to perform their own activities such as investigation, analysis, discussion, critical thinking, practical experiments and the like. While previously teachers conducted most of the activities in the classrooms, this is now changing as learners take more responsibility for learning. If we observe a session of teaching and learning, we can see that teachers are involved in many activities in the



early stages of the teaching process such as demonstrating the objectives of the lesson, asking students to carry out experiments, conducting observation, analyzing data and drawing up conclusions and implications. Although the classroom is now changing towards more activities by students, the teachers maintain their role as an active facilitator, motivator and adviser.

EXAMINATIONS

In Cambodia, public examinations are conducted in the form of written examinations only. At the end of basic education, the national examination is organized for about 10 hours and covers 10 subjects. At the end of the 12 years of general education system, the number of subjects taken in the national examination is 9 and the examination lasts for about 12 hours.

In 1997, with assistance from the Australian Council for Education Research (ACER), Cambodia began to improve the reliability and validity of its public examinations. Specifically, the improvement was intended to provide infrastructural support so as to enable Ministry Officers to efficiently handle and administer the national examinations; to improve the quality of the examination papers and the marking processes and to facilitate a review of the examination and other educational policies. In relation to this, the guidelines to construct public examination questions were officially drawn up. The structure of the examinations includes multiple choice questions, short answer questions and essays or structured answer questions. The annual school-based assessment is also included in public examination results.

According to the summary report of the Ministry of Education, Youth and Sport, there are now about 12 to 13 specialist subcommittees officially formed to administer all examination procedures. These subcommittees include the committee of central presidencies; the committee of national presidencies; the committee of provincial presidencies; the committee of the examination centers; the committee of centered invigilators; the committee of building invigilators; the committee of centered administrators and room invigilators; the committee of marking and script distribution; the committee for calculating marks; the committee of markers; the committee of documentations; the committee of question paper setting and selecting and the committee of packing question papers. In the school year 2001-2002, public examinations lasted between 17 to 31 days for lower secondary and upper secondary levels.

Before 1997, the examination questions were written on the blackboard by teachers or invigilators. This has resulted in a high incidence of frauds. At present, the examination papers are printed centrally by the examination authority. Basically, the formats of the papers are designed to suit the questions and exercises used. Although the formats are changed yearly, the need to collect candidates' general



information is maintained. Upon receiving the exam paper, candidates are instantly advised to complete the general information box before starting to work on the answers. Candidates are prohibited to make any signs or marks on the examination papers and each candidate can receive only one copy of the examination paper. Candidates who attempt to seek contact with their examiners are likely to end up with zero marks. In order to produce true and reliable results, certain professional requirements are imposed such as the scripts have firstly to be numbered with confidential codes. While coding the scripts, the marking committee which is composed of teaching subject specialists meets to determine the system for marking. The scripts are marked manually by subject specialist teachers. Grades given are: A for excellent results; B for very good performance; C for good performance; D for satisfactory results and E for limited achievement. As observed by the experts “the examination process is complex, and involves the intervention of a large number of people. It is therefore not surprising that mistakes happen.”

Technically, the formula used to calculate final public examination results are complicated especially when about 20 percent of the marks come from annual school-based assessments is added on. There are nine subjects examined in the national examination for grade 12 and ten subjects for grade 9. The average marks obtained in the examinations held during the year are added to the final results of examination. The results of public examinations are used for many purposes. Among them are selection purposes and promotion of candidates qualified for their further studies. The timing for releasing public examination results is a very sensitive issue and creates various pressures. In recent years, however, the situation has improved. There is now a fixed schedule for public examinations and lately, the lower secondary examination has been decentralized and is the responsibility of the local provincial education authority.

TEACHER TRAINING PROGRAMME

With regard to the qualifications of the teaching staff in Cambodia, it has been reported that teachers are not highly qualified. Around 5 percent of the Cambodian teaching staff possesses only primary education; 60 percent possess lower secondary education; 29 percent possess upper secondary certificates and only 6 percent possess tertiary education. Except for upper secondary teachers who are required tertiary education, primary and lower secondary teachers are required only a few years of training to become teachers. Normally, primary teachers are recruited and trained at the Provincial Teacher Training Colleges (PTTCs) which are located in all provinces around the country except in the remote provinces. The Provincial Teacher Training Colleges offer two year programs. Lower secondary teachers are trained at the Regional Teacher Training Colleges (RTTCs) which are located in densely populated provinces. There are six Regional Teacher Training Colleges (RTTCs) in Cambodia which offer two year training programs. The basic requirement for



admission to teacher training college is the completion of grade 12 but there are wide variations in the admission procedures. There are also geographical variations because remote provinces face problems in attracting qualified students. Because the admission requirements for teachers are not very high, the curriculum for teacher training is academically based, where a large proportion of time is spent on upgrading the trainees' general knowledge as opposed to teaching professional skills. At primary level, teachers are trained to become multi-subject specialists while for secondary schools teachers they are trained to become single-subject specialists.

Upper secondary teachers are trained at the National Institute of Education (NIE) where offers two year training programs. The admission to the National Institute of Education is required bachelor graduation from the Royal University of Phnom Penh.

Upon completion of the training programs, graduates are nominated to be teachers and are sent directly into the classrooms. The deployment of new teachers is done centrally, normally by the Personnel Department through the Provincial Offices of Education. Because of family-ties and salary conditions, new teachers choose to be posted to nearby locations. This creates more problems because urban schools receive more teachers compared to the rural schools.

Teachers are key players in the delivery of instructional programs in schools. Teacher education programs in Cambodia are being continuously reviewed and reorganized mainly to change the philosophy of training teachers from content-driven to skills-driven teaching by introducing practical work, problem-solving, hands-on activities and simple experiment work. All these efforts are to enable teachers to acquire skills in the use of simple teaching apparatus and equipment, including computers and high-technology equipment as well as simple materials which are relevant to real-life situations. The revision of teacher training programs is regarded as one of the most constructive factors affecting the quality of schooling in basic education. For example in some developing countries, it has been shown that when teachers receive training to manipulate high-technological tools, particularly computers, they can prepare better lesson plans and use the internet to get more information for their teaching. Unfortunately in Cambodia, there are some limitations to this. Computers are not always easily accessible to teachers. Computers are available only in some places and a majority of the computer programs are in foreign languages mainly English, a language in which most Cambodian teachers do not have the necessary skills. Fortunately, teacher training programs place importance on the use of simple materials that are relevant to real-life situations. The use of local and low cost materials in the classroom for teaching purposes is encouraged because it can develop creative ideas among students.



NATIONAL STRATEGIC PLAN FOR EDUCATION

Cambodian government has adopted rectangular strategy for growth, employment, equity and efficiency to be implemented in her fourth legislation term. According to this rectangular strategy, the Royal Government of Cambodia will continue to strengthen its partnership with private sector and the national and international communities to enhance and improve the quality of education services paying more attention to information and foreign language training at all levels of general education, technical and vocational training, and in higher education as well, consistent with international standards and the country's development needs. Equally importantly, the government continues to pay attention to technician and engineer training through technical and vocational training schools and higher education. As well, in order to reduce the gap between demand and supply for jobs, the government continues to implement the vocational training policy linking with labor market in close cooperation with relevant parties through the following measures: (1) provide basic skills training to people in rural locations to increase income; (2) provide training or skill improvement to factory workers in cooperation with employers; (3) continue to expand technical and vocational training to provinces/municipalities, including entrepreneurship training program; and (4) establish National Agency for Profession and Employment, and Employment Centers in provinces/municipalities as a mechanism for dissemination of labor market information. The Royal Government will also continue to expand informal education through literacy and vocational programs, establishment of community learning centers and implementation of equity programs. The government will increase budget allocation for education and mobilize more financing to support education to ensure higher and effective quality of education.

EDUCATION LAW TOWARD SCIENCE

In addition to above mentioned policy, the law on education which adopted in late 2007 states as written in the article 28, chapter 6 that the state shall promote and support research, development, invention and production, which are scientific and technological for education to meet the needs of the labor markets and globalization to promote human resource capacity and to enhance the development of the country. This law has guided to the Ministry in charge of education shall determine the policies on science and technology for education at all education levels of the Cambodian education system in compliance with the policy of the Royal Government of Cambodia.



CONCLUSION AND RECOMMENDATIONS

In general context, there has been shown the efforts to enhance the quality of education development in Cambodia. Specifically, toward science education development, the investments have to prioritize on the quality of delivery which translated theory into classroom practice. There are so many areas required deep considerations, particularly, on retraining science teachers with continuing supports on the implementation or classroom instruction and creating the environment of interaction and sharing of essential practical skills not only with students and teachers but also among the science teachers, planners and decision-makers. The evaluation to student learning should focus mainly on the application of their scientific knowledge by project works.



ANNEX

SCIENCE AND SOCIAL STUDIES GRADES 1 - 3

According to the Policy for Curriculum Development 2005-2009, Science and Social Studies in grade 1-3 are integrated and taught within 3 hours per week.

The curriculum in Grades 1 – 3 builds on students' natural curiosity about and existing knowledge of their immediate environment and the world around them and concentrates on helping students learn about their everyday world by asking questions, developing observational skills and recording information. Through these processes, they learn planning, organisation and problem solving skills.

Through the integrated study of Science and Social Studies in Grades 1 – 3 students develop basic knowledge about themselves, their families and the world in which they live.

Students develop a love of Cambodian culture, nation and know the national identification through being introduced to traditional dance. Their creativity is developed by drawing and making and they are helped to enjoy music. They begin to develop an understanding and appreciation of Cambodia's system of government.

They develop positive attitudes toward their health and well-being through acquiring basic personal hygiene, health and safety skills. They learn respect for others through being taught the moral behaviors encouraged in families, schools and communities.

They are introduced to basic scientific concepts of types of matter and energy using familiar examples and are encouraged to investigate and develop an interest in the world around them, including learning skills that help them grow crops and care for animals. They begin to learn reasons for protecting and ways in which they can care for, their immediate environments.

They begin to develop a sense of time and the sequence of past events.

SCHOOL CURRICULUM FOR SCIENCE AND SOCIAL STUDIES GRADE 1

Topic	Sub Topic	Learning Outcome
MY FAMILY AND ME	1. Family members (8 hours)	Identify self by name, age and position in family
		Describe order of key events in family life (for example, birth of children) using words associated with time and change (for example, before, then, two years after)
		Describe family (including terms father, mother, younger and older brothers and sisters, younger and older aunts and uncles, grandfather, grandmother)
		Share description of important or significant event in past life of family
	2. Good behavior in the home (8 hours)	Use simple picture representations of family members to show relationships in immediate family, e.g. father, mother, brothers, sisters (following the teacher's model)
		Learn gestures of respect to be used when greetings parents, teachers, students, the elderly and monks
		Make finger or hand puppets to practice greetings of respect
		Describe types of behavior encouraged and discouraged in the home
		Participate in role plays to show examples of behavior encouraged and discouraged in the home
		Explain reasons why some kinds of behavior are encouraged and some discouraged
		Explain the concept and importance of rules in the family
	3. My body and me (6 hours)	Name main parts of the human body and identify function of each
		Draw approximate representations of main parts of human body
		Recognise how senses provide different kinds of information (for example, heat and cold, light and dark)
		Use a 'feel box' to use touch to identify hidden objects, a blindfold to use hearing to identify different sounds
		Identify own characteristics, for example, appearance, likes and dislikes.
	4. Hygiene (5 hours)	Identify own individual qualities and abilities (for example, I am a good runner, or I like helping others)
		Explain the importance of keeping the body clean
		Describe how to clean hands
		Explain what is used to keep the body clean
		Explain how and why toilets should be used correctly, including washing hands



	5. Food and where it comes from (5 hours)	Identify why we need food Name common foods eaten at home Name different foods either from plants or from animals Draw, color and label pictures of different familiar foods
MY HOME	1. Where I live (8 hours)	Draw approximate pictures of home Describe materials used for building house (for example, wood, bricks) Explain some uses of houses Describe location of house in relation to other local features using words like near, next to, in front of, behind
		Describe what an accident is, and identify common accidents around the home (for example, burns, falls, grazes, cuts, medicines or poisons...)
		Identify how risk of accidents at home can be reduced
	2. Safety in the home (7 hours)	Describe main ways of keeping house clean, and explain importance of keeping house clean Explain importance of maintaining clean environment around the home
		Collect and give everyday examples of living and non-living things: - Identify examples of living and non-living things - Ask questions about and identify some differences between living and non-living things - Identify some needs of living things - Demonstrate own attitude towards objects, animals, plants
		Use examples of common plants to: - Observe and learn names of local water and land plants - Ask questions about and observe similarities and differences between plants (for example, flowering/non-flowering, roots, branch, stems, fruits, leaves, vines, trees) - Name main part of plants (roots, stems, leaves) - Identify some uses of plants - Draw and color representations of some plants
	4. Plants we know (6 hours)	Observe and list names of animals around the home Draw and color representations of some animals Keep an animal in a simple habitat (for example, fish in a bowl, insects in a jar) and identify some requirements of animals Identify main parts of animals Make observations about and describe main features of some animals (for example, size, color, sounds, habitat) Name 'wild' or 'domestic', aquatic animals and birds and describe the difference of each category and identify types of habitats Model or glaze to make the picture of familiar animals
		Observe and describe properties of liquids (e.g. can drip or flow) Observe and describe how wet materials become dry when left in heat Categorise everyday objects as solids or liquids or gas Give examples of visible effects of gas (for example, inflating tires or balloons, wind) Observe different sorts of solids that float and sink in liquids Make a simple toy that floats on water (e.g. boat made from sponge or cardboard) Fold paper to make a paper boat
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	5. Animals we know (7 hours)	Observe and describe properties of liquids (e.g. can drip or flow) Observe and describe how wet materials become dry when left in heat Categorise everyday objects as solids or liquids or gas Give examples of visible effects of gas (for example, inflating tires or balloons, wind) Observe different sorts of solids that float and sink in liquids Make a simple toy that floats on water (e.g. boat made from sponge or cardboard) Fold paper to make a paper boat
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	6. Things we know (6 hours)	Observe and describe properties of liquids (e.g. can drip or flow) Observe and describe how wet materials become dry when left in heat Categorise everyday objects as solids or liquids or gas Give examples of visible effects of gas (for example, inflating tires or balloons, wind) Observe different sorts of solids that float and sink in liquids Make a simple toy that floats on water (e.g. boat made from sponge or cardboard) Fold paper to make a paper boat
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MY HOUSE TO SCHOOL	1. My housework and home work (8 hours)	Identify daily tasks that need to be completed before and after school each day Explain reasons for these tasks Identify what needs to be taken to school each day, and explain why Observe how class members travel to school Identify four main compass points and describe directions from home to school Describe main features noticed between home and school
		Understand main features of traveling on roads (traffic travels on right side of road, footpaths) Identify activities that can cause dangers on roads Identify dangerous places on roads near school
		Describe types of behavior encouraged and discouraged in school Explain reasons why some kinds of behavior are encouraged and some discouraged - Participate in role plays to show examples of behavior encouraged and discouraged in school Explain the importance of good rules at school
	2. Road danger prevention (7 hours)	Understand main features of traveling on roads (traffic travels on right side of road, footpaths) Identify activities that can cause dangers on roads Identify dangerous places on roads near school
	3. Good rules at school (7 hours)	Describe types of behavior encouraged and discouraged in school Explain reasons why some kinds of behavior are encouraged and some discouraged - Participate in role plays to show examples of behavior encouraged and discouraged in school Explain the importance of good rules at school
		Describe types of behavior encouraged and discouraged in school Explain reasons why some kinds of behavior are encouraged and some discouraged - Participate in role plays to show examples of behavior encouraged and discouraged in school Explain the importance of good rules at school
NIGHT AND DAY IN MY VILLAGE	1. Day and night (5 hours)	Observe, describe activities of humans and animals in the day and night time Observe, describe and ask questions about the changes of temperature under the effect of the sun (morning, afternoon, evening, night) Observe and describe differences between day and night Observe and describe different kinds of weather (hot, rainy, cloudy)
		Identify different everyday forces and their effects (for example, blowing wind, pedaling a bike) Play games to experiment with effects of different levels of pulling and pushing forces (for example, tug-of-war, pushing balls or toy cars)
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	2. Movement of man and nature in my village (5 hours)	Identify different everyday forces and their effects (for example, blowing wind, pedaling a bike) Play games to experiment with effects of different levels of pulling and pushing forces (for example, tug-of-war, pushing balls or toy cars)



		Design and make from everyday materials (wire, string, wood) simple toys (e.g. cars from cardboard boxes, boats from leaves, spinning tops) that move by being pushed or pulled
	3. Songs and Entertainments (6 hours)	Learn first section of National Anthem and two Khmer traditional songs
	4. Craft and collage (2 hours)	Fold paper to make a variety of shapes

SCHOOL CURRICULUM FOR SCIENCE AND SOCIAL STUDIES GRADE 2

Topic	Sub Topic	Learning Outcome
GOOD HABIT FOR SAFETY AND MY HEALTH	1. Good habit at my school (9 hours)	Use simple role plays to show behavior encouraged and discouraged in school <ul style="list-style-type: none"> - Demonstrate respects for others - Display cooperative activities (e.g. taking turns) - Demonstrate importance of rules in school - Participate in discussion about reasons for different rules - Develop friendships with peers - Listen and respond to others Explain how to identify and respect own and others property Give examples and show appreciation of others' abilities and qualities
	2. My safety when traveling (9 hours)	Explain safe behavior in traffic <ul style="list-style-type: none"> - Demonstrate safe road crossing behavior - Cut and glue color paper to make traffic signs and explain meaning of traffic lights and main traffic signs - Identify reasons for traveling on right hand side of the road - Explain dangers of playing on roads
	3. My safety in water (3 hours)	Explain safe behavior when playing or swimming in water (river, sea, lake, pond) Describe possible consequences of unsafe behavior in water
	4. Hygienic food (6 hours)	Explain how to handle and eat food safely Explain causes of and how to treat diarrhea
	5. My unwounded skin and healthy teeth (4 hours)	Describe how to avoid and treat common injuries including skin cuts, grazes and infections Describe how to care for teeth and avoid tooth decay
	6. Five senses of mine (2 hours)	Give examples of how five senses are used in everyday life
	7. Avoidance from threats (9 hours)	Give some examples of safe and unsafe situations and express feelings about each, for example: <ul style="list-style-type: none"> - good friendships and family relationships compared to school or family bullying - helping with tasks compared to being forced to work - appropriate and inappropriate bullying from familiar and unfamiliar adults and peers Give example of people who can provide protection from threats Describe how to contact people who can provide protection
	8. My daily work at home (2 hours)	List tasks that need to be completed before school each day
	1. My growth (4 hours)	Keep a personal chart to show growth over one year <ul style="list-style-type: none"> - Record different heights on significant days (e.g. national holidays) Construct simple timeline to show main events in own life
	2. Food for my growth (6 hours)	Explain in simple terms how food contributes to good health using simple terms: <ul style="list-style-type: none"> - Ask questions related to food and health - Identify that a variety of food is needed for good health Describe basic food requirements of people Fold paper or banana leaves to make containers for food
	3. Plants I grow (10 hours)	Collect, observe and compare different plant seeds (e.g. longans, pumpkin, mango, sesame) <ul style="list-style-type: none"> - Cut seeds to observe differences - Soak different seeds in water, observe and ask questions about different subsequent changes Grow a common plant: <ul style="list-style-type: none"> - Observe and describe changes as plant grows - Draw and color simple pictures of the plant at different stages of growth Conduct activities to investigate main requirement of growing plants <ul style="list-style-type: none"> - Grow seeds in cans placed in light and dark places, with water and without water, in soil and in clay, covered and uncovered - Explain main requirements of growing plants
	4. Animals I raise (6 hours)	Explain main requirements of young animals (e.g. air, food, water, shelter, space) <ul style="list-style-type: none"> - Take care of young animals (e.g. chickens, rabbits) for a short period of time - Draw and color simple representation of young animal and shelter
GROWTH OF HUMAN, ANIMALS AND PLANTS		



		Identify different food requirements of different kinds of animals (e.g. chickens, cows, frogs, fish, mosquitoes)
		Name examples of animals that change forms and maintain form during growth
	5. Animal locomotion (3 hours)	Identify and give examples of different kinds of animal locomotion
		Categorise animals according to their kinds and types of locomotion
THINGS IN MY COMMUNITY	1. Location of school and of my village (9 hours)	Describe location and surrounding of own school
		Draw and color a simple map of location of school, using a simple legend to show main features
		Draw and duplicate representation of favorite place in village
		Observe and gather information about local area, for example, describe and categorise places in local area (for example, areas where people live, where they work, where they play)
	2. History of school and my village (4 hours)	Give some examples of some differences in school, village and commune now and in the past
		- Give some examples of differences in way of living for family or people in village now and in the past
		Find basic information about name and history of school, village and commune
	3. I help care for school (3 hours)	Listen to and ask questions of guests from community talk about life in past generations
		Identify sources of pollution in the school and explain how to reduce or eliminate them
	4. I practice dancing (4 hours)	Identify how school can be cared for and well-maintained
		Practice hand, arm and leg exercise and basic Khmer traditional patterns of dance
		Practice hand, arm and leg movements used in traditional dance and practice first style Ramvong dance
THE WORLD AROUND US	5. I learn singing (4 hours)	Learn two popular songs
		Learn two section of the National Anthem
	1. I love the King and the country leader (1 hours)	Tell the name of the King and Prime Minister of Cambodia
	2. Things around us (12 hours)	Use examples to give simple explanation of the terms solids, liquids and gases
		List common uses and sources of heat:
		- Conduct simple activities to generate heat (e.g. rubbing, burning)
		- Give examples of common uses of heat (e.g. cooking, warming)
		- Describe safe behavior around sources of heat
		List common uses and sources of pulling forces
		- Conduct activities to explore effect of different levels of pulling forces (e.g. try to pull a book or other object tied to string with little finger, then with hand)
	3. In the sky (4 hours)	List common uses and sources of pushing forces
		- Conduct activities to explore effect of different levels of pushing forces (e.g. try to roll marbles to a line, find who can throw a paper plane the furthest)
		Show how magnets attract some objects but not others
		Demonstrate how magnetic force is affected by distance
		Compare the strengths of different magnets
		Conduct simple activities to observe and describe the movement of shadows caused by movement of the earth in relation to the sun (e.g. place stick in ground and mark the position of the shadow each minute or 5 minutes for a period of 15 minutes)
		- Explain how movement of shadows is a result of rotation of earth
		- Ask questions about and identify some uses of the sun for the earth
		- Develop understanding that the earth is a globe that rotates

SCHOOL CURRICULUM FOR SCIENCE AND SOCIAL STUDIES GRADE 3

Topic	Sub Topic	Learning Outcome
GOOD HABIT IN COMMUNITY	1. Loving one another (6 hours)	Use simple role plays to show behavior encouraged in the community
		Discuss importance of good moral conduct in the community
		Identify some reasons for rules and laws in the community
	2. Care-taking for others (6 hours)	Explain why property of others should be cared and respected
		Explain what action can be taken with found property
		Identify some examples of common property and explain why it should be cared for
	3. Maintaining safety when traveling on roads (6 hours)	Explain why helmets should be worn on bicycles and motos by drivers and passengers
		Explain how passengers should behave to contribute to safe travel in cars and on motos
		Explain common street markings
	4. Maintaining safety in landmine areas (4 hours)	Explain common landmine warning signs
		Describe safe behavior in landmine areas



	5. Avoidance from threats (4 hours)	Give examples of situations that can lead to feeling threatened or unsafe Give examples of strategies to follow in such situations
	6. Safe storage of hazardous materials (4 hours)	Give examples of hazardous household items that can cause danger Describe how each item can be stored and handled safely
HEALTHY LIVING	1. Cleaning body (4 hours)	Explain and give examples of the function of eyes, nose, mouth, ears, teeth and skin Explain how each of these parts of the body can be cleaned and cared for
	2. Caring for body (4 hours)	Explain how people catch viruses and illnesses including measles, colds, whooping cough, diarrhea and what people can do to avoid catching these viruses and illnesses
		Identify the symptoms of these illness and explain how these illness can be treated
		Identify the location of the nearest community health centre
		Explain the function of the community health centre
		Listen to and ask questions of a speaker from a local community health centre
	3. Healthy foods (6 hours)	Explain how to store food safely
		Explain why it is important to eat a variety of healthy and hygienic foods
		Explain importance of clean water from safe sources and how to produce clean water
	4. Recognition of good deeds (4 hours)	Take part in activities to recognise good deeds, skills and abilities in others Listen to examples of different good deeds, skills and abilities identified in self by others
	5. Being organised (2 hours)	Choose a small task (e.g. performing a song or dance or story by memory) and write a simple list of what is needed to prepare for and complete the task
GROWTH OF HUMAN, ANIMALS AND PLANTS	1. Timelines (5 hours)	Interview an older person about their life, the major events that occurred and the main changes they have experienced
		Construct a timeline showing the major events, places and dates in the life of an older person
	2. Plants I grow (8 hours)	Construct simple instructional posters to show the steps needed to grow plants - Identify the effect of light, water and soil on plant's growth - Use simple tools that can be useful in growing plants
		Identify main benefits and uses of different plants (eg. food, construction, textiles, medicines, aesthetics)
	3. Animals I raise (8 hours)	Group common animals into different categories (e.g. reptiles, insects, birds, land and water animals)
		Identify main benefits to people of animals
		Observe, monitor and record the growth and development of an animal (e.g. chicken, rabbit) Explain, in simple oral language, how to raise and care for animals used for eggs and produce (e.g. pigs, chickens and ducks) Give information about animal raising in terms of food, water, shelter, preventing and controlling disease
LOCAL LIFE IN MY COMMUNITY	1. Place where I live (7 hours)	Identify approximate location of own district on map of Cambodia
		Describe type of land areas in the local district (e.g. urban, forest, mountain)
		Identify key people-made changes to environment (e.g. roads, bridges, tree clearing)
		Observe and gather information about local district (for example, how many schools in district, kind of work carried out) Name some neighboring districts and describe their location in relation to own district (e.g. approximate direction, distance)
	2. Places in my village (3 hours)	Draw and color simple maps of routes traveled by students in local area (eg. to school, community health center, markets, leisure places), using simple legends to show key features
	3. Leaders in my village (1 hours)	Describe the duties of local government (head of village, head of commune)
	4. Plants in my village (6 hours)	Collect, observe and compare different local plants
		Compare different characteristics of plants (leaves or trunks) that grow in different conditions (e.g. plants that grow in water or wetlands compared to plants that grow in hard soil)
		Divide common plants into categories (e.g. vines, bushes, grasses)
	5. Songs (2 hours)	Learn and sing popular and traditional songs, including third part of the National Anthem
	6. Dance (2 hours)	Follow and repeat simple movements to different rhythms, including RamVong beat
	7. I learn weaving and collage (2 hours)	Weave in a form of interlacing to make Cambodian's flag and collage the Temple in the middle
THE WORLD AROUND US	1. National flag (3 hours)	Describe the main features of the national flag of Cambodia Identify the flags of some other regional countries
	2. I need heat and light	Understand that heat and light are different types of energy



	(8 hours)	Identify different examples of sources of heat and light
		Identify different uses of heat and light
		Conduct simple experiments to investigate the effect of heat on water and ice
		- Make and test predictions - Write simple descriptions of result of experiments
	3. Sound and music (3 hours)	Identify examples of how sound is produced by vibration (rubber band, guitar string)
		Demonstrate different ways of producing sound (e.g. striking glass or table, blowing across bottle or flute)
		Make simple sound producing device that can be adjusted to produce different levels of sound
	4. Marvelous earth (3 hours)	Observe, ask questions about and describe the differences between day and night and the changes and benefits brought about by the daily movement of the earth
		- differences between main seasons
	5. Weather (3 hours)	Identify and describe differences between main seasons
		Observe, ask questions about, record and describe patterns of daily weather at different times of the year (sunny, rain, cloud, windy) and the affect these differences have on daily life
		- Draw, color and describe different kinds of clouds
		- Explain some causes of changes in temperature

SCIENCE GRADES 4 - 6

Students study Science for 3 hours per week in Grade 4 and 4 hours per week in Grades 5 – 6.

In Grades 4 – 6 students begin to develop their knowledge in the specific discipline areas of Biology, Chemistry, Physics and Earth and Environment Studies.

In Biology, students develop their knowledge of plant growth and also develop their understanding of how to improve and maintain their own health and protection from disease and illness, including HIV/AIDs in the context of learning about positive relationships.

In Chemistry, students develop their understanding of the properties of a substance, and investigate those features that make it suitable to be used for particular purposes. They explore the concept of change in terms of physical and chemical change with practical experiments.

In Physics, students investigate, experiment and describe the effect of different forces on objects including weight, friction and thrust. They begin to develop their understanding of how electricity is transmitted.

In Earth and Environmental Studies, students develop their knowledge of the relationship of Earth to other elements of the solar system. They investigate the impact of weather on the physical environment, and learn about the importance of considered use of both renewable and non-renewable resources. Particular focus is placed on developing their understanding of the problems caused by pollution and action that can be taken at the local level to prevent pollution.

SCHOOL CURRICULUM FOR SCIENCE GRADE 4

Topic and Sub Topic	Learning Outcome
Benefits of plants (10 hours)	Discuss and describe the benefits of plants
	Name some plants used for the following purposes: - Food (from trunk, bulb, fruit, leaf and flower) - Textiles - Construction (tables, cupboards, chairs) - Aesthetics - Shade and shelter
	Describe how plants, both in public reserves and private land, can be cared for and maintained.
	Observe, compare and describe differences between mono and dicotyledonous plants
Plant life cycles (10 hours)	Draw and label the main part of flowers, and describe the functions of each
	Grow and record a complete life cycle of a plant from seed to seed
	- Prepare soil and plant seed - Observe and care for plant during growth - Extract/collect seeds after flowering - Plant new seed
	Ask questions about, predict, describe and compare the functions of roots, trunks



	and leaves of green plants
Animal classification (8 hours)	Classify animals into different categories according to physical appearance Classify animals into biological categories, for example: - Vertebrate and invertebrate - Insects - Fish - Reptiles - Birds - Mammals
Human skeleton and muscles (10 hours)	Describe the purpose of the human skeleton and muscles Draw and label the main parts of the human skeleton and the major muscles Describe the causes of common injuries to muscles and bones and identify ways to prevent these accidents List the types of foods that strengthen bones and muscles
Eyes (8 hours)	Draw and label the main parts of the eye Give a simple explanation of how the eye functions Describe how eyes can be prevented and identify types of eye-supporting food
Prevention of mosquito-borne illnesses (8 hours)	Describe the symptoms of dengue fever and malaria and explain how these diseases are spread Describe how to protect self from dengue and malaria List ways to protect from mosquitoes
Natural environment (10 hours)	Describe and identify the biotic and abiotic components of different kinds of environments Investigate food sources for people, animals and plants Explain the meaning of the term 'food chain' and draw an example of a food chain - Identify the impact on the food chain of one link being removed - Explain how the food chain contributes to the maintenance of balance in the environment
Properties of materials (8 hours)	Conduct simple experiments to demonstrate the effect of water and force on different materials (for example, paper, plastic, brick, dirt) Draw conclusions on the basis of the experiments about which materials are most useful for shelter and explain why
Force and movement (10 hours)	Conduct simple experiments that show how different forces can be used to move different objects (e.g. moving air and balloons, moving water and small sticks, springs, pushing and pulling toy cars)
Levers (12 hours)	Draw and label the main parts of levers Give examples of how levers are used in everyday life - show different effects of changing length of lever and position of fulcrum - show how a small force can create a large force - show how a small movement can create a large movement
Water pollution (10 hours)	List importance of water for people, animals and plants Identify some of the causes of water pollution Construct and conduct a simple experiment to show the effect of water pollutants on people, animals and plants Explain some of the impacts of polluted water on people, animals, plants and the environment
Movement of earth (8 hours)	Conduct simple experiments (for example, with a torch and a ball) and draw simple pictures to demonstrate how day and night are produced by the rotation of the earth Use simple models to show how the movement of the earth produces seasons (rainy season and dry season)

SCHOOL CURRICULUM FOR SCIENCE GRADE 5

Topic and Sub Topic	Learning Outcome
Plant reproduction (12 hours)	Illustrate and label the main parts of a flowers Use drawings and labels to describe how flowering plants reproduce
Seed growth (12 hours)	Use observation of seeds at different stages of growth to create drawings and labels that describe the pattern of seed growth Conduct simple experiments with seeds in different growing conditions (e.g. different soils, different levels of moisture) to determine the more favorable growing conditions for different seeds
Animal reproduction (12 hours)	Identify the different ways that animals reproduce, and give examples of each: - Sexual/asexual (e.g. common animals such as cows and pigs/ worms and leeches) - Eggs (e.g. fish, chickens, lizards) - Live births (e.g. pigs, water buffalo) Describe the process of fertilization in sexual reproduction by live birth.
Natural environment (10 hours)	Investigate examples of different food sources for different people and animals Conduct simple experiments to design and test inferences about food (e.g. what kind of food is preferred by people, what kind of leaf is preferred by caterpillars) Describe some of the benefits that food can provide (e.g. energy, strong bones)
Food for health (12 hours)	Use a table format to show examples of food belonging to each of the following three groups: - Energy - Body building - Health protecting Describe how each of the following supplements contributes to good health, and how they can be included with food: - Iodine



	<ul style="list-style-type: none"> - Iron - Vitamin A
	Give an example of a good daily diet that includes food from each group
	Explain how a good diet can help prevent liver disease
Unclean food and water (14 hours)	Describe how the following illnesses can be caused by eating unclean food and water <ul style="list-style-type: none"> - Intestinal worms - Typhoid - Cholera - Hepatitis
	Describe the symptoms of each of the above illnesses, and describe ways in which these illnesses can be prevented
Vaccination (10 hours)	Explain the meaning of the term 'vaccination' Name some common immunization vaccines and identify the illnesses they protect against, such as polio
Heat and matter (16 hours)	Name and show correct use of measuring instruments Conduct simple experiments to identify materials that are conductors and materials that are insulators of heat Conduct simple experiments to investigate the effect of heat on examples of solids (e.g. rubber), liquids (e.g. water) and gas (e.g. air in balloon) Use scientific method to write reports on experiments
Friction (14 hours)	Explain the meaning of the term 'friction' and give examples of friction in everyday life Conduct simple experiments to identify the advantages of reducing friction (e.g. using roller to move a heavy object) and increasing friction (e.g. brakes on a bicycle) Conduct simple experiments to investigate how friction generates heat (e.g. rubbing hands together) and how friction can cause an object to change shape (e.g. pencil eraser)
Electricity (14 hours)	Conduct simple experiments using batteries and globes to: <ul style="list-style-type: none"> - Show how a complete circuit is needed for electricity to be used - Show how electricity flows from positive to negative charges Give everyday examples of use of electrical circuits Use simple experiments with small batteries, globes and wires to: <ul style="list-style-type: none"> - Investigate materials that are good conductors and materials that are good insulators of electricity - Demonstrate how lightening is formed Describe how batteries should be treated to ensure safety
Pollution and Environment Pollution Reduction (8 hours)	Identify common sources of water pollution, and action that can be taken to reduce this pollution Discuss ways in which rubbish in the local community can be managed and treated to reduce pollution Identify everyday objects that can be recycled or reused such as glass, paper and plastic <ul style="list-style-type: none"> - Discuss the benefits of reuse and recycling of products - Discuss ways in which the local community can be encouraged to reuse and recycle
Soil structure (10 hours)	Describe the differences between top soil and sub soil Identify the typical characteristics of fertile soil
Solar system (8 hours)	List planets of solar system and construct a diagram to show their location in relation to each other Draw and label diagrams to show the orbit of the planets around the sun Construct a simple model to show how the rotation of the earth creates the impression that the stars move during the night

SCHOOL CURRICULUM FOR SCIENCE GRADE 6

Topic and Sub Topic	Learning Outcome
Adaptation of plants (8hours)	Describe different ways that seeds are distributed Describe examples of how plants have adapted to different habitats to provide protection from weather and animals
Growing common crops (7 hours)	Prepare a small garden plot in which to grow a common crop Grow the crop, and report by labeled illustration on the progress of the crop from sowing to harvesting Identify any problems encountered during the growing period and describe action taken to deal with the problems
Caring for young animals (6 hours)	Give examples of the kind of animals that are raised for produce and for labor Choose one of these animals, and provide a description of how to raise and care for that animal, including identification of potential predators and providing protection from predators
Natural environment (7 hours)	Identify, explain and give examples of predator-prey relationships from the natural environment
Human reproduction (10 hours)	Draw and label main parts of the reproductive system of a woman and man Describe the main function of the major reproductive organs Explain the process of conception and reproduction in humans
Puberty (7 hours)	Identify and describe the major physical and emotional changes that occur during puberty in boys and girls
Contraception (7 hours)	Identify and explain some most common forms of contraception
Reproductive health (7 hours)	List common diseases that can affect the reproductive organs and list steps that



	can be taken to reduce the risk of disease
	Identify the symptoms of the AIDS virus, and explain how it can be transmitted.
	Describe steps that can be taken to prevent the transmission of the AIDS virus
Digestive system (7 hours)	Draw and label the main parts of the digestive system
	Describe the function of the major parts of the digestive system
	List common diseases affecting the digestive system and describe ways to prevent and treat these diseases
Circulatory system (7 hours)	Identify the names and explain the key functions of the main parts of the circulatory system in humans
	Explain the role of the circulatory system in taking nutrients to and from the digestive system
Matter (9 hours)	Conduct and report on experiments to investigate physical and chemical changes of matter (e.g. heating water and wax, rusting steel, burning wood)
	Explain the difference between changes to physical structure and changes to chemical structure
	Distinguish reversible from irreversible changes of material, and give examples of each
Mixtures (11 hours)	Explain the difference between a 'pure' substance and a 'mixture'
	Investigate, describe and categorise the mixture of different everyday liquids and solids, for example:
	- Two or more solids (e.g. sand and salt)
	- A solid and a liquid (e.g. sugar and water)
	- Two or more liquids (e.g. milk and water)
	Distinguish substances that will dissolve in water from those that will not
Pulleys and levers (12 hours)	Make a model to demonstrate how a pulley uses force
	- Give examples of the use of pulleys in everyday life
	Make a model to demonstrate how an inclined plane uses force
	- Give examples of the use of an inclined plane in everyday life
Electrical circuits (13 hours)	Construct simple models of parallel and series circuits
	Explain the difference between a parallel and series circuit
	Use correct notation to draw and label a parallel and a series circuit
Insulators and conductors (13 hours)	Explain the meaning of the terms 'insulator' and 'conductor'
	Conduct simple experiments to determine substances that are good conductors and substances that are good insulators
	Explain how accidents involving electricity can be avoided
	- Use the terms 'conductors' and 'insulators' as part of the explanation
Renewable and non-renewable resources (7 hours)	Explain the meaning of the term 'resource'
	Explain the meaning of the term 'renewable resource' and give examples:
	- Give examples of how solar energy can be used
	Explain the meaning of the term 'non-renewable resource' and give examples:
	- Give examples of how non-renewable resources can be conserved
	- Give some examples of how alternative renewable resources can be used in place of non-renewable resources
Weather (7 hours)	Identify specific components of weather
	Explain the difference between the terms 'weather' and 'climate'
	Recognise and describe examples of landscapes in the environment caused by weathering and erosion (e.g. Sampao Mountains)
Constellations (7 hours)	Identify differences in appearance of some stars
	Recognise and draw some examples of simple star constellations

SCIENCE GRADES 7 - 9

Students study Science for 6 hours per week in Grades 7 – 9.

In Grades 7 – 9, students extend their knowledge in the specific discipline areas of Biology, Chemistry, Physics and Earth and Environment Studies and focus on developing problem-solving skills.

In Biology, students develop their knowledge of how plants and humans reproduce, grow and obtain nutrients and emphasis on how to improve their own health, with a particular focus on the avoidance of harmful substances. In addition, they learn about appropriate care for infants.

In Chemistry, students develop their understanding of the classification and structure of matter, and use their knowledge in some practical applications. They develop their understanding of some of the basic terms and concepts of chemistry that will be required for more advanced study.

In Physics, students investigate the properties of light, sound and different forces. They extend their knowledge of electricity and its safe use in the home.

In Earth and Environmental Studies, students extend their knowledge of the structure of the earth. Particular focus is placed on developing their understanding of environmental issues that have national importance.



SCHOOL CURRICULUM FOR SCIENCE GRADE 7

Topic and Sub Topic	Learning Outcome
Natural environment (14 hours)	Give a simple explanation of the meaning of the term 'eco-system'
	Give examples of parasite-host relationships, and identify the eco-system in which they operate: - Explain some of the benefits and dangers of such relationships, including examples of impact of parasites on health of humans
Plants (13 hours)	Use diagrams to explain in simple terms the path taken by water and minerals from the soil to the leaves of the flowering plant and other plants
Tissues and cells (14 hours)	Give a simple explanation of the terms 'cells' and 'tissues'
	Describe how animals and plants are made up of different kinds of tissues and cells Describe in simple terms how cells and tissues grow to form organs in humans
Digestion (15 hours)	Explain the meaning of the term 'digestion' and why food for animals and people must be digested
	Illustrate, label and describe the main parts and functions of the human digestive system
	Explain the mechanical and chemical process of digestion
	Give examples of some common illnesses and viruses that effect the digestive system, and explain how they can be prevented and treated
Alcohol and tobacco (20 hours)	Identify and give examples of the following categories of drugs: - legal and illegal - natural and artificial
	Describe potential benefit and harm of alcohol and suggest ways to protect self and others against alcohol abuse
	Explain the harmful effects of tobacco, and suggest ways to avoid smoking
Classification of matter (8 hours)	Give the definition of term 'Classification'
	Classify examples of everyday objects in different ways (for example, chemical or physical properties; uses; where they are found)
	Classify examples of everyday objects according to the following specific properties: density; strength; hardness; flexibility; electrical conductivity; thermal conductivity; boiling/melting point (e.g. metal, ceramic, glass, plastic and fiber)
Structure of matter (16 hours)	Describe the pattern of physical transformation (e.g. water)
	Describe the properties and how matters change
	Use a simple particle model showing atoms and molecules to explain the structure and properties of solids, liquids and gases
	Compare properties and uses of matters Identify factors that can change physical and chemical properties (light, heat, mixtures, electricity and chemical reaction)
Air- Air pollutants (14 hours)	Describe properties and elements of air
	Name pollutants in airs and sources
	Describe impacts of human activities on air
Heat (26 hours)	Identify uses of heat in everyday life
	Using examples from everyday life, explain the relationship between heat, energy and temperature
	Explain the meaning of the term 'heat transfer'
	Identify processes and explain applications of heat transfer by conduction, convection and radiation (e.g. heating, cooling, insulation)
Electricity (26 hours)	Describe, with examples, how the transfer of heat can be controlled and used
	Explain the relationship between electric charge and moving electric charge Explain the term 'electric current, resistance and voltage or potential different'
Pressure (24 hours)	Explain the terms 'area' and 'pressure'
	Show simple examples using everyday objects of different forms of pressure
	Conduct experiments to demonstrate relationship between area and pressure
	Use everyday examples to show how increasing or decreasing the area of pressure can be useful (e.g. decrease the area when inserting a needle, increase the area when standing a motorbike in loose soil)
	Conduct experiments to demonstrate relationship between area, pressure and depth Explain everyday examples of use of pressure (e.g. hydraulic brakes)
Solar system (12 hours)	Describe the main characteristics and features of each of the nine planets of the solar system
	Explain the meaning of the following terms: asteroids, comets, meteorites: - Read information and answer questions about examples of sighting of asteroids and comets and places where meteorites have landed on earth
	Define, in simple terms, the meaning of the term 'the universe'
Movement of the earth (12 hours)	Revise how the movement of the earth around the sun creates day and night
	Explain how the revolution of the earth around the sun creates different seasons
	Relate the different seasons to Cambodian climate patterns Explain the effects of climate patterns on agriculture
Lakes and rivers (14 hours)	Identify the location of the Tonle Sap lake and river and the Tonle Sap flooded forests on a map of Cambodia
	Identify and explain some of the environmental issues associated with the Tonle Sap flooded forests, lake and river
	Discuss the advantages and disadvantages of different actions that could be taken to preserve the Tonle Sap lake, river and flooded forests



SCHOOL CURRICULUM FOR SCIENCE GRADE 8

Topic and Sub Topic	Learning Outcome
Natural environment (10 hours)	Give some examples of some local eco-systems Give examples of dependence and competition within groups living in the same eco-system
Plants and pests (12 hours)	Explain the need to protect growing and mature plants from pests Investigate and report on how some plants protect themselves from pests Investigate and identify how common pests and diseases affect common crops and describe their effects Investigate and evaluate different methods of pest control for common crops, taking into account environmental impacts
Transportation in plants (13 hours)	Conduct simple experiments to demonstrate and explain the terms 'osmosis', 'diffusion' and membrane Explain, in simple terms, how plants use these processes to obtain nutrients
Respiration and transportation (15 hours)	Explain the meaning of the term 'respiration' in animals and people Use simple diagrams to explain the main parts and function of the human respiratory system Identify some illnesses and viruses that affect the respiratory system and suggest ways to prevent and treat these illnesses and viruses Explain the need for a 'transport' system within animals and people Describe the role of the circulatory system in transporting the products of digestion and respiration to cells
Infant care (14 hours)	Investigate and report on good practice in the care of infants, including: - the importance of touch and communication with infants - good feeding practices - good hygiene practices - safe environment
Prevention of drug abuse (14 hours)	Identify common drugs (other than alcohol and tobacco) that are harmful to the body Describe the damage caused to the body by these drugs Suggest ways to avoid drug abuse
Atoms and molecules (7 hours)	Use the concepts of atoms and molecules to explain the terms matter, elements, compounds and mixtures and give examples of each Write chemical symbols and formulas of some compounds
Metals and non-metals (4 hours)	Investigate and explain in simple terms differences between metals and non-metals - Describe some of the physical characteristics of metals and non-metals - Give some examples of and compare the uses of metals and non-metals
Water (6 hours)	Give simple explanation of the elements that make up water - Describe benefits and water maintenance Conduct a simple experiment to separate water into its two elements
Solutions (7 hours)	Explain the meaning of and the difference between the following terms: solutes, solvents and solutions - Give examples of the use of each in everyday life - Conduct experiments to investigate how different factors such as temperature and surface areas affect solutions and solvents Explain what is meant by 'volume percentage' of solutions: - Calculate different volume amounts when given a volume percentage and the quantity of the solution
Mixtures (14 hours)	Describe basic principles involved in some separation techniques including filtration, vaporization and magnetic attraction Carry out and report on a range of techniques for separating mixtures, including filtering and vaporization (for example, to produce pure water) Describe the differences between mixtures and pure substances
Sound (16 hours)	Investigate how sound is produced and the properties of vibrations - Conduct simple experiments to test hypotheses about: - How sound is produced - How sound is transmitted - How different vibrations produce different sounds Describe the difference between the speeds of light, sound and common moving objects
Electricity (15 hours)	Revise explanations of the terms current, resistance and voltage Conduct a simple experiment and show and give a simple explanation of the relationships between current, resistance and voltage Use these terms to give a simple explanation of the operation of the electrical system of a house
Magnetic force (14 hours)	Conduct simple experiments with magnets to describe magnetic fields and rules of attraction and repulsion
Distance, speed and time (14 hours)	Give examples from everyday life to show the relationship between: - Distance, speed and time
Force (15 hours)	Give examples from everyday life to show the relationship between: - Force, mass and acceleration - Work and force
The Earth(17 hours)	Draw and label a cross-section of the main layers that make up the structure of the earth that shows: - Earth's crust - Earth's mantles - Earth's core Draw and label a cross-section that shows the main layers of the atmosphere



	above the earth
Rocks and mines (10 hours)	Describe the formation, composition and cycling of rocks
	Describe different properties and uses of igneous, sedimentary and metamorphic rocks
	Explain the relationship between rocks, ores and minerals
	Give some examples of some of the most common ores and minerals that are mined, and give examples of their uses
	Discuss impact of mining of ores and minerals on the environment
Earth, Moon and Sun (15 hours)	Revise the position and orbit of the moon around the earth and the earth around the sun
	Describe and explain solar and lunar eclipses
	Describe and explain the motion of waves and the term 'tides'
	Describe how the sea's tides are affected by the positions of the earth, moon and sun
Environment (6 hours)	Identify, discuss and propose actions in relation to environmental issues related to land use in Cambodia
	- Describe positive and negative factors associated with use of forest land
	- Describe impact of loss of forest land on wildlife and how impact can be reduced

SCHOOL CURRICULUM FOR SCIENCE GRADE 9

Topic and Sub Topic	Learning Outcome
Photosynthesis (15 hours)	<p>Explain in simple terms the process of photosynthesis in green plants:</p> <ul style="list-style-type: none"> - Explain the conditions necessary for photosynthesis to occur - Explain how photosynthesis converts sunlight into energy - Conduct simple experiment to demonstrate the presence of chlorophyll in green leaves
Nervous system (13 hours)	<p>Explain the role of the nervous system in animals and people</p> <ul style="list-style-type: none"> - Describe the main parts and functions of the nervous system - Conduct simple experiments to investigate nervous system (for example, tests to demonstrate reflex actions) <p>Give examples of illnesses that can effect the nervous system (for example, polio) and identify how some of these can be prevented</p>
Immune system (13 hours)	<p>Explain in simple terms the role of the immune system in humans</p> <ul style="list-style-type: none"> - Explain natural antibodies <p>Explain in simple terms the effect of HIV/AIDS on the human immune system</p> <ul style="list-style-type: none"> - Describe some of the consequences of a weakened immune system <p>Explain steps that can be taken to strengthen the bodies immune system</p>
Micro-organisms and disease (20 hours)	<p>Explain the meaning of the term 'micro-organism' and the role of micro-organisms in the spread of viruses</p> <p>Describe the modes of transmission of some common sexually-transmitted diseases, including syphilis and gonorrhea</p> <p>Explain steps that can be taken to prevent and control the transmission of some common sexually-transmitted diseases, including syphilis and gonorrhea</p> <p>Explain differences between safe and high risk sexual behavior, in particular in order to reduce risk of HIV/AIDS transmission and other common sexually-transmitted diseases</p>
Impact of human actions on natural eco-systems (15 hours)	<p>Identify more complex relationships between living things in eco-systems, with a focus on the impact of human actions on natural eco-systems:</p> <ul style="list-style-type: none"> - Give examples of human actions that impact on natural eco-systems (e.g. waster disposal, sewage, insecticide, industrial waste, building) - Describe the effect of these actions
Matter (7 hours)	<p>Describe the structure of atoms using a simple nuclear model</p> <p>Describe how elements are arranged in the periodic table</p> <p>Recognise and use internationally recognised symbols for common elements and compounds (e.g. water as H₂O; oxygen as O₂; carbon dioxide as CO₂)</p> <p>Calculate the molecular mass of simple compounds</p>
Chemical reactions (5 hours)	<p>Describe examples of useful chemical reactions using word equations</p> <p>Explain how chemical reaction equations are written and balanced</p> <p>Describe the law of mass</p>
Carbon, oxygen and hydrogen (14 hours)	<p>Specify the physical characteristics, chemical reactions and usefulness to society of the following elements:</p> <ul style="list-style-type: none"> - Carbon - Hydrogen - Oxygen <p>Describe the patterns involved in oxidation-reduction reactions</p>
Acids, bases, salts and oxides (14 hours)	<p>Give a definition of the following terms:</p> <ul style="list-style-type: none"> - Oxides - Acids - Bases - Salts <p>Specify the physical characteristics, chemical reactions and usefulness to society of:</p> <ul style="list-style-type: none"> - Oxides - Acids - Bases - Salts
Force (20 hours)	<p>Conduct simple experiments to demonstrate the conditions of balanced levers:</p> <ul style="list-style-type: none"> - Explain the conditions under which the lever is balanced



	<ul style="list-style-type: none"> - Explain what is meant by the term 'moment of force' - Calculate simple balanced forces
Electrical energy (21 hours)	Use examples from everyday life to explain the relationship between: <ul style="list-style-type: none"> - Electrical energy and heat energy - Electrical energy, power and time Solve simple problems on the cost of using electrical appliances, using kilowatt-hour as a unit (kwh) of electrical energy consumption Explain reasons for and ways to reduce electrical energy consumption
Magnetic force (12 hours)	Make and conduct experiments with magnets Give simple explanation of magnetic force Give examples of and describe simple uses of magnets
Lenses (23 hours)	Conduct and report on an experiment that investigates the properties of light and the use of lenses Describe the difference between reflection and refraction of light Describe and demonstrate dispersion of white light by a prism Conduct simple experiments to show the different benefits of convex and concave lenses
Water (12 hours)	Identify different water sources (fresh water and salt water) Explain the water cycle in terms of the physical processes involved Identify common causes of fresh and salt-water pollution and describe ways to protect coastal zones and inland waterways
Earth's crust (11 hours)	Describe the causes of movement in the Earth's crust Relate these movements to the formation of the following: <ul style="list-style-type: none"> - Rock layers - Folds - Faults - Mineral and fossil fuel resources Identify the impact of movements in the Earth's crust with a particular focus on <ul style="list-style-type: none"> - Continental drift - Earthquakes, volcanoes and tsunamis
Global environmental issues (15 hours)	Identify and discuss one example of a significant global environmental issue, for example, air pollution, global warming, solid waste disposal, water shortages) Identify, discuss and evaluate possible actions that could be taken in response to this issue

CURRICULUM FOR TEACHER TRAINING PROGRAMS

The curriculum for lower secondary teacher training is designed to provide a 2-year program. In recent year, this 2 year program was revised and the trainees are trained to become double subject trainers. The courses are divided into three major areas including mathematics-physics (Math-Phy), physics-chemistry (Phy-Che) and biology-earth science (Bio-ES). There are five science subjects are designed for Physics (Math-Phy trainees), Physics (Phy-Chem trainees), Chemistry, Biology and Earth and Environment trainees. The objectives of five science subject can be summarized into the following points.

- To review and strengthen subject knowledge necessary to teach science subjects in lower secondary schools.
- To equip the trainees with the ability to produce and use relevant teaching materials as well as conduct research and experiments.
- To enable the trainees to carry out teaching and learning activities in science with the use of student-centred approaches.
- To equip trainees with the ability to use curriculum and new textbooks of lower secondary education, and
- To develop attitude to carefully use technology, maintain natural resources, conserve the environment and be responsible for the health of oneself, one's family and society.

It should be noted that there is no textbook prepared for science lesson in the teacher training program. Instead, trainers use school textbooks as reference.

The Lower Secondary Teacher Training Program for Science (12+2)

Major Subject	Year 1		Year 2		Total
	Semester 1	Semester 2	Semester 1	Semester 2	
1. Mathematics – Physics Course					
- Mathematics	195hrs	195hrs	195hrs	169hrs	754hrs



- Physics	120hrs	120hrs	120hrs	104hrs	464hrs
2. Physics – Chemistry Course					
- Physics	195hrs	195hrs	195hrs	169hrs	754hrs
- Chemistry	120hrs	120hrs	120hrs	104hrs	464hrs
3. Biology – Earth Science					
Biology	195hrs	195hrs	195hrs	169hrs	754hrs
Earth Science	120hrs	120hrs	120hrs	104hrs	464hrs

Source: Pre-service teacher training program for lower secondary teacher, 2005

The current curriculum for primary pre-service teacher training (PRSET) program is designed for 2 year training program. This two-year PRESET program provides science subject to all the trainees, whether they are recruited from the graduates of upper secondary or lower secondary level.

According to the curriculum, the aims of science subject training program are:

- To review and reinforce certain knowledge pertaining to practical science at primary schools.
- To develop teacher trainees' habit of living with good hygiene and environmental protection.
- To equip teacher trainees with ability to teach and learn practical science by using skills and student-centred method.

The Primary Teacher Training Program (12 + 2)

Content	Year 1		Year 2		Total
	Semester 1	Semester 2	Semester 1	Semester 2	
1. Professional skills training					
- Psychology	30hrs	30hrs	30hrs	0	90hrs
- Pedagogy	30hrs	30hrs	30hrs	52hrs	142hrs
- Administration studies	15hrs	15hrs	15hrs	13hrs	58hrs
- Moral Profession	15hrs	15hrs	0	0	30hrs
- General knowledge	15hrs	30hrs	30hrs	26hrs	101
- Library	15hrs	15hrs	15hrs	13hrs	58
2. Basic knowledge development					
- Khmer literature	60hrs	15hrs	15hrs	13hrs	103hrs
- Mathematics	60hrs	15hrs	30hrs	0	105hrs
- Foreign languages	30hrs	30hrs	30hrs	26hrs	116hrs
- ICT	30hrs	30hrs	30hrs	39hrs	129hrs
3. Primary knowledge and teaching methodology					
- Khmer language and methodology	45hrs	60hrs	75hrs	52hrs	232hrs
- Mathematics and methodology	30hrs	75hrs	75hrs	52hrs	232hrs
- Science and methodology	15hrs	30hrs	15hrs	26hrs	86hrs
- Social studies and methodology	90hrs	105hrs	105hrs	91hrs	391hrs
- Life skills	75hrs	60hrs	60hrs	0	195hrs
4. Thesis	0	0	4hrs	8hrs	12hrs
5. Pedagogical practicum		6 weeks		6 weeks	
Total	555h	555h	559h	411h	2080h

Source: Curriculum for teacher training, 2006