Chapter 2
Related Literature Review

In analyzing knowledge and imagination on science and technology in the verse tale "*Phra Abhaimani*," the researcher had reviewed the essences of the literatures and researches related to the topic as follows:

1. Thai Literature
    1.1. Meaning of literature
    1.2. Value of literature
    1.3. Type of literature
    1.4. Verse tale literature
    1.5. The verse tale *Phra Abhaimani*
    1.6. Definition, interpretation, theory, and message in literature
    1.7. Aesthetics in literature
    1.8. Thai wisdoms and Thai literature
    1.9. Philosophical issues in literature
2. Life and Works of *Sunthorn-Phu*
    1.1. Life of *Sunthorn-Phu*
    1.2. Works of *Sunthorn-Phu*
    1.3. The 200 year anniversary of *Sunthorn-Phu.*
3. Science and Technology
    3.1. Meaning of science
    3.2. Scientific Foundation
    3.3. Acquisition of science knowledge
    3.4. Nature of science
    3.5. Meaning of technology
    3.6. Societal roles of science and technology
    3.7. Progress in science and technology during the Reign of Kings Rama 1st to the 4th.
    3.8. Knowledge and body of knowledge
    3.9. Body of knowledge in science and technology
4. Scientific imagination in literature
    4.1. Imagination and science
    4.2. Imagination and literature
    4.3. Scientific and technological imaginations in the novels.
5. Science Strand of 2001 Basic Education Curriculum
    5.1. Goals of learning and teaching in science
    5.2. Science Strand and learning standard in science
6. Related researches
    6.1 Research related to the verse tale *Phra Abhaimani*
    6.2 Research related to other literary works.
    6.3 Research related to the use of literature in learning and teaching
    6.4 Research related to the analysis of science body of knowledge

Thai literature

As the verse tale *Phra Abhaimani* is a major literary work and it was the verse tale used in this research, the researcher would start with the meaning, value, and type of the verse tale literature. After that he would discuss about the interpretation, message, aesthetics, wisdoms, philosophical issues, and the content analysis of literature. The detail of the review and discussion is as follows:

Meaning of Literature

The term "literature" or "*Wannakhadee*" in Thai is composed of two words - "wanna" means book and "khadee" means proceeding, event, characters, for example. The whole term then is referred to the book which is accepted as of good composing. This Sansakrit-based Thai word has the same meaning as "Literature" in English (Sittha Pinitpouwadol and Nittaya Kanchanawan, 1977, page 3). The word was also used to refer to the book written in verse form as always done in those days (Ruenruthai Sujjapun, 1983, pages 4 – 5). There were two meanings for this word as follows:

1) In general, the term literature was referred to the document written to express knowledge, thought, and feeling to communicate and explain things. In other word, literature covered books and any type of writing.

2) In specific or academic uses, the term literature was used to refer to an artistically composed story producing melodious sound and nice meaning generating aesthetics and worth following. It entertained and provided analogy. The readers were stimulated to realize its beauty and informative values leading them to know life and society in various perspectives.

Besides, literature could be referred to the subject of reading comprehension (Panya Borisut, 1999, page 1). From all these citations, literature could mean the work constructed through linguistic creation and validity yielding benefit to the readers or listeners in both entertaining and knowledge providing aspects. The work was accepted by the society as a good literary work. The term was also referred to a field of study.

Value of Literature

Literature is significant to the readers in various ways such as serving as friend, entertainer, and intellectual sources. Regarding this, Ruenruthai Sujjapun (1983, pages 2-3) and certain lecturers of Sukhothai Thammathirat Open University had similarly concluded the value of literature in two aspects – emotional and intellectual as follows:

1. **Emotional Value:** Literature was regarded a piece of art work which generated enjoyment through the aesthetics of language. It could lead the readers to have the same emotion as did the poet.

2. **Intellectual Value:** Literature provided knowledge in various fields with and without intention of the poet. The knowledge was useful for the listeners or readers to understand nature of human beings and see the general picture of the society in the period in which the work had been created.

Value of literature could be put in another word that the emotional value served as the food of mind while the intellectual value served as food of brain.

Type of Literature

There are many types of literature. Sittha Pinitpouwadol and Nittaya Kanchanawan (1977, pages 8 - 40) noted that Thai literature was classified into 2 main types-the general literature and the belles letters. The details of each were as follows:

1. **General Literature** was the type of literatures which include all written materials such as inscription, prayer, oath, court succession rule, as well as the text for transmitting knowledge of various fields.

2. **Belles Lettres** was the literature which is artistically created inducing the readers' emotion and imagination, and using melodious language with balance and unity. Belles letters could be classified in three sub-categories as follows:

2.1 Poetry was the writing that had system of word and phrase regulations such as number of words in a phrase, tone, vowel, and rhythm. The regulation for the Thai octameter poem, for example, ruled that each phrase had to have 8-10 syllables. In the poem, the poet used symbols and verbal expression to create imagination in the mind of the readers. There were many types of Thai verse such a *Khlong, Chan, Gaph, Glon*, folk song, etc.

2.2 Drama is a kind of literature used for performance. Thai drama had Indian influence in its posture, words, and rhythm. The forms of Thai drama included Khone, puppet, drama with dance, shadow dance, etc.

2.3 Fiction is the written literature aiming at entertaining the reader. It is written in prose. Examples of the fiction include tale, notes, novel, short story, modern drama, features, etc. Fiction is read and listened. The latter form is known as oral literature. Fiction is mainly descriptive, using simple literary technique. It is sometimes called narrative literature.

Literature has many forms each of which has different function or goal. In practice, however, many pieces of literature could not be mutually excluded from one another. Verse tale is another type of legendary story composed through imagination without the intention to have the readers too concerned with whether the story is true but have fun. Verse tale is also a kind of narrative literature intended to tell a story.

Verse Tale Literature

Panya Borisut (1999, page 33) explained the meaning of verse tale literature as a book composed with certain type of verses. Most of them is composed in the style known as *Klon* or octameter in which each phases of eight syllables is contented with the next one by the vowel sound. The verse tale differs from drama in that is does not have the terms "At that moment" or "Meanwhile" like in the drama. Unlike drama, it does not have music cue. If someone would like to sing the verse, he or she has to invent or base on certain melody. Verse tale often has its origin in the folk tale but sometimes it could also be totally created.

The Verse Tale *Phra Abhaimani*

Phra Abhaimani is the longest the verse tale composed by *Sunthorn-Phu*. It has 132 episodes. It is the most well-known work and has enjoyed popularity among the readers. The purpose of the composition was not explicitly stated by the composer. However, Prince Damrong Rajanubhab (1970, page 17 - 18) and Cholada Ruengraklikit (2005, page 170) had similarly speculated that the literature was composed while the composer was in prison during King Rama 2nd, 1821-1823. The composing was continuously done but finally done in about 1845 taking more than 20 years to finish. The episodes which have been read mostly and well known are at the beginning of the story when *Phra Abhaimani* and his brother – *Srisuwan* had brought themselves to study with the knowledgeable persons until Episode 64 when *Phra Abhaimani*, Nang Suwannamalee, and Nang Lawengwanla had been ordained and stayed in priesthood on the top of Singkhutara Mountain and some episodes after that

until Episodes 132. Many literature academic had come to believe that *Sunthorn-Phu* had someone else continue composing it or helping him out. They cited the different verse style which differed from his typical one (Arwut Ngernchooklin, 2001, Preface; Cholada Reungraklikit, 2005, page 171).

The verse tale *Phra Abhaimani* had enjoyed popularity in Thai society and neighboring countries. It was found that *Phra Abhaimani* was translated into Khmer on the episodes in the beginning of the story until when *Phra Abhaimani* had been kidnapped by the woman giant. In Lanna, parts of *Phra Abhaimani* were used in *Phra Abhaimani Khawsaw* by Phayapromwoharn (1802-1887). Note that "*Khawsaw*" is a style of Lanna verse singing. The *Khawsaw* included only the episodes up to when *Srisuwan* married *Nang Kessara*. At Muang Nakorn or the present Nakorn Si Thammarat, there was a discovery of the written version of *Phra Abhaimani* which was in at least 12 Thai books (Santi Pakdeekham, 2007, page 97 - 101). Note that Thai book is the term use to call the book whose paper is made from bark of wood such as *Sa* or bamboo.

In the Reign of King Rama 5th in 1870, Dr. Smith, the owner of Bang Kholaem Press had published the written version of *Phra Abhaimani* for the first time and sold each copy for 25 Stang, the Thai monetary unit which is worth one forth of a Baht. The book had enjoyed a wide popularity at that time yielding a lot of income for Dr. Smith who could give out some of the earned income to the successors of *Sunthorn-Phu* (Ruenruthai Sujjapun, 2001, pages 82-83). This reflects a good sign of popularity of the verse tale *Phra Abhaimani* and the talent of *Sunthorn-Phu*.

Meaning, Interpretation, and Message in the Literature

In Thai literature, the poet typically used the words transmitting the author's feeling and piles of knowledge to the readers. Reading a literature then requires one's understanding about the message in the literature, its interpretation, and meaning of the words use in the literature.

Message in Literature

Literature is the object created by the poet to transmit the message to the readers through both spoken and written language serving as the medium for expressing the ideas for the readers to understand (Johnson, cited in Prasit Kapklon, 1989, page 1). The communication helps the receiver and the sender share the same understanding. To achieve this goal, the poet will use refined language either the choices of common expression, the idiom, or symbol to transmit his/her image, feeling, thought, experience, imagination, belief or need (Pittaya Limmanee, 1994, page 2). One example is in *Prathomsomphothikatha* in which the composer- Prince Paramanuchit had used the character "*Phraya Ramathirat*" which was a totally made up personality to symbolize lust. The interpretation then plays important role in reading literature.

Interpretation

As language has deeper and more complex meanings than its literal appearance, the readers have to depend on the interpretation of its meaning. They have to analyze the language used by the poet to understand the message and emotion of which the poet wanted to communicate. Language is essentially a system of symbols. Hence, the readers have to decode such symbols in three steps, namely, (1) what such symbol represents, (2) how the symbol or signifier and the signified thing

differ, and (3) what the composer would like to communicate (Ruenruthai Sujjapun, 1983, page 53; Prasit Kapklon (1989, page 2). By this virtue, interpretation is then an advanced level of the art of reading. The readers have to have ability to understand the content, intention, and tone of the writer. They should also reflect on the material being read relevantly. The comprehension could be expressed in three behavioral terms as follows (Pittaya Limmanee, 1994, page 3):

1. Translating which is referred to the change of old matter into new words, language, or style.

2. Interpreting which is to collect the old message to note, to reorganize, or to reverse it to see the old story in new way.

3. Expanding which covers the inferring or expanding the message to cover more matters than originally put in the story.

These three procedures are parts of the reading comprehension.

The interpretation of the meaning embedded in language requires the analysis of words, statement, symbol, and analogy used by the poet to build up the image the process of which requires experience and imagination as well as the thinking on the part of the readers who are to interpret the text. Because of internal factors on the part of the readers, the interpretation of the text or symbol could be at different depths.

Interpretation Theory

Literature is the outcome of the human's creation. That's why we need to utilize approaches in humanities. The research done in this field should be of qualitative research which requires the interpretation of the phenomena embedded in any form – text, document, drawing, sculpture, and social event. The goal is to understand the logic of the embedded actions (Khu Ban Nork webside, 2009). Through this one could gain understanding into the message embedded in the literature. This kind of research is fundamentally different from the scientific research which attempts to discover the general rule of nature and stresses the quantitative research whose validity could be objectively checked.

Interpretivism is a paradigm governing how to look at social phenomena. It is important for interpreting the text within social and historical contexts. The leading figure in the paradigm is Max Weber. Studying the verse tale *Phra Abhaimani* on *Sunthorn-Phu*'s ideas embedded in the text requires interpretation of the words, symbols, and metaphors to understand the knowledge, thought, and truth of the text. The study will focus on the examination of the text of the verse and the socio-cultural and historical contexts to understand the poet's thoughts.

Meaning of Words in Literature

Words in literature carry the message sent by the author to the reader. Their meaning might be beyond the literal appearance in the text. It requires interpretation to get deeper into the meaning of those words. Regard this, Pittaya Limmanee (1994, page 41) had divided the meaning of words in literature into two main types: (1) **Direct meaning** – the message directly indicated the meaning, and, (2) **Inferential meaning** – the words were used to represent the composer's thinking, and imagination but not directly. They need interpretation to really access the meaning intended to communicate by the composer. Composer chose the words as the symbols from which the readers had to interpret. Symbols had been used since ancient times. The poet will use one thing to represent another. It is the readers who

had to build imagination about the word which was abstract to the image which was concrete (Tanes Wespada, 2006, page 52-54). The flower is used to represent woman as they both have shared a common property. That is they both are beautiful and fragile. Lion, on the other hand, represents man as they both have the same property of being intimidating, for example.

Regarding the symbol, there are two type of them, namely, (1) universal or traditional symbol, such as pigeon is symbol of peace, the rainbow represents hope, for example, and, (2) specific or created symbols, such as a phrase in the verse composed by Prakhin Chumsai Na Ayuthaya. The composer used the phrase "Khong Khiew Riew Duan", literally "curvy sickle – curvy moon," to mean socialist ideology and proletariat class or people (Ruenruthai Sujjapun, 2001, page 167 - 173; Thanes Wespada, 2006, page 52 -55; Yuwapa Prateepasen Chaisinwattana,, 2001, pages 147 – 152).

The symbols used in literature are often the things seen from nature and are regarded as good, prestigious, comprehensible, and universal, such as the storm for struggling and fighting, star for beautiful hope, for example. (Ruenruthai Sujjapun, 2 001, pages 167 - 173). Besides using the single symbol as mentioned, the poet may other parts of thing to symbolically represent a certain meaning such as the character, the character's behavior, and setting Yuwapa Prateepasen Chaisinwattana,, 2001, pages 147 – 152).

These language symbols are used in literature in form of metaphoric language to make a comparison to induce image in the mind of the audiences. Such images are perceived better by them than do the direct language. The symbols also challenge the readers to search for the meaning and have them more involved in the literature. Symbols also help communicate the message sender's emotion to the receivers. In Thai literature, many kinds of analogy are used but the most popular ones are simile and metaphor. Regarding this, Prasit Kapklon (1989, page 147 -148), explained as follows:

1. Simile is the analogy to state that one thing is similar to another thing though the two things are of different objects. The compared things normally had something in common. The simile often has analogy-suggested term such like, similar, as if, as, etc. The simile expression is, for example, "Lawpee was delighted as was the fish that found water," or "Her hair was black as the sky during the dark-moon night," for example.

2. Metaphor is the analogy to use one certain thing to represent something else which has similar function in another context connecting with the term "is" such as the camel is the boat of the desert.

As the symbol is created by individual poet to allow the readers large room of interpretation to suit their experiences, the interpretation requires knowledge, experience, and theoretical concepts to understand the meaning hidden behind the words or phrases. These theories are found in the disciplines of linguistics, literature, sociology, psychology, philosophy, and science. The relevant principles could help one in comprehending the words in a language1 including the comprehension inferred from political and cultural contexts, values, and beliefs of the people in the society in which the poet had been living. The readers could learn and understand the behavior of the characters and the poet through some psychology concepts such as personality, motivation, for example. They also have insight into the philosophical foundation of

the world view held by the poet making them understand how situations could influence the particular poet. In our case, the British's conquer of Sri Lanka had partly influenced the designing of the character such as Nang Laweng who was a ruler queen in *Phra Abhaimani*, for instance. Besides, the theories could help the reader to speculate what the poet meant in using particular objects such as the color of the leaves, or the rainbow. The scientific imagination of the poet such as the machined boat which could travel both on land and sea reflected the dream of the people in those days in wanting to travel to any place on earth.

From all these reasons, it could be concluded that to interpret the meaning out of the text in which it has been embedded in order to get the "message" either the knowledge, imagination, emotion, and feeling of the poet, requires the analysis of the symbols carried by the metaphoric language and knowledge in various fields to analyze and interpret such symbols.

Aesthetics in Literature

Aesthetics is defined as the beauty in nature or art work in which each individual could access using his or her intelligence and affection (Royal Academy, 2003, page 1205; Wassana Boonsom, 1997, pages 84-86). Literature depends on language as the medium through which the readers could understand and appreciate the natural beauty that forms the basis of any beauty (Yuwapa Prateepasen Chaisinwattana,2001, pages 5-77). The components of the beauty are as follows:

1. **Explicit and Implicit Meanings.** This component of meaning has important role in transmitting content and substance in an effective way inducing emotion, feeling, imagination, and melodiousness of the work. To achieve all these goals, the poet has to choose the right word.

2. **Images and Imaging Process.** This component helps the readers to form the images through the imaging process.

3. **Imagery Language.** It the language making use of the analogy to make abstract thing more concrete. It is a creative language providing emotional aesthetics such as metaphor, simile, and symbols, helping the readers to access deeper meaning than from the direct language.

4. **Tone.** It is used to express the feeling and attitude of the poet such. Tone could reflect the poet's intention. It tells if author was joking or serious, cynical or sincere, for example. The tone could help the readers to correctly understand the thing being presented by the writer.

5. **Sound and Meaning,** Naturally, language had its own sound from the difference of vowel, consonant, tonal mark, and syllable. When they all are combined in a word or phrase, it would be meaningful and melodious in itself.

In short, it could be conclude that aesthetics or beauty in literature in the understanding and feeling of each individual to perceiving the content and emotion generated by the poet in his or her work. The readers can touch the "taste" and "sound" of the literature, particularly in the Belles Lettres. To be able to do so, the readers have to interpret the language to acquire the clear images intended to be communicated by the poet so that they could share the common feeling with the creator of the work.

Wisdom and Thai Literature

Literature is a type of wisdom in which Thai people could express their literary aesthetics. It is the way the poet used to transmit his or her idea to the readers.

It is then productive to discuss about the wisdom on its meaning, forms and types which are as follows:

Meaning of Wisdom

The term wisdom has been similarly defined as the knowledge and experience of local people as the result of a long accumulation and transmission of them. The wisdom integrated various kinds of knowledge and experience. Knowledge on economy, career, education, and culture is linked to one another (Cholathit Eiamsam-ang and Wissanee Sintrakoon, 1990, cited in Weerapong Saeng-Xuto, 2001, page 27; Prawes Wasi, 1990, page 75) From the analysis of the related literature, it could be concluded that wisdom is referred to the knowledge and experience that has been accumulated for a long period of time. It is passed on from one generation to another. It is constructive and integrative among many fields for the benefit of life maintenance.

Form of Wisdom

Though Thai wisdom is an integral of various disciplines, it has some fundamental characteristics. It is based on culture not science, highly integrated, linking to profound and high abstract values, and stresses on morality than materialism (Prawes Wasi, 1990, page 68). Many scholars have attributed wisdom to 2 characteristics – the concrete and abstract forms of it. The concrete forms include the piece of work, object, or action. The abstract one, on the other hand, covers the knowledge, competence, belief, or guidelines to solve the problem and to construct the peace and happiness for human beings (Sanya Sanyawiwat, 1992, page 74-88; Weerapong Saeng-Xuto, 2001, page 29). It could be concluded that wisdom had 2 significant characteristics – the concrete ones dealing with the work piece or technology, and the abstract ones dealing with body of knowledge, customs, traditions, and culture all of which are integrated basing on culture.

Types of Wisdom

Wisdom could be categorized into many types depending on the framework of the classification. Virapong Saeng-Xuto (2001, page 15) had based the classification on the 4 necessities, namely, the wisdom on food, on residence, on cloth, and on medicine. He, however, had found some wisdom that could not be fit in any of the categories in a mutually exclusive way. He then proposed two more types – transportation, career, and recreation. To him, literature was one type of wisdom on recreation using language and communication to convey the ideas and imagination from the poet to the audiences. Thai language was rich with words and tones which made the verse sound like music. Besides, the verse had rule of sound links both within and between phrases both on vowel and consonant creating melodiousness.

Philosophical Points in Thai Literature

The work of any poet always communicates certain ideas intended to reach the receivers. Besides its sophistication, literature has some values that last through time. It has shown the beauty, melodiousness, insight into the essence of life, and reality perceived by the poet of its time all of which were embedded in the work. The readers than have to make themselves informed about philosophical thinking. As a great poet, *Sunthorn-Phu* had had the ideas and philosophical thinking of the East of which the reader must make themselves clear, particular that of Thai philosophy. Such philosophical thinking should influence other domains of *Sunthorn-Phu's* thoughts.

Meaning of Philosophy

The term "Phrachaya" used to represent the term philosophy in English has its root in Sanskrit and was prescribed to represent the term in English (Wikipedia Free Enchyopedia, 2009, website). It means the ultimate knowledge or truth. Some academics noted that the meaning of the Sanskrit-rooted Thai term and the English term did not really match. They insisted the term English term philosophy meant the love of knowledge which was emerged from the curiosity, astonishment, and the attempt to explain the unknown part. The Thai term "*Prachaya*" which was translated into Sanskrit-rooted Thai meant the ultimate knowledge and enlightenment (Wirote Inthranon, 2006, page 2) or a field of study covering the sources of knowledge and truth as defined by the dictionary published by the Royal Academy (1999, page 668)

Subfields of Philosophy

Some academics divided philosophy into 3 subfields such Wirot Inthanon (2006, page 2) who stated that philosophy was divided into 3 subfields:

1. **Epistemology** or Theory of Knowledge which was to study the nature, origin, completion, scope, and evolution of knowledge.

2. **Metaphysics or Ontology** was to study the reality of nature of the world and humans to answer the fundamental questions of what the truth was and what the ultimate truth was. It was also the study about the universe, mind, soul, matters, time, space and god.

3. **Axiology** was the study on values which could be broken down into the subfields of:

3 .1 **Logics** covering the criteria to identify and use reasons to make decision about things.

3 .2   **Ethics** concerned the proper and appropriate behavior.

3 .3   **Aesthetics** dealt with all kinds of beauty.

The others divided it into 5 subfields (Samreong Boonreungrat, 1997, page 1; Wikipedia, 2009 website):

1. **Metaphysics** was the subfield of philosophy that attempted to find the truth, nature, and properties of existing things, and the truth concerning the world or universe.

2. **Epistemology** was the subfield of philosophy that dealt with the origin of knowledge and truth, condition, proof of the truth, and ways of knowing it.

3. **Ethics** was the subfield of philosophy that concerned happiness, good deed, validity, values of behaving, self-maintaining, and achieving the best of things.

4. **Aesthetics** was the subfield of philosophy that discovered the beauty, nature of beauty, and criteria to determine a beauty.

5. **Logics** was the subfield of philosophy that dealt with the provision of reasoning, and the evaluation of the reasoning if it was reasonable.

In conclusion, philosophy has 3 subfields, namely, (1) metaphysics dealing with real truth of nature, (2) Epistemology dealing with the origin of knowledge, (3) Axiology dealing with valuing things. The subfield could further be divided into 3 branches: logics, ethnics, and aesthetics.

Eastern Philosophy

While in the West, there emerged thinking about things in the universe to the point it has become 2 main disciplines – philosophy and science, in the East, there

focused on the use of intelligence in explaining the truth in terms of content, meaning, and value of things emerging as the Eastern philosophy. In the East, there were 2 main sources of philosophy – India and China (Wirot Inthanon, 2006, page 2-3). Eastern philosophy had been so integrated that it could not be separated from the religion. Major philosophy and religions had influence on the thinking bases of the Eastern people such as Hinduism, Buddhism, and Chinese philosophy (Fritjof Capra, 1989. page 95-123).

Hinduism is the religion that has tremendous influence on mode of intellectual life of Indian people. It has wholly determined social and cultural conditions of the Indians. Vedas of the Indian people has its origin in Hinduism through various legends such as The Great Parata, Ramayana, etc. Most of the philosophy deals with the teaching basing on the assumption that things surrounding us are essentially the concrete form of the ultimate truth called "Brahman". This way of thinking has made Hinduism is a monotheism. In Hinduism's view about nature, every thing is interrelated, fluid, and ever-changing illusion. The freedom from these things requires the realization of the unity and interrelatedness of nature.

Buddhism is the major religion in the Asian countries. It has deep influence on intellectual life, culture, and arts. It started with Prince Siddartha Gotama who had lived in India during the 6th century before Christian Era. At the time, there was the big attempt to study mind and philosophy. Besides Prince Siddartha, there emerged other philosophers such as Confucius and Lao Tze in China and Heraclitus in Greece, for example.

The goal of Buddhism was to solve the problems confronting humans most of which were sufferings. Buddhism tried to discover the causes of the sufferings and the ways to overcome them. Such approach was clearly based on the principle of cause and effect which operated on the principle of the Four Truths. It was like the healing of a physician who first tried to find the cause of the sickness before assuring that it could be cured by fixing a medicine for the patient to take.

From Buddhist view, things are all composed of the meeting of 4 basic elements – earth, water, wind, and fire. The Planet Earth is one of many thousands planets in the universe and divided itself into 4 continents surrounding the mountains and oceans. The land we live on is Chompudhaveep. Besides our world, there are other worlds – heaven and hell. All these worlds are called Tri Poom all of which share the same unity, interrelate, and keep on changing. This principle is similar to that of Hinduism. These thoughts are the essence of the Eastern View.

Chinese Philosophy. China has long culture aging more than 2,000 years. The philosophy has two aspects – life maintenance and ultimate mind. Concerning life maintenance, the philosophy covers life maintaining in the society, human relations, moral values, and ruling. The second aspect includes the deep instruction and guidance on how to achieve the ultimate mind- the level achieved by the great thinkers who realize the unity of the universe.

In the 6th century before Christian Era, there were two main schools of philosophy – the Confucius and Taoism. Confucius is the philosophy that focuses on social organization, philosophy of common sense, knowledge on life maintenance, family system, and ancestor worship. All of these form the foundations for education and morality of the Chinese society up to the present. Meanwhile, Taoism attempts to observe nature and discover the mode of nature or "Tao". The humans' happiness

according to Taoism is achieved through the natural rule. People should do things within the natural framework and trust in the Intuitive intelligence.

From the Chinese perspective, things have opposite polar. The 2 polars form the unity whose existence is based on their dialectics. The philosophical principle of "Yin" and "Yang" insists that life is composed of two opposite polar which are integrated parts of both human life and nature. To maintain life along this principle leads to the balance of nature as well.

The Thai philosophical thinking has maintained that knowledge has its root in wisdom (Witot Inthanon, 2006, page 106-107). Similar to other Eastern philosophy, Thai thinking has religious influence. Hinduism, Buddhism, and Chinese philosophy share the view that every thing has unity, interrelates, and keeps changing. They stress on practicing oneself to be free from the plane life to achieve the ultimate truth. People should maintain their life righteously, relevantly, and integrally with nature. The philosophy is the knowledge that aims at achieving the truth of all types of nature as does the science. In other word, philosophy in Eastern perspective is a science – the Eastern science.

Thai Philosophy

Thai people is one of the peoples who have long history of existence accumulating their own thinking which become a philosophy emerged from the experience toward the world and life. The origin of Thai philosophy is the folk wisdom (Wirot Inthanon, 2006, page 106 – 107). Philosophy in the perspective Thai people is the maintenance of life at the present to yield the good outcomes for life and society. Thai philosophy has 6 characteristics (Chinda Chankaew, 1989, page 115):

1. **Thai Philosophy was Animism and Spiritualism.** Thai people have strong held in animism from ancient times. They worshiped supernatural beings such as sky spirit, guarding spirit, town spirit, ancestral spirit, house spirit, as well as the spirit of tree, creek, mountain, etc. These beliefs were clearly influenced by Brahmanism and Buddhism in a harmonious way.

2. **Thai Philosophy Has Religious Influence.** The religious beliefs that had influence on Thai philosophy were those of Brahmanism and Buddhism. The two religious beliefs were well integrated in which law of determination and law of deed was simultaneously used.

3. **Thai Philosophy Dealt with Soul and Luck.** Thai philosophy insisted that humans and the world were composed of two kinds of natural substances: the concrete one – body, and the abstract one – the mind and soul. Every object in nature had these two components. River, for example, had the physical and the soul parts. Soul distributed all over the body. If it was well attached with the body, the people would have well being. If the soul departed the body, the person would not feel well. There was a need for a soul calling ritual.

4. **Thai Philosophy Emphasizing Daily Life Practical Principle.** These practical principles had been influenced by religious instruction and the experience of the knowledgeable person. The principles were often put in term of proverb, saying, and idiom, for example.

5. **Thai Philosophy was Individualistic.** It stressed the importance of the individual. This might have been because of the religious belief that insisted that each individual were born to pay back the deeds they had done in the past. Each should

accumulate merit for the next life. It was then individual matter and involved none others.

6. **Thai Philosophy Stressed the Importance on Mind Than Body.** Mind is more important because it had been more durable than materials which could be gone but the mind and soul still survive. Dead person's body decomposed away but the soul and mind floated around for the rebirth. By this virtue, the mind was the real being. It controlled the body and dictated it to move the way it wanted. Through this belief, Thai people often paid respect to the soul part of thing such the god of the tree. They worshiped the god inside not the tree outside.

It could be concluded that Thai philosophy was originated by local wisdom that provides practical method or principle of maintaining life with intelligence for solving the faced problems along the 6 characteristics as mentioned above.

It is clear that the body of knowledge basing on the wisdom of the East or a science that explains the truth of life and nature. The Eastern philosophy deals with knowledge and concepts about nature including the practical principles for maintain life to achieve the good outcomes. It is consisted of reasoning knowledge and knowledge that shows the interrelationship between humans and nature, and humans and the super-natural things to lead humans to maintain their life in balance.

Epistemology

Besides the philosophy that deals with metaphysics, there is also philosophy that deals with epistemology whose details are as follows:

The term "*Yanawittaya*" is Sanskrit referring to a branch of philosophy which deals with knowledge or theory on knowledge. This term was used to represent the term epistemology (Chaiwat Attapat, 1985, page 3; Wit Thiengburathum, 1993, page 438; Royal Academy, 2003, page 390). Knowledge in this context came in 3 forms (Chaiwat Attapat, 1983, page 4 – 5) whose details are as follows:

1) **General knowledge** was the knowledge that dealt with the set of unrelated facts which were not yet validated but still speculative. It was not a systematic set of knowledge and had no method of its own.

2) **Scientific knowledge** was the knowledge of facts and these facts were interrelated making them universal and certain basing on evidence and proof through experiment and could be measured in quantitative terms. It was a systematic set of knowledge and had its own methods.

3) **Epistemological knowledge** was the knowledge generated by organizing general knowledge and scientific knowledge together in a systematic way basing on certain conceptual framework. Epistemological knowledge and scientific knowledge could share the same content such as on matter. Both were systematic knowledge. Scientific knowledge, however, differed from epistemological knowledge in that it had divided knowledge into parts of subfields while the epistemological knowledge studied the whole world. Science saw the world in quantitative term while epistemology sees in qualitative one. Science depended on observation, experiment, classification, explanation, analysis, synthesis, inference, and deduction in discovering knowledge while epistemology depended on reflecting from general as well as from the scientific experiences.

4) It is clear that epistemology is related to metaphysics as the เนื่องจาก metaphysics deals with knowledge which is the real truth while epistemology deals with the approach of acquiring the knowledge. Epistemology relates to science as

both study the same thing and place emphasis on knowledge organization. The difference, however, is that science studies the world from reductionist perspective and stresses quantity while epistemology studies the world in holistic and qualitative terms. Where humans acquired knowledge had been a debating issue leading to many theories of human knowledge evolution (Chaiwat Attapat, 1985, page 22 -33) as follows:

a) **Knowledge was acquired from supernatural forces:** This has been based on the assumption that there is the supernatural thing. This kind of knowledge is abstract by its very nature. It is the highest form of intelligence which the supernatural being would deliver to humans.

b) **Knowledge was acquired from Veda basing on Brahminism:** It was believed that the essences in Veda had come out from the mouth of Promma which is the origin of all types of knowledge.

c) **Knowledge was acquired through human's sensory receptors:** Knowledge could be put into an experiment to be sensed by people. It was the product of the interaction between these 5 sensory receptors of humans with the outside environment. It was the empiricist epistemology. The reception of knowledge helped us human beings to classify knowledge and build up theories and rules in science.

d) **Knowledge was acquired through thinking:** This is the knowledge that was generated by mental process. It is the imagination about outside things sensed by people and later been reflected by their mental mechanism known in Buddhism as the 6th sense.

Regarding the human's knowledge on the origin of knowledge, there are 4 main theories according to Chaiwat Attapat (1985), Boon Nelaket (1985), and Pisit Kotsupho (2000), whose details are as follows:

a) **Rationalism** led by Rene Descartes who viewed that real knowledge was acquired through reasoning. It was the product of using intelligence to clarify things using the rationalizing process ignited by intuition not by observation or external experience. Rationalists held that knowledge had emerged and existed in the mind. It was the constant truth. The experience was just an instrument used by the mind to obtain the truth from the perception to be used in the thinking.

b) **Empiricism** proposed by John Locke who viewed that the real knowledge emerged through the experience of using sensory receptors. It was a clear and explicit knowledge which came up in 2 types: knowledge experienced through the 5 sensory receptors and knowledge gained through mental experiences - the reflection on the experience gained through the sensory reception. This theory recognized the existence of matters and mind. Matters could be perceived through sensory reception while mind was felt by thinking. Empiricists also recognized that mind had capacity to construct concrete thought or knowledge.

c) **Apriorism** introduced by Immanuel Kant who had integrated rationalism with empiricism. He viewed that all kinds of knowledge started with experience and later rationalized. Kant asserted that sensation was a part of experience and served as the raw product of knowledge before the mind would function in synthesizing the sensations into a systematic organization.

d) **Intuitionism** introduced by Henry Bergson who believed that knowledge was generated by internal insight – an intuitive mechanism. It required an

internal observation focusing on nature of the mind to truly understand things as they were. The process was similar to meditation.

It could be concluded that regarding the emergence of human knowledge, philosophers had proposed 4 schools of thought. Rationalism believes that true knowledge emerges from rationalization. Empiricism believes that true knowledge emerges from human experience on things. Apriorism believes that knowledge emerges from the combination of sensory reception and rationalization. Intuitionism believes that knowledge emerges from the clear insight into things.

Autobiography and Works of *Sunthorn-Phu*

Sunthorn-Phu is a major poet of Thailand who had been honored by the UNESCO to be one of the world's great poets. He had been honored by the UNESCO to be a great world poet who had created the verse tale *Phra Abhaimani*. It would be helpful in being informed about his life and works.

Figure 1 The Sculpture of *Sunthorn-Phu* at Ban Gram, Glang District, Rayong Province

Life History of *Sunthorn-Phu*

In one of the written works of Prince Damrong Rajanupab (cited in Literature and History Division, Department of Fine Art, 2001, Life History of *Sunthorn-Phu,* Pages 13-46), the author had mentioned life history of *Sunthorn-Phu* which could be concluded that Phra Sunthorn Vohara (Phu) or often known as "*Sunthorn-Phu*" was born in the reign of King Rama 1st of Ratanakosin on the date of January 26, 1786. His parents divorced. He had lived with mother who had served as a godmother of the Prince of Rear Palace. *Sunthorn-Phu* had studied at Samnak Wat Cheepakhaw or the present Wat Sri Suda Ram in Bangkok. He had acquired some knowledge and had served as the clerk in the palace. He later had sexual relationship with a court woman servant who was supposed not to marry. He was put in jail and was released in 1806 after which he had presented himself to become a court servant for the Prince of the Rear Palace. In the reign of King Rama the 2nd, *Sunthorn-Phu* had served in the Royal Secretariat Department and had entitled Khun Sunthorn Wohara functioning as a poetry assistant to the King until the reign of King Rama the 3rd when he had resigned from the royal service and entered the ordination becoming the monk for 8 years. After leaving the ordination, he had maintained his living by becoming an advisor on verses and wrote books. He had composed literary work for many princes until the

reign of King Rama the 4th - King Mongkut who kindly accepted him back to the palace and served the royal service as Phra Sunthorn Wohara, of Royal Secretariat for the Front Palace. His main duty was to prepare the letter and compose some book for the king. He had been in the royal service for 5 years before dying in 1855 at the age of 70.

Literary Works of *Sunthorn-Phu*

Works of *Sunthorn-Phu* were plenty and of variety. There were 24 pieces with manuscripts. These works could be classified as follows (Literature and History Division, Department of Fine Arts, 2001, Life History of *Sunthorn-Phu ,* 47-49)

1. Niras or poem on the theme of departure such as Niras Muang Glang, Niras Phra Bata, etc.
2. Tale –there were 5 tales such as *Phra Abhaimani, Khobutra, Singhagaipop,* etc.
3. Ethical Instruction – there were 5 pieces such as *Swasdiraksa*, Proverb for women, for example.
4. Drama – there was one piece of this type of work – *Abainuraj.*
5. Sepha or singing verse – there were 2 pieces of it. They were Khun Chang Khun Plan in the Birth of Plai Ngam episode and the Singing Verse on Rajapongsawadan.
6. Lullaby – there were 4 pieces of it such as *Phra Abhaimani* lullaby, *Kakee* lullaby, for example.

The work that had been published for the first time in 1870 during the reign of King Rama 5th was the verse tale *Phra Abhaimani* by Dr.Smith the owner of Bang Kholaem Press. The book was sold for 25 Stangs or a quarter of Baht.

Two Hundred Year Anniversary of *Sunthorn-Phu*

 Sunthorn-Phu had been recognized of his talent in creating literature many pieces of which had high value to the Thai society. Later the government had erected a monument for *Sunthorn-Phu* (as shown in the Figure 1 picture above) at Klaeng District, Rayong Province, which is his birthplace. The construction started in 1955 but discontinued until 1968 when the work resumed with the statue molding of *Sunthorn-Phu* and other actors. *Sunthorn-Phu's* statue was installed on March 5, 1970.

The poetic talent of *Sunthorn-Phu* had been honored as a great world poet by the UNESCO and the Thai government had set up the Two Hundred Year Anniversary for *Sunthorn-Phu* during June 26, 1986, till June 26, 1987.

Science and Technology

In regard to science and technology, the researcher would start from discussing the meaning of science, its origin, acquisition of science knowledge, nature of science, meaning of technology, its social roles, progress in science and technology from the reign of King Rama the 1st to the 4th, and body of knowledge. The details are as follows:

Meaning of Science

Regarding the definition of "science", many academics have provided various of it. Some viewed that science was the system of selecting and screening knowledge through a set of methods (Liberal Arts, Sukhothai Thammathirat Open Universiy, 1995, page 6). Others believed that science was the discipline dealing with the

methods to search for knowledge leading to the acquisition of the new knowledge and expanding the scope of knowledge leading to criteria and the structure of the relationship between knowledge and knowledge searching process that acquired such various types of knowledge (Supote Suppakun, 1996). Yet the others saw that science was the knowledge about nature and the interrelationship of the objects in nature. It also included the process of knowledge searching using scientific methods and the organization of the discovered knowledge or facts in a systematic way (Suwitcha Rakharn, 1998). Some others regarded science as both the discipline, knowledge, and a specific methodology (Phob Laohapaiboon, 1999, page 31).

In short, it would be safe to say that "science" has many different meanings but in general, "science" is referred to a discipline that deals with knowledge to explain the natural phenomena with their own process of searching for knowledge that is specific within the domain of the discipline.

Origin of Science

Science as known at the present is the Western scienc. Fritjof Capra (1989, page 1 9-2 9) proposed that science emerged from Greek philosophy in 600 hundred years before Christ. A philosopher of Milesian School was interested in the components of all things and called it Physis – an original term before having evolved into the term "Physics" at the present. They believed that all object had life of its own. It had a god embedded in it. Everything has its opposite. Everything is a unity of the opposites. This philosophy was similar to that of India and ancient China. Later the Elias School had proposed the separation between mind and matter leading dualism which was a unique characteristic of Western philosophy and led to the idea of atom making the difference between mind and matter even more obvious.

In fact, scientific knowledge had been developed during the Renaissance at the end of 15th century when nature was studied by scientific method and mathematics was used in the calculation. Matter did not have life. Those who still held the dualism continued to examine nature and later had been influenced by Newtonian mechanism law. Such law was believed to have been determined by god and applied to the world. It stayed unchanged and eternal.

Until the 20th century when scientists found that many phenomena had not conform to the law. Newtonian belief had led to the view on things and life along separatism. The unity of the opposites had come back. Einstein's relativity theory had pointed to the relativity of matter and energy. This philosophical belief was similar to the Eastern thought of holistic view.

It is clear that science had its origin in Greek philosophy which continuously focused on the idea on truth of things. From the view that everything had unity, it had led to the separation of mind and matter. It was the foundation of the view that matter existed forming the basis for the present science study with Physics as the starting point before diffusing to other science fields such as chemistry and biology in the attempt to understand nature.

The Acquisition of Knowledge in Science

All disciplines had their origin or foundation (Phra Depveti - Payoot Payooto), 1992, page 30 – 31) such as economics had originated at the demand and science at the need to know the truth of nature and the belief that nature had its own logics which were constant and certain.

The term "science" in English has its root in Latin "Scientia" which means "Knowledge". The meaning is still too board. In German, the term "Wissenschaft" is used to refer to the "knowledge that has been well organized" which implies that it would not cover the knowledge that has not been organized making the definition to specific. Science in philosophical view is the "body of knowledge acquired to various methods including observation" (Robert B. Fischer, 1984, page 18-21).

The body of knowledge in science has been obtained through the process of knowledge search and it is the knowledge that could be proved or validated and be accepted or rejected with certain evidences (Liberal Arts Division, Sukhothai Thammathirat Open University, 1995, page 6). The proof of truth relies on the "hypothesis" and the data collection emphasizing experimentation (Phob Laohapaiboon, 1999, page 11). Scientists believe that everything in nature follows certain patterns from which concepts, principles, rules, or theory could be derived and used to predict phenomena of the nature.

The process to construct knowledge or truth in science as suggested by Phob Laohapaiboon (1999, page 8 – 9) covered deduction and induction. Induction is to construct truth from observation of facts and develop them into concepts, principles, or theory to be used to predict things. The derived theories could be broken down to many truths to explain phenomena. This process is called deduction.

It is clear that "science" has origin in the peoples' need to know the truth of nature basing on the assumption that nature has been governed by certain definite rules. Science has its own way of constructing knowledge by observation and fact collection to build up the concepts, principles, and theories. Deduction could be used to break down the knowledge into specific knowledge or facts.

Nature of Science

Science is the discipline that has its own nature both at the parts of knowledge and the process of knowledge search.

Knowledge in Science

Knowledge in science is knowledge generated by the process of knowledge search conducted by the scientists. There are 6 components of science knowledge (Phob Laohapaiboon, 1999, page 2 -8) covering:

1. **Scientific Facts** referring to knowledge which is the fact of nature and could be directly observed and true.

2. **Concepts** referring to the idea concluded from certain thing or story resulting from observation and experience in such thin such as insect has 6 legs and arachnid has 8 legs, ice is the water in solid phase.

3. **Principles** referring to truth that is provable, objective, commonly understood, and could be used as a reference, such as the matter when heated will be decompressed, for example.

4. **Laws** referring to the statement of relationship between cause and effect and could be represented in equation such Ohm's law $V = IR$, for example.

5. **Scientific Hypothesis** referring to the answer speculated for a certain problem supported by knowledge or evidence such as the Universe emerged from the Big Bang, for example.

6. **Theories** referring to the statement generally accepted to explain the phenomenon such as cell theory, kinetic theory of gas, for example.

Process of Science Knowledge Search

Process of knowledge search in science has been used by scientists in searching for knowledge. It is composed of 3 parts – (1) scientific method, (2) scientific process skills, and, (3) scientific mind or scientific attitude as formerly known.

Scientific Method

Scientific method as noted by Phob Laohapaiboon, (1999, page 10-12) was the working procedures for the scientist to search for knowledge in a logical way. The procedures were (1) problem identification stage, (2) setting hypothesis stage, (3) data collecting stage, and (4) Concluding stage. When a scientist was interested in a certain problem, he or she would start with setting a hypothesis before collecting the data by observation or experimentation on such problem. Afterward, the scientist would conclude the result which is a piece of knowledge in science.

Science Process Skills

Science process skill is the competence of intellectual ability which is crucial for the scientist's thinking and working. In 1970, the American Association for the Advancement of Science (AAAS) had identified the science process skills which the learners should acquire and came up with 13 skills – 8 basic and 5 integrated skills (Phob Laohapaiboon, 1999, page 14-2 9). Basic skills included skills of observation, measurement, calculation, classification, space-space and space-time relationships, data manipulation and communication, conclusion basing on the data, and the prediction. Combined or integrated skills included the skills of hypothesis setting, operational definition, variable specification and control, experimentation, data interpretation, and generalization.

It could be concluded that the scientific process skills are competence of individual. It is the intellectual skills which could be classified into 8 basic skills and 5 integrated ones all of which are required to learn and work on science of the learners.

Scientific Attitude

Concerning scientific attitude, Phob Laohapaiboon (1999, page 12) had defined it as the tendency of individuals in thinking, feeling, and acting. It formed the habits and characteristics of the scientist. Attitude is an outcome of learning and expected to be developed in the learners through various learning processes. According to the author (1999, page 12-13), there were 6 attitudes related to science, namely, curiosity, persistence, reasonability, honesty, prudence, and generosity. The Institute for the Promotion of Teaching Science and Technology (IPST) (2003, page 216) had specified 7 scientific attitudes, namely, curiosity, honesty, self-determination, open-mindedness, creativity, doubt, and enthusiasm in finding the answer. One with good scientific attitude would accept the explanation if it was logical enough. Detail of the scientific attitude varied from one school to the other.

Roles Science and Technology on the Society

Science and technology helped push forward for the society's progresses some of which were satellite communication, computer, biological technology, for example. All of these progresses brought convenience to human living. On the other hand, science and technology could also have negative impact on humans such the use of insecticides could lead to the destruction of ecological system and toxin residual. (Phob Laohapaiboon, 1999, page 33 -35). Science and technology have

responded to humans in both ways depending on the purpose of using them – for constructive or destructive purposes.

The Progress of Science and Technology in Thailand During the Periods of King Rama the 1st to the 4th

Science and technology existed in Thailand from the early period. They did in forms of folk knowledge and technology related to life maintenance of Thai people such as water wings and various kinds of tools. The western science and technology clearly appeared in early Ratanakosin period. Regarding this Virapong Seang-Xuto (2001, page 23-26) had studied the history and development of science and technology in Thailand. Part of his findings was that Thai people had known science and technology in early Ratanakosin period through the foreigners who came to the country during the reign of King Rama the 2nd. Most of it dealt with way of living,ts, and military. Later, King Raman the 3rd had sent Thai students to study science in foreign countries. Other condition was the missionaries who came in to the country to diffuse religion and also provided knowledge to the prime personalities in the court.

During the reign of King Rama the 4th, science had become prosperous. King Rama the 4th himself had realized the significance of science as the knowledge that could help develop the country. King Rama the 4th or widely known as King Mongkut had accurately predict the occurrence of the total eclipse of the sun which could be seen in total view at Wa Gor Sub-district, Prachuab Khirikhan Province, on August 18, 1868. His accurate prediction was well known among the foreigners in Thailand at that time too. However, during this period science was still studied exclusively by the few of upper class echelon.

Knowledge and Body of Knowledge

The term "Body of knowledge" has been interchangeably use with the term "knowledge." The latter was prescribed in the dictionary published by the Royal Academy in 1999 (Royal Academy, 2003, page 232) as the things accumulated from the study, search, or experience as well as the practical competence and skill and understanding or information gained through experience; the things received through hearing, listening, thinking, or acting; body of content in each discipline such as knowledge on Thailand, knowledge on health, etc.

Academics had provided definition for this term with similar connotation such as Hosper (cited in Monot Wetchaphan, 1989, page 15 - 16) who regarded knowledge as the basic behavior dealing with the ability to recall either through memory, seeing, hearing, or listening. Knowledge was part of learning composing of definition or meaning of the facts, theories, rules, structures, problem solving method, and standard, for instance. Knowledge was the matter of memorizing and recalling without much attempt to use complex thinking or mental ability. Benjamin S. Bloom (cited in Aksorn Swasdee, 1999, page 26 - 28) had similarly defined the term. To him, knowledge was referred to the matter on recalling specific thing, method, and processes basing on psychological process of memory linked to organization. Similarly, Phisit Kotsupho (2000, page 8) had defined knowledge as mental condition covering clever, intelligence, being well-informed, insight, knowing, remembering, recognition, and familiarity of a certain thing gained from training, practicing, and learning. It included beliefs, concepts, facts, imagination, thought, and perception. Knowledge was the thought that had been verified. Jamriang Chantaraprapa (2009 , website) defined the term as the content, data, ideas,

principles, etc. one acquired through experience in life maintenance as the result of the interaction with the environment both of nature, society, and technology. People learned from experience, study, training, acculturation, perception, thinking, and practice, to the point he or she could utilize it or upgrade it to a higher level.

In short, it could be concluded that knowledge had two connotations. The first one is referred to the essences, information, concepts, and principles kept in the people's mind as the results of his or her learning and experiences. In the second meaning, knowledge is the ability to recall memory in kept in the brain to be used in maintaining one's living.

The Thai term for "Body of knowledge" is not formally defined in the dictionary published by the Royal Academy in 1999. It only gives the meaning of "knowledge" and "body". The latter term is defined as the structure of body parts or components of a thing or idea such as the Buddhist principle of "Mark" or paths which is composed of 8 paths, for example (The Royal Academy, 2003, page 1320). The academics, however, define the term "Body of knowledge" in many different ways. Kampanart Srichua (2006, website) had compiled the definitions and came up in 4 of them as follows:

1. Knowledge existed in the disciplines such as concepts, principles, and approaches which were kept in the texts or library materials, outside of the people. This knowledge has been accumulated and passed on to younger generations.

2. How or How to Knowledge which was used for doing something in an effective and efficient ways others of which could not do.

3. Knowledge occurred in a situation of a particular matter. This kind of knowledge occurred through the transmission of experience or the analysis and synthesis of the information. The occurring knowledge could be used by the acquirer to be directly used or adjusted to fit the situation or task being carried out.

4. Knowledge occurred on certain issue. This type of knowledge could be used by the acquirer in various ways.

Terasoft company (2008, Website) who engaged in the business on internet system development had mentioned the meaning of knowledge similarly to the second definition provide by Kampanart Srichua which stated that knowledge was the know-how or how-to knowledge to do things in an efficient and effective ways which could never done by any other methods. Chamriang Chantarapapha, (2009, Website) had defined the term knowledge as the knowledge which was composed on main concepts, structure, and channel to access knowledge. The involved partners had involve in the process of (1) collecting, deeply studying, and taking part in; (2) putting it into practice, analyzing, and concluding, ; (3) emerging the ideas, content, and the guideline to develop it, and; (4) synthesizing the idea, content, and guidelines and integrating them into the knowledge at higher level.

It could be concluded that the term "Body of knowledge" had different sense that the term "knowledge" alone. Knowledge is the matter of content retrieved from one's member or recalled from learning and experience. Body of knowledge, on the other hand, deals with a particular topic or discipline. It is a set of knowledge resulting from the transmission of experience or the information analysis and synthesis. Such knowledge could be applied well in one's everyday life or to explain certain things.

Body of Knowledge in Science and Technology

From the meaning of the body of knowledge and the meaning of science and technology, it is clear that "Body of knowledge" is knowledge on certain topic. It is the knowledge in a specific discipline or the set of knowledge transmitted through experiences or the analysis and synthesis of the information and the resulted knowledge could be used in everyday life or to explain things. Science is a field of knowledge that deals with the attempt to explain natural phenomena. It also includes the process of knowledge search which is specific from one discipline to another. Technology, meanwhile, is referred to knowledge related to the techniques of producing, constructing, or developing the products, invention, system, as well as the methods that facilitate or solve the problems confronted by the individuals and society.

In conclusion, knowledge in science and technology is referred to the set of knowledge on natural phenomena. It could explain the phenomena is a reasonable way through the use process of knowledge search, particularly that in science and people can apply such knowledge in their everyday life or using principle in science to invent things, systems, methods, etc. to facilitate their life or solve the problem confronting them.

Knowledge in science is knowledge that focuses on nature of things. It is the knowledge about the world in physical and biological senses (Prawes Wasi, 2004). It also covers knowledge on laws of nature. In Buddhist perspective, knowledge about nature has 5 definitions (Phrathepwethee, 1992, page 103) as follows:

1. Meteorological definition: dealing with climate and all non-living things.
2. Biological definition: dealing with rules of nature on biological domain, particularly the heredity.
3. Mental definition: dealing with nature of mind and the mental process.
4. Karma definition: dealing with law of action or natural laws governing human behaviors.
5. Dhamma definition: dealing with natural law of cause and effect of things such as the three characteristics principle.

Knowledge is science typically deals with natural laws concerning climate and non-living things is known as physical science-or meteorological definition. While the science that deals with living things is biological science or bio-definition. Modern science is further divided into subfields of physics, astronomy, geography, and geology. The biological science covers biology.

Knowledge in science related to the analysis of the body of knowledge and scientific and technological imagination in the verse tale *Phra Abhaiman* is included in the six subfields of science, namely, physics, chemistry, biology, geography, astronomy, and geology. Physics deals with physical nature while chemistry focuses on the component of matter and chemical reaction. Biology studies nature of living things while geography deals with condition of various localities and the relationship between natural environment and society. Astronomy studies the earth, starts, and space. Geology is the field dealing with evolution, structure, and changes of the earth.

From all these literatures cited above, it could be concluded that body of knowledge in science and technology is the knowledge of the facts of nature maintained by *Sunthorn-Phu.* It is embedded in the form of language and symbols to describe various phenomena in a logical way. Part of the knowledge is in the fields of science such as physics, chemistry, geography, astronomy, geology, and biology. The

knowledge is accessed through the analysis of words, statements, and symbols appeared in the verse tale *Phra Abhaimani.*

Scientific Imagination in Literature

Imagination is an ability of humans enabling them to invent things. This is true for the verse tale *Phra Abhaimani* itself which is the product of the imagination of *Sunthorn-Phu*. Imagination helps people to create and invent things.

Meaning of Imagination

Regarding the meaning of the term "Imagination," most academics similarly noted that it is referred to the construction of image in the mind of people (Ruenruthai Sajjapun, 1983, page 8; Sathien Koses, 1990, page 73; Wit Thiengburanathum, 1993, page 337; Chukiat Mungmit, 2003, Website). Imagination has crucial roles in human's life maintaining. The image constructed in the people's mind vary to the understand and perception of the individual. The images constructed in the people's mind, according to Chukiat Mungmit, are of three types:

Type 1 is imaginary. Imagination of this type could be real or otherwise, such as the Superman which is the character constructed to serve the people's dream to fly.

Type 2 is the image constructed through the vision to the future. It is the imagination of the things to happy and could simply popped up or constructed through logical process supported by some information. One example of this is when a ruling class individual looks forwards to the future seeing the well being of the people in the country.

Type 3 is the image constructed on a logical speculation. It is the imagination that could be assured to yield the expected result if one has followed the standard operational procedure such as a golf player could shift the ball to the green if he has followed the process as trained, for example.

It could be concluded that imagination is the construction of image in the mind of people. The imagination comes in 3 types: imagery, vision, and imagination basing on a logic derived from the real practice.

Imagination and Science and Technology

At first glance, "imagination" and "Science and Technology" do not seem to have anything to do with each other as most people often perceive that science and technology deal with facts and reasoning. They are based on empirical evidence and verification. Imagination, to many, is just the idea or dream. In facts, science/ technology and imagination are closely related. The scientists have recognized that in constructing knowledge in science, one has start out with imagination first before transforming it to a certain set of scientific knowledge. This has been noted by Albert Einstein who insisted that "imagination is more important than knowledge" (Som Sujeera, 2008, page 121). Besides, imagination used in predicting or forecasting was useful to the scientists to create new inventions (Prachak Praphaphitthayakon, 1986, page 107). As in the science fiction "Twenty Thousand Leagues Under the Sea" written by Jules Verne in 1869 had imagined a vehicle used to travel in the depth under the sea which served as the model inspiring the invention of modern submarine.

It could be concluded that the imagination in science and technology is the thought about something with clear images in the thinker's mind used to predict the event to occur in the future to come. Imagination through the dream or based on real things were both related to knowledge on science and technology.

Imagination and Literature

In relating to literature, imagination is a component of the it. Imagination helps the readers to come up with the picture in their mind. The poet could transform their imagination into many forms ranging from the direct one such as the picture of the battle to the complex one such as when the poet use analogy of the moon to represent a girl's beauty (Ruenruthai Sajjapun, 1983, page 8 – 1 1) Regarding this, Sathien Koses (1990, page 73 – 3 6) had raised part of the verse in *Phra Abhaimani* to illustrate this point as follows:

He closely looked at the water,
Seeing island all over.
Above there was some clouds ,
Seeing sky and stars here and there.
At night sea water reflects Sparks and reflexivities,
Looking like diamonds Shining in the middle of the sea.

A reader who had seen the sea would be able to come up with the imagination reproduced from what he or she had seen. Though he or she had never seen the sea, these phrases of verse would still help form imagination. This is called productive imagination which leads the readers to get deeply involved in the literature and its artistic nature. If they share the same emotional reaction with the poet, their imagination turns to be another type of it which is known among literature specialists as interpretative imagination.

Moreover, the imagination could be expressed in term of symbol such as the love scene which appears once in a while as well in *Phra Abhaimani*. One episode of these types of imagination is as follows:

A Kula kite got close to Pakpao kite.
Parts of it clashed on the other's.
Kula kite struggled away.
Pakpao kite kept on the attack and attach.
Kula lost its control.
Pakpao thrusted right at the target.
Kula tried in vain to escape.
But finally was dragged down.

This part of verse was created by the poet to symbolize the love scene engaged by a man and a woman. It was written out in form of a complex imagination using two kinds of kite-Chula and Pakpao on fighting action. The message expressed through this symbolization is then more accepted than when it was directly expressed. Thai society, particularly at the time, had the value that sex was something not to be mentioned in the public. The verse, however, had helped express the prohibited topic in the public in an acceptable way. *Sunthorn-Phu* would have also realized this and tried to overcome the societal constraints in expressing this particular issue. His work is regarded creative imagination.

The 2001 Basic Education Curriculum-Science Strand

The 2001 basic education curriculum has provided framework for the teachers in various strands to organize learning activities for the learners to acquire knowledge

as prescribed in the standards of each strand. The details in science strand are as follows:

Goals of Science Learning and Teaching

Department of Curriculum and Instruction, Ministry of Education, (2003, page 3) prescribed the objectives of the science instruction in school as follows:

Upon the completion of the strand, the students should be able to…

1. To understand the basic principles and theories in science.
2. To understand the scope of nature and limitations of science.
3. To have the major skills for searching for knowledge and enquire in science and technology.
4. To develop the thinking process and imagination, problem-solving ability, communication skills, and decision making competence.
5. To be aware of the relationship between science and technology, mankind, and environment that has impact upon one another.
6. To apply knowledge and understanding in science and technology for the benefit of the society and life maintenance.
7. To become the person who is equipped with scientific mind, morality, and values in using science and technology in a constructive way.

In analyzing the body of knowledge and imagination in science and technology in the verse tale " *Phra Abhaimani*", one should obtain basic knowledge and understanding in science which serves as the guideline for using it for the benefit of the society, developing his or her own thinking process and imagination in science to see things surrounding him or her. All of these goals are specified in the goals 1, 4, 6, and 7, of learning and teaching science as above.

Learning Substance and Learning Standard in Science

The basic learning substance of science required for every student to learn in accordance with the basic education curriculum issued by the Department of Curriculum and Instruction, Ministry of Education, (2002, page 1 0 - 1 2). Such curriculum is composed of 8 strands or learning substances to form the characteristics of the students on knowledge, thinking, skills, learning process, morality, and values. The eight substances are as follows:

Substance 1: Living Things and Life Maintaining Processes

Standard Sc 1.1: Understand the basic unit of living things, the relationship between structure and function of various systems of living things that work in relation to one another; have knowledge searching process and scientific mind; are able to communicate the things learned, and apply knowledge.

Standard Sc 1.2: Understand the process and significance of the genetic transmission, evolution of living things, biological diversity, the use of biological technology that affects humans; have knowledge searching process and scientific mind; are able to communicate the things learned, and apply knowledge.

Strand 2: Life and Environment

Standard Sc 2 .1: Understand the local environment, relationship between environment and living things, relationship between living things in the ecological system; have knowledge searching process and scientific mind; are able to communicate the things learned, and apply knowledge.

Standard Sc 2 .2: Understand the significance of natural resources, the use of natural resources at local, national, and the world levels; apply knowledge in managing natural resources and environment in the locality in a sustainable way.

Strand 3: Matters and Their Property

Standard Sc.3 .1: Understand the property of matters, the relationship between the property of matters and structure and adhesive between particles; have knowledge searching process and scientific mind; are able to communicate the things learned, and apply knowledge.

Standard Sc. 3.2: Understand the principles and nature of matter state transformation, emergence of solution, chemical reaction; have knowledge searching process and scientific mind; are able to communicate the things learned, and apply knowledge.

Strand 4: Force and Motion

Standard Sc 4.1: Understand nature of electromagnetic force, velocity, and nuclear force; have knowledge searching process and scientific mind; are able to communicate the things learned, and the apply knowledge.

Standard Sc 4.2 : Understand kinds of motion of the objects in nature; have knowledge searching process and scientific mind; are able to communicate the things learned, and apply knowledge.

Strand 5: Energy

Standard Sc 5.1: Understand the relationship between energy and life maintaining, the transformation of energy interaction between matters and energy, the result of using energy on living things and environment; have knowledge searching process and scientific mind; are able to communicate the things learned, and apply knowledge.

Strand 6: The Process of Earth Evolution

Standard Sc 6.1 : Understand the processes occurring on the surface of and within the earth, he relationship between the processes on the climate changes, and earth structure; have knowledge searching process and scientific mind; are able to communicate the things learned, and apply knowledge.

Strand 7: Astronomy and Space

Standard Sc 7.1: Understand the evolution of the solar system and galaxy, interaction within the solar system, and the effects on living things on the earth; have knowledge searching process and scientific mind; are able to communicate the things learned, and apply knowledge.

Standard Sc 7.2: Understand the significance of space technology to be used in the space exploration and agricultural natural resources; have knowledge searching process and scientific mind; are able to communicate the things learned, and apply knowledge.

Strand 8 : Nature of Science and Technology

Standard Sc 8.1: the use of science process and scientific mind in searching for knowledge and problem solution; realize that most of the natural phenomena have certain and explainable patterns which could be checked with the instruments and information existing at the time period, and understand that the interrelationship among science, technology, society, and environment.

It is clear that all 8 strands have learning standard prescribed to have all the learners to know and schools to provide science learning in accordance with the

strands above. One benefit of this research was to acquired the knowledge which the teachers could insert into the learning activities in accordance with the strand and learning standard in science in an integrating manner basing on science, technology, literature, and socio-cultural factors.

Related Literatures

In this study, the researcher had studied the related researches as follows:

Researches relating to the Verse Tale *Phra Abhaimani*

Most of research relating to the verse tale *Phra Abhaimani* was on its socio-cultural aspects such as that of Nipon Insin (1978) which investigated the contrasts appeared in the *Phra Abhaimani* and found that *Sunthorn-Phu* had onstructed many contrasts in this literature such as the contrast between the characters, the contrast between the events, the contrast between the weather, and the contrast of the scenes and settings. Rienthong Somsak (1986) had conducted a critical analysis on ethics used by *Sunthorn-Phu* in his works including *Phra Abhaimani* and found that the ethics in literature created by *Sunthorn-Phu* was the ethical principles that could be used to distinguish between good and bad deeds of the people in general as the principle could yield the benefits to the individuals and the society.

Besides, Kunwachalee Theerakun (1997) had used psychology theories to analyze the characters in Thai literatures including *Ramakien, E-nao, Khun Chang – Khun Phlan*, and *Phra Abhaimani* and found that the both male and female characters in the literatures had aggressive behavior driven by the death instinct. The male characters were aggressive in destroying the others. The female counterparts had aggressive behavior in self-destruction. On the other hand, characters were also driven by the life instinct which led the male characters to have playboy behavior. Female characters, however, did not have this instinct-driven behavior. Suwanna Kriangkaiphet (2006) had studied *Phra Abhaimani* on literal aspects and found that the work had core theme of adventurous journey with 4 minor themes. According to her, the characters were divided into 3 groups- *Phra Abhaimani,* female characters, and non-human characters. She also found that *Sunthorn-Phu* has created symbolic systems such as the sea and wind blowing to represent the loneliness.

The research on the verse tale *Phra Abhaimani* have been studied continuously up till the present through many perspectives and approaches including psychological, ethical, and literature critique, for example.

Researches Related to Other Literatures

The researches on other literatures were conducted by many as well. One example was carried out by Sommai Thiapthiem (1984) who applied socio-cultural analysis into *Ngawpa* created by King Rama V. He found that the literature had reflected the socio-culture of the familial household, material culture, beliefs, and rituals. Ngaw tribal people in many aspects including the

Besides, there have been the analysis of folk literatures such as the Lanna folk literature conducted by Apichart Yodsuwan (1991) who studied the roles of *Phra Uppakhut* in *Maha Uppakhut* – the Lanna Version. He found there were 2 major roles of *Phra Uppakhut*, namely, the role in suppressing the bad guys and those in protecting and maintaining work affairs. The character also had many minor roles many of which could still be seen taken in the present society such as the Lanna

beliefs embedded in the tradition, rituals, and art, for instances. Darunee Nipatsarn (2006) analyzed moral issues in local literature titling *Witoon Sorn Larn* (Witoon Teaching Newphews) to teach Thai for vocational purpose, a course in the certificate of vocational education study program. She found that the poem literature had contained many moral principles mostly basing on Buddhism such as being kind, persistence, performing the role of husband as the household's leader, solidarity, the king's ten ethics, and self-maintenance. The moral issues to be promoted to the learners at this level included good behavior in bodily, verbal, and mental aspects and maintaining discipline, saving, for example. The guideline for setting up the learning activities was the discussion to lead the learners to realize the moral issues and the group process to have the learners simulating the roles in practicing their life activities. The instructional process also included the development of the learning media and kept them up to date.

It is apparent that in studying literature, many researchers have taken various issues and approaches to achieve the goals of more understanding both in literal, socio-cultural, and moral senses.

The Research on Using Literature in the Learning and Teaching

In using of literature in the learning and teaching, there are many researchers have carried out the studies. Chantaporn Pholinta (2003) had studied the effect of using the instructional module to teaching creative writing from the substances in Thai literature in an integrated way. She found that the students taught through it had higher ability of creative writing at .01 statistical significance level. Waraporn Laohapensaeng (2002) had analyzed northern legends to each local literature and found that the legend composers had been influenced by the traditional beliefs on super-natural things and miracles and also Buddhism which provided common sense instruction to explain various phenomena. The world views embedded in the legends reflected the combination of traditional and Buddhist beliefs which covered the inter-relationship among humans, nature, and super-natural things.

Moreover, it was also found that the legends had the roles as the societal diary and responded to the needs of the society in 2 aspects: psychological and social ones. In teaching these materials to the students, it was suggested that the teachers should organize the learning and teaching activities to have the learners learning things in a meaningful way, realizing the importance of the things to be learned, had opportunity to further search for more knowledge, express their opinion, and engage in a meaningful dialogue. The researcher also suggested the inquiry approach along with the collaborative methods advocated by constructivism.

Researches Related to the Analysis of Body of Knowledge in Science

The analysis of the body of knowledge in science has been taken by some researcher such as Virapong Saeng-Xuto (2001) who had analyzed the local wisdom and folk technology on science in Upper North of Thailand and found that the wisdom could be categorized into groups of the four necessities – food, residence, cloth, and medicine. There were 3 more supporting groups - transportation, career, and recreation. The groups of local wisdom that had the most science element embedded was the career followed by food and the least was medicine. This set of knowledge was inserted in the curriculum for science at upper primary and lower secondary levels and the materials were included in CD. Salee Ngamsiri, et al. (2006) had analyzed body of knowledge in science from the folk toys in Chiang Mai Province

and Chiang Rai and found that the learning sources on folk toys in Chiang Mai were at *Mae Ui Sorn Lan* (Grand Mother Teaching Grand Children) group, Ban Kad Sub-district, Mae Wang District, and Grand Moterh Chanphloy Phuangkaew, Pa Pong, Doi Saket District. In Chiang Rai, there were 3 resources – (1) *Khon Thaw Khon Kae* (The Eldery) Group, Ban Pa Dad, Mae Suay District, (2) *Wood Crafting Group*, Ban Tham Pa Tong, Tha Sud Sub-district, Muang District, and (3) Natural Dye Textile group, Sri Don Chai, Chiang Khong District. The most found science principles were from those of physics followed by those in biology and the least was from chemistry. The science process skill to be acquired by the students through playing folk toys was on observation. The least possibly used skill was the skill on operational definition and variable control. The science attitude mostly acquired was curiosity and the least one was the belief in theoretical principles.

It could be concluded that the researches related to the verse tale *Phra Abhaimani* and other literatures had studied mostly on socio-cultural, moral, and psychological aspects. There had been some uses of the literature in the learning and teaching for the learners at various levels and forms. There had also been some studies on body of science knowledge embedded in the folk wisdom. However, there has not been many studies on the analysis and explanation of the body science in the verse tale *Phra Abhaimani* and its application in the learning and teaching. There has not been many, if any, applications in enhancing knowledge, thinking, and imagination in science to the Thai youths with which literature could be an intervening factor to link between science and social sciences/humanities in a clearer way. The attempt should also stimulate the students' pride in Thai knowledge and the ability of Thai people to generate science and technology along with those of the western world.