CHAPTER 2

THEORETICAL OVERVIEW

2.0. INTRODUCTION

Our society these days is divided into two different ways of thinking on education. Some believe that modern methods are better than the traditional method of teaching. Even though teaching methods are usually different, the content delivered is the same. In the traditional method, teachers shouldered too much of responsibility for teaching in the classroom to make sure everything they taught were understood by the students and there was efficient communication between teacher and students.

![Diagram of Traditional Method of Learning](image)

Fig – 2.1 – Traditional Method of Learning

The use of Information and Communication Technology has been growing since the invention of computers and internet. These technologies enable students to learn independent of time and location.
As with any field of study, it is helpful to begin learning the basics early if you want to master them. Physics is a discipline and, as such, it's a matter of training your mind to be prepared for the challenges it will present.

In addition to mathematics (which is a form of problem-solving), it is helpful for the prospective physics student to have a more general knowledge of how to tackle a problem and apply logical reasoning to arrive at a solution which can also be learnt in non-science contexts like solving practical problems, or scouting, where learners frequently have to think quickly to resolve a situation that would come up during a camping trip, reading on all topics, solving logic puzzles, debating, playing chess or video games. Anything that can be done to train the mind to organize data, look for patterns, and apply information to complex situations will be valuable in laying the foundation for physical thinking.

2.1. SCIENTIFIC PROCESSES AND SKILLS

The scientific process involves (Padilla, 1990) some steps or a series of operations undergone by scientists during their investigation. They are Observation, Problem Identification, Communication, Formulating Hypothesis, Experimenting and Classification. The processes are the activities performed by scientists. Everybody involved in scientific investigation will perform all these operations in varying order.

2.1.1. Scientific Skills

To be able to perform the above operations, a scientist must possess some skills.
The skills to be learnt or acquired to be able to do science (www.iteachbio.com, 2006) are:

1. To observe - that is, they are able to use the sense organs to examine nature. They do this with as many senses as possible and as the phenomena demand.

2. To identify problems - ability to identify discrepancies in the observed phenomena or objects.

3. To communicate their ideas with others - ability to describe observations to others and use diagrams, charts and graphs.

4. To formulate hypotheses - ability to make an intelligent guess based on the observation made.

5. To design experiments - to find scientific explanation for the observation.

6. To ask questions.

7. To control variables.

8. To measure and use numbers.

9. To keep records.

10. To analyze data.

11. To make inference.

12. To formulate operational definitions.

13. To make predictions.

14. To classify.
2.1.2. Development of Scientific Skills

In promoting physics to the public and encouraging students to have a career in physics, the development of problem solving ability in physics is usually emphasized. In a survey of the value of a physics degree, physics alumni of an American university (Talisayon\textsuperscript{69}, 2005) underscored the importance of the following skills in their profession, as follows:

1. Problem solving skills, mathematics and other technical skills.
2. Problem solving skills – allow work from one leading edge technology to another.
3. Mathematical skills applied to physical systems.
4. Analyzing and modeling a physical process.
5. Gathering data, making and testing models and predictions.
6. Experimental, computation, theoretical skills – applicable to a broad spectrum of problems.
7. Scientific method of thinking that is applicable in all areas of life.
8. Ability to learn new information rapidly and efficiently.
9. Ability to logically and systematically pursue a line of thought.
10. Analytical skills, precise thinking, clarity of thought.
11. Logical, data-based decision-making.
12. Writing, speaking, thinking in a logical, predictable and consistent way – appreciated in work.
13. Learning how to learn new things on your own.
14. Skills on how to learn, define problems, strategically plan, implement and communicate solutions- creative thinking skills.

15. Independent learning skills and time management.

The school physics curriculum in Hong Kong (http://www.edb.gov.hk/FILEMANAGER/EN/CONTENT_4036/phy.pdf) lists the following goals for skills development:

1. Develop skills for scientific inquiry.

2. Develop ability to think scientifically, critically and creatively, and solve Physics related problems individually or collaboratively.

3. Understand language of science and communicate ideas and views on physics related issues.

4. Make informed decisions and judgments on physics-related issues.

In this technological age, knowing how to acquire and evaluate information and how to use it to understand and solve problems is a prerequisite for most jobs the students will have as adults.

Science skills can be grouped into three separate sections: Process Skills, Reasoning Skills, and Critical Thinking Skills (Catherine Valentino, 2000). These groups correspond to three distinct types of cognitive skills. Process skills are used to gather information about the world. Reasoning skills help children make sense of the information they gather by fostering an open mind, curiosity, logic, and a data-based approach to understanding the
world. Critical thinking skills require students to apply information in new situations and in solving problems.

Table 2.1 - Science Process Skills

<table>
<thead>
<tr>
<th>SKILL</th>
<th>DESCRIPTION</th>
</tr>
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<tbody>
<tr>
<td>Observing</td>
<td>Determining the properties of an object or event by using the senses.</td>
</tr>
<tr>
<td>Classifying</td>
<td>Grouping objects or events according to their properties.</td>
</tr>
<tr>
<td>Measuring/Using Numbers</td>
<td>Skills include: Describing quantitatively using appropriate units of measurement</td>
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<td></td>
<td>- Estimating</td>
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<tr>
<td></td>
<td>- Recording quantitative data</td>
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<tr>
<td></td>
<td>- Space or time relationships</td>
</tr>
<tr>
<td>Communicating</td>
<td>Using written and spoken words, graphs, tables, diagrams, and other information presentations, including those that are technology based.</td>
</tr>
<tr>
<td>Inferring</td>
<td>Drawing a conclusion about a specific event based on observations and data; may include cause and effect relationships.</td>
</tr>
<tr>
<td>Predicting</td>
<td>Anticipating consequences of a new or changed situation using past experiences</td>
</tr>
<tr>
<td>Collecting, Recording, and Interpreting Data</td>
<td>Manipulating data, either collected by self or by others, in order to make meaningful information and then finding patterns in that information that lead to making inferences, predictions and hypotheses.</td>
</tr>
<tr>
<td>Identifying and Controlling Variables</td>
<td>Identifying the variables in a situation; selecting variables to be manipulated and held constant.</td>
</tr>
<tr>
<td>Defining Operationally</td>
<td>Defining terms within the context of one's own experiences; stating a definition in terms of &quot;what you do&quot; and &quot;what you observe&quot;.</td>
</tr>
<tr>
<td>Making Hypotheses</td>
<td>Proposing an explanation based on observations.</td>
</tr>
<tr>
<td>Experimenting</td>
<td>Investigating, manipulating materials, and testing hypotheses to determine a result.</td>
</tr>
<tr>
<td>Making and Using Models</td>
<td>Representing the &quot;real world&quot; using a physical or mental model in order to understand the larger process or phenomenon.</td>
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</tbody>
</table>

**CRITICAL THINKING SKILLS**

<table>
<thead>
<tr>
<th>SKILL</th>
<th>DESCRIPTION</th>
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</thead>
<tbody>
<tr>
<td>Analyzing</td>
<td>Studying something to identify constituent elements or relationships among elements.</td>
</tr>
<tr>
<td>Synthesizing</td>
<td>Using deductive reasoning to pull together key elements.</td>
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<td>--------------</td>
<td>----------------------------------------------------------</td>
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<tr>
<td>Evaluating</td>
<td>Reviewing and responding critically to materials, procedures, or ideas, and judging them by purposes, standards, or other criteria.</td>
</tr>
<tr>
<td>Applying</td>
<td>Using ideas, processes, or skills in new situations.</td>
</tr>
<tr>
<td>Generating Ideas</td>
<td>Expressing thoughts that reveal originality, speculation, imagination, a personal perspective, flexibility in thinking, invention or creativity.</td>
</tr>
<tr>
<td>Expressing Ideas</td>
<td>Presenting ideas clearly and in logical order while using language that is appropriate for the audience and occasion.</td>
</tr>
<tr>
<td>Solving Problems</td>
<td>Using critical thinking skills to find solutions.</td>
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</tbody>
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**SCIENTIFIC REASONING SKILLS**

<table>
<thead>
<tr>
<th>SKILL</th>
<th>DESCRIPTION</th>
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<tbody>
<tr>
<td>Longing to Know and Understand</td>
<td>The desires to probe, find information, and seek explanation.</td>
</tr>
<tr>
<td>Questioning of Scientific Assumptions</td>
<td>The tendency to hold open for further verification presented assumptions, encounters, and ideas.</td>
</tr>
<tr>
<td>Search for Data and Its Meaning</td>
<td>The propensity to collect information and to analyze it in context.</td>
</tr>
<tr>
<td>Demand for Verification</td>
<td>The inclination to repeat and replicate findings and studies.</td>
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<td>---------------------------------------------------------------</td>
</tr>
<tr>
<td>Respect for Logic</td>
<td>The inclination to move from assumption to testing and data collection to conclusions.</td>
</tr>
<tr>
<td>Consideration of Premises</td>
<td>The tendency to put into context the reason for a particular point of view.</td>
</tr>
<tr>
<td>Consideration of Consequences</td>
<td>The tendency to put into perspective the results of a particular point of view.</td>
</tr>
<tr>
<td>Respect for Historical</td>
<td>The inclination to understand and learn from earlier ideas, studies, and events.</td>
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### 2.1.2.1 Reasoning Skill

#### Basic Reasoning Skills

Basic reasoning skills are those processes basic to cognition of all forms. There are four categories of basic reasoning skills: (1) storage skills, (2) retrieval skills, (3) matching skills, and (4) execution skills.

http://education.purduecal.edu/Vockell/EdPsyBook/Edpsy7/edpsy7_reasoning.htm

**Storage and retrieval skills** enable the thinker to transfer information to and from long-term memory. The learner focuses on the information being studied or to relate it to information that is already in long-term memory. An example of a commonly used storage and retrieval technique is visual imagery mediation. The learner develops a visual (or auditory, kinesthetic, or emotional) representation for the information to be remembered. Mnemonic strategies are also examples of storage and retrieval skills.
Matching skills enable a learner to determine how incoming information is similar to or different from information already stored in long-term memory. There are five types of matching skills:

**a. Categorization** enables learners to classify objects or ideas as belonging to a group and having the characteristics of that group. It speeds up the thinking process, making it possible to generalize and to go beyond the information immediately given by the isolated object or idea.

When you look at an animal and call it a cat or listen to a comedian and decide that a particular story was a joke, you are categorizing. Any time you classify something as being an example of something you already know, you are categorizing. Categories are hence synonymous with concepts in the sense that it is used here.

**b. Extrapolation** enables learners to match the pattern of information from one area to that found in another area making it unnecessary to start from scratch. The learner takes the already existing information and adapts it to a new situation, or is extrapolating and in other words, generalizing.

**c. Analogical reasoning** involves seeing the similarities among essentially different objects or ideas and using existing knowledge about the first set of objects or ideas to understand the others. Analogical reasoning enables learners to combine categorization and extrapolation to deal with new information and new relationships more effectively.
d. **Evaluation of logic** is the process of comparing the structure of information with an internalized system of logic to see if the information is valid or true.

e. **Evaluation of value** is the process of matching information to an internalized value system and analyzing the logic of that value system. For example, a learner might decide that a concept or a solution to a problem represents "the way things should be" and accept it as accurate. Or a person might realize that a certain piece of information is not really worth remembering. These value judgments often incorporate the motivational and affective aspects of learning.

**Execution Skills** are the final set of basic reasoning skills. They coordinate a set of other skills in order help learners build new cognitive structures or drastically restructure old ones. The three basic execution skills are:

a. **Elaboration** is the process of inferring information not explicitly stated in what the learner saw or heard. Learners use such skills as categorization, elaboration, analogical reasoning, and information retrieval to make inferences.
b. **Problem Solving** is the process of finding a strategy to achieve a goal or overcome an obstacle. This basically consists of describing the problem, determining the desired outcome, selecting possible solutions, choosing strategies, testing trial solutions, evaluating the outcomes of these trails, and revising steps as necessary. Creativity and critical thinking hence are important aspects of problem solving.

c. **Composing** is the process of creating new information to express an idea. This can be viewed as a specific type of problem solving and consists of either written or oral communication of ideas.
2.1.2.2. Problem Solving Skill

Problem solving involves finding a strategy to achieve a goal to overcome an obstacle. Even though Problem solving has been described in many ways, it usually consists of describing the problem, determining the desired outcome, selecting possible solutions, choosing strategies, testing trial solutions, evaluating the outcomes of these trials, and revising steps as necessary. Creativity and critical thinking are important aspects of problem solving, as the solution to problems often requires original thinking.


Fig – 2.3 – Problem Solving
2.1.2.3. Interpretative Skill

To conceive new ideas faster without being affected by our own bias to finally reach a conclusion requires an open mind and analytical thinking. Existing Knowledge has to be properly analyzed and applied. Another aspect of interpretation is analyzing facts and figures for correct decision making, as the case of a pilot in the cockpit interpreting the signals displayed by the complex instruments to avoid a disaster and to enable a safe landing, George\(^\text{25}\) (2010)

( [http://authspot.com/thoughts/interpretation-skill/#ixzz24Mliorax\(^\text{24}\)] )

Interpretation also refers to a vital part of how people experience the places they visit - our towns and countryside, our historic sites and monuments, our museums and galleries and is an international concept of information and education.

The roots of this concept go back to the middle of the 19th century. At that time Ralph Waldo Emerson founded the "Transcendental Club" (transcendere: lat. for ‘reaching beyond’) in Boston on the east coast of the USA, which dealt with one’s immediate relationship to nature. This practice-oriented approach "learning by doing" is typical for the nature conservation movement in the USA. The immediate contact with largely untouched nature played an important role from the beginning.

Types of Interpretations

1. Nature interpretation
2. Personal interpretation

3. Cultural interpretation

One of the first topics taught in a traditional introductory high-school or college physics course is motion, including the concepts of position, velocity and acceleration. Graphs of objects in motion are frequently used since they offer a valuable alternative to verbal and algebraic description of motion by offering students another way of manipulating the developing concepts. Developing interpretation skill is hence vital in the learning of science.

2.1.2.4. Reporting Skill

Report writing is an essential skill for professionals in almost every field. A report aims to inform, as clearly and precisely as possible. It should be easy to read, and professional in its presentation. The content to be included in the report and its presentation will vary according to the respective discipline and the specific purpose of the report.

A report must in short, present information, should be able to be scanned quickly by the reader, use numbered headings and sub-headings, use short, concise paragraphs, use graphics (tables, graphs, illustrations), needs an abstract. Writing and presenting a report on students investigation on any subject matter in a science class is very important aspect of today’s curriculum.
2.2. WEB-BASED INSTRUCTION

Instructional Support in an On-line Environment

Web-based instruction refers to providing a learning environment that is mediated and supported via the Internet/Intranet and connected to a computer with hyperlinks to resources outside the instructional domain. The instruction is designed so that the computer displays lessons in response to learner interactions. (Khan, 1997; Relan and Gillami, B.B 1997).

The instruction can be as simple or, as complex as an integrated system which logs learner inputs and responses, provides interactions with video, animation, imagery, forms, examinations, or software. In this case, learning can occur through interactions with the content available and also through a community of learners using chat, threaded discussion, e-mail, whiteboards, or other programs like "Net meeting" or C-U-See-Me software.

Web-based instruction can also aid in incidental learning. In a traditional "face-to-face" instructional environment, learning is considered to be intentional - there is usually very little incidental learning. Computers and the Web have changed this model of instruction; they allow learners to view, retrieve, and store information at any place and at any time. When teachers begin to develop web-based instructional components to their teaching strategies, they must keep the learning perspective in view as to whether the instructional strategies designed is to train or to educate. Both strategies are designed to enhance knowledge, but one is specific and the other is general. One is like hunting (training) and the other is like fishing (education). In hunting, one is after a specific target,
you know the goal and you know when the goal has been achieved. However, in fishing, when you cast out your line, you have an idea as to what you hope to catch based upon location, type of bait used, techniques, and "luck," but you are never really sure as to what you will catch until it is hauled in.

Robert Gagne\textsuperscript{64}, one of the most influential researchers in the field of objectivist instructional design, identified nine events of instruction which correlate with the conditions of learning and the desirable outcomes. On analyzing these events of instructions with a view to designing materials for the World Wide Web, it can be observed that Internet offers an innovative and powerful fashion to accomplish these events.

In a study conducted by Oliver and Herrington\textsuperscript{58}, they proposed a specific framework for the creation of instructional materials for the World Wide Web. The framework comprises three elements that have to be taken into account:

1. Learner
2. Documents
3. Implementation

1. Learner
   a. Collaboration (Group and team work)
   b. Reflection (increasing levels of learner control)
   c. Articulation (Using resources within a social context)

2. Documents
   a. Organization (linear linking versus less hierarchical linking)
b. Orientation (Placement cues, indices, image maps)

c. Navigation (Simplicity and consistency in design)

d. Presentation (Global structure, readability, avoid fragmentation)

e. Interactivity (CGI scripts, e-mail)

3. Implementation

a. Coaching and scaffolding (observing the learner, providing guidance and feedback)

b. Integrated assessment (concerned with the process and with the product)

In yet another study by Ron Oliver (2001) three interconnected elements were mentioned.

Table – 2.2 – Learning Design Elements

<table>
<thead>
<tr>
<th>Learning design elements</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Learning tasks</td>
<td>The activities, problems, interactions used to engage the learners and on which learning is based.</td>
</tr>
<tr>
<td>Learning Resources</td>
<td>The content, information and resources with which the learners interact and upon which learning is based.</td>
</tr>
<tr>
<td>Learning supports</td>
<td>The scaffolds, structures, encouragements, motivations, assistances and connections used to support learning.</td>
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</table>
These frameworks provide a pragmatic view of how to design online activities and lessons, in either an exclusive online course or in a course that also combines traditional tutoring.

Designing instructionally sound and intelligent web tutorial courses requires proper planning and patience, and hence it is a difficult and time consuming task for instructors who lack experience and are novice in interaction and web-based instructional design.

To promote effective instruction, web based courses must be designed with a focus on the learning theories. However, theories are abundant and users have difficulties in their application to online course materials.

2.2.1. E-Learning

E-Learning is defined by the Open and Distance Learning Quality Council (2005) in the UK as “E-Learning is the effective learning process created by combining digitally delivered content with (learning) support and services.”

Kenya Education Network (2005) gives important words about this definition:

• Effective: learning that succeeds.

• Combining: the combination of ICTs and pedagogy makes the difference (some call it blended learning).

• Digitally delivered content: content delivered electronically by CDs, cell phones, the computer, and the Internet.

• Support: support provided by tutors, facilitators or course coordinators.
Online education is characterized by:

- The separation of teachers and learners which distinguishes it from face to-face education.

- The influence of an educational organization which distinguishes it from self-study and private tutoring.

- The use of a computer network to present or distribute educational content.

![Diagram of Flexible Learning](image-url)

**Fig – 2.4 – Flexible Learning**
Fig - 2.5 – M Learning Environment

With the development of the World Wide Web and the global expansion of higher education, large numbers of institutions are looking to produce web-based teaching materials. One of the greatest advantages of web-based learning systems is their provision for interactivity, which can provide intrinsic feedback on the actions of the learner (Laurillard\textsuperscript{44}, 2002) and boost the speed and level of student learning (Najjar\textsuperscript{55}, 1998; Horton\textsuperscript{33} 2000). Types of interactions:

From the learning perspective there are three types of interactions, each of which make use of computer technology:

1. **Student – Student Interaction:** (Electronic discussion boards, text chat rooms, video conferencing or electronic white –boarding).

2. **Teacher – student interaction:** (Electronic discussion boards, text chat rooms, video conferencing or electronic white –boarding).
3. **Student – Content Interaction**: (computer based learning packages).

This can be further categorized into two –

a. **Student – initiated** interaction in which the student seeks some information from the content in a similar way to looking up something in a book or watching a TV program.

b. **Computer - initiated** interaction in which the system requires some input from the learner that includes pressing a button or answering a question and the like.

Basically, three interactions involved are:

1. **Initiation**: where the first agent inviting input from the second.
2. **Response**: Second providing that input.
3. **Feedback**: First agent passing back information about the response.

And the three actions are correlated. The response must be a direct consequence of the initiation, and the feedback must be in direct relation to the response.

![Feedback - Response Diagram](image_url)

**Fig – 2.6 – Feed back – Response**
This is in accordance with Laurillard’s\textsuperscript{44} (2002) definition of Intrinsic Feedback. In the case of computer – initiated interaction, the response action is carried out by the student and the feedback action by the computer.

Three actions involved in Navigation interaction:

1. Present button or control to learner (Computer initiation)
2. Student presses button or uses control (learner response)
3. Present new screen to learner (computer feedback)

The three actions involved in the three-way model may form a part of an interactive cycle. In such a cycle, the computer feedback simultaneously initiates another interaction:

\[\text{Computer Initiation} \rightarrow \text{Student Response} \rightarrow \text{Computer Feedback}\]

\[\begin{array}{c}
\text{Sequenced Activity} \\
\text{Simultaneous Activity}
\end{array}\]

\textbf{Fig – 2.7 – Student – Computer Interaction}
2.3. STEPS IN THE PREPARATION OF THE WEB BASED INSTRUCTION PACKAGE

1. **Question:** Identifying and listing the content.

2. **Plan:** Developing a strategy to find the pertinent information rapidly. (like developing hyperlinks in the package).

3. **Gather:** Harvesting information.

4. **Sort, sift and analyze:** Rearranging the puzzle pieces ie – getting the picture.

5. **Synthesize:** Refining the content to the level of students.

6. **Evaluate:** Figuring out what is missing.

7. **Report:** Sharing insights and finalizing the software.

2.4. TOOLS (HARDWARE) USED IN INSTRUCTION OF THE PACKAGE

2.4.1. SMART BOARD / E-PODIUM

The SMART Board interactive whiteboard is an interactive whiteboard that uses touch detection for user input – e.g., scrolling, right mouse-click – in the same way normal PC input devices, such as a mouse or keyboard, detect input. A projector is used to display a computer’s video output on the interactive whiteboard, which then acts as a large touch screen. The SMART Board typically comes with 4 digital pens, which use digital ink and replace traditional whiteboard markers. Most SMART Board interactive whiteboards register only one touch at a time however, in June 2009, SMART Technologies introduced their first dual-touch interactive whiteboard. The dual-touch SMART Board accepts two
simultaneous touches, however only on two separate sides of the interactive whiteboard surface.

The SMART Board interactive whiteboard operates as part of a system that includes the interactive whiteboard, a computer, a projector and white boarding software called SMART Notebook collaborative learning software. The components are connected wirelessly, via USB or serial cables. A projector connected to the computer displays the computer’s desktop image on the interactive whiteboard. The interactive whiteboard accepts touch input from a finger, pen or other solid object. Each contact with the SMART Board interactive whiteboard is interpreted as a left-click from the mouse. SMART Board interactive whiteboards are also available as a front-projection flat-panel display – interactive surfaces that fit over plasma or LCD display panels.

2.4.2. DViT

The SMART Board interactive whiteboard uses DViT (Digital Vision Touch) technology to detect and respond to touch interactions on the interactive whiteboard surface. This camera-based touch technology for interactive whiteboards and interactive displays uses digital cameras and proprietary software and firmware to detect finger or pen contact with the screen. That contact is then interpreted as finger or pen activity.

2.4.3. Digital ink

The SMART Board digital ink operates by using an active digitizer that controls the PC input for writing capabilities such as drawing or handwriting. The SMART Board uses
passive pen tools, which means that no technology is housed in the pen tool to use
digital ink or determine color. All digital ink options can be selected from the SMART
Board Pen Tray.

Most models of SMART Board include a pen tray on the front of the interactive
whiteboard that holds four plastic pen tools and an eraser. The pen tools have neither
electronic components nor ink - the technology is in the pen tray. When a pen tool is
removed from its slot in the tray, an optical sensor recognizes its absence. SMART Board
software processes the next contact with the interactive whiteboard surface as a pen
action from the pen tool that resides in the corresponding slot. There are slots for black,
blue, red and green pen tools, although a control panel can be used to change the color of
the digital ink or change the pen tools to colored highlighters.

Once a pen tool is removed from its slot, users can write in the selected color with
that pen tool, a finger or any other object. Similarly, when the eraser is removed from its
position in the pen tray, the software processes the next contact with the screen as an
erasing action, whether the contact is from the eraser, the user’s finger or another object.
As such, the potential exists that using a particular pen, such as the blue pen, may not
result in blue digital ink if all objects – colored pens and eraser tool – have not been
replaced in their corresponding locations on the pen tray. The SMART Board also
registers the last pen tray tool picked up as the active tool. This means that when a user
picks up the black pen and then picks up the red pen before putting the black pen down,
the interactive whiteboard will
register red ink, rather than black. In order to write in black digital ink, a pen needs to be
put back in the red slot.

Below the pen tray are two buttons that, when pressed, allow the user to do right
click functions such as copy, cut, paste, select all, etc., or bring-up a traditional on-screen
QWERTY keyboard, which allows the user to type in letters, words or numbers. Other
models, such as the SMART Board interactive display, include a black pencil tool which
incorporates a digital ink eraser. Unlike the SMART Board, the interactive display
models use active pen technology.

2.4.4. Resistive technology

The earlier SMART Board 600-series interactive whiteboards use resistive
technology. A flexible plastic front sheet and hard backboard are coated with a thin
resistive film. The resistive sides of each are separated by an air gap of two-thousandths
of an inch, or about the width of two human hairs. Pressure applied to the surface of the
front sheet closes the gap and is registered as a contact point. This contact point is then
converted from an analog signal to a serial data stream which is sent to a computer for
further processing. This technology can process contact from a finger, pen tool or any
device – such as a pointer.

2.4.5. Classroom use

The interactive nature of the SMART Board provides many practical uses for the
classroom. Using SMART Notebook software, teachers can record each step of a lesson
activity for students to review at a later time. The flexibility of use in the classroom, including the multiple ways in which teachers can display information (interactive text, images, sound and video files), has been shown to facilitate ESL instruction and support both differentiated learning and universal design for learning (UDL). Research indicates that use of an interactive whiteboard in the classroom can be an effective means of decreasing teacher stress.

Direct interaction with a touch-sensitive display makes use of natural, intuitive movements which allows students as young as preschool to easily use a SMART Board. Furthermore, the size of the display screen has been shown to assist in the education of visually impaired students, while the addition of a classroom amplification system has been proven to benefit deaf and hard of hearing students.

2.5. PROS AND CONS OF THE METHOD

Talking about the pros there are cons to traditional method where students were to afraid to ask their teacher questions. Thus students get bored with the same way of teaching method done by the teacher which is on the blackboard and listening to the teacher talk while they sit down in class and heat up their chairs.

On the other hand, the pros of modern method in teaching help a lot where there is a centered classroom which is created by the teacher and accepted by the students.

In modern method students are aware of their learning process through the computers. Thus with the help of computers teachers prepare their work in their thumb drive and present it to the class through slides show which is an easier way. And students
can do their studying and their work all in the computer without depending 100% on their teacher in schools.

Besides that, there is also classroom contract which consists of agreement between teachers and student regarding on how each will contribute to and behave in the classroom to start building a student’s expectation towards independence. Therefore students even have a bonding relationship with their teacher to be their friend so that they can share their problems to the teacher without being afraid.

As for the cons of the modern method of teaching students become too independent where they think they don’t need guidance from anybody because they think they can accomplish anything by themselves. Thus with the use of computers in school children gets distracted with online games and websites to browse on besides their studies which will cause them distraction.

Besides that saving all data in the thumb drive can be a problem when there is a virus. As students begin to be too comfortable with their teacher as their friend in schools they forget their responsibilities and respect over the teacher.