UNITED ARAB EMIRATES
MINISTRY OF EDUCATION

UAE K-12 Computer Science and Technology Standards

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MOE K - 12 Computer Science and Technology Standards

Executive Summary

The new global economy has a great potential to shift economic power on a massive level resulting in a new and growing digital divide in the world. Over the past few decades, computers have transformed both the world and the workforce in many profound ways. As a result, computer science and associated technologies now lie at the heart of economy and the way we live our lives. To be well - educated and productive citizens in a computing - intensive world and to be prepared for careers in the 21st century, our students must have a clear understanding of the principles and practices of computer science and technologies. No other subject will open as many doors in the 21st century as computer science, regardless of a student's ultimate field of study or occupation.

Many reports around the world state that failure to teach Computer Science and associated technologies in the Digital Age will be disastrous. Moreover, the current state of computer science education in many countries is unacceptable at a time when computing is driving job growth and new scientific discovery. While some countries are requiring a computer science course for high school students just as they require math or biology, high school computer science education (as it would be) in many countries does not exist. As such, the lack of engagement with issues relating to computer science education is shortsighted and potentially disastrous.

This document provides comprehensive standards and performance criteria for K - 12 computer science and technology education designed to strengthen computer science fluency and competency throughout primary and secondary Schools in UAE. It is written in response to the pressing need to provide academic coherence between coursework and the rapid growth of computing and technology in the modern world, alongside the need for educated students that can not only utilize the technology but also build it effectively for the most benefit of UAE society.

These standards provide a three - level difficulty framework for computer science and technology for K - 12 aimed at grade spans K - 5, 6 - 9, 10 - 12, and advanced 10 - 12, respectively. We expect that the learning outcomes in Level 1 can be addressed in the context of other academic subjects in the K - 5 grade span.. The learning outcomes in Level 2 and Level 3 need to be addressed through discrete computer science and technology courses and utilizing subject matter experts. These learning standards will serve as a catalyst for widespread adoption of computer science education for all K - 12 students. We encourage you to read this document and then to take part in the effort to implement these standards in a way that benefits both you and the K - 12 education community.

The standards are divided into four major and separate domains: Digital Literacy and Competence, Computational Thinking, Computer Practice and Programming, and Cyber Security/Safety/ ethics. The standards provide learning content that should be mastered by all students; whether they are college - bound or not. Many follow - up efforts are still needed, however, to sustain the momentum these standards generate. Teacher training, curriculum innovation, teaching resources, and dissemination are but a few of these challenges.

It is recognized that a set of standards is only the first foundational step in meeting our goals. These standards must— and will be — accompanied by curriculum materials, aligned assessments and professional development to ensure that the vision captured in them becomes a reality in every classroom in the UAE.

These standards are not made in a vacuum. We understand the constraints under which schools are operating and the UAE MOE other educational priorities. Thus, we conclude this report with a series of recommendations that are intended to provide support for a long - term evolution of computer science and technology in K - 12 schools.

Document Revision Sheet

Document name: MOE Computer Science and Technology Standards

Release #	Date	Revised by and reason for revision	Approved by	Approval Date
Rev 0	February 2015	Initial Draft is developed based on MoE requirements (Revised by Curriculum Manager)		
Rev 1				
Rev 2				
Rev 3				
Rev 4				
Rev 5				

UAE Schools Computer Science and Technology Standards

1.0 Introduction

This publication is designed to help today's students take advantage of the power of technology. It provides a set of guidelines for schools, describing what students should know and be able to do in order to use technology effectively for learning and be prepared for university/college education. These guidelines represent realistic, attainable activities that link to the content standards of the Ministry of Education (MOE) Frameworks.

All over the world, there has been a vigorous debate about what should be done about information and communication technology (ICT) and computer science in the school curriculum. Most universities want to reverse the decline in applicants for computer science courses/programs. Many Gaming companies want more programmers. The UAE government wants more high - tech start - ups, while Manufacturers want trainees who can design embedded systems. What's missing from all this is a big vision? Instead of educating children about the most revolutionary technology of their young lifetimes, we have focused on training them to use obsolescent software products. The reason we did this because we fell into what is called a "category mistake" - an error in which things of one kind are presented as if they belonged to another. We made the mistake of thinking that learning about computing is like learning to drive a car, and since knowledge of internal combustion technology is not essential for becoming a proficient driver, it followed that an understanding of how computers work was not important for our children. What we forgot was that cars don't run the world, monitor our communications, power our mobile phones, manage our bank accounts, keep our diaries, mediate our social relationships, snoop on our social activities and even - in some countries - count our votes. But networked computers do all of these things, and a lot more besides.

It is time for a dramatic change in ICT and computer science schooling education! The biggest justification for change is not economic but moral. Our children live in a world that is shaped by physics, chemistry, biology and history, and so we - rightly - want them to understand these things. But their world will be also shaped and configured by networked computing and if they don't have a deeper understanding of this stuff then they will effectively be intellectually crippled. They will grow up as passive consumers of closed devices and services, leading lives that are increasingly circumscribed by technologies created by elites working for huge corporations such as Google, Facebook and the like.

So, what is exactly missing in the current curricula? The school children need a set of key concepts that is essential to understand the networked world in which they are growing up. They need to appreciate that computer science field involves a new way of thinking about problem - solving: it's called computational thinking, and it's about understanding the difference between human and artificial intelligence, as well as about thinking recursively, being alert to the need for prevention, detection and protection against risks, using abstraction and decomposition when tackling large tasks, and deploying heuristic reasoning, iteration and search to discover solutions to complex problems.
As such, the key topics include algorithms (the mathematical recipes that make up programs); cryptography (how confidential information is protected on the net); machine intelligence (how services such as YouTube, Google and Amazon predict your preferences); computational biology (how the genetic code works); search (how we find needles in a billion haystacks); recursion (a method where the solution to a problem depends on solutions to smaller instances of the same problem); and heuristics (experience - based techniques for problem - solving, learning, and discovery) are becoming essential ingredients in todays' school curricula.

The UAE Schools Computing Standards and Expectations (UAE - CSE) incorporate the Information and Communication Technology (ICT) Literacy skills developed and based on well - known international standards that includes: (a) Partnership for 21st Century Skills; (b) the National Educational Technology Standards for Students (NETS - S) developed by the International Society for Technology in Education (ISTE); and (c) Computer Science Teacher Association (CSTA) from Association for Computing Machinery (ACM) organization.

The Computer Science and Technology Standards 2015 fall into four broad categories/domains (as shown in Fig 1 below):

1. Digital Literacy and Competence: Demonstrate proficiency in the use of computers and applications, as well as an understanding of the concepts underlying hardware, software, operation, and connectivity, communication, productivity, and collaboration.

2. Computational Thinking: Demonstrate the ability to use technology for research, critical thinking, problem solving, decision making, data representation, creativity, and innovation that is vital in the 21st century. Computational thinking also consists of some very specific problem solving skills such as the ability to think logically, algorithmically and recursively.

3. Computer Practice and Programming: Demonstrate the ability to write computer code for problem solving, accomplish certain tasks, and decision making, and have the opportunity to progress to the next level of excellence in these activities.

4. Cyber Security, Safety, and Ethics: Demonstrate the responsible use of technology and an understanding of ethics and safety issues in using electronic media at home, in school, and in society.
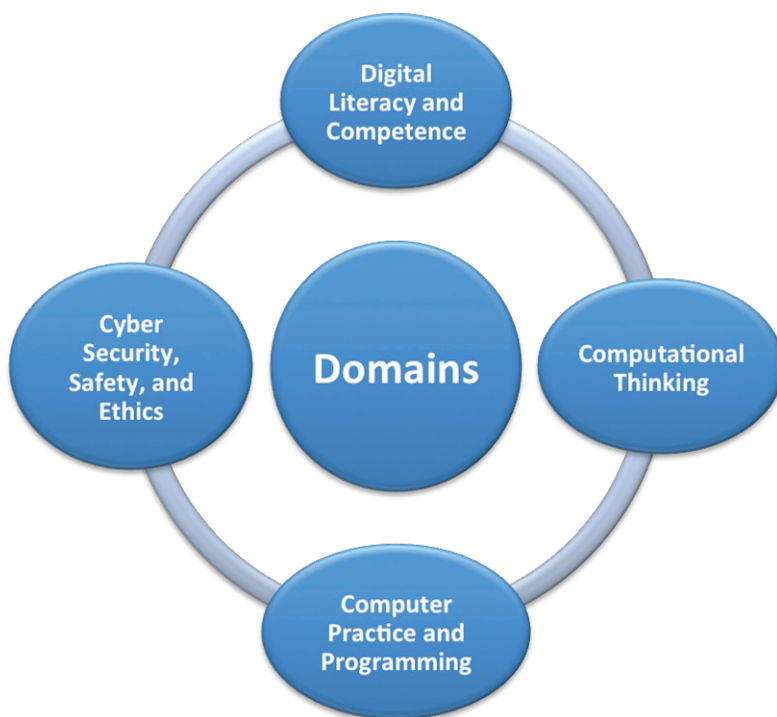

Figure 1: CST Domain Skeleton

2.0 Development of this Document

In October 2008, the UAE MOE published the UAE MOE Recommended ICT Standards to define what UAE MOE K - 12 students should know and be able to do in order to use technology for learning. Since then, continuing technological advances have led to new opportunities, new challenges, and new risks. As a result, the MOE has called for a comprehensive update on the original document to include the knowledge and skills that students are likely to need now and in the future.

Another reason is the rise of the worldwide accepted standards - based teaching. The adoption of Standards in Teaching and Learning contributes significantly to economic development and social well - being in developed and developing countries. Evidence worldwide suggests that system wide educational improvement has been a significant contributing factor to economic development to many countries (e.g., USA, UK, Singapore, Australia, etc.). These countries have developed and implemented clear, coherent, demanding, and publicly disseminated student learning standards that demonstrated consistently high levels of educational performance on international assessments. These findings confirm that implementing rigorous student learning standards leads to high achievement.

During the last quarter of 2014, UAE MOE conducted student and teacher surveys after which MOE reported the number of students who have met the technology standards of 2008 as part of the Collection of Education Data. The results showed that students and teachers felt there is a great gap between advances in the computer science and technology field around the world and current deliverables of the standards developed in 2008.

In October 2014, the UAE MOE Leadership brought together a group of educators from higher education, K - 12 school departments, and educational organizations to help the Ministry review and update the original document. The working group reviewed, compared, and evaluated a number of national and local standards documents in order to ensure that the UAE MOE standards would be as comprehensive as possible. The group first looked at the 2008 UAE MOE standards, which were based on those published in 1998 by the National Educational Technology Standards (NETS) Project[1]. Next the group examined standards from other countries. The group also studied the newly updated standards developed by the Computer Science Teacher Association (CSTA) of ACM organization. A draft of the revised UAE MOE Computing Standards was developed in October 2014.

In February 2015, the Ministry shared the draft of the updated standards with a small number of business representatives from the UAE MOE Technology Leadership Partners inside UAE. In addition, educators across the country had an opportunity to review and comment on the anticipated new standards draft at roundtable discussion meeting in October 2014. Educators also submitted additional comments and suggestions to the Ministry using electronic feedback forms and e - mail. The UAE MOE Curriculum Department has incorporated these recommendations into this current version.

2.1 Relation of this Standards document to Other International Standards

In general, this standards document benefited from various resources and initiatives in this important field around the world. As a general frame of reference for developing these standards, we use the International Society for Technology in Education's Technology Foundation Standards for Students, as well as Computer Science Teacher Association standards document along with the recommendations of the Partnership for 21st Century Skills. We have incorporated the "Refreshed ISTE NETS" and latest CSTA standards into this document as follows:

a. International Society for Technology in Education (ISTE) (formerly known as the NETS) standards, Ministry has incorporated the new NETS standards into the 2015 Standards. The ISTE Standards are the standards for learning, teaching and leading in the digital age and are widely recognized and adopted worldwide. The family of ISTE Standards work together to transform education. The goal of the ISTE - NETS Project is to develop national standards for educational technology. The framework for the Refreshed ISTE NETS includes the following standards:

- Creativity and Innovation
- Communication and Collaboration
- Research and Information Fluency
- Critical Thinking, Problem Solving, and Decision Making
- Digital Citizenship
- Technology Operations

b. Computer Science Teachers Association: The Computer Science Teachers association, working under the auspices of ACM, has been organized to serve as a focal point for addressing several serious issues in K - 12 computer science education. The CSTA goal is to promote the importance of teaching computer science during the K - 12 schooling. CSTA sets forth the computer science knowledge and skills that students must have— at all stages of their learning—to enable them to thrive in this new global information economy. They defined a core set of learning standards designed to provide the foundation for a complete computer science curriculum and its implementation at the K - 12 level. The Organization of the Learning Outcomes was divided into three Levels corresponding to three grade spans and Five Strands as shown in Fig. 2. The five strands are: computational thinking; collaboration; computing practice; computers and communication devices; and community, global, and ethical impacts.

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1 NETS is an initiative of the International Society for Technology in Education (ISTE) and the U.S. Department of Education.
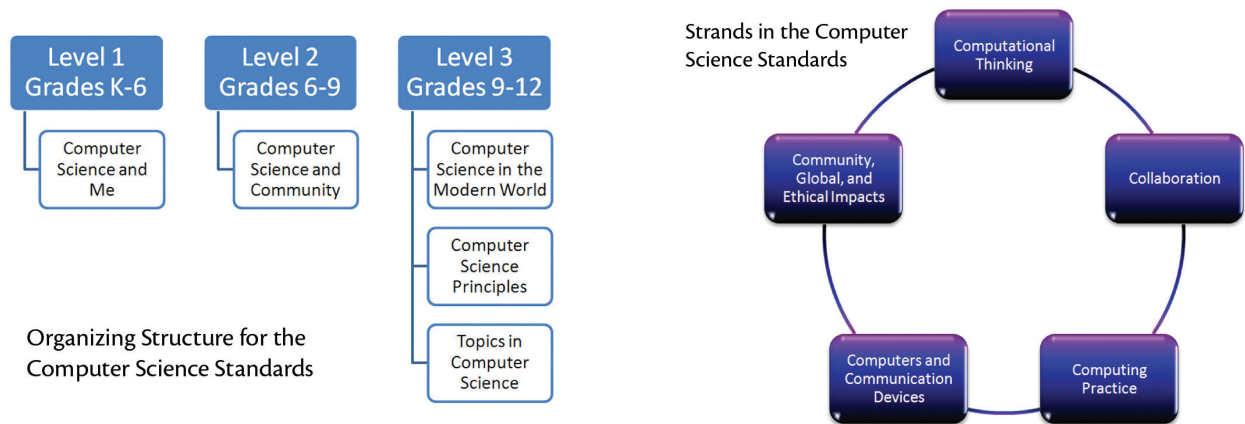
Fig.2 : CSTA standards breakdown

c. 21st Century Skills: The updated version of the UAE MOE K - 12 Technology Literacy Standards also incorporates the recommendations of the Partnership for 21st Century Skills. The Partnership's Framework for 21st Century Learning includes six key elements/standards:
    1. Core subjects as identified by the No Child Left behind Act.
    2. 21st century content that includes global awareness; financial, economic, business and entrepreneurial literacy; civic literacy; and health and wellness awareness.
    3. Learning and thinking skills that include Computational thinking/critical thinking and problem solving, communication skills, creativity and innovation skills, collaboration skills, contextual learning skills, and information and media literacy skills.
    4. Information and communications technology (ICT) literacy, enabling students to learn, think critically, solve problems, use information, communicate, innovate, and collaborate.
    5. Life skills that include leadership, ethics, accountability, personal productivity, personal responsibility, people skills, self - direction, and social responsibility.
    6. 21st century assessments that measure the core subjects, 21st century content, learning and thinking skills, ICT literacy, and life skills. The use of modern technologies in assessment is recommended to "increase efficiency and timeliness."

In this document, the MoE incorporated the all of previously mentioned standards into the four domains of the new UAE Ministry of Education Computer Science and Technology Standards as follows:

UAE K - 12 Computer Science and Technology Standards	Corresponding CSTA Standards	Corresponding ISTE	Corresponding 21st Century Skills
Domain 1	Standards 1 and 3	Standards 1, 2, 3, and 4	Standards 1, 2, 3, and 4
Domain 2	Standards 3, 4, 5, and 6	Standard 6	Standard 3 and 4
Domain 3	Standards 3, 4, 5, and 6	Standard 6	Standard 3 and 6
Domain 4	Standard 2	Standard 5	Standard 2 and 5

In order for this document to be recent and follow the rapidly changing field of computer science and technology, it is advised that this document be revised every five years.

2.2 New Changes in this document

There is a substantial change between this document and the 2008 standards document developed by MOE. The change was made to address new and evolving challenges in the field of computer science and technology. To meet these challenges and achieve the ambitious vision, schools and teachers need clear guidance on the knowledge, skills, and abilities in each content area that will prepare them to respond to changing conditions and societal needs. The K - 12 Computer Science and Technology standards will guide schools toward a more relevant, rigorous, and coherent curriculum for the next generation of Emiratis. More specifically, these standards reflect the following changes and enhancements:

1. There is a stronger balance between procedures (i.e., how to solve problems), concepts (i.e., why the procedures make sense), and applications (i.e.,

when do these procedures and concepts get used).

2. The document splits content areas into major domains and is organized by strands that cross a set of grades and define coherent progressions of computer science and technology understanding that incorporate developmental readiness, identify prerequisite understanding and reduce duplication.
   - There are fewer student learning outcomes (SLOs) for many grades to allow more time to focus in depth on the important computing for that grade especially in higher grades (qualitative vs. Quantitative).
   - The core 10 - 12 program is fully specified, and then supplemented by standards for additional Grade 10, 11 and Grade 12 advanced computer science and technology course offerings.

3. The new standards reflect world - class expectations as the development process drew from the existing UAE ICT 2008 standards, and the K - 12 standards from ISTE, CSTA, and 21st century skills along with associated student Assessment.

4. The new standards focus on fundamental concepts with the following general goals:
   a) The curriculum should prepare students to understand the nature of computer science with its technologies and its place in the modern world.
   b) Students should understand that computer science interweaves concepts and skills.
   c) Students should be able to use computer science skills (especially computational thinking) in their problem - solving activities in other subjects.

It is worth mentioning that in order to accommodate the needs of high school students and teachers better, this publication lists technology skills for all high school years. Teachers should integrate the appropriate and advanced technology skills into their courses to help their students learn those subject areas and/or prepare for future careers.

2.3 Overview of Grade Spans

Although technology opens up exciting avenues for learning, computers should complement, rather than replace successful methods that teachers use to help students develop basic skills and understanding. The Ministry of Education encourages the use of a wide range of tools, both traditional and technological, to help students gain those understandings. For example, although students may become fluent in keyboarding on a computer, they need to continue developing legible handwriting. By the same token, even though students might become highly skilled in electronic research, they should know how to find a book in the library. Throughout their school years, students will grow to regard technology as one of the many tools they can use to help them solve problems and improve their productivity and their capacity to learn as they move through life.

In this publication, specific technology skills are listed collectively for each grade span and then individually for each grade. Although these proficiency expectations are recommended by the Ministry, local school management can make their own decisions about their students' technology proficiency. Local decisions should be based on the accessibility and availability of technology, as well as the developmental readiness of an educational district's students. Overall, the Ministry will work with various schools to provide a minimum unified CST technology curriculum that satisfy a minimum set of schools across all the country.

Currently, UAE adopts the notion of dividing the grade span into three spans, or so called cycles, each consists of number of grades in addition to K grades in a separate cycle. Based on the developmental readiness of the students and age factors, this document groups the technology skills in three grade spans as per Ministry of Education definition (see Fig. 3):

Cycle 1: Grades K - 5
Cycle 2: Grades 6 - 9
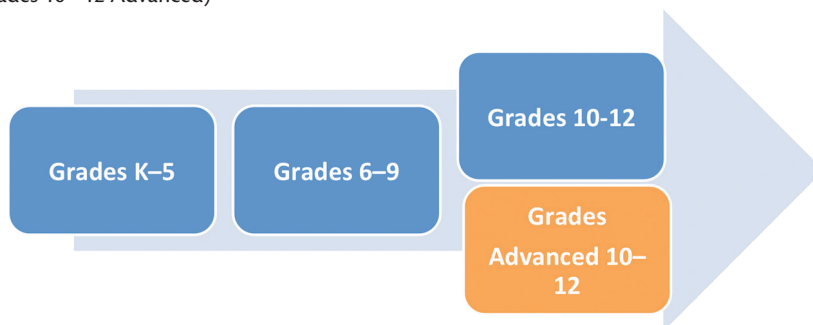Cycle 3: Grades 10 - 12 (Grades 10 - 12 Advanced)

Fig. 3: Grade Span for MoE Schools

The ministry decides also to introduce the notion of advanced program for talented students in the last cycle. In this document we refer to this cycle as Advanced Grades (G10A, G11A, G12A).

2.4 Skills/Knowledge Acquisition

Students can acquire the skills/knowledge enumerated in this document in a variety of ways:
- Everyday classroom activities (gaining technology skills while learning the content of the curriculum).
- Specific course work (e.g., taking a Web design course)
- Independent study (e.g., supporting a specific project)
- An after - school activity (e.g., publishing a school newsletter)
- Peer tutoring (e.g., a high school student coaching a middle school student)
- Work at home (Assuming all homes are equipped with necessary technology tools. In fact, many surveys indicate a much higher presence of computers in the homes of low income and limited English proficient families than many educators presume; such surveys at the classroom and school level can be instructive.)

The teaching of technology literacy skills should not be separate from the curriculum. Integrating the appropriate use of technology into the curriculum should enhance the learning of the content. The examples of certain scenarios on Page 353 are a good demonstration of how a school provides students the technology skills they need, not as a discrete subject, but as "flowing through the curriculum."

In this document, we focus on educational/instructional technology as well as relevant computer science and/or technology/engineering standards.

3.0 General Outcomes and Expectations of Grade Spans

The following summarizes the generic outcomes of the new standards document as per each grade span:

3.1 Grades K through 5

In the early grades, technology should not replace the manipulative, pencil - and - paper, and other manual methods through which children acquire basic skills. The MOE Mathematics Curriculum Framework, for example, stresses the importance of understanding basic arithmetic operations in elementary school. Given this context, the technology literacy standards for the earliest grade span allow the teacher flexibility in deciding when students are ready to use technology. For this reason, the competencies listed for K - 5 are described as exploratory concepts and skills. These are skills that will be introduced and, in some cases, developed in elementary grades and mastered in middle and high school.
By the end of fifth grade, all students should have the opportunity to become familiar with the tools they will be expected to use with proficiency. Through this exposure, they will have gained a positive view of technology as a tool for learning. Students will demonstrate elementary competencies in using tools such as word processing, computer operation, spreadsheet, Web browser, presentation, and graphics applications. Teachers might help them to select the appropriate tool for a task. For example, electronic sources such as multimedia encyclopedias and teacher - previewed Web sites can be used to gather information for a report. Additionally, there are many developmentally appropriate applications for children: interactive books, graphic organizers, and writing assistants, as well as mathematical and scientific tools. Such tools can enhance learning for all children, including those with disabilities; for example, multimedia reading software reinforces literacy skills by providing visual and auditory feedback to early readers. These tools can be integrated appropriately in an effective lesson plan.

3.2 Grades 6 through 9

In this grade span, special emphasis will be given to certain skills and technologies. By the completion of ninth grade, students should:
Demonstrate intermediate competencies in using tools such as word processing, database, spreadsheet, Web browser, presentation, and graphics applications. The students will be familiar enough with the purpose and function of these technologies to enable them to select the appropriate tool for a task.
Be able to identify various components of a computer system and be able to explain basic concepts of networking.
Practice good file management skills and operate peripheral equipment independently.
Understand the legal, ethical, and safety issues concerning the use of e - mail, the Internet, and other online tools.
Understand how to protect their personal identification and information on the Internet and be knowledgeable about general rules for safe Internet practices. In addition, students should develop an awareness of how they present themselves on the Internet.
Have had ample opportunities to become fluent in the use of technology tools for research, problem solving, and communication across all curriculum areas. They should know how to communicate their learning with peers and other audiences through multimedia presentations, desktop - published reports, and other electronic media. They should have learned effective strategies for locating and validating information on the Internet by using multiple Web sites for their research, rather than relying on a single site for information.
Understand the use of computation thinking methods and techniques to solve problems and practice some research.
Have the ability to formulate simple algorithms and write a functional code mainly using block programming techniques.

In summary, when students enter the tenth grade, they should be able to use technology to learn and enhance their understanding of academic subjects and the world around them. Technology should be incorporated into their everyday learning activities, both inside and outside the classroom.

3.3 Grades 10 through 12

Throughout high school, as students take courses to prepare themselves for college and the world of work, they should acquire increasingly sophisticated technology skills. Depending on the pathways and courses they choose to take, high school students will become more proficient with certain technology tools than others. Moreover, as the curriculum demands more complicated learning tasks, students will discover advanced capabilities in previously taught tools and applications. They will also have opportunity to use more specialized technology tools that enhance their learning. These might include simulation software, geographic information systems, computer - aided design software, or any of a wide variety of content - specific tools.
In addition, students should have the opportunity to learn how to write a comprehensive code in a commonly used programming language (e.g. Java) possibly for different platforms (mobile, desktop, server, etc.).
They should also understand the use of computational thinking methods and techniques to solve problems and practice some research. Different types of thinking would be heavily introduced (e.g. scientific, innovative, logical, and algorithmic).
In high school, students will fully realize the legal, ethical, and safety issues concerning the use of all electronic resources. They will become more versed with protecting their personal identification and information and recognize all types of malicious software and rules and regulations governing misuse of online resources.

By the completion of high school, students should have developed an appreciation for the capabilities and capacities of technology, as well as an understanding of how these tools can be used for lifelong learning. In addition, students should be knowledgeable about the role technology plays in various fields of work, enabling them to better plan for their careers in the 21st century.

3.4 Grades 10 through 12 (Advanced)

In the advanced version of high school, students will take same courses as regular high school students but will acquire advanced and sophisticated technology skills and tools to enhance their learning. Depending on the pathways and courses they choose to take, advanced high school students will become more adept with certain technology tools than their typical high school peers. Moreover, as the curriculum demands more complicated learning tasks, students will discover advanced capabilities in tools such as databases, spreadsheet applications, simulation software, geographic information systems, computer - aided design software, or any of a wide variety of content - specific tools.
In addition, students should have the opportunity to learn how to write a more sophisticated code in commonly used programming languages. Advanced high school students will be very productive coders and are able to produce useful applications for different platforms (mobile, desktop, server, etc.).
They should also understand the deep use of computation thinking methods and techniques to solve problems and practice some profound research. Innovative thinking techniques will be reinforced in many project based teaching components.

In high school, students will master legal, ethical, security, and safety issues concerning the use of all electronic resources. They should be able to address various types of malicious software and rules and regulations governing misuse of all technology resources.
By the completion of high school, students should have developed an appreciation for the capabilities and capacities of technology, as well as an understanding of how these tools can be used for lifelong learning. In addition, students should be knowledgeable about the role technology plays in various fields of work, enabling them to better plan for their careers in the 21st century.

4.0 Domains and Generic Outcomes

The 2015 Computer Science and Technology Standards have identified the following major domains and strands as the backbone for the new curriculum and related activities.

Digital Literacy and Competence (DLC)

Students demonstrate a sound understanding of technology concepts, systems, and operations. Students will:
   a) understand and use technology systems.
   b) apply digital tools, media, and environment to gather, evaluate, use, communicate and work collaboratively.
   c) evaluate, select, and use information sources and digital tools based on the appropriateness to specific tasks effectively and productively.
   d) process data and report results.
   e) interact, collaborate, and publish with peers or project teams.
   f) communicate information and ideas effectively using a variety of media and formats.
   g) troubleshoot systems and applications.
   h) transfer current knowledge to learning of new technologies.

Critical thinking (CT)

Students use critical thinking skills to plan and conduct research, manage projects, solve problems, and make informed decisions using appropriate digital tools and resources. Students will:
   a) identify and define authentic problems and significant questions for investigation.
   b) plan and manage activities to develop a solution or complete a project.
   c) collect and analyze data to identify solutions and/or make informed decisions.
   d) use multiple processes and diverse perspectives to explore alternative solutions.
   e) apply existing knowledge to generate new ideas, products, or processes.
   f) identify trends and forecast possibilities.
   g) demonstrate creative thinking, construct knowledge, and develop innovative products.
   h) use predefined methods to divide a complex problem into simpler parts.
   i) explain how sequence, selection, iteration, and recursion are building blocks of algorithms.
   j) discuss the value of abstraction to manage problem complexity.

Computer Practice and Programming (CPP)

Students understand, analyze, write, test, and document computer programs that model behavior and theories. Students will:
   a) describe a software development process used to solve problems (e.g., design, coding, testing, verification).
   b) use appropriate software tools and libraries to help solve algorithmic and computational problems.
   c) understand the broad array of programming languages and tools across other fields and disciplines.
   d) design, develop, publish, and present products (e.g., webpages, mobile applications, animations) using technology resources.
   e) demonstrate an understanding of algorithms and their practical application.
   f) implement problem solutions using a programming language, including: looping behavior, conditional statements, logic, expressions, variables, and functions.
   g) collect and analyze data that is output from multiple runs of a computer program.

Cyber Security, Safety, and Ethics (CCC)

Students understand human, cultural, and societal issues related to technology and practice legal and ethical behavior. Students will:
   a) advocate and practice safe, legal, and responsible use of information and technology.
   b) exhibit a positive attitude toward using technology that supports collaboration, learning, and productivity.
   c) demonstrate personal responsibility for lifelong learning.
   d) exhibit leadership for digital citizenship.
   e) locate, organize, analyze, evaluate, synthesize, and ethically use information from a variety of sources and media.
   f) develop cultural understanding and global awareness by engaging with learners of other cultures.
   g) demonstrate good practices in personal information security, using passwords, encryption, and secure transactions.

5.0 Standards Development Methodology

The process by which these standards were developed began with agreement that high - quality teaching and learning standards systematically organize content in a given subject area—in this case, Computer Science and Technology—into domains and strands, and then into standards and SLOs that specify, on a grade - by - grade basis, exactly what specific Mathematics should be taught and learned. The table below (Table 1) shows the K - 12 domains and the grade band strands within which grade level standards and SLOs were developed. The four domains were further broken down into several strands that span across all grades as shown below:

Table 1: Computer Science and Technology Domains and Associated strands

DLC	CT	CPP	CCC
1. Computer Operation 2. Productivity Tools 3. Internet surfing and information retrieval 4. Collaboration tools 5. Computer Networking.	1. Algorithmic thinking 2. Evaluation 3. Decomposition 4. Abstraction 5. Generalization	1. Programming Evolution 2. Human Computer Interaction (HCI) 3. Data Representation 4. Coding 5. Testing and Validation 6. Documentation and Deployment	1. Responsible Use & Cyber - Security 2. Impacts of Technology 3. Information accuracy & reliability 4. Cyber Ethics & Laws 5. Cyber Safety

The development of the document followed the below structure and as depicted in the hierarchical figure shown below (See Fig. 3).

Subject is the curriculum area of interest and the first level of analysis in the structure of standards.
Domains are the major elements of a subject. In the UAE, CST has four domains (see Table 1). Domains run through the entire K - 12 system.
Strands are the key topics that domains consist of. All of the strands for each domain are shown in Table 1. In CST, strands cover a number of grades but rarely run through the entire K - 12 system.
Standards are the broad target objectives within each strand and are grade specific.
Student learning outcomes (SLOs) are the lowest level of analysis in the structure of standards. SLOs are the grade - specific expected learning outcomes, which may take one to three classes to achieve. These are what teachers should target their instruction toward. Lesson plans should be aligned with SLOs—as should all instructional resources—and test items. The SLOs provided here may need further fine tuning when used for lesson planning, materials design, and other pedagogical activities.
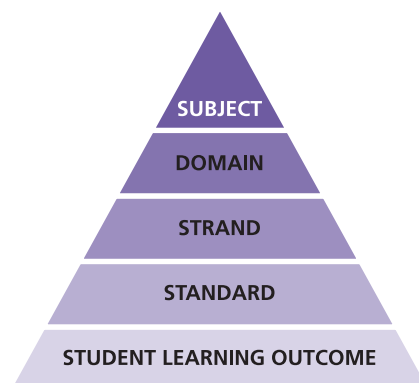
Fig. 3: Standards Development Hierarchy

The below figure (Fig. 4) lists key content areas per domain:

DLC	CT	CPP	CCC
Computer Organization	Solving Logical Problems	Programming Languages	Responsible Use & Cyber - Security
Operating System	Algorithm Components	Human Computer Interface	Impacts of Technology
Keuboarding	Algorithm Thinking	Coding	Information Accuracy & Reliability
Software Application	Abstraction	Block Based Programming	Cyber Ethics & Laws
Computer Networking	Sorting and Simulation	Puzzles/Games	Digital Safety
Internet	Modeling and Indertion	Platforms	
Searching	Decomposition	Mobile Applications	
	Algorithm Evaluation	Testing Code	
	Generalization	Documentation	
	Computational Thinking Applications	Data Representation	
	Functional Correctness		

Fig. 4: Breakdown of Topics Per Domain

The major part of this document will list all expected student learning outcomes (SLOs) per domain per cycle.
The below table (Table 2) summarizes the quantitative analysis of the SLOs for all grades/cycles per domain and their associated percentages:

Table 2: Distribution of SLOs over all domains per grade

Grade	No. of outcomes					Outcomes Percentages			
	DLC	CT	CPP	CCC	Sum	DLC	CT	CPP	CCC
KG1	7	6	3	2	18	38.9%	33.3%	16.7%	11.1%
KG2	7	5	3	2	17	41.2%	29.4%	17.6%	11.8%
G1	12	4	4	4	24	50.0%	16.7%	16.7%	16.7%
G2	8	6	3	5	22	36.4%	27.3%	13.6%	22.7%
G3	12	6	5	8	31	38.7%	19.4%	16.1%	25.8%
G4	12	6	7	8	33	36.4%	18.2%	21.2%	24.2%
G5	20	6	7	9	42	47.6%	14.3%	16.7%	21.4%
Cycle 1	78	39	32	38	187	41.7%	20.9%	17.1%	20.3%
G6	13	12	9	9	43	30.2%	27.9%	20.9%	20.9%
G7	7	13	9	8	37	18.9%	35.1%	24.3%	21.6%
G8	7	15	12	7	41	17.1%	36.6%	29.3%	17.1%
G9	10	12	10	8	40	25.0%	30.0%	25.0%	20.0%
Cycle 2	37	51	40	32	160	23.1%	31.9%	25.0%	20.0%
G10	8	13	20	16	57	14.0%	22.8%	35.1%	28.1%
G11	8	15	14	14	51	15.7%	29.4%	27.5%	27.5%
G12	7	13	12	6	38	18.4%	34.2%	31.6%	15.8%
Cycle 3	23	41	46	36	146	15.8%	28.1%	31.5%	24.7%
G10 A	8	14	20	16	58	13.8%	24.1%	34.5%	27.6%
G11 A	9	15	14	14	52	17.3%	28.8%	26.9%	26.9%
G12 A	8	13	12	6	39	20.5%	33.3%	30.8%	15.4%
Cycle 3 A	25	42	46	36	149	16.8%	28.2%	30.9%	24.2%

Domain Distribution:

Cycle 1

DLC — 62%
CT — 16%
CPP — 7%
CCC — 16%

● DLC   ● CT   ● CPP   ● CCC

Cycle 2

DLC — 41%
CT — 17%
CPP — 26%
CCC — 16%

● DLC   ● CT   ● CPP   ● CCC

Cycle 3

DLC — 15%
CT — 25%
CPP — 45%
CCC — 15%

● DLC   ● CT   ● CPP   ● CCC

Cycle 3A

DLC — 15%
CT — 35%
CPP — 35%
CCC — 15%

● DLC   ● CT   ● CPP   ● CCC
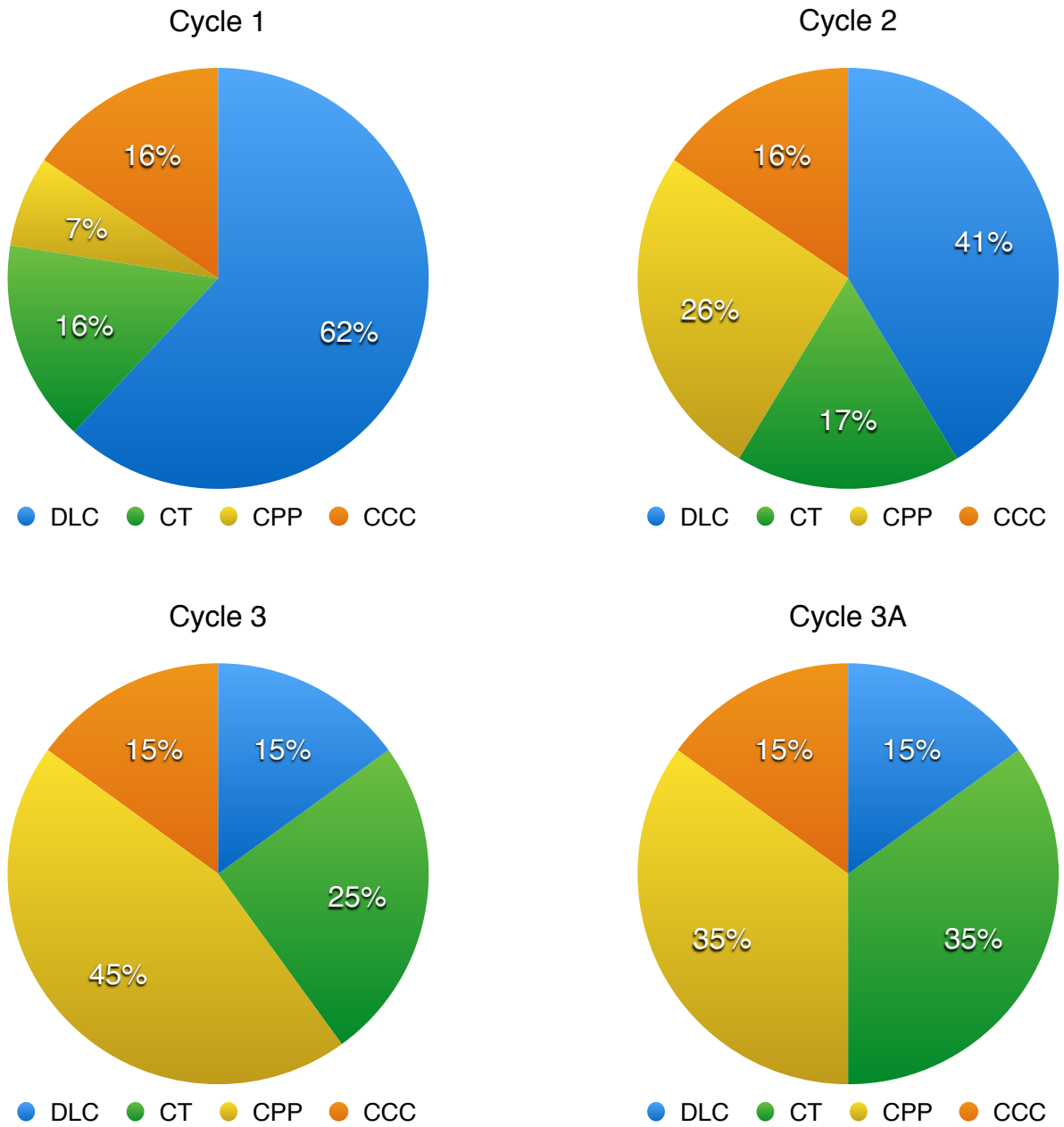
Fig. 5 Domain Coverage Distribution Per Cycle

6.0 Guidelines for Teachers

In this section, we present general guidelines for teachers who are going to implement the essence of this standards document. To streamline the presentation, the guidelines will be presented in four general categories:

6.1 Knowledge of core content

The teachers will demonstrate the following knowledge that model important principles and concepts:
 a) Demonstrate knowledge of and proficiency in data representation and abstraction through the use of primitive data types, static and dynamic data structures, various types (text, images, sound, etc.) over various locations (local, server, cloud), etc
 b) Effectively design, develop, and test algorithms to problems in different contexts (textual, numeric, graphic, etc.) using advanced data structures
 c) Using a modern, high - level programming language, construct correctly functioning programs involving simple and structured data types; sequential, conditional, and iterative control structures
 d) Demonstrate knowledge of two or more programming paradigms over two or more development environments, models, and project management strategies
 e) Demonstrate knowledge of digital devices, systems, and networks
 f) Demonstrate an understanding of operating systems and networking in a structured computer system including the operation of computer networks and mobile computing devices
 g) Demonstrate an understanding of the social, ethical, and legal issues and impacts of computing
 h) Analyze the contributions of computer science to current and future innovations in sciences, humanities, the arts, and commerce

6.2 Teaching and learning strategies

The teachers should use effective content pedagogical strategies that make the discipline comprehensible to students.
 a) Plan and teach lessons/units using effective and engaging practices and methodologies, e.g., using a variety of real - world computing problems and project - based methodologies that support active and authentic learning and provide opportunities for creative and innovative thinking and problem solving
 b) Demonstrate the use of a variety of collaborative groupings in lesson plans/units and assessments by designing activities that require students to effectively describe computing artifacts and communicate results using multiple forms of media
 c) Develop lessons and methods that engage and empower learners from different backgrounds
 d) Design and implement developmentally appropriate learning opportunities supporting the diverse needs of all learners
 e) Create and implement multiple forms of assessment and use resulting data to capture student learning, provide remediation, and shape classroom instruction

6.3 Learning Environments and Resources

Teachers should apply knowledge of learning environments by creating and maintaining safe, ethical, supportive, fair, and effective learning environments for all students. In particular, teachers should:
 a) design environments that promote effective teaching and learning in classrooms and online learning environments and promote digital citizenship
 b) promote and model the safe and effective use of computer hardware, software, peripherals, and networks
 c) plan for equitable and accessible classroom, lab, and online environments that support effective and engaging learning

6.4 Professional knowledge and Skills

The teachers should apply knowledge and skills in their field and acquire further knowledge and skills by:
 a) participate in, promote, and model ongoing professional development and life - long learning relative to computer science and technology education
 b) identify and participate in professional computer science and technology education societies, organizations, and groups that provide professional growth opportunities and resources
 c) demonstrate knowledge of evolving social and research issues relating to computer science and technology education

7.0 Scope - and - Sequence — Domains, Strands and Standards by Cycle

The following sections provide a narrative holistic summary of the key aspects of the four domains, strands, and standards for each grade along with performance criteria.

Collaboration

Productivity

Operation

Communication

Internet
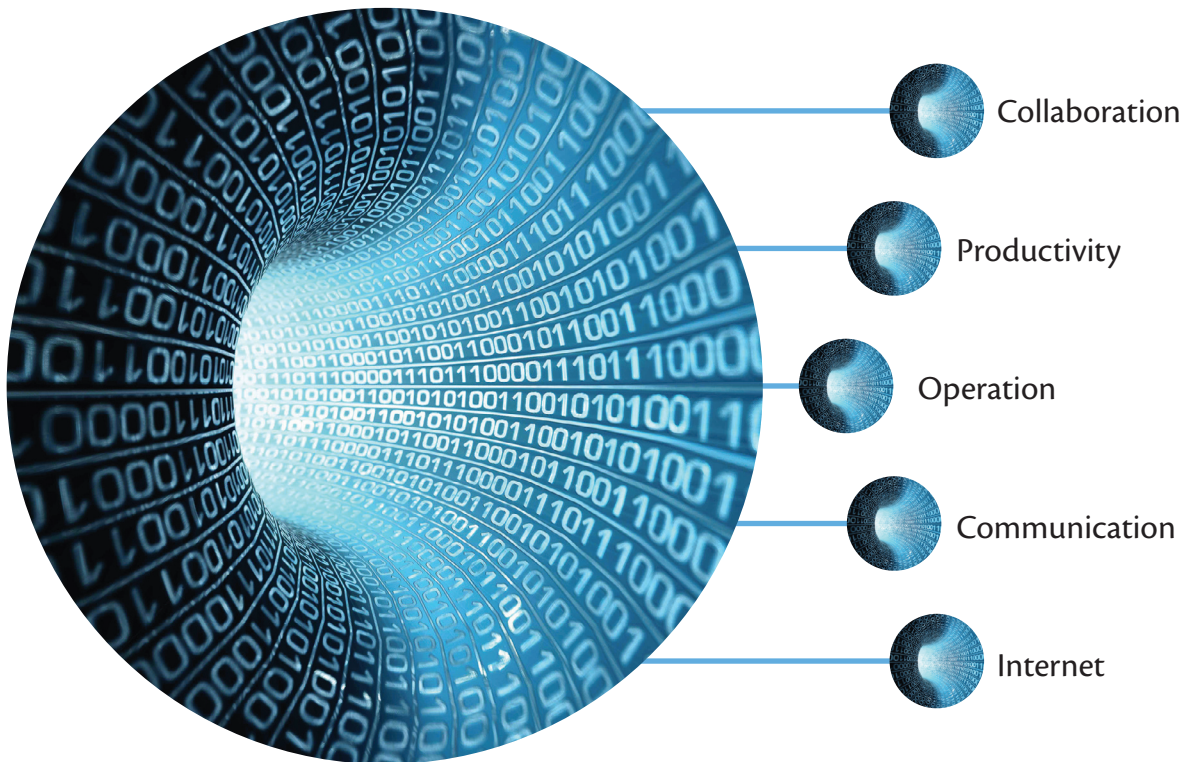
Digital Literacy and Competence (DLC)

Domain 1: Digital literacy and Competence (DLC)

Definition

Digital Literacy is the ability to use information and communication technologies to find, evaluate, create, and communicate information, requiring both cognitive and technical skills.

There are eight essential elements of digital literacy. These elements are cultural, cognitive, constructive, communicative, confidence, creative, critical and civic. The cultural element requires the ability to use technology in different contexts. Whereas, the cognitive component enables mastery of technological tools, software, and platforms. Also, one of the most important elements of digital literacy is the ability to reuse, remix existing resources to create and share new data digitally with others depending on emerging needs, while using different communication devices with proficiency to communicate.

Gaining competence with digital technologies will create confidence and suitable environment to support self - learning. Students/learners will be part of online communities where they can share knowledge and content. Furthermore, It is providing a place for creativity where learners become able to create new products using their searching and constructing skills. and use their critical skills to develop various perspectives and take different circumstances into account.

The strands to be covered are:

- Computer Operation
- Productivity Tools
- Internet Surfing and Information Retrieval
- Collaboration Tools
- Computer Networking

Generic Outcomes

KG - G5 (cycle 1)

At the end of cycle one, the students will be able to identify the basic components of a personal computer. They will safely and correctly perform basic operations involving a personal computer. They will launch and use specified software to create and edit word document, presentation and spreadsheet and introduce basic keyboarding skills.

G6 - G9 (cycle 2)

At the end of cycle two, the students will be able to explain the computer organization and compare computer performances; They will Create animated stories using multimedia tools. They will perform effective search methods on the web. They will practice collaboration activities using age appropriate tools and sites and Exhibit abilities in technical writing and enhanced computer skills.

G10 - G12 (cycle 3)

At the end of cycle three, the students will be able to explain different hardware, functions, software and utilities of network systems. They will be able to select the most effective tools to collaborate successfully with peers. They will produce different multimedia products using different types of tools like animation tools, web authoring tools and video and audio editing tools.

G10 - G12 (cycle 3 advanced)

At the end of cycle three (advanced), the students will be able to interact, collaborate, and publish with peers or project teams, communicate information and ideas effectively using a variety of media and formats, troubleshoot systems and applications, transfer current knowledge to learning of new technologies.

Strands Description and Technical Keywords

	Strand Title	Strand Description	Key words
1	Computer Operation	In this strand, students will develop their Knowledge, skills and behaviors to utilize computers and related technology efficiently. They will use a range of skills covering different levels from basic to advance on how computers work and operate. They will be able to solve common hardware and software problems.	Computer hardware - computer software - computer uses - Computer organization - Input and output devices - Storage devices - operating systems.
2	Productivity Tools	In this strand, students will understand and use different productivity tools. During K - 9 students will explore and use the most common productivity software application used in business, education and home. They will learn how to create word processing documents, spreadsheets, databases and multimedia products. At Secondary level, they will understand advance concepts and technology of different media. They will be able to select appropriate application to develop storyboard, animation, website, video and audio projects to solve a real problem and communicate the wider community.	Microsoft Paint - Microsoft Word - Microsoft PowerPoint - Microsoft Excel - Publisher - Photoshop - Microsoft Database - Adobe Flash - Dreamweaver - Sony Vegas
3	Internet Surfing and Information Retrieval	In this strand, students will know how to connect to the Inernet, browse different websites and customize browsers. They will be able to control their privacy and security while serving the net. They will be introduced to different search options and strategies to find appropriate information to suit the requested task. They will be able to make informed choices of search sites, search tools, precise keywords that yield the best results and reliable resources.	Internet Components - different types of Internet connections - search engine
4	Collaboration Tools	In this strand, students will examine new technologies, devices, online tools and strategies to communicate effectively over a network. They will use Inernet and online resources to collaboratively select and interact together while working on school tasks or projects.	Mobile apps - groupware - interactive website - video conference - Bulletin boards - discussion forums - web conferencing - wiki - blog - version control - online web tools - IDEs
5	Computer Networking	From secondary level, students will start to examine networking concepts in more depth. They will develop their knowledge and practical application skills in networking. They will focus on hardware and software components and use them to connect and manage networks while understanding security network issues. They also, study how networks affected individual life, organization systems and Teams' collaborative works.	Network Devices - Network service - Inernet protocols - network cables - Networks operating systems

Strands Distribution Per Grade

Grade Domains	KG	1	2	3	4	5	6	7	8	9	10	10A	11	11A	12	12A
Digital literacy and competence	Computer Operation															
	Productivity Tools															
	Internet Surfing and Information Retrieval															
					Collaboration Tools											
										Computer Networking						

Table 3: DLC Domain Strands Distribution across all grades

Student Learning Outcomes distribution Per Grade

Domains	Strand	Cycle 1								Cycle 2					Cycle 3				Cycle 3A			
		KG1	KG2	G1	G2	G3	G4	G5		G6	G7	G8	G9		G10	G11	G12		G10A	G11A	G12A	
Digital literacy and competence	Computer Operation	4	4	8	4	5	4	6	35	2	2	1	1	6	0	0	0	0	0	0	0	0
	Productivity Tools	1	1	2	2	3	5	7	21	5	3	3	5	15	2	2	2	6	2	3	2	7
	Internet Surfing and Information Retrieval	2	2	2	3	4	3	3	19	3	2	2	3	10	0	0	0	0	0	0	0	0
	Collaboration Tools	0	0	0	0	0	0	4	4	3	2	1	1	7	3	3	2	8	3	3	2	8
	computer networking	0	0	0	0	0	0	0	0	0	0	0	0	0	3	3	3	9	3	3	4	10
Total									79					38				23				25

Table 4: Quantitative Analysis of DLC domain SLOs per Grade
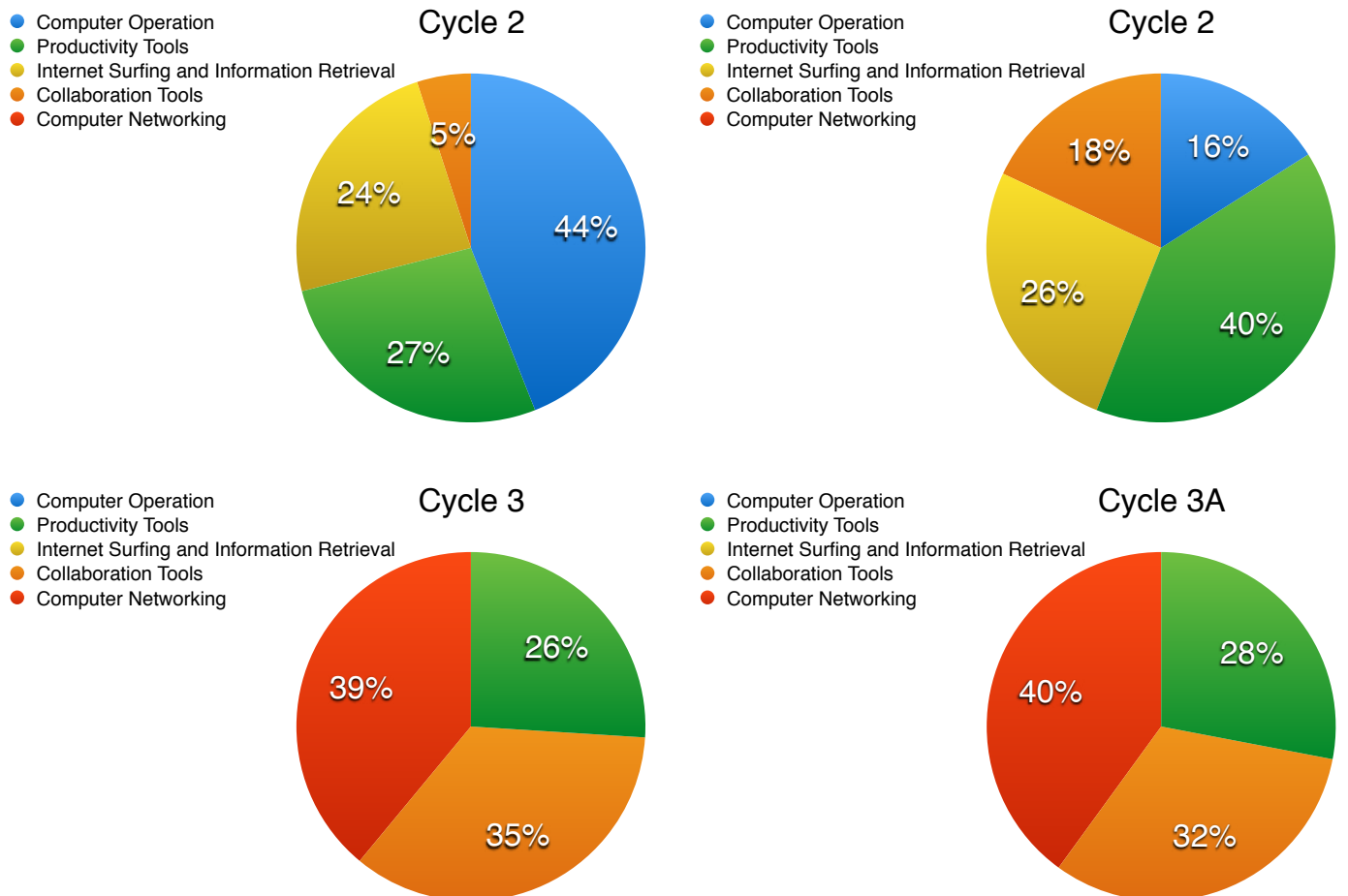
Fig. 4: DLC Domain Strand Distribution Per Cycle

Percentage of outcomes as per level of difficulty and percentage wise

Grade	No of outcomes				Outcomes Percentage		
	Difficulty Level				Difficulty Level		
	1	2	3	Sum	1	2	3
KG1	3	4	0	7	43%	57%	0%
KG2	2	4	1	7	29%	57%	14%
G1	6	6	0	12	50%	50%	0%
G2	5	3	0	8	63%	38%	0%
G3	4	8	0	12	33%	67%	0%
G4	2	10	0	12	17%	83%	0%
G5	9	10	1	20	45%	50%	5%
Cycle 1	**32**	**47**	**5**	**78**	**41%**	**60%**	**6%**
G6	5	6	2	13	38%	46%	15%
G7	1	3	3	7	14%	43%	43%
G8	0	5	2	7	0%	71%	29%
G9	0	8	2	10	0%	80%	20%
Cycle 2	**6**	**22**	**9**	**37**	**16%**	**59%**	**24%**
G10	5	1	2	8	63%	13%	25%
G11	3	2	3	8	38%	25%	38%
G12	2	3	2	7	29%	43%	29%
Cycle 3	**10**	**6**	**7**	**23**	**43%**	**26%**	**30%**
G10A	3	2	3	8	38%	25%	38%
G11A	2	2	5	9	22%	22%	56%
G12A	2	3	3	8	25%	38%	38%
Cycle 3A	**7**	**7**	**11**	**25**	**28%**	**28%**	**44%**

Allocated Periods distribution per cycle

	Number of Periods				
DLC	C 1	C2	C3	C3A	Total
	18.6	12.4	9.3	14	54.3

Strands Evolution Per Grade

Domain	Strand	Grade 1	Grade 2	Grade 3	Grade 4	Grade 5
Digital literacy and competence	Computer Operation	• Understand the pervasiveness of computers and computing in daily life • Develop understanding of major windows desktop components • Expand student's typing ability and promote the correct keyboarding position	• Identify the function of computer hardware components • Utilize basic OS user interface elements • Expand student's typing ability and promote the correct keyboarding position	• Identify types of computers, how they process information and how individual computers interact with other computing systems and device • Utilize Intermediate OS user interface elements • Expand student's typing ability and promote the correct keyboarding position	• Identify the function of computer hardware components • Manipulate and control the windows desktop files and disks • Expand student's typing ability and promote the correct keyboarding position	• Identify the function of computer hardware components • Use various operating system features • Expand student's typing ability and promote the correct keyboarding position
	Productivity Tools	• Demonstrate the ability to use tools in drawing programs to communicate and exchange ideas	• Demonstrate the ability to use tools in drawing programs to communicate and exchange ideas	• Demonstrate the ability to use tools in word processing programs to communicate and exchange ideas • Use a presentation tools to communicate and exchange ideas	• Demonstrate the ability to use tools in word processing programs to communicate and exchange ideas • Use a presentation tools to communicate and exchange ideas • Use a media tools to communicate among classes or groups within a class	• Demonstrate the ability to use tools in word processing programs to communicate and exchange ideas • Use a presentation tools to communicate among classes or groups within a class • Demonstrate the ability to use tools in spreadsheet programs to communicate and exchange ideas
	Internet Surfing and Information Retrieval	• Access and use the World Wide Web to browse a specific website	• Access and use the World Wide Web to browse a website	• Student should be able to use various web browser features • Use the search engine to locate information • Use the search engine to locate information	• Student should be able to use various web browser features • Use technologies to locate, collect and organize information	• Understanding the meaning of network and their features. • Perform basic searches to locate information, using techniques to refine and limit such searches
	Collaboration Tools					• Communicate with other using appropriate technology including email. • Communicate and collaborate with others using social network

Domain	Strand	Grade 6	Grade 7	Grade 8	Grade 9
Digital literacy and competence	Computer Operation	• Use different features of computer operating system	• Apply strategies for identifying simple hardware and software problems that may occur during use	• Apply strategies for identifying and solving routine hardware problems that occur during everyday computer use	• Apply strategies for identifying and solving routine hardware problems that occur during everyday computer use
	Productivity Tools	• Select appropriate software to develop a multimedia presentation for a specific audience • Demonstrate the ability to use tools in word processing programs to communicate and exchange ideas • Design spreadsheet for given task and use it to make predictions	• Design spreadsheet for given task and use it to make predictions.	• Demonstrate the ability to use desktop publishing tools in to communicate and exchange ideas. • Compose digital artwork to achieve effective communication using graphics tools	• Compose digital artworks to achieve effective communication • Select and implement appropriate procedure and tools to access, organize and present information
	Internet Surfing and Information Retrieval	• Use technology tools for effective searching and processing of data and information from a range of sources	• Apply specific criteria to evaluate information from a range of sources	• Apply specific criteria to evaluate information from a range of sources	• Apply specific criteria to evaluate information from a range of sources
	Collaboration Tools	• Apply productivity / multimedia tools and peripherals to group collaboration and support learning throughout the curriculum	• Collaboratively design, develop, publish and present products using technology resources that demonstrate and communicate curriculum concept	• Collaboratively design, develop, publish and present products using technology resources that demonstrate and communicate curriculum concept	• Collaboratively design, develop, publish and present products using technology resources that demonstrate and communicate curriculum concept

Domain	Strand	Grade 10	Grade 11	Grade 12
Digital literacy and competence	Productivity Tools	• Produce different types of multimedia projects using a variety of applications to communicate the wider community	• Produce different types of multimedia projects using a variety of applications to communicate the wider community	• Produce different types of multimedia projects using a variety of applications to communicate the wider community
	Internet Surfing and Information Retrieval	• Plan and implement a collaborative project using effective communication tools	• Plan and implement a collaborative project using effective communication tools	• Plan and implement a collaborative project using effective communication tools
	Computer Networking	• Demonstrate understanding of key components and functions of computer networks	• Describe types of networks,topologies, access methods and network models	• Describe key services and protocols of local and wide area network technologies.

Integration between DLC domain and other domains

DLC	CCC	CT	CPP
Computer Operation	• Responsible Use & Cyber - Security • Impacts of Technology • Digital Safety	• Generalization	• Programming Evolution
Productivity Tools	• Responsible Use & Cyber - Security • Impacts of Technology • Digital Safety • Cyber Ethics & Laws	• Decomposition • Abstraction • Evaluation	• Deployment and Documentation
Internet Surfing and Information Retrieval	• Responsible Use & Cyber - Security • Digital Safety • Cyber Ethics & Laws • Information accuracy & reliability	• Evaluation • Decomposition • Abstraction	
Collaboration Tools	• Responsible Use & Cyber - Security • Impacts of Technology • Information accuracy & reliability • Cyber Ethics & Laws • Digital Safety	• Generalization	• Data Representation
Computer Networking	• Cyber Ethics & Laws • Responsible Use & Cyber - Security • Digital Safety	• Evaluation	

Scope and Sequence
Domains, Strands and Standards by Grade

Grade: KG1					
Domain	Strand	Standards	Learning outcomes	Integration	Level
1. Digital literacy and competence	(1.1) Computer Operation	(1.1.1) Describe the importance of computers and identify the main parts of a computer system	(KG1.1.1.1.1) Describe the importance of computers in today's world		1
			(KG1.1.1.1.2) List the main parts of a computer		1
		(1.1.2) Develop understanding of major windows desktop components	(KG1.1.1.2.1) Demonstrate starting, and shutting down a computer		2
			(KG1.1.1.2.2) Use the desktop icons to open a program		2
	(1.2) Productivity Tools	(1.2.1) Demonstrate the ability to use tools in drawing programs to communicate and exchange ideas	(KG1.1.2.1.1) Draw simple shapes using appropriate tools or software		2
	(1.3) Internet Surfing and Information Retrieval	(1.3.1) Access and use the World Wide Web to browse a specific website	(KG1.1.3.1.1) Define Internet		1
			(KG1.1.3.1.2) Browse a web site		2

Grade: KG2					
Domain	Strand	Standards	Learning outcomes	Integration	Level
1. Digital literacy and competence	(1.1) Computer Operation	(1.1.1) Describe the importance of computers and identify the main parts of a computer system	(KG2.1.1.1.1) Describe the importance of computers in today's world		1
			(KG2.1.1.1.2) Identify the main parts of a computer		3
		(1.1.2) Develop understanding of major windows desktop components	(KG2.1.1.2.1) Demonstrate rebooting, Log on and log out procedure		2
			(KG2.1.1.2.2) Use the desktop icons to open an application		2
	(1.2) Productivity Tools	(1.2.1) Demonstrate the ability to use tools in drawing programs to communicate and exchange ideas	(KG2.1.2.1.1) Draw simple shapes using appropriate tools or software		2
	(1.3) Internet Surfing and Information Retrieval	(1.3.1) Access and use the World Wide Web to browse a specific website.	(KG2.1.3.1.1) Define Internet		1
			(KG2.1.3.1.2) Browse a web site		2

Grade: 1					
Domain	Strand	Standards	Learning outcomes	Integration	Level
	(1.1) Computer Operation	(1.1.2) Develop understanding of major windows desktop components	(G1.1.1.2.1) Demonstrate starting, rebooting, and shutting down a computer		2
			(G1.1.1.2.2) Identify elements of windows desktop		1
			(G1.1.1.2.3) Manipulate windows using basic functions		2
		(1.1.3) Understand the pervasiveness of computers and computing in daily life	(G1.1.1.3.1) Describe the importance of computers in today's world		1
			(G1.1.1.3.2) Identify the main parts of a computer		1
			(G1.1.1.3.3) List different type of computer based on size, use and application		1
		(1.1.4) Expand student's typing ability and promote the correct keyboarding position	(G1.1.1.4.1) Classify types of basic keys on the keyboard		1
			(G1.1.1.4.2) Apply basic keyboarding techniques		2
	(1.2) Productivity Tools	(1.2.1) Demonstrate the ability to use tools in drawing programs to communicate and exchange ideas	(G1.1.2.1.1) Draw a picture using different tools or software		2
			(G1.1.2.1.2) Manipulate text using basic formatting tools		2
	(1.3) Internet Surfing and Information Retrieval	(1.3.1) Access and use the World Wide Web to browse a specific website	(G1.1.3.1.1) Define Internet.		1
			(G1.1.3.1.2) Open specific web site		2

Grade: 2					
Domain	Strand	Standards	Learning outcomes	Integration	Level
	(1.1) Computer Operation	(1.1.4) Expand student's typing ability and promote the correct keyboarding position	(G2.1.1.4.1) Classify types of advance keys on the keyboard		1
			(G2.1.1.4.2) Apply intermediate keyboarding techniques		2
		(1.1.5) Identify the function of computer hardware components	(G2.1.1.5.1) Identify the input and output devices		1
		(1.1.6) Utilize basic OS user interface elements	(G2.1.1.6.1) Use the OS start menu and taskbar		2
	(1.2) Productivity Tools	(1.2.1) Demonstrate the ability to use tools in drawing programs to communicate and exchange ideas	(G2.1.2.1.1) Identify the menus in paint software		1
			(G2.1.2.1.2) Draw a picture Using advance d tools		2
	(1.3) Internet Surfing and Information Retrieval	(1.3.1) Access and use the World Wide Web to browse a website	(G2.1.3.1.1) List components required for an Internet connection		1
			(G2.1.3.1.2) Identify the purpose of a browser in accessing information on the World Wide Web		1
			(G2.1.3.1.3) Navigate different web site using basic functions		2

Grade: 3					
Domain	Strand	Standards	Learning outcomes	Integration	Level
1. Digital literacy and competence	(1.1) Computer Operation	(1.1.4) Expand student's typing ability and promote the correct keyboarding position	(G3.1.1.4.1) Students keyboard using correct hand, movement, arm, and body position		2
			(G3.1.1.4.2) Promote accuracy and speed of typing		2
		(1.1.7) Utilize Intermediate OS user interface elements	(G3.1.1.7.1) Manipulate desktop folders and icons		2
		(1.1.8) Identify types of computers, how they process information and how individual computers interact with other computing systems and device	(G3.1.1.8.1) Identify main processing components of a computer		1
			(G3.1.1.8.2) Describe the flow of information between storage devices to the microprocessor and RAM in relation to everyday computer operations		1
	(1.2) Productivity Tools	(1.2.1) Demonstrate the ability to use tools in word processing programs to communicate and exchange ideas	(G3.1.2.1.1) Create a new word processing document		2
			(G3.1.2.1.2) Use menu, tool bar functions in a word processing program		2
		(1.2.5) Use a presentation tools to communicate and exchange ideas	(G3.1.2.5.1) Create a simple presentation		2
	(1.3) Internet Surfing and Information Retrieval	(1.3.2) Student should be able to use various web browser features	(G3.1.3.2.1) Identify terminology related to the Internet		1
			(G3.1.3.2.2) Navigate different web site using intermediate functions		2
		(1.3.3) Use the search engine to locate information	(G3.1.3.3.1) Define search engines		1
			(G3.1.3.3.2) Find specific information on a web site		2

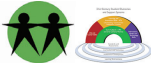| Grade: 4					
Domain	Strand	Standards	Learning outcomes	Integration	Level
	(1.1) Computer Operation	(1.1.4) Expand student's typing ability and promote the correct keyboarding position	(G4.1.1.4.1) Students keyboard using correct hand, movement, arm, and body position		2
			(G4.1.1.4.2) Promote Accuracy and speed of typing		2
		(1.1.5) Identify the function of computer hardware components	(G4.1.1.5.1) Identify the types of storage devices		1
		(1.1.9) Manipulate and control the windows desktop files and disks	(G4.1.1.9.1) Mange files using the windows explorer / file manager		2
	(1.2) Productivity Tools	(1.2.5) Use a presentation tools to communicate and exchange ideas	(G4.1.2.5.1) Identify effective design principles for a simple presentation		1
			(G4.1.2.5.2) Manage Slides.		2
		(1.2.4) Use a media tools to communicate among classes or groups within a class	(G4.1.2.4.1) Create a simple movie		2
		(1.2.8) Demonstrate the ability to use tools in word processing programs to communicate and exchange ideas	(G4.1.2.8.1) Insert objects		2
			(G4.1.2.8.2) Modify documents		2
	(1.3) Internet Surfing and Information Retrieval	(1.3.2) Student should be able to use various web browser features	(G4.1.3.2.1) Utilize a web browser toolbar while browsing the Internet		2
			(G4.1.3.2.2) Use advance tools in a web browser		2
		(1.3.4) Use technologies to locate, collect and organize information	(G4.1.3.4.1) Search the Internet for information based on specified keywords		2

Grade: 5					
Domain	Strand	Standards	Learning outcomes	Integration	Level
1. Digital literacy and competence	(1.1) Computer Operation	(1.1.4) Expand student's typing ability and promote the correct keyboarding position	(G5.1.1.4.1) Students use correct hand, movement,arm, and body position		2
			(G5.1.1.4.2) Promote accuracy and speed of typing		2
		(1.1.5) Identify the function of computer hardware components	(G5.1.1.5.1) Describe how hardware and software interact		1
			(G5.1.1.5.2) Define simple terms and concepts related to the software development process		1
			(G5.1.1.5.3) Identify issues related to software upgrades		1
		(1.1.10) Use various operating system features.	(G5.1.1.10.1) Identify different control panel settings		1
	(1.2) Productivity Tools	(1.2.5) Use a presentation tools to communicate among classes or groups within a class	(G5.1.2.5.1) Modify a slide layout.		2
			(G5.1.2.5.2) Add animation and transitions to slides and objects		2
		(1.2.6) Demonstrate the ability to use tools in spreadsheet programs to communicate and exchange ideas	(G5.1.2.6.1) Define the spreadsheet		1
			(G5.1.2.6.2) Create simple spreadsheet		2
			(G5.1.2.6.3) Write formulas using arithmetic operators		2
		(1.2.8) Demonstrate the ability to use tools in word processing programs to communicate and exchange ideas	(G5.1.2.8.1) Use Text and Language Tools		2
			(G5.1.2.8.2) Insert advanced objects		2

Grade: 5					
Domain	Strand	Standards	Learning outcomes	Integration	Level
1. Digital literacy and competence	(1.3) Internet Surfing and Information Retrieval	(1.3.5) Understand the meaning of network and their features	(G5.1.3.5.1) Download a file from a web site to specified location		2
			(G5.1.3.5.2) Define a network		1
		(1.3.6) Perform basic searches to locate information, using techniques to refine and limit such searches	(G5.1.3.6.1) Develop the basic techniques to find specific file format		2
	(1.4) Collaboration Tools	(1.4.1) Communicate with other using appropriate technology including email	(G5.1.4.1.1) Identify the features of online communications		1
			(G5.1.4.1.2) Apply communication tools (email)		1
		(1.4.2) Communicate and collaborate with others using social network	(G5.1.4.2.1) Identify social network		1
			(G5.1.4.2.2) Classify the features of online social networks		3

Grade: 6					
Domain	Strand	Standards	Learning outcomes	Integration	Level
1. Digital literacy and competence	(1.1) Computer Operation	(1.1.11) Use different features of computer operating system	(G6.1.1.11.1) Identify an operating systems and how it works		1
			(G6.1.1.11.2) Identify how to change system settings, install and remove software		1
	(1.2) Productivity Tools	(1.2.7) Select appropriate software to develop a multimedia presentation for a specific audience	(G6.1.2.7.1) Develop complex multimedia presentation		3
		(1.2.8) Demonstrate the ability to use tools in word processing programs to communicate and exchange ideas	(G6.1.2.8.1) Perform common editing and formatting functions in word processing		3
			(G6.1.2.8.2) Insert, edit and format tables in a document		2
		(1.2.9) Design spreadsheet for given task and use it to make predictions	(G6.1.2.9.1) Modify worksheet data and structure		2
			(G6.1.2.9.2) Add and modify charts in a worksheet		2
	(1.3) Internet Surfing and Information Retrieval	(1.3.7) Use technology tools for effective searching and processing of data and information from a range of sources	(G6.1.3.7.1) Discuss advanced Inernet Terminology		1
			(G6.1.3.7.2) Identify the ways a search engine classifies and looks for Web sites		1
			(G6.1.3.7.3) Searching a Specific Web Site (Using Directories Using Portal Sites)		2
	(1.4) Collaboration Tools	(1.4.3) Apply productivity /multimedia tools and peripherals to group collaboration and support learning throughout the curriculum	(G6.1.4.3.1) Describe communication tools and techniques		1
			(G6.1.4.3.2) Use an electronic mail application		2
			(G6.1.4.3.3) Interact with peers employing a variety of digital environments and media		2

Grade: 7					
Domain	Strand	Standards	Learning outcomes	Integration	Level
1. Digital literacy and competence	(1.1) Computer Operation	(1.1.12) Apply strategies for identifying simple hardware and software problems that may occur during use	(G7.1.1.12.1) Describe the processes used to install, upgrade, configure, and optimize a computer operating system		2
			(G7.1.1.12.2) Solve common problems related to computer hardware		3
	(1.2) Productivity Tools	(1.2.9) Design spreadsheet for given task and use it to make predictions	(G7.1.2.9.1) Manipulate data using formulas and functions		3
			(G7.1.2.9.2) Analyze data using appropriate tools		3
	(1.3) Internet Surfing and Information Retrieval	(1.3.8) Apply specific criteria to evaluate information from a range of sources	(G7.1.3.8.1) Differentiate between Search Tools		2
			(G7.1.3.8.2) Search for information using advance strategies		2
	(1.4) Collaboration Tools	(1.4.4) Collaboratively design, develop, publish and present products using technology resources that demonstrate and communicate curriculum concept	(G7.1.4.4.1) Identify new social network trends		1
			(G7.1.4.4.2) Apply appropriate social network to communicate specific audience		2

Grade: 8					
Domain	Strand	Standards	Learning outcomes	Integration	Level
1. Digital literacy and competence	(1.1) Computer Operation	(1.1.13) Apply strategies for identifying and solving routine hardware problems that occur during everyday computer use	(G8.1.1.13.1) Apply preventive maintenance and troubleshooting techniques		3
	(1.2) Productivity Tools	(1.2.10) Demonstrate the ability to use desktop publishing tools in to communicate and exchange ideas	(G8.1.2.10.1) Create a variety of publications for different purpose		2
		(1.2.11) Compose digital artwork to achieve effective communication using graphics tools	(G8.1.2.11.1) Create digital artwork		2
			(G8.1.2.11.2) Operate a wide range of program tools		2
	(1.3) Internet Surfing and Information Retrieval	(1.3.8) Apply specific criteria to evaluate information from a range of sources	(G8.1.3.8.1) Plan basic strategies to guide inquiry		2
			(G8.1.3.8.2) Select information sources and digital tools based on the appropriateness to specific tasks		2
	(1.4) Collaboration Tools	(1.4.4) Collaboratively design, develop, publish and present products using technology resources that demonstrate and communicate curriculum concept	(G8.1.4.4.1) Contribute to project teams to produce original works or solve problems using suitable social network tools		3

Grade: 9					
Domain	Strand	Standards	Learning outcomes	Integration	Level
1. Digital literacy and competence	(1.1) Computer operation	(1.1.13) Apply strategies for identifying and solving routine hardware problems that occur during everyday computer use	(G9.1.1.13.1) Solve common computer hardware and software problems		3
	(1.2) Productivity Programs	(1.2.12) Compose digital artworks to achieve effective communication	(G9.1.2.12.1) Develop using advance tools used in photo - realistic graphic programs		2
			(G9.1.2.12.2) Demonstrate a range of techniques to produce high quality results		2
		(1.2.13) Select and implement appropriate procedure and tools to access, organize and present information	(G9.1.2.13.1) Build a database with related tables		2
			(G9.1.2.13.2) Query a database using different methods		2
			(G9.1.2.13.3) Design forms and reports		2
	(1.3) Internet Surfing and Information Retrieval	(1.3.8) Apply specific criteria to evaluate information from a range of sources	(G9.1.3.8.1) Plan advanced strategies to guide inquiry		2
			(G9.1.3.8.2) Evaluate selected information sources and digital tools based on the appropriateness to specific tasks		3
			(G9.1.3.8.3) Process data and report results		2
	(1.4) Collaboration Tools	(1.4.4) Collaboratively design, develop, publish and present products using technology resources that demonstrate and communicate curriculum concept	(G9.1.4.4.1) Contribute to project teams to produce original works using a variety of media tools		2

Grade: 10					
Domain	Strand	Standards	Learning outcomes	Integration	Level
1. Digital literacy and competence	(1.3) Productivity Tools	(1.3.14) Produce different types of multimedia projects using a variety of applications to communicate the wider community	(G10.1.3.14.1) Describe the processes of acquiring and capturing, manipulating, storing, displaying and distributing data types		1
			(G10.1.3.14.2) Utilize appropriate presenting application to create animation		2
	(1.4) Collaboration Tools	(1.4.5) Plan and implement a collaborative project using effective communication tools	(G10.1.4.5.1) Discuss the key functions of the hardware and software tools used in communication		1
			(G10.1.4.5.2) Investigate methods of using communications in commerce, education, home and government		3
			(G10.1.4.5.3) Discuss the advantages and disadvantages of different communication tools which used to collaborate with peers		1
	(1.5) Computer Networking	(1.5.1) Demonstrate understanding of key components and functions of computer networks	(G10.1.5.1.1) Discuss main network hardware components and available operating systems		1
			(G10.1.5.1.2) Describe key functions of network OS		1
			(G10.1.5.1.3) Compare and contrast client - server and peer-to-peer network strategies		3

Grade: 10A					
Domain	Strand	Standards	Learning outcomes	Integration	Level
1. Digital literacy and competence	(1.3) Productivity Tools	(1.3.14) Produce different types of multimedia projects using a variety of applications to communicate the wider community	(G10A.1.3.14.1) Describe the processes of acquiring and capturing, manipulating, storing, displaying and distributing data types		1
			(G10A.1.3.14.2) Use appropriate presenting application to create animation using advance skills		2
	(1.4) Collaboration Tools	(1.4.5) Plan and implement a collaborative project using effective communication tools	(G10A.1.4.5.1) Discuss the key functions of the hardware and software tools used in communication		1
			(G10A.1.4.5.2) Investigate methods of using communications in commerce, education, home and government		3
			(G10A.1.4.5.3) Justify the advantage and disadvantage of different communication tools which used to collaborate with peers		3
	(1.5) Computer Networking	(1.5.1) Demonstrate understanding key components and functions of computer networks	(G10A.1.5.1.1) Discuss main network hardware components and key functions of available network operating systems		1
			(G10A.1.5.1.2) Compare and contrast client - server and peer-to-peer network strategies		3
			(G10A.1.5.1.3) Use suitable hardware, cables and software to connect and operate a network		2

Grade: 11					
Domain	Strand	Standards	Learning outcomes	Integration	Level
1. Digital literacy and competence	(1.3) Productivity Tools	(1.3.14) Produce different types of multimedia projects using a variety of applications to communicate the wider community	(G11.1.3.14.1) Use web-authoring tool to create, edit, and publish well organized web sites with effective navigation		2
			(G11.1.3.14.2) Evaluate a website in terms of design, content and usability		3
	(1.4) Collaboration Tools	(1.4.5) Plan and implement a collaborative project using effective communication tools	(G11.1.4.5.1) Describe how computer tools enhance forms of experience, communication and collaboration		1
			(G11.1.4.5.2) Evaluate selected communication strategies and online tools based on specific criteria		3
			(G11.1.4.5.3) Select appropriate online communication tools to collaborate with peers, community members, and field experts		2
	(1.5) Computer Networking	(1.5.2) Describe types of networks,topologies, access methods and network models	(G11.1.5.2.1) Compare LANs, WANs and PAN Technologies and network topologies		3
			(G11.1.5.2.2) Explain token ring and Ethernet methods to send data over a network		1
			(G11.1.5.2.3) Discuss common network models		1

Grade: 11A					
Domain	Strand	Standards	Learning outcomes	Integration	Level
1. Digital literacy and competence	(1.3) Productivity Tools	(1.3.14) Produce different types of multimedia projects using a variety of applications to communicate the wider community	(G11A.1.3.14.1) Use web-authoring tool with advance skills to create, edit, and publish well organized web sites with effective navigation		2
			(G11A.1.3.14.2) Examine different technical issues related to using different multimedia formats on website (i.e. best graphic, audio and video file formats for web pages)		3
			(G11A.1.3.14.3) Evaluate aspects of design and development of a multi - platform international implementation		3
	(1.4) Collaboration Tools	(1.4.5) Plan and implement a collaborative project using effective communication tools	(G11A.1.4.5.1) Describe how computer tools enhance traditional forms and enables new forms of experience, communication and collaboration.		1
			(G11A.1.4.5.2) Evaluate selected communication strategies and online tools based on specific criteria		3
			(G11A.1.4.5.3) Select appropriate online communication tools to collaborate with peers, community members, and field experts		2
	(1.5) Computer Networking	(1.5.2) Describe types of networks,topologies, access methods and network models	(G11A.1.5.2.1) Compare LANs, WANs and PAN Technologies and network topologies		3
			(G11A.1.5.2.2) Explain token ring and Ethernet methods to send data over a network		1
			(G11A.1.5.2.3) Examine parts of OSI and TCP/IP network models		3

Grade: 12					
Domain	Strand	Standards	Learning outcomes	Integration	Level
1. Digital literacy and competence	(1.3) Productivity Tools	(1.3.14) Produce different types of multimedia projects using a variety of applications to communicate the wider community	(G12.1.3.14.1) Develop a multimedia product using suitable software and media to solve a real life problem		3
			(G12.1.3.14.2) Use different digital devices to share and present multimedia product		2
	(1.4) Collaboration Tools	(1.4.5) Plan and implement a collaborative project using effective communication tools	(G12.1.4.5.1) Identify collaboration tools influences on design and development of software product		1
			(G12.1.4.5.2) Select appropriate tool to collaboratively develop a software product		2
	(1.5) Computer Networking	(1.5.3) Describe key services and protocols of local and wide area network technologies	(G12.1.5.3.1) Classify different services provided by a network.		1
			(G12.1.5.3.2) Examine Inernet protocols. i.e., (TCP, HTTP,FTP and other protocols)		3
			(G12.1.5.3.3) Use appropriate network operating system to setup and manage small network		2

Grade: 12A					
Domain	Strand	Standards	Learning outcomes	Integration	Level
1. Digital literacy and competence	(1.3) Productivity Tools	(1.3.14) Produce different types of multimedia projects using a variety of applications to communicate the wider community	(G12A.1.3.14.1) Develop a multimedia product using suitable software and media to solve a real life problem		3
			(G12A.1.3.14.2) Use different digital devices to share and present multimedia product		2
	(1.4) Collaboration Tools	(1.4.5) Plan and implement a collaborative project using effective communication tools	(G12A.1.4.5.1) Identify collaboration tools influences on design and development of software product		1
			(G12A.1.4.5.2) Use one project collaboration tools, version control systems, and integrated development environments (IDEs) while working on a collaborative software project		2
	(1.5) Computer Networking	(1.5.3) Describe key services and protocols of local and wide area network technologies	(G12A.1.5.3.1) Classify different services provided by a network		1
			(G12A.1.5.3.2) Examine Internet protocols i.e., (TCP, HTTP, FTP and other protocols)		3
			(G12A.1.5.3.3) Use appropriate software to operate and manage small network		2
		(1.5.4) Identify career options in network technologies	(G12A.1.5.4.1) Research career options related to networking		3

Student Performance Criteria

KG1				
Student	1-Barely or not initiated	2-Under development	3-Satisfies expectations	4-Exceeds expectations
Domain Digital Literacy and Competence	A (Level 1) Student may be able to:	A (Level 2) Student is able to:	A (Level 3) Student is able to:	A (Level 4) Student is able to:
Computer Operation	• identify 0 - 2 main parts of computer and demonstrate limited ability in starting, rebooting and shutting down a computer.	• identify 2 - 4 main parts of computer and demonstrate some ability in starting, rebooting and shutting down a computer.	• identify 4 - 5 main parts of computer and demonstrate some ability in starting, rebooting and shutting down a computer.	• identify the main parts of computer and demonstrate considerable ability in starting, rebooting and shutting down a computer.
Productivity Tools	• draw shapes using drawing tools with a lot of assistance.	• draw shapes using drawing tools with some assistance.	• draw shapes using drawing tools with little assistance.	• draw shapes using drawing tools independently.
Internet and Information Search	• define Internet with many errors and open a website with a lot of assistance.	• define Internet with few errors and open a website with some assistance.	• define Internet with few errors and open a website with little assistance.	• define Internet and open a website independently.

KG2				
Student	1-Barely or not initiated	2-Under development	3-Satisfies expectations	4-Exceeds expectations
Domain Digital Literacy and Competence	A (Level 1) Student may be able to:	A (Level 2) Student is able to:	A (Level 3) Student is able to:	A (Level 4) Student is able to:
Computer Operation	• identify 0 - 2 main parts of computer and demonstrate limited ability in starting, rebooting and shutting down a computer.	• identify 2 - 4 main parts of computer and demonstrate some ability in starting, rebooting and shutting down a computer.	• identify 4 - 5 main parts of computer and demonstrate some ability in starting, rebooting and shutting down a computer.	• identify the main parts of computer and demonstrate considerable ability in starting, rebooting and shutting down a computer.
Productivity Tools	• draw shapes using drawing tools with a lot of assistance.	• draw shapes using drawing tools with some assistance.	• draw shapes using drawing tools with little assistance.	• draw shapes using drawing tools independently.
Internet and Information Search	• define Internet with many errors and open a website with a lot of assistance.	• define Internet with few errors and open a website with some assistance.	• define Internet with few errors and open a website with little assistance.	• define Internet and open a website independently.

Grade 1				
Student	1-Barely or not initiated	2-Under development	3-Satisfies expectations	4-Exceeds expectations
Domain Digital Literacy and Competence	A (Level 1) Student may be able to:	A (Level 2) Student is able to:	A (Level 3) Student is able to:	A (Level 4) Student is able to:
Computer Operation	• identify 1 - 2 main parts of computer, sort types of computer based on size, power and purpose, elements of windows desktop and manipulate windows with a lot of assistance. • define 1 - 2 types of keys on the keyboard and rarely keeps fingers on the home row keys while typing.	• identify 2 - 4 main parts of computer, sort types of computer based on size, power and purpose, elements of windows desktop and manipulate windows with some a assistance. • define 3 - 4 types of keys on the keyboard and hardly keep fingers on the home row keys while typing.	• identify 2 - 4 main parts of computer, sort types of computer based on size, power and purpose, elements of windows desktop and manipulate windows with little a assistance. • define types of keys on the keyboard and keep fingers on the home row keys while typing with curved hands and proper wrist position most of the time.	• identify main parts of computer, sort types of computer based on size, power and purpose, elements of windows desktop and manipulate windows independently. • define types of keys on the keyboard and keeps fingers on the home row keys while typing with curved hands and proper wrist position almost the entire time.
Productivity Tools	• draw pictures using shapes tools only.	• draw pictures using different tools and enter simple text with some assistance.	• draw pictures and entering text using different tools.	• draw and edit pictures using different tools and easily work with text.
Internet and Information Search	• define Internet with many errors and open a website with a lot of assistance.	• define Internet with few errors and open a website with some assistance.	• define Internet with few errors and open a website with little assistance.	• define Internet and open a website independently.

Grade 2				
Student	1-Barely or not initiated	2-Under development	3-Satisfies expectations	4-Exceeds expectations
Domain Digital Literacy and Competence	A (Level 1) Student may be able to:	A (Level 2) Student is able to:	A (Level 3) Student is able to:	A (Level 4) Student is able to:
Computer Operation	• name and sort 0 - 2 parts of input and output devices and use OS start menu with a lot of assistance. • define 1 - 2 types of keys on the keyboard and rarely keeps fingers on the home row keys while typing.	• name and sort 3 - 5 parts of input and output devices and use OS start menu with some assistance. • define 3 - 4 types of keys on the keyboard and hardly keep fingers on the home row keys while typing.	• name and sort 5 - 7 parts of input and output devices and use OS start menu with little assistance. • define types of keys on the keyboard and keep fingers on the home row keys while typing with curved hands and proper wrist position most of the time.	• name and categorize 5 - 7 parts of input and output devices and use OS start menu independently. • define types of keys on the keyboard and keeps fingers on the home row keys while typing with curved hands and proper wrist position almost the entire time.
Productivity Tools	• draw pictures using drawing tools only with a lot of assistance.	• draw pictures using different tools and menus with some assistance.	• draw pictures using different tools and menus with little assistance.	• draw and edit pictures using different tools and menus independently.
Internet and Information Search	• list 0 - 2 of components required for an Inernet connection and open a website.	• list 2 - 3 components required for an Internet connection and navigate different website with some assistance.	• list 3 - 4 components required for an Internet connection and navigate different website with little assistance.	• list all components required for an Internet connection and navigate different website independently.

Grade 3				
Student	1-Barely or not initiated	2-Under development	3-Satisfies expectations	4-Exceeds expectations
Domain Digital Literacy and Competence	A (Level 1) Student may be able to:	A (Level 2) Student is able to:	A (Level 3) Student is able to:	A (Level 4) Student is able to:
Computer Operation	• name and show 0 - 2 parts of main processing components and manipulate folders and icons with a lot of assistance. • rarely keep fingers on the home row keys while typing with curved hands and proper wrist position.	• name and show 3 - 5 parts of main processing components and manipulate folders and icons with some assistance. • keep fingers on the home row keys while typing with curved hands and proper wrist position about half the time.	• name and show all parts of main processing components and manipulate folders and icons with little assistance. • keep fingers on the home row keys while typing with curved hands and proper wrist position most of the time.	• name and show all parts of main processing components and manipulate folders and icons independently. • keep fingers on the home row keys while typing with curved hands and proper wrist position almost the entire time.
Productivity Tools	• type and create document using the letter, number, space bar and enter keys • create simple presentation contain text only with a lot of assistance.	• change size, color and look of the text in a document with some assistance. • create 2 - 3 slides in presentation contain only text.	• change size, color and look of the text in a document with little assistance. • create 3 - 5 slides in presentation contain text and pictures.	• change the size, color and look of the text to make their document more interesting. • create 5 - 7 slides in presentation contain text, pictures and shapes.
Internet and Information Search	• identify 0 - 2 terminology related to the Internet and define search engines with many of errors.	• identify 3 - 4 terminology related to the Internet and define search engines with few errors	• identify 4 - 5 terminology related to the Internet, navigate different website using intermediate functions and use search engines to find information with little assistance.	• identify 6 terminology related to the Inernet, navigate different website using intermediate functions and easily use search engines to find information in specific topic.

Grade 4				
Student	1-Barely or not initiated	2-Under development	3-Satisfies expectations	4-Exceeds expectations
Domain Digital Literacy and Competence	A (Level 1) Student may be able to:	A (Level 2) Student is able to:	A (Level 3) Student is able to:	A (Level 4) Student is able to:
Computer Operation	• name 0 - 2 types of storage devices and use windows explorer to create folder with a lot of assistance. • produce more than 15 spelling and grammar mistakes (0 - 69% level of accuracy).	• name 3 - 5 types of storage devices and use windows explorer to create folder, change view and copy, move files or folders. • produce between 11 - 15, spelling and grammar mistakes(70 - 79% level of accuracy).	• name 5 - 6 types of storage devices and use windows explorer to create, rename, copy folder or files and view their properties. • produce between 5 - 10, spelling and grammar mistakes (80 - 89% level of accuracy).	• name 7 types of storage devices and use windows explorer to create, rename, copy folder or files with, view file or folder properties and using recycle bin. • produce few spelling and grammar mistakes, between 1 - 4 (90 - 99% level of accuracy).
Productivity Tools	• format text with stumble through inserting pictures and shapes in word processing. • create simple presentation, placing pictures and clipart with a lot of assistance. • storyboard of the movie shows little to no evidence of preplanning. Over use or misuse of graphics, color, effects, transitions and music in creating movie.	• format text with ability of finding, inserting and resizing in word processing with some assistance. • create simple presentation, placing pictures or clipart choosing colors and layout of slide with some assistance. • storyboard of the movie shows some evidence of pre - planning with somewhat vague goal in mind. Makes attempted use of graphics, color, effects, transitions and music was inappropriate to topic.	• format paragraph with ability of finding, inserting and resizing clipart illustrations in word processing with little assistance. • create simple presentation, placing pictures or clipart, use colors and layouts that make the information clear with little assistance. • storyboard of the movie shows evidence of pre - planning with clear intent in mind. Makes a good use of color, graphics, effects, transitions and music.	• format paragraph with ability of finding, inserting and resizing clipart illustrations in word processing independently. • create simple presentation, placing pictures or clipart, and use design skills or select a template to make presentation easy to view independently. • storyboard shows strong evidence of pre - planning and achieves the goal. Excellent use of color, graphics, effects, transitions and music was clearly planned.
Internet and Information Search	• define web browser with a lot of errors and Needs assistance throughout process from key term or search word selection to result selection.	• define web browser with few errors, use basic tool bar and construct a search with some assistance.	• define web browser, use 3 - 4 advance tool bar, and select suitable terms or phrases in searching with little assistance.	• define web browser, use 5 advance tool bar, and select suitable terms or phrases in searching independently.

Grade 5				
Student	1-Barely or not initiated	2-Under development	3-Satisfies expectations	4-Exceeds expectations
Domain Digital Literacy and Competence	A (Level 1) Student may be able to:	A (Level 2) Student is able to:	A (Level 3) Student is able to:	A (Level 4) Student is able to:
Computer Operation	• describe how hardware and software interact with a lot of errors and customizing the desktop display with a lot of assistance. • produce more than 15 spelling and grammar mistakes (0 - 69% level of accuracy).	• stumble in describing how hardware and software interact with few errors and customizing the desktop display with some assistance. • produce between 11 - 15, spelling and grammar mistakes(70 - 79% level of accuracy).	• describe how hardware and software interact, upgrade software, customizing the desktop display, mouse, Keyboard, date & time, and install new fonts with a little assistance. • produce between 5 - 10, spelling and grammar mistakes (80 - 89% level of accuracy).	• describe how hardware and software interact, upgrade software, customizing the desktop display, mouse, Keyboard, date & time, and install new fonts independently. • produce few spelling and grammar mistakes, between 1 - 4 (90 - 99% level of accuracy).
Productivity Tools	• spot and correct spelling mistakes in their writing document but might miss one or two. • modify slide layout and use animated clipart that helps to explain idea. • format and organize the spreadsheet with a lot of assistance. Spreadsheet has no formula(s).	• spot and correct spelling errors in writing document but might have one spelling or grammar error. • modify slide layout, use animated clipart, add clipart sound and video in presentation. • format and organize spreadsheet with some assistance. Formula(s) cannot be used to correctly determine the needed information.	• spot and correct spelling errors, check grammar, find / replace, and use word account in writing document. • add sounds, timing to slide transitions, insert clip art sound and video. • format and organize spreadsheet with little assistance. Formula(s) will correctly determine the needed information.	• spot and correct spelling errors, check grammar errors, find / replace, use word account, thesaurus and translate in writing document • add custom animation to pictures and text to add meaning and emphasis to the presentation. • format and organize spreadsheet independently. Formula(s) are well - developed and will correctly determine the needed information.
Internet and Information Search	• define network with a lot of errors and download file from the Inernet with a lot of assistance.	• define network with few errors and download file form the Inernet with some assistance.	• define network and download file from Inernet with little assistance.	• define network and download file to specific place in a computer independently.
Collaboration Tools	• identify the features of online communications and social networks with a lot of errors. create email with a lot of assistance	• identify the features of online communications and social networks with a few of errors. create email with some assistance.	• identify the features of online communications and social networks with little errors. create, receive and send emails with some assistance.	• identify the features of online communications and social networks, create, receive and send independently.

Grade 6				
Student	1-Barely or not initiated	2-Under development	3-Satisfies expectations	4-Exceeds expectations
Domain Digital Literacy and Competence	A (Level 1) Student may be able to:	A (Level 2) Student is able to:	A (Level 3) Student is able to:	A (Level 4) Student is able to:
Computer Operation	• defining operating system with error and change the desktop background with help.	• describe the operating system with errors and change simple control panel setting.	• describing the purpose of an operating system and the difference between operating system and application software, customize the desktop using the control panel and managing application program with few errors.	• describing the purpose of an operating system and the difference between operating system and application software, customize the desktop using the control panel and managing application program easily.
Productivity Tools	• create simple presentation by insert text and graph with a lot of help from teacher. • create word processing document without using any format function. • create simple table and insert bar graph with stumble in the spreadsheet.	• create simple presentation with clear information and without any kind of media. • the word processing document somewhat organized readability. • create table, modifying data and insert bar graph in the spreadsheet with some difficulties.	• create presentation to suit a different audience, insert video or sound from other sources to add meaning to the presentation. • create word processing file using different formatting function. (changing spacing option, insert and modify bullet, insert and delete page break, page number,footer and header, borders and styles). • create tables and bar graph or pie charts to display data and perform basic mathematical calculations.	• create presentation to suit a different audience, insert video or sound from other sources to add meaning to the presentation and use all type of illustrations to make the ideas in the presentation more clear. • create word processing using different formatting function to make the ideas more clear to readers and to suit the type of writing assignment. • create tables, insert the suitable chart to display data and perform advanced mathematical calculations.
Internet Surfing and Information Retrieval	• define 1 - 2 Inernet terminology with errors and use search engines with a lot of hesitation.	• define 3 - 4 Inernet terminology and using search engines ineffectively	• define most of Inernet terminology and using search engines with few difficulties.	• differentiate between Inernet terminology and using search engines effectively.
Collaboration Tools	• define 0 - 2 communication tools and open the email application with a lot of help from teacher.	• define 3 - 5 communication tools, create and send email with some help from teacher.	• define most of communication tools and using most of different email application features to communicate and collaborate with peers.	• define communication and using email application effectively to communicate and collaborate with peers.

Grade 7				
Student	1-Barely or not initiated	2-Under development	3-Satisfies expectations	4-Exceeds expectations
Domain Digital Literacy and Competence	A (Level 1) Student may be able to:	A (Level 2) Student is able to:	A (Level 3) Student is able to:	A (Level 4) Student is able to:
Computer Operation	• display control panel without using any operating system utility.	• customize some of operating system utilities and install software with some errors.	• customize most of operating system utilities and manage application software with little errors.	• customize most of operating system utilities and manage application software.
Productivity Tools	• Perform simple editing to spreadsheet and difficult to create formulas.	• create Simple Formulas with some difficulties in the spreadsheet.	• use the right function to manipulate formula and methods of tracking down invalid entries with some errors.	• use the right function to manipulate formula and methods of tracking down invalid entries.
Internet Surfing and Information Retrieval	• list 0 - 2 of search tools and use basic search strategies with a lot of hesitation.	• list most of search tools and use basic search strategies with some of hesitation.	• differentiate between search tools and search using advanced strategies with few errors.	• use the suitable search tools and advanced search strategies.
Collaboration Tools	• identify social network trends with error.	• list some social network trends and chose tools to communicate with some difficulties.	• list new social network trends and select the appropriate tools to communicate with few difficulties.	• list new social network trends and select the effective tools to communicate.

Grade 8				
Student	1-Barely or not initiated	2-Under development	3-Satisfies expectations	4-Exceeds expectations
Domain Digital Literacy and Competence	A (Level 1) Student may be able to:	A (Level 2) Student is able to:	A (Level 3) Student is able to:	A (Level 4) Student is able to:
Computer Operation	• use disk software utilities, stumble in backup the system and solve little of common problems with a lot of help from teacher.	• use disk software utilities, stumble in backup the system and solve little of common problems with some teacher assistance.	• organize data directory structure, develop backup routine schemes and solve simple solution to common problems.	• organize data directory structure, develop backup routine schemes and solve advanced solution to common problems.
Productivity Tools	• create sample desktop publishing document somewhat organized readability. • use painting tools to create digital artwork with a lot of difficulties.	• create sample publishing with simple editing techniques. • demonstrate basic skills in developing artworks with some of difficulties.	• create a variety of publication for different purpose. • use painting tools and manipulate, edit, and adjust images by using, the different tools and blending modes to create special effects and quality artworks with few difficulties.	• redesign and create templates; use special and advanced formatting features to create different publication purpose. • use painting tools and manipulate, edit, and adjust images by using, the different tools and blending modes to create special effects and quality artworks.
Internet Surfing and Information Retrieval	• identify search strategies with a lot of mistakes.	• list search strategies to guide inquiry with some mistakes.	• plan basic strategies to guide inquiry and select the information sources based on appropriate task.	• select the suitable strategies to guide inquiry and select the information sources based on appropriate task.
Collaboration Tools	• select tool to collaborate and develop a software product with more difficulty.	• select appropriate tool to collaborate and develop a software product with some difficulty.	• select appropriate tool to collaborate and develop a software product, independently.	• use with proficiency selected communication tools to produce works with team.

Grade 9				
Student	1-Barely or not initiated	2-Under development	3-Satisfies expectations	4-Exceeds expectations
Domain Digital Literacy and Competence	A (Level 1) Student may be able to:	A (Level 2) Student is able to:	A (Level 3) Student is able to:	A (Level 4) Student is able to:
Computer Operation	• detect the problem and difficult to fix it.	• detect the problem and try to fix it with difficulty.	• choose the suitable methods to detect the problem and fix some of problems.	• choose the suitable methods to detect the problem and fix most of problems.
Productivity Tools	• optimize images for use on the Web, and use image-slicing techniques with more difficulties. • create a database with a lot of difficulties.	• optimize images for use on the Web, and use image-slicing techniques with some difficulties. • create a database with some difficulties.	• optimize images for use on the Web, and use image-slicing techniques with few difficulties. • create a database to support the creation of multi - table forms, create queries that search for specific data and reports with few difficulties.	• optimize images for use on the Web, and use image-slicing techniques easily. • create a database to support the creation of multi - table forms, create queries that search for specific data and reports.
Internet Surfing and Information Retrieval	• use search strategies and difficult to evaluate information sources.	• plan basic strategies to guide inquiry with teacher help and found information without evaluating.	• plan advanced strategies to guide inquiry with evaluation of information sources.	• select the suitable advanced strategies to guide inquiry with evaluation of information sources.
Collaboration Tools	• identify collaboration tools influences on design and difficult to develop software product.	• identify influences on design and development of software product with errors.	• use suitable selected media tools to communicate with project team.	• use with proficiency selected media tools to communicate with project team.

Grade 10				
Student	1-Barely or not initiated	2-Under development	3-Satisfies expectations	4-Exceeds expectations
Domain Digital Literacy and Competence	A (Level 1) Student may be able to:	A (Level 2) Student is able to:	A (Level 3) Student is able to:	A (Level 4) Student is able to:
Computer Networks	• identify few of the main network components, available network operating systems and its functions, client - server and peer-to-peer network strategies with a lot of mistakes, and able to select network devices and operating system based on the evaluation of its effectiveness and reliability to design small network, with a lot of difficulty and mistakes.	• identify some of the main network components, available network operating systems and its functions, client - server and peer-to-peer network strategies with • little mistakes, and able to select network devices and operating system based on the evaluation of its effectiveness and reliability to design small network, with the help of the teacher.	• identify most of the main network components, available network operating systems and its functions, client - server and peer-to-peer network strategies with adequate explanation, and able to select network devices and operating system based on the evaluation of its effectiveness and reliability to design small network, with adequate level of explanation.	• identify most of the main network components, available network operating systems and its functions, client - server and peer-to-peer network strategies with adequate explanation, and able to select network devices and operating system based on the evaluation of its effectiveness and reliability to design small network, with excellent explanation.
Collaboration Tools	• identify few key functions of hardware and software tools used in communication, few advantages and disadvantages of different communication tools used to collaborate with peers with limited explanation of communication links with commerce, education, home and government.	• identify some key functions of hardware and software tools used in communication, some advantages and disadvantages of different communication tools used to collaborate with peers and explain communication links with commerce, education, home and government. with the help of the teacher.	• identify most of the key functions of hardware and software tools used in communication, advantages and disadvantages of different communication tools used to collaborate with peers and explain communication links with commerce, education, home and government. with good demonstration of knowledge.	• identify all of the key functions of hardware and software tools used in communication, advantages and disadvantages of different communication tools used to collaborate with peers and explain communication links with commerce, education, home and government. with excellently.
Productivity Tools	• describe the processes of acquiring, capturing, manipulating, storing, displaying and distributing data types and use appropriate presenting application to create animation with a lot of difficulty and many errors.	• describe the processes of acquiring, capturing, manipulating, storing, displaying and distributing data types and use appropriate presenting application to create animation with some difficulty and with the help of teacher.	• describe the processes of acquiring, capturing, manipulating, storing, displaying and distributing data types and use appropriate presenting application to create animation with acceptable standards while meeting the most of task requirements independently.	• describe the processes of acquiring, capturing, manipulating, storing, displaying and distributing data types and use appropriate presenting application to create animation with excellent standards while meeting all of the task requirements independently.

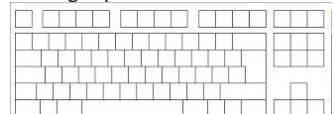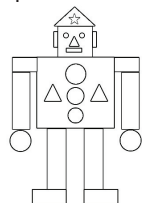| Grade 10A				
Student	1-Barely or not initiated	2-Under development	3-Satisfies expectations	4-Exceeds expectations
Domain Digital Literacy and Competence	A (Level 1) Student may be able to:	A (Level 2) Student is able to:	A (Level 3) Student is able to:	A (Level 4) Student is able to:
Computer Networks	• identify few of the main network components, available network operating systems and its functions, client - server and peer-to-peer network strategies with a lot of mistakes, and able to select network devices and operating system based on the evaluation of its effectiveness and reliability to design small network, with a lot of difficulty and mistakes. • identify with a lot of difficulty few hardware, cables and software that is require to connect and operate network.	• identify some of the main network components, available network operating systems and its functions, client - server and peer-to-peer network strategies with little mistakes, and able to select network devices and operating system based on the evaluation of its effectiveness and reliability to design small network, with the help of the teacher. • identify with some errors, hardware, cables and software that is require to connect and operate network.	• identify most of the main network components, available network operating systems and its functions, client - server and peer-to-peer network strategies with adequate explanation, and able to select network devices and operating system based on the evaluation of its effectiveness and reliability to design small network, with adequate level of explanation • identify and select the most suitable hardware, cables and software that is require to connect and operate network, with good and sufficient explanation.	• identify most of the main network components, available network operating systems and its functions, client - server and peer-to-peer network strategies with adequate explanation, and able to select network devices and operating system based on the evaluation of its effectiveness and reliability to design small network, with excellent explanation • identify and use the most suitable hardware, cables and software that is require to connect and operate network, with excellent explanation.
Collaboration Tools	• identify few key functions of hardware and software tools used in communication, few advantages and disadvantages of different communication tools used to collaborate with peers with limited explanation of commerce, education, home and government.	• identify some key functions of hardware and software tools used in communication, some advantages and disadvantages of different communication tools used to collaborate with peers and explain communication links with commerce, education, home and government. with the help of the teacher.	• identify most of the key functions of hardware and software tools used in communication, advantages and disadvantages of different communication tools used to collaborate with peers and explain communication links with commerce, education, home and government. with good demonstration of knowledge.	• identify all of the key functions of hardware and software tools used in communication, advantages and disadvantages of different communication tools used to collaborate with peers and explain communication links with commerce, education, home and government. with excellently.
Productivity Tools	• describe the processes of acquiring, capturing, manipulating, storing, displaying and distributing data types and use appropriate presenting application to create animation with a lot of difficulty and many errors.	• describe the processes of acquiring, capturing, manipulating, storing, displaying and distributing data types and use appropriate presenting application to create animation with some difficulty and with the help of teacher.	• describe the processes of acquiring, capturing, manipulating, storing, displaying and distributing data types and use appropriate presenting application to create animation with acceptable standards while meeting the most of task requirements independently.	• describe the processes of acquiring, capturing, manipulating, storing, displaying and distributing data types and use appropriate presenting application to create animation with excellent standards while meeting all of the task requirements independently.

Grade 11				
Student	1-Barely or not initiated	2-Under development	3-Satisfies expectations	4-Exceeds expectations
Domain Digital Literacy and Competence	A (Level 1) Student may be able to:	A (Level 2) Student is able to:	A (Level 3) Student is able to:	A (Level 4) Student is able to:
Computer Networks	• explain few of network types, technologies. and describe with a lot of difficulty token ring, Ethernet methods to send data over a network, and define few terms related to OSI and TCP/IP network models with a lot of mistakes.	• explain some of network types, technologies with mistakes. and describe with some hesitate token ring, Ethernet methods to send data over a network, and define some terms related to OSI and TCP/IP network models with help of the teachers.	• explain most of network types and technologies. describe with some hesitate token ring, Ethernet methods to send data over a network, with confident. and define most of the terms related to OSI and TCP/IP network models with adequate explanation independently.	• explain all network types and technologies. describe with token ring, Ethernet methods to send data over a network, with confident, and define all the terms related to OSI and TCP/IP network models with excellent explanation independently.
Collaboration Tools	• identify few communication strategies and online tools to use while working collaboratively on projects with a lot of difficulty, and describe how computer's tools enhance traditional forms and enable new forms of experience, communication with a lot of hesitant.	• identify some communication strategies and online tools to use while working collaboratively on projects, with the help of the teacher, and describe how computer's tools enhance traditional forms and enable new forms of experience, communication with some hesitant.	• identify and use with proficiency selected communication strategies and online tools while working collaboratively on projects, and describe how computer's tools enhance traditional forms and enable new forms of experience, communication with confident.	• identify, evaluate and use with proficiency selected communication strategies and online tools while working collaboratively on projects, and describe how computer's tools enhance traditional forms and enable new forms of experience, communication with excellent demonstration of knowledge.
Productivity Tools	• use web-authoring tool to create, edit, and publish well organized web sites with acceptable navigation, and evaluate a website using design criteria with a lot of difficulty.	• use web-authoring tool to create, edit, and publish well organized web sites with acceptable navigation, and evaluate a website using design criteria with some difficulty and the help of the teacher.	• use web-authoring tool to create, edit, and publish well organized web sites with good navigation, and evaluate a website using design criteria, independently with adequate level.	• use web-authoring tool to create, edit, and publish well organized web sites with effective navigation, and evaluate a website using design criteria, independently with professional confident.

Grade 11A				
Student	1-Barely or not initiated	2-Under development	3-Satisfies expectations	4-Exceeds expectations
Domain Digital Literacy and Competence	A (Level 1) Student may be able to:	A (Level 2) Student is able to:	A (Level 3) Student is able to:	A (Level 4) Student is able to:
Computer Networks	• explain few of network types, technologies. and describe with a lot of difficulty token ring, Ethernet methods to send data over a network, and define few terms related to OSI and TCP/IP network models with a lot of mistakes.	• explain some of network types, technologies with mistakes. and describe with some hesitate token ring, Ethernet methods to send data over a network, and define some terms related to OSI and TCP/IP network models with help of the teachers.	• explain most of network types and technologies. describe with some hesitate token ring, Ethernet methods to send data over a network, with confident. and define most of the terms related to OSI and TCP/IP network models with adequate explanation independently.	• explain all network types and technologies. describe with token ring, Ethernet methods to send data over a network, with confident, and define all the terms related to OSI and TCP/IP network models with excellent explanation independently
Collaboration Tools	• identify few communication strategies and online tools to use while working collaboratively on projects, with a lot of difficulty, and describe how computer's tools enhance traditional forms and enable new forms of experience, communication with a lot of hesitant.	• identify some communication strategies and online tools to use while working collaboratively on projects, with the help of the teacher, and describe how computer's tools enhance traditional forms and enable new forms of experience, communication with some hesitant.	• identify and use with proficiency selected communication strategies and online tools while working collaboratively on projects, and describe how computer's tools enhance traditional forms and enable new forms of experience, communication with confident.	• identify, evaluate and use with proficiency selected communication strategies and online tools while working collaboratively on projects, and describe how computer's tools enhance traditional forms and enable new forms of experience, communication with excellent demonstration of knowledge.
Productivity Tools	• use web-authoring tool to create, edit, and publish well organized web sites with acceptable navigation, and evaluate a website using design criteria with a lot of difficulty.	• use web-authoring tool to create, edit, and publish well organized web sites with acceptable navigation, and evaluate a website using design criteria with some difficulty and the help of the teacher.	• use web-authoring tool to create, edit, and publish well organized web sites with good navigation, and evaluate a website using design criteria, independently with adequate level.	• use web-authoring tool to create, edit, and publish well organized web sites with effective navigation, and evaluate a website using design criteria, independently with professional confident.

Grade 12				
Student	1-Barely or not initiated	2-Under development	3-Satisfies expectations	4-Exceeds expectations
Domain Digital Literacy and Competence	A (Level 1) Student may be able to:	A (Level 2) Student is able to:	A (Level 3) Student is able to:	A (Level 4) Student is able to:
Computer Networks	• list few services provided by a network, few Inernet protocols with many errors, and use network operating system to setup and manage small network with a lot of difficulty.	• list some services provided by a network, some Inernet protocols with errors, and use network operating system to setup and manage small network with the help of the teacher.	• list most of the services provided by a network, most of Inernet protocols with adequate explanation, and use network operating system to setup and manage small network with little errors, independently.	• list all of the services provided by a network, Inernet protocols with excellent explanation, and use network operating system to setup and manage small network with confident independently.
Collaboration Tools	• identify few of influences of collaboration tools on design and development of software product, and select appropriate tool to collaboratively develop a software product with a lot of difficulty.	• identify some of influences of collaboration tools on design and development of software product, and select appropriate tool to collaboratively develop a software product with some difficulty and the help of teacher.	• identify most of the influences of collaboration tools on design and development of software product, and select and use the most appropriate tool to collaboratively develop a software product with confident.	• identify influences of collaboration tools on design and development of software product, and select and use the most appropriate tool to collaboratively develop a software product with confident, independently.
Productivity Tools	• create a multimedia solution to solve real life problem with less quality and a lot of difficulty, and select a digital device to share and present multimedia product with little accuracy.	• create a multimedia solution to solve real life problem with acceptable quality and some difficulty, and select a digital device to share and present multimedia product with the help of the teacher.	• create a multimedia solution to solve real life problem with good quality, and select a digital device to share and present multimedia product independently.	• create a multimedia solution to solve real life problem with high quality, and select a digital device to share and present multimedia product independently with proficiency.

Grade 12A				
Student	1-Barely or not initiated	2-Under development	3-Satisfies expectations	4-Exceeds expectations
Domain Digital Literacy and Competence	A (Level 1) Student may be able to:	A (Level 2) Student is able to:	A (Level 3) Student is able to:	A (Level 4) Student is able to:
Computer Networks	• list few services provided by a network, few Inernet protocols with many errors, and use network operating system to setup and manage small network with a lot of difficulty, and identify career options related to networking with limited details.	• list some services provided by a network, some Inernet protocols with errors, and use network operating system to setup and manage small network with the help of the teacher, and identify career options related to networking with some details and the help of the teacher.	• list most of the services provided by a network, most of Inernet protocols with adequate explanation, and use network operating system to setup and manage small network with little errors, independently, and identify career options related to networking with acceptable details, independently.	• list all of the services provided by a network, Inernet protocols with excellent explanation, and use network operating system to setup and manage small network with confident, independently. and identify career options related to networking with in - depth details, independently.
Collaboration Tools	• identify few of influences of collaboration tools on design and development of software product, and select appropriate tool to collaboratively develop a software product with a lot of difficulty.	• identify some of influences of collaboration tools on design and development of software product, and select appropriate tool to collaboratively develop a software product with some difficulty and the help of teacher.	• identify most of the influences of collaboration tools on design and development of software product, and select and use the most appropriate tool to collaboratively develop a software product with confident.	• identify influences of collaboration tools on design and development of software product, and select and use the most appropriate tool to collaboratively develop a software product with confident, independently.
Productivity Tools	• create a multimedia solution to solve real life problem with less quality and a lot of difficulty, and select a digital device to share and present multimedia product with little accuracy.	• create a multimedia solution to solve real life problem with acceptable quality and some difficulty, and select a digital device to share and present multimedia product with the help of the teacher.	• create a multimedia solution to solve real life problem with good quality, and select a digital device to share and present multimedia product independently.	• create a multimedia solution to solve real life problem with high quality, and select a digital device to share and present multimedia product independently with proficiency.

Sample Activities

Sample Activity (Grade 1):

By the end of Grade 1, the student will be able to:

Grade 1				
Domain	Digital literacy and competence			
Strand	Learning outcome	Example	Sample Activity	Suggested Assessment
Computer Operation	• identify main parts of computer.	• The monitor is the visual component of the computer. It displays information to the user. Kinds of monitors are LCD, LED, CRT and touch screen.	• Label the kind of monitor under the pictures:	• Circle the monitor that represent high resolution:
	• define types of keys on the keyboard.	• Alphanumeric keys are all of the letters and numbers on the keyboard. A-Z and 0-9.	• Color the numbers keys red, and letters keys blue.	• Write the letters and numbers in the right place.
Productivity Tools	• draw and edit pictures using different tools and work with text.	• Draw a picture using circle, square, rectangle and triangle tools.	• Draw a house using shapes tools in paint program:	• Which tools we should use to draw this picture:
Internet Surfing and Information Retrieval	• define Internet and open a website.	• Open a website using Google chrome browser.	• Open code website using the url : www.code.org	• Circle the part that we use to open a specific web site.
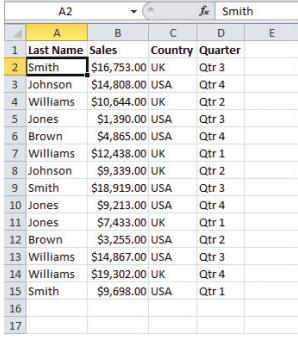
Sample Activity (Grade 4):

By the end of Grade 4, the student will be able to:

Grade 4				
Domain	Digital literacy and competence			
Strand	Learning outcome	Example	Sample Activity	Suggested Assessment
Computer Operation	• list different types of storage devices.	• A data storage device is a device for recording (storing) information (data). There are two types of storage devices used in computers; a primary storage device, such as RAM, and a secondary storage device, like a hard drive. Secondary storage can be a removable, internal, or external storage.	• In group of 3 write name of each storage device:	• Categorize the storage device to primary or secondary storage.
Productivity Tools	• manage slides in presentation.	• Change slides background.	• Open a presentation using PowerPoint program. • Change the background of the first slide to blue color.	• Use the background tool to change the color of the slides.
Internet Surfing and Information Retrieval	• search the Internet for information based on specified keywords.	• Search the Internet for information based on specified keywords.	• Open Google search. • Search about the history of the United Arab Emirates	• Search about the UAE builder?
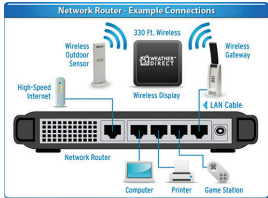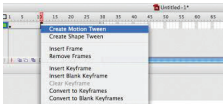
Sample Activity (Grade 7):

By the end of Grade 7, the student will be able to:

Grade 7				
Domain	Digital literacy and competence			
Strand	Learning outcome	Example	Sample Activity	Suggested Assessment
Computer Operation	• solve common problems related to computer hardware.	• Student is able to solve common computer problems.	• Some keyboard keys stopped working. • Some keyboard keys do not work at all or type wrong characters.	• Stir brainstorming among student by offering some computer problems and ask student to search for the solution in a report.
Productivity Tools	• sort data in the spreadsheet.	• Student is able to sort data ascending and descending by one column or more.	• Sort the table ascending by the country. • Sort the table by last name first and sales second.	• What is the advantage of using sort data in the spreadsheet?
Internet Surfing and Information Retrieval	• list search tools and find the difference between them.	• Student is able to list search tools and differentiate between them.	• Compare between search tools: • define search tools? • Compare the search result of google and yahoo.	• Compare between different search tools in a presentation.
Collaboration Tools	• apply appropriate social network to communicate specific audience.	• create appropriate social network.	• Describe what is blogs. • Discuss in groups which blogging platform to use related to cost. • create an account in the blogging such as blogger or word press Start blog.	• create blogs.

Sample Activity (Grade 10):

By the end of Grade 10, the student will be able to:

Grade 10				
Domain	Digital literacy and competence			
Strand	Learning outcome	Example	Sample Activity	Suggested Assessment
Computer Operation	• discuss main network hardware components.	• Explain router definition and functions.	• In groups of 3 to conduct mini search and write a small paragraph about router definition, functions in the network and its advantages over the network. • Discuss and share with other students. 	• Define router • Identify the main functions of router in the network
Collaboration Tools	• discuss the advantages and disadvantages of different communication tools which used to collaborate with peers.	• Use Google drive to collaborate over Inernet.	• Discuss Google drive online tools and how it can facilitate communication and collaboration over Inernet. • In groups of 3 work together online to use the tools and then summarize the advantages and disadvantages of this tools. • Present and share with other groups.	• List the main tasks that can be accomplished using Google drive while team collaboration. • Explain main advantages of Google drive tools.
Productivity Tools	• utilize appropriate presenting application to create animation.	• create motion-tween using Flash animation application.	• Search and define motion-tween command and its function. • Create simple animation of a picture using motion-tween command. 	• Define motion-tween. • Use motion-tween command to create smooth transition of an object using Flash animation.

Algorithmic Thinking

Evaluation

Decomposition

Abstraction

Generalization
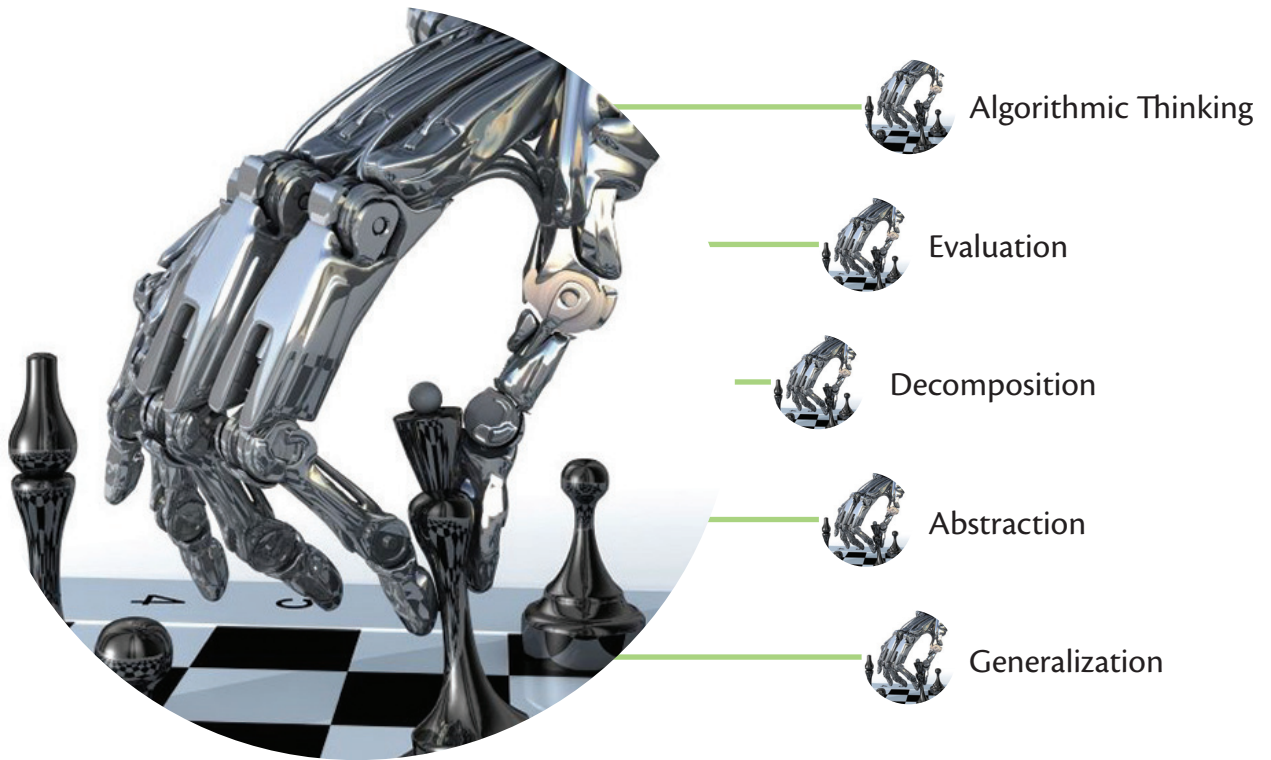
Computational Thinking (CT)

Domain 2: Computational Thinking (CT)

Definition

Computational thinking is the thought processes involved in formulating problems and their solutions so that the solutions are represented in a form that can be effectively carried out by an information - processing agent.

There are five core concepts involved in computational thinking:

- Algorithmic thinking
- Evaluation
- Decomposition
- Abstraction
- Generalization

Algorithmic thinking is a way of getting to a solution through clear definition of the steps. Rather than coming up with a single answer, like 42, the students develop a set of instructions or rules that if followed precisely (whether by a person or a computer) leads to answers to that and similar problems.

Evaluation is the process of ensuring an algorithmic solution is a good one: that it is fit for purpose. Various properties of algorithms need to be evaluated including whether they are correct, are fast enough, are economic in the use of resources, are easy for people to use and promote an appropriate experience. Trade - offs need to be made as there is rarely a single ideal solution for all situations. There is a specific and often extreme focus on attention to detail in computational thinking based evaluation.

Decomposition is a way of thinking about problems, algorithms, artifacts, processes and systems in terms of their parts. The separate parts can then be understood, solved, developed and evaluated separately. This makes complex problems easier to solve and large systems easier to design.

Abstraction involves hiding detail and removing unnecessary complexity. The skill is in choosing the right detail to hide so that the problem becomes easier without losing anything that is important.

Generalization is a way of quickly solving new problems based on previous problems we have solved.

Generic Outcomes

KG - G5 (cycle 1)

By the end of cycle 1, students will be able to:

1. differentiate various artifacts based on certain parameters.
2. demonstrate the ability to follow steps of simple processes.
3. demonstrate ability to rank, sort, and search objects manually based on some criteria.
4. demonstrate the ability to use logical thinking tools.

At this stage, student will be able to use different technological resources to solve simple problems to illustrate his/her thoughts, ideas, and stories in a step-by-step manner. Different online visual coding resources such as (code.org) will be used to give appropriate logical instructions to solve logical problems which involve sequences, repetitions and conditional instructions. In addition, student will be able to use logical thinking programs to solve some puzzles. Student will be able to understand how to arrange (sort) information into useful order. Moreover, student will be able to describe the process of sorting items from smallest to biggest as well as finding or inserting items in a sorted set of items.

G6 - G9 (cycle 2)

By the end of cycle 2, students will be able to:

1. identify various elements of a problem.
2. express problem solutions as a sequence of steps.
3. decompose a problem into sub problems that are easier to solve than the original problem.
4. show basic ability to simulate and model natural processes and systems.

Show the connection between the Computer Science problems and other fields.

At this stage, student will be able to define an algorithm as sequence of instructions that can be processed by a computer. Student will be able to formulate the problem mathematically using different techniques other than sequencing such as selection and iteration. Analyzing the correctness of the developed algorithm is one of the objectives of this stage as well as determining the complexity of the algorithm. To enhance algorithmic thinking, basic searching and sorting techniques will be introduced. The student will learn how to decompose a large/difficult problem into smaller problems. Moreover, student will be able to describe the notion of hierarchy and abstraction in computing. Furthermore, student will able to understand the concept of simulation and list different area of applications to solve real life problems. Student will also be able to define the link between Computer Science and other fields.

G10 - G12 (cycle 3 + cycle 3 advanced)

By the end of Cycle 3 and Cycle 3 A, students will be able to:
1. demonstrate the ability to evaluate algorithm working, complexity and structure.
2. organize algorithmic solution into logical modules.
3. use various data structure in algorithmic solutions.
4. use various decomposition and parallelization techniques.
5. analyze data and identify patterns through models and simulation.

At this stage, student will be able to understand algorithms complexity and classify problems in terms of difficulty. In addition, he/she will be able to explain the value of heuristic algorithms to approximate solutions for hard problems. Student will also be able to evaluate algorithms by their efficiency, correctness, and clarity. Moreover, he will be able to compare and contrast simple data structures and their uses. Student will also be able to use functions and parameters, classes and methods to divide a complex problem into simpler parts. Recursion techniques will be introduced at this stage as another way of using repetition. Furthermore, student will be able to describe the concept of parallel processing as a strategy to solve large problems. Advanced modeling and simulation techniques will be used to formulate, refine, and test scientific hypotheses. Finally, student will be able to show the symmetry between real-life problems and computer - related problems and identify different patterns and commonalities in problems, processes, solutions, or data.

Strands Description and Technical Keywords

	Strand Title	Strand Description	Key words
1	Algorithmic Thinking	Algorithmic thinking aims to build the problem solving skill and methodology. It allows the students to identify the problem components (i.e. input, output, and processing) prior to developing the solution. In addition to using various techniques to organize the solution steps.	Function, loop, iteration, conditional statements, procedure, parallel processing, data structures
2	Evaluation	This strand allows the student to evaluate the time and number of steps ramifications of various solution designs, compare and contrast the performance various algorithms, and be able to evaluate the memory requirements of algorithmic solutions.	algorithm complexity, big O notation, run time, memory requirements
3	Decomposition	Nowadays problems are very complicated. Decomposition divides large problems into smaller sub problems that are easier to solve. Solutions to some of these constituting sub - problems can be later reused when it comes to software components. To this end, students need to get exposed to various decomposition techniques.	Divide and conquer, greedy algorithms, recursion, object, class
4	Abstraction	Abstraction removes unnecessary details and focuses on the fundamental problem. It requires the ability to identify patterns in data. Through modeling and simulation, some systems problems maybe abstracted.	Modeling, simulation, pattern recognition, abstraction
5	Generalization	By identifying the relationship of Computer Science to modern problems, it is possible to generalize and adapt existing solutions to new problems. The students need to be able to identify the symmetry in problems all around us, and solve new problems based on previous problems that have been solved before.	Adaptation, solution transfer

Strands Distribution Per Grade

Grade Domains	KG	1	2	3	4	5	6	7	8	9	10	10A	11	11A	12	12A
Computational Thinking	Algorithmic Thinking															
	Abstraction															
						Decomposition										
						Generalization										
													Evaluation		

Student Learning Outcomes distribution Per Grade

Domains	Strand	Cycle 1								Cycle 2					Cycle 3				Cycle 3A			
		KG1	KG2	G1	G2	G3	G4	G5		G6	G7	G8	G9		G10	G11	G12		G10A	G11A	G12A	
Computational Thinking	Algorithmic Thinking	4	4	3	4	4	4	4	27	7	5	7	6	25	3	5	2	10	3	5	2	10
	Abstraction	2	1	1	2	2	2	2	12	2	5	3	1	11	3	3	3	9	3	3	3	9
	Decomposition	0	0	0	0	0	0	0	0	2	2	2	3	9	1	3	3	7	2	3	3	8
	Generalization	0	0	0	0	0	0	0	0	1	1	2	2	6	1	1	1	3	1	1	1	3
	Evaluation	0	0	0	0	0	0	0	0	0	0	0	0	0	5	3	4	12	5	3	4	12
Total									39					51				41				42

CT Domain Strand Distribution Per Cycle

Percentage of outcomes as per level of difficulty and percentage wise

Grade	No of outcomes				Outcomes Percentage		
	Difficulty Level				Difficulty Level		
	1	2	3	Sum	1	2	3
KG1	6	0	0	6	100%	0.00%	0.00%
KG2	5	0	0	5	100%	0.00%	0.00%
G1	4	0	0	4	100%	0.00%	0.00%
G2	2	4	0	6	33.33%	66.67%	0.00%
G3	0	6	0	6	0.00%	100%	0.00%
G4	0	0	6	6	0.00%	0.00%	100%
G5	0	0	6	6	0.00%	0.00%	100%
Cycle 1							
G6	7	5	0	12	58.33%	41.67%	0.00%
G7	4	7	2	13	30.77%	58.33%	15.38%
G8	1	7	6	15	6.67%	58.33%	40.00%
G9	1	4	7	12	8.33%	33.33%	58.33%
Cycle 2							
G10	10	3	0	13	76.92%	25.00%	0.00%
G11	11	4	0	15	73.33%	33.33%	0.00%
G12	5	8	0	13	38.46%	66.67%	0.00%
Cycle 3							
G10A	0	11	3	14	0.00%	91.67%	21.43%
G11A	0	11	4	15	0.00%	91.67%	26.67%
G12A	0	5	8	13	0.00%	41.67%	61.54%
Cycle 3A							

Allocated Periods distribution per cycle

	Number of Periods				
DLC	C 1	C2	C3	C3A	Total
	4.65	6.2	15.5	32.6	58.9

Strands Evolution Per Grade

Domain	Strand	Grade 1	Grade 2	Grade 3	Grade 4	Grade 5
Computational Thinking	Algorithmic Thinking	• Utilize technological resources to solve simple problems • Utilize authoring tools, digital cameras, and drawing tools to illustrate thoughts and ideas in a step-by-step manner	• Utilize technological resources to solve simple problems • Utilize authoring tools, digital cameras, and drawing tools to illustrate thoughts and ideas in a step-by-step manner	• Utilize technological resources to solve simple problems • Utilize authoring tools, digital cameras, and drawing tools to illustrate thoughts, ideas, and stories in a step-by-step manner	• Utilize technological resources to solve simple problems • Illustrate thoughts, ideas, and stories in a step-by-step manner	• Utilize technological resources to solve simple problems • Utilize technological resources to solve simple problems
	Abstraction	• Understand how to arrange (sort) information into useful order	• Understand how to arrange (sort) information into useful order	• Understand how to arrange (sort) information into useful order	• Understand how to arrange (sort) information into useful order	• Understand how to arrange (sort) information into useful order

Domain	Strand	Grade 6	Grade 7	Grade 8	Grade 9
Computational Thinking	Algorithmic Thinking	• Formulate the problem mathematically. • Define an algorithm as a sequence of instructions that can be processed by a computer • Develop a simple understanding of an algorithm.	• Use the basic steps in algorithmic problem-solving to design a solution • Develop a simple understanding of an algorithm	• Analyze the correctness of the developed algorithm. • Describe the process of parallelization as it relates to problem solving • Use visual representations of problem states, structures and data • Describe how various types of data are stored in a computer system	• Determine the complexity of the algorithm • Use basic searching techniques • Act out searching and sorting algorithms
	Decomposition	• Decompose a large problem into smaller problems	• Define the concept of modularity for solving large problems	• Demonstrate the importance of reusability in the decomposition process	• Decompose problem into sub - problems using divide and conquer
	Abstraction	• Understand the concept of abstraction	• Understand the concept of simulation • State the benefits of using simulation	• Describe how a simulation can be used to solve a problem.	• Interact with content-specific models and simulations to support learning and research
	Generalization	• Understand the connections between Computer Science and other fields	• Understand the connections between Computer Science and other fields	• Understand the connections between Computer Science and other fields	• Understand the connections between Computer Science and other fields

Domain	Strand	Grade 10	Grade 11	Grade 12
Computational Thinking	Generalization	• Understand Algorithms Complexity • Design Algorithmic solutions	• Classify problems in terms of difficulty • Explain the value of heuristic algorithms to approximate solutions for hard problems • Design Algorithmic solutions	• Explain the value of heuristic algorithms to approximate solutions for intractable problems
	Evaluation	• Critically examine classical algorithms • Evaluate algorithms by their efficiency, correctness, and clarity. • Compare and contrast simple data structures and their uses	• Critically examine classical algorithms • Evaluate algorithms by their efficiency, correctness, and clarity	• Critically examine classical algorithms • Evaluate algorithms by their efficiency, correctness, and clarity • Compare and contrast simple data structures and their uses
	Decomposition	• Use functions and parameters, classes and methods to divide a complex problem into simpler parts.	• Explain how sequence, selection, iteration, and recursion are building blocks of algorithms. • Describe the concept of parallel processing as a strategy to solve large problems.	• Explain how sequence, selection, iteration, and recursion are building blocks of algorithms. • Describe the concept of parallel processing as a strategy to solve large problems.
	Abstraction	• Use modeling and simulation to represent and understand natural phenomena • Discuss the value of abstraction to manage problem complexity	• Use modeling and simulation to represent and understand natural phenomena • Discuss the value of abstraction to manage problem complexity • Use models and simulations to test scientific hypotheses	• Use modeling and simulation to represent and understand natural phenomena • Discuss the value of abstraction to manage problem complexity • Use models and simulations to help formulate, refine, and test scientific hypotheses
	Generalization	• Describe how computation shares features with art and music by translating human intention into an artifact	• Describe how computation shares features with art and music by translating human intention into an artifact	• Describe how computation shares features with art and music by translating human intention into an artifact

Domain	Strand	Grade 10A	Grade 11A	Grade 12A
Computational Thinking	Generalization	• Understand Algorithms Complexity • Design Algorithmic solutions	• Classify problems in terms of difficulty • Explain the value of heuristic algorithms to approximate solutions for hard problems • Design Algorithmic solutions	• Explain the value of heuristic algorithms to approximate solutions for intractable problems
	Evaluation	• Critically examine classical algorithms • Evaluate algorithms by their efficiency, correctness, and clarity • Compare and contrast simple data structures and their uses	• Critically examine classical algorithms and implement an original algorithm • Evaluate algorithms by their efficiency, correctness, and clarity	• Critically examine classical algorithms • Evaluate algorithms by their efficiency, correctness, and clarity • Compare and contrast simple data structures and their uses
	Decomposition	• Use functions and parameters, classes and methods to divide a complex problem into simpler parts • Describe the concept of parallel processing as a strategy to solve large problems	• Explain how sequence, selection, iteration, and recursion are building blocks of algorithms • Describe the concept of parallel processing as a strategy to solve large problems	• Explain how sequence, selection, iteration, and recursion are building blocks of algorithms • Describe the concept of parallel processing as a strategy to solve large problems
	Abstraction	• Use modeling and simulation to represent and understand natural phenomena • Discuss the value of abstraction to manage problem complexity	• Use modeling and simulation to represent and understand natural phenomena • Discuss the value of abstraction to manage problem complexity • Use models and simulations to test scientific hypotheses	• Use modeling and simulation to represent and understand natural phenomena • Discuss the value of abstraction to manage problem complexity • Use models and simulations to help formulate, refine, and test scientific hypotheses
	Generalization	• Describe how computation shares features with art and music by translating human intention into an artifact	• Describe how computation shares features with art and music by translating human intention into an artifact	• Describe how computation shares features with art and music by translating human intention into an artifact

Integration between CT domain and other domains

CT	CCP	DLC	CCC
Algorithmic Thinking	• Coding		• Impacts of Technology
Evaluation	• Testing and validation	• Algorithmic Thinking	• Information accuracy & reliability
Decomposition	• Coding		
Abstraction	• Coding	• Algorithmic Thinking	
Generalization	• Coding		• Impacts of Technology

Scope and Sequence
Domains, Strands and Standards by Grade

Grade: KG1					
Domain	Strand	Standards	Learning outcomes	Integration	Level
2. Computational Thinking	(2.1) Algorithmic thinking	(2.1.1) Utilize technological resources to solve simple problems	(KG1.2.1.1.1) Solve age appropriate puzzles		1
			(KG1.2.1.1.2) Play a guessing game with a friend to develop a method for efficient guessing		1
		(2.1.2) Utilize authoring tools, digital cameras, and drawing tools to illustrate thoughts and ideas in a step-by-step manner	(KG1.2.1.2.1) Illustrate steps needed to complete simple task using simple computer graphics program		1
			(KG1.2.1.2.2) Describe story read by the teacher using simple computer graphics program		1
	(2.2) Abstraction	(2.2.1) Understand how to arrange (sort) information into useful order	(KG1.2.2.1.1) Sort set of objects with different sizes from smallest to biggest		1
			(KG1.2.2.1.2) Sort students by their date of birth		1

Grade: KG2					
Domain	Strand	Standards	Learning outcomes	Integration	Level
2. Computational Thinking	(2.1) Algorithmic thinking	(2.1.1) Utilize technological resources to solve simple problems	(KG2.2.1.1.1) Solve age appropriate puzzles		1
			(KG2.2.1.1.2) Play a guessing game with a friend to develop a method for efficient guessing		1
		(2.1.2) Utilize authoring tools, digital cameras, and drawing tools to illustrate thoughts and ideas in a step-by-step manner	(KG2.2.1.2.1) Illustrate steps needed to complete simple task using simple computer graphics program		1
			(KG2.2.1.2.2) Describe story read by the teacher using simple computer graphics program		1
	(2.2) Abstraction	(2.2.1) Understand how to arrange (sort) information into useful order	(KG2.2.2.1.1) Sort set of objects with different sizes from smallest to biggest		1

Grade: 1					
Domain	Strand	Standards	Learning outcomes	Integration	Level
2.\nComputational\nThinking	(2.1)\nAlgorithmic\nthinking	(2.1.1)\nUtilize technological resources to solve simple problems	(G1.2.1.1.1)\nSolve simple maze following step by step solution pattern		1
			(G1.2.1.1.2)\nPlay guessing games with classmate to develop guessing strategy		1
		(2.1.2)\nUtilize authoring tools, digital cameras, and drawing tools to illustrate thoughts and ideas in a step-by-step manner	(G1.2.1.2.1)\nIllustrate steps needed to complete simple task using simple computer graphics program		1
	(2.2)\nAbstraction	(2.2)\nUnderstand how to arrange (sort) information into useful order	(2.2.1)\nSort objects in a requested order		1

Grade: 2					
Domain	Strand	Standards	Learning outcomes	Integration	Level
2.\nComputational\nThinking	(2.1)\nAlgorithmic\nthinking	(2.1.1)\nUtilize technological resources to solve simple problems	(G2.2.1.1.1)\nDemonstrate logical thinking through puzzles or guessing games		2
			(G2.2.1.1.2)\nGive appropriate logical instructions to solve simple problems using logical thinking tools		1
		(2.1.2)\nUtilize authoring tools, digital cameras, and drawing tools to illustrate stories in a step-by-step manner	(G2.2.1.2.1)\nDescribe process to accomplish a simple task		2
			(G2.2.1.2.2)\nBuild animated stories using logical thinking tools		2
	(2.2)\nAbstraction	(2.2.1)\nUnderstand how to arrange (sort) information into useful order	(2.2.1)\nSort large number of items of different sizes from biggest to smallest by dividing them into smaller groups		2
			(2.2.2)\nSort basketball team players from shortest to tallest		1

Grade: 3					
Domain	Strand	Standards	Learning outcomes	Integration	Level
2. Computational Thinking	(2.1) Algorithmic thinking	(2.1.1) Utilize technological resources to solve simple problems	(G3.2.1.1.1) Solve logical problems using logical thinking tools		2
			(G3.2.1.1.2) Solve puzzle which involves repetition and logical instructions using logical thinking tools		2
		(2.1.2) Utilize authoring tools, digital cameras, and drawing tools to illustrate thoughts, ideas, and stories in a step-by-step manner	(G3.2.1.2.1) Describe a step by step solution to sum several numbers		2
			(G3.2.1.2.2) Illustrate the process of sorting objects		2
	(2.2) Abstraction	(2.2.1) Understand how to arrange (sort) information into useful order	(G3.2.2.1.1) Describe the process of sorting items		2
			(G3.2.2.1.2) Insert new item in an already sorted set of items		2

Grade: 4					
Domain	Strand	Standards	Learning outcomes	Integration	Level
2. Computational Thinking	(2.1) Algorithmic thinking	(2.1.1) Utilize technological resources to solve simple problems	(G4.2.1.1.1) Provide appropriate logical instructions to solve logical problems.		3
			(G4.2.1.1.2) Solve puzzle which involves repetition		3
		(2.1.2) Illustrate thoughts, ideas, and stories in a step-by-step manner	(G4.2.1.2.1) Illustrate step by step instructions to perform multiplications and division		3
			(G4.2.1.2.2) Illustrate the process of inserting new object in an already sorted set of objects		3
	(2.2) Abstraction	(2.2.1) Understand how to arrange (sort) information into useful order	(G4.2.2.1.1) Sort given sets of objects in an efficient way (minimum number of steps)		3
			(G4.2.1.1.2) Insert new item in an already sorted set of item in an efficient way (minimum number of steps)		3

Grade: 5					
Domain	Strand	Standards	Learning outcomes	Integration	Level
2. Computational Thinking	(2.1) Algorithmic thinking	(2.1.1) Utilize technological resources to solve simple problems	(G5.2.1.1.1) Provide appropriate logical instructions to solve logical problems which involve repetition and conditional instructions		3
			(G5.2.1.1.2) Solve puzzles which involve repetition and conditional instructions		3
		(2.1.2) Illustrate thoughts, ideas, and stories in a step-by-step manner	(G5.2.1.2.1) Illustrate step by step instructions to perform sorting		3
			(G5.2.1.2.2) Illustrate step by step instructions to perform inserting		3
	(2.2) Abstraction	(2.2.1) Understand how to arrange (sort) information into useful order	(G5.2.2.1.1) Describe the process of sorting items from smallest to biggest		3
			(G5.2.2.1.2) Describe the process of finding items in a sorted set of items		3

Grade: 6					
Domain	Strand	Standards	Learning outcomes	Integration	Level
2. Computational Thinking	(2.1) Algorithmic thinking	(2.1.1) Formulate the problem mathematically	(G6.2.1.1.1) Identify the key elements of the problem such as inputs, outputs, assumptions, limitations		1
		(2.1.2) Define an algorithm as a sequence of instructions that can be processed by a computer.	(G6.2.1.2.1) Define an algorithm		1
			(G6.2.1.2.2) Use the identified key elements to systematically solve problems		2
			(G6.2.1.2.3) Discuss different algorithms that solve the same problem		2
		(2.1.3) Develop a simple understanding of an algorithm.	(G6.2.1.3.1) Develop an algorithm using basic sequencing techniques		1
			(G6.2.1.3.2) Express an algorithm in simple form		1
			(G6.2.1.3.3) Use notation and diagrams to describe the algorithm		2
	(2.2) Decomposition	(2.2.1) Decompose a large problem into smaller problems	(G6.2.2.1.1) Discuss the usefulness of the decomposition		1
			(G6.2.2.1.2) Decompose problem into subtasks		1
	(2.3) Abstraction	(2.3.1) Understand the concept of abstraction	(G6.2.3.1.1) Identify the important information from the problem		2
			(G6.2.3.1.2) Describe the notion of hierarchy and abstraction in computing		2
	(2.4) Generalization	(2.4.1) Understand the connections between Computer Science and other fields	(G6.2.4.1.1) List some connections between elements of mathematics and Computer Science		1

Grade: 7					
Domain	Strand	Standards	Learning outcomes	Integration	Level
2. Computational Thinking	(2.1) Algorithmic thinking	(2.1.1) Use the basic steps in algorithmic problem-solving to design a solution	(G7.2.1.1.1) Apply logical thinking for solving real-world problems		1
			(G7.2.1.1.2) Define the elementary steps of an algorithm to solve a given problem		2
			(G7.2.1.1.3) Select an efficient and effective solution		3
		(2.1.1) Develop a simple understanding of an algorithm	(G7.2.1.1.1) Develop an algorithm by using selection and iteration		2
			(G7.2.1.1.2) Adapt the algorithm to the context of the problem		3
	(2.2) Decomposition	(2.2.1) Define the concept of modularity for solving large problems	(G7.2.2.1.1) Decompose large problem into sub - problems using modules		2
			(G7.2.2.1.2) Use graph as a tool for representing problem states and solutions to complex problems		2
	(2.3) Abstraction	(2.3.1) Understand the concept of simulation	(G7.2.3.1.1) Define simulation		1
			(G7.2.3.1.2) Identify what kinds of problems can be solved using modeling and simulation		1
			(G7.2.3.1.3) Use modeling to represent and understand natural phenomena		2
		(2.3.2) State the benefits of using simulation	(G7.2.3.2.1) List the benefits of simulation and areas of application		1
			(G7.2.3.2.2) Discuss the simulation results		2
	(2.4) Generalization	(2.4.1) Understand the connections between Computer Science and other fields	(G7.2.4.1.1) Use binary numbers as an example of connections between elements of mathematics and Computer Science		2

| Grade: 8					
Domain	Strand	Standards	Learning outcomes	Integration	Level
2. Computational Thinking	(2.1) Algorithmic thinking	(2.1.1) Analyze the correctness of the developed algorithm	(G8.2.1.1.1) Analyze the correctness of basic algorithmic structures		2
			(G8.2.1.1.2) Evaluates the effectiveness of the algorithm (time and memory usage)		3
			(G8.2.1.1.3) Compare different solutions of a problem		3
		(2.1.2) Describe the process of parallelization as it relates to problem solving.	(G8.2.1.2.1) Describe the concept of parallel processing as a strategy to solve large problems		2
		(2.1.1) Use visual representations of problem states, structures and data	(G8.2.1.1.1) Use different techniques to solve problems		3
		(2.1.2) Describe how various types of data are stored in a computer system	(G8.2.1.2.1) Represent data in various forms, including text, sounds, pictures, and numbers		2
			(G8.2.1.2.2) Analyze the representations and trade - offs among various forms of digital data		2
	(2.2) Decomposition	(2.2.1) Demonstrate the importance of reusability in the decomposition process	(G8.2.2.1.1) Discuss the usefulness of modules in terms of computational complexity		2
			(G8.2.2.1.2) Define the concept of reusability		1
	(2.3) Abstraction	(2.3.1) Describe how a simulation can be used to solve a problem	(G8.2.3.1.1) Use content-specific tools, software, and simulations to support learning and research		3
			(G8.2.3.1.2) Demonstrate different experiments using models		3
			(G8.2.3.1.3) Analyze the degree to which a model accurately represents the real world problem		3
	(2.4) Generalization	(2.4.1) Understand the connections between Computer Science and other fields	(G8.2.4.1.1) Use binary numbers and logics as an example of connections between elements of mathematics and Computer Science		2
			(G8.2.4.1.2) Give examples of interdisciplinary applications of computational thinking.		2

Grade: 9					
Domain	Strand	Standards	Learning outcomes	Integration	Level
2. Computational Thinking	(2.1) Algorithmic thinking	(2.1.1) Determine the complexity of the algorithm	(G9.2.1.1.1) Estimate the complexity of an algorithm by counting the number of steps required		3
			(G9.2.1.1.2) Change difficult and ambiguous steps by clear steps		3
		(2.1.2) Use basic searching techniques	(G9.2.1.2.1) Search in a given problem looking for the highest, the lowest, the largest, or the smallest value		2
		(2.1.3) Act out searching and sorting algorithms	(G9.2.1.3.1) Define what is sorting		1
			(G9.2.1.3.2) Arrange the data/elements/objects in ascending or descending order using different types of sorting		2
			(G9.2.1.3.3) Compare search and sort algorithms		3
	(2.2) Decomposition	(2.2.1) Decompose problem into sub - problems using divide and conquer	(G9.2.2.1.1) Define the concept of divide and conquer algorithm to solve large problems		2
			(G9.2.2.1.2) Describe how some parts of algorithm can be used many times		2
			(G9.2.2.1.3) Combine sub - solutions for sub - problems to form a generic solution		3
	(2.3) Abstraction	(2.3.1) Use simulations to formulate and test hypotheses and examine results	(G9.2.3.1.1) Use a model of a simple ecosystem to evaluate the results of conducted experiments		3
	(2.4) Generalization	(2.4.1) Understand the connections between Computer Science and other fields	(G9.2.4.1.1) Use binary numbers, logic, sets and functions as an example of connections between elements of mathematics and Computer Science		3
			(G9.2.4.1.2) Give examples of interdisciplinary applications of computational thinking		3

| Grade: 10					
Domain	Strand	Standards	Learning outcomes	Integration	Level
2. Computational Thinking	(2.1) Algorithmic thinking	(2.1.1) Understand Algorithms Complexity	(G10.2.1.1.1) Calculate the number of steps required to finish the algorithm steps		1
		(2.1.2) Design Algorithmic solutions	(G10.2.1.2.1) Write instructions that if followed in a given order (sequences) achieve a desired effect		2
			(G10.2.1.2.2) Write instructions that choose between different constituent instructions (selection) to achieve a desired effect		2
	(2.2) Evaluation	(2.2.1) Critically examine classical algorithms	(G10.2.2.1.1) Verify that an algorithm works (proof)		1
			(G10.2.2.1.2) Assess whether a solution meets the specification (criteria)		1
		(2.2.2) Evaluate algorithms by their efficiency, correctness, and clarity	(G10.2.2.2.1) Assess that an algorithm is fit for purpose		1
			(G10.2.2.2.2) Assess whether an algorithm does the right thing (functional correctness)		1
		(2.2.1) Compare and contrast simple data structures and their uses	(G10.2.2.1.1) Compare and contrast simple data structures and their uses		2
	(2.3) Decomposition	(2.3.1) Use functions and parameters, classes and methods to divide a complex problem into simpler parts	(G10.2.3.1.1) Group a collection of instructions that do a well-defined task		1
	(2.4) Abstraction	(2.4.1) Use modeling and simulation to represent and understand natural phenomena	(G10.2.4.1.1) Reduce complexity by removing unnecessary detail		1
			(G10.2.4.1.2) Choose a way to represent artefacts (whether objects, problems, processes or systems) to allow it to be manipulated in useful ways		1
		(2.4.2) Discuss the value of abstraction to manage problem complexity	(G10.2.4.2.1) Hide complexity in data, for example by using data structures		1
	(2.5) Generalization	(2.5.1) Describe how computation shares features with art and music by translating human intention into an artifact	(G10.2.5.1.1) Identify patterns and commonalities in problems, processes, solutions, or data		1

| Grade: 10A					
Domain	Strand	Standards	Learning outcomes	Integration	Level
2. Computational Thinking	(2.1) Algorithmic thinking	(2.1.1) Understanding Algorithms Complexity	(G10A.2.1.1.1) Calculate the number of steps required to finish the algorithm steps		2
		(2.1.2) Designing Algorithmic solutions	(G10A.2.1.2.1) Write instructions that if followed in a given order (sequences) achieve a desired effect		3
			(G10A.2.1.2.2) Write instructions that choose between different constituent instructions (selection) to achieve a desired effect		3
	(2.2) Evaluation	(2.2.1) Critically examine classical algorithms	(G10A.2.2.1.1) Verify that an algorithm works (proof)		2
			(G10A.2.2.1.2) Assess whether a solution meets the specification (criteria)		2
		(2.2.2) Evaluate algorithms by their efficiency, correctness, and clarity	(G10A.2.2.2.1) Assess that an algorithm is fit for purpose		2
			(G10A.2.2.2.2) Assess whether an algorithm does the right thing (functional correctness)		2
		(2.2.3) Compare and contrast simple data structures and their uses	(G10A.2.2.3.1) Compare and contrast simple data structures and their uses		3
	(2.3) Decomposition	(2.3.1) Use functions and parameters, classes and methods to divide a complex problem into simpler parts	(G10A.2.3.1.1) Group a collection of instructions that do a well-defined task		2
		(2.3.2) Describe the concept of parallel processing as a strategy to solve large problems	(G10A.2.3.2.1) Describe the concept of parallel processing as a strategy to solve large problems		2
	(2.4) Abstraction	(2.4.1) Use modeling and simulation to represent and understand natural phenomena	(G10A.2.4.1.1) Reduce complexity by removing unnecessary detail		2
			(G10A.2.4.1.2) Choose a way to represent artefacts (whether objects, problems, processes or systems) to allow it to be manipulated in useful ways		2
		(2.4.2) Discuss the value of abstraction to manage problem complexity	(G10A.2.4.2.1) Hide complexity in data, for example by using data structures		2
	(2.5) Generalization	(2.5.1) Describe how computation shares features with art and music by translating human intention into an artifact	(G10A.2.5.1.1) Identify patterns and commonalities in problems, processes, solutions, or data		2

			Grade: 11		
Domain	Strand	Standards	Learning outcomes	Integration	Level
2. Computational Thinking	(2.1) Algorithmic thinking	(2.1.1) Classify problems in terms of difficulty	(G11.2.1.1.1) Classify problems as simple or complex to solve		1
		(2.1.2) Explain the value of heuristic algorithms to approximate solutions for hard problems	(G11.2.1.2.1) Understand the meaning of exact, approximate, and heuristic solutions		1
		(2.1.1) Designing Algorithmic solutions	(G11.2.1.1.1) Step through algorithms/code step by step to work out what they do (dry run / tracing)		1
			(G11.2.1.1.2) Write instructions that repeat groups of instructions (loops/ procedures, iteration)		1
			(G11.2.1.1.3) Group a collection of instructions that do a well-defined task to make a new instruction (subroutines, functions, methods)		1
	(2.2) Evaluation	(2.2.1) Critically examine classical algorithms	(G11.2.2.1.1) Use rigorous argument to justify that an algorithm works (proof)		2
			(G11.2.2.1.2) Assess whether a system is easy for people to use (usability)		2
		(2.2.2) Evaluate algorithms by their efficiency, correctness, and clarity	(G11.2.2.2.1) Show an Understanding of the various bounds on number of steps an algorithm takes		2
	(2.3) Decomposition	(2.3.1) Explain how sequence, selection, iteration, and recursion are building blocks of algorithms	(G11.2.3.1.1) Break down artefacts (whether objects, problems, processes, solutions, systems or abstractions) into constituent parts to make them easier to work with		1
		(2.3.2) Describe the concept of parallel processing as a strategy to solve large problems	(G11.2.3.2.1) Demonstrate concurrency by separating processes into threads		1
			(G11.2.3.2.2) Divide data into parallel streams		1
	(2.4) Abstraction	(2.4.1) Use modeling and simulation to represent and understand natural phenomena	(G11.2.4.1.1) Analyze data to identify patterns through modeling and simulation		1
		(2.4.2) Discuss the value of abstraction to manage problem complexity	(G11.2.4.2.1) Show how abstraction can reduce problem complexity		2
		(2.4.3) Use models and simulations to test scientific hypotheses	(G11.2.4.3.1) Use models and simulations to test scientific hypotheses		1
	(2.5) Generalization	(2.5.1) Describe how computation shares features with art and music by translating human intention into an artifact	(G11.2.5.1.1) Show the symmetry between real-life problems and computer - related problems		1

Grade: 11A					
Domain	Strand	Standards	Learning outcomes	Integration	Level
2. Computational Thinking	(2.1) Algorithmic thinking	(2.1.1) Classify problems in terms of difficulty	(G11A.2.1.1.1) Classify problems as simple or complex to solve		2
		(2.1.2) Explain the value of heuristic algorithms to approximate solutions for hard problems	(G11A.2.1.2.1) Understand the meaning of exact, approximate, and heuristic solutions		2
		(2.1.3) Designing Algorithmic solutions	(G11A.2.1.3.1) Step through algorithms/code step by step to work out what they do (dry run / tracing)		2
			(G11A.2.1.3.2) Write instructions that repeat groups of instructions (loops/ procedures, iteration)		2
			(G11A.2.1.3.3) Group a collection of instructions that do a well-defined task to make a new instruction (subroutines, functions, methods)		2
	(2.2) Evaluation	(2.2.1) Critically examine classical algorithms and implement an original algorithm	(G11A.2.2.1.1) Use rigorous argument to justify that an algorithm works (proof)		3
			(G11A.2.2.1.2) Assess whether a system is easy for people to use (usability)		3
		(2.2.2) Evaluate algorithms by their efficiency, correctness, and clarity	(G11A.2.2.2.3) Show an Understanding of the various bounds on number of steps an algorithm takes		3
	(2.3) Decomposition	(2.3.1) Explain how sequence, selection, iteration, and recursion are building blocks of algorithms	(2.3.1) Break down artefacts (whether objects, problems, processes, solutions, systems or abstractions) into constituent parts to make them easier to work with		2
		(2.3.2) Describe the concept of parallel processing as a strategy to solve large problems	(G11A.2.3.2.1) Demonstrate concurrency by separating processes into threads		2
			(G11A.2.3.2.2) Divide data into parallel streams		2
	(2.4) Abstraction	(2.4.1) Use modeling and simulation to represent and understand natural phenomena	(G11A.2.4.1.1) Analyze data to identify patterns through modeling and simulation		2
		(2.4.2) Discuss the value of abstraction to manage problem complexity	(G11A.2.4.2.1) Show how abstraction can reduce problem complexity		3
		(2.4.3) Use models and simulations to test scientific hypotheses	(G11A.2.4.3.1) Use models and simulations to test scientific hypotheses		2
	(2.5) Generalization	(2.5.1) Describe how computation shares features with art and music by translating human intention into an artifact	(G11A.2.5.1.1) Show the symmetry between real-life problems and computer - related problems		2

				Grade: 12		
Domain	Strand	Standards	Learning outcomes	Integration	Level

Domain	Strand	Standards	Learning outcomes	Integration	Level
2. Computational Thinking	(2.1) Algorithmic thinking	(2.1.1) Explain the value of heuristic algorithms to approximate solutions for intractable problems	(G12.2.1.1.1) Create algorithms that give good, though not always the best, solutions (heuristics)		1
			(G12.2.1.1.2) Design algorithmic solutions that take into account the abilities, limitations and desires of the people who will use them		1
	(2.2) Evaluation	(2.2.1) Critically examine classical algorithms	(G12.2.2.1.1) Compare some classical algorithms in terms of use and speed		2
			(G12.2.2.1.2) Inspect different algorithms to determine the run-time complexity of some algorithms (e.g., bubble sort)		2
		(2.2.2) Evaluate algorithms by their efficiency, correctness, and clarity	(G12.2.2.2.1) Assess whether a system is easy for people to use (usability)		2
		(2.2.3) Compare and contrast simple data structures and their uses	(G12.2.2.3.1) Introduce more complicated data structure		2
	(2.3) Decomposition	(2.3.1) Explain how sequence, selection, iteration, and recursion are building blocks of algorithms	(G12.2.3.1.1) Break down artefacts (whether objects, problems, processes, solutions, systems or abstractions) into constituent parts to make them easier to work with		1
			(G12.2.3.1.2) Break down a problem into simpler but otherwise identical versions of the same problem that can be solved in the same way (Recursive and Divide and conquer strategies)		1
		(2.3.2) Describe the concept of parallel processing as a strategy to solve large problems	(G12.2.3.2.1) Demonstrate concurrency by separating processes into threads and dividing data into parallel streams		2
	(2.4) Abstraction	(2.4.1) Use modeling and simulation to represent and understand natural phenomena	(G12.2.4.1.1) Analyze data to identify patterns through modeling and simulation		2
		(2.4.2) Discuss the value of abstraction to manage problem complexity	(G12.2.4.2.1) Go through multiple problems to remove unnecessary details		2
		(2.4.1) Use models and simulations to help formulate, refine, and test scientific hypotheses	(G12.2.4.1.1) Use models and simulations to help formulate, refine, and test scientific hypotheses		2
	(2.5) Generalization	(2.5.1) Describe how computation shares features with art and music by translating human intention into an artifact	(G12.2.5.1.1) Transfers solutions from Computer Science to real-life problems		1

Grade: 12A					
Domain	Strand	Standards	Learning outcomes	Integration	Level
2. Computational Thinking	(2.1) Algorithmic thinking	(2.1.1) Explain the value of heuristic algorithms to approximate solutions for intractable problems	(G12A.2.1.1.1) Create algorithms that give good, though not always the best, solutions (heuristics)		2
			(G12A.2.1.1.2) Design algorithmic solutions that take into account the abilities, limitations and desires of the people who will use them		2
	(2.2) Evaluation	(2.2.1) Critically examine classical algorithms	(G12A.2.2.1.1) Compare some classical algorithms in terms of use and speed		3
			(G12A.2.2.1.2) Inspect different algorithms to determine the run-time complexity of some algorithms (e.g., bubble sort)		3
		(2.2.2) Evaluate algorithms by their efficiency, correctness, and clarity	(G12A.2.2.2.1) Assess whether a system is easy for people to use (usability)		3
		(2.2.3) Compare and contrast simple data structures and their uses	(G12A.2.2.3.1) Introduce more complicated data structure		3
	(2.3) Decomposition	(2.3.1) Explain how sequence, selection, iteration, and recursion are building blocks of algorithms	(G12A.2.3.1.1) Break down artefacts (whether objects, problems, processes, solutions, systems or abstractions) into constituent parts to make them easier to work with		2
			(G12A.2.3.1.2) Break down a problem into simpler but otherwise identical versions of the same problem that can be solved in the same way (Recursive and Divide and conquer strategies)		2
		(2.3.2) Describe the concept of parallel processing as a strategy to solve large problems	(G12A.2.3.2.1) Demonstrate concurrency by separating processes into threads and dividing data into parallel streams		3
	(2.4) Abstraction	(2.4.1) Use modeling and simulation to represent and understand natural phenomena	(G12A.2.4.1.1) Analyze data and identify patterns through modeling and simulation		3
		(2.4.2) Discuss the value of abstraction to manage problem complexity	(G12A.2.4.2.1) Go through multiple problems to remove unnecessary details		3
		(2.4.3) Use models and simulations to help formulate, refine, and test scientific hypotheses	(G12A.2.4.3.1) Use models and simulations to help formulate, refine, and test scientific hypotheses		3
	(2.5) Generalization	(2.5.1) Describe how computation shares features with art and music by translating human intention into an artifact	(G12A.2.5.1.1) Transfers solutions from Computer Science to real-life problems		2

Student Performance Criteria

KG1				
Student	1-Barely or not initiated	2-Under development	3-Satisfies expectations	4-Exceeds expectations
Domain Computational Thinking	A (Level 1) Student may be able to:	A (Level 2) Student is able to:	A (Level 3) Student is able to:	A (Level 4) Student is able to:
Algorithmic Thinking	• solve puzzle with help of teacher	• solve puzzle with some help of teacher	• solve puzzle without any help	• solve puzzle without any help in noticeably short time
Abstraction	• sort objects with few mistakes	• sort objects correctly with the help of teacher	• sort objects correctly without any help	• sort objects correctly without any help in noticeably short time

KG2				
Student	1-Barely or not initiated	2-Under development	3-Satisfies expectations	4-Exceeds expectations
Domain Computational Thinking	A (Level 1) Student may be able to:	A (Level 2) Student is able to:	A (Level 3) Student is able to:	A (Level 4) Student is able to:
Algorithmic Thinking	• solve puzzle with help of teacher	• solve puzzle with some help of teacher	• solve puzzle without any help.	• solve puzzle without any help in noticeably short time.
Abstraction	• sort objects with few mistakes	• sort objects correctly with the help of teacher	• sort objects correctly without any help.	• sort objects correctly without any help in noticeably short time.

Grade 1				
Student	1-Barely or not initiated	2-Under development	3-Satisfies expectations	4-Exceeds expectations
Domain Computational Thinking	A (Level 1) Student may be able to:	A (Level 2) Student is able to:	A (Level 3) Student is able to:	A (Level 4) Student is able to:
Algorithmic Thinking	• show some attempts to solve maze • show some of the steps needed to complete task	• solve maze with help of teacher • show some of the steps needed to complete task	• solve simple maze • illustrate steps needed to complete task.	• solve simple maze with easiness • Illustrate steps to complete task clearly and correctly.
Abstraction	• sort students from shortest to tallest with the help of teacher.	• sort students from shortest to tallest with some help from the teacher.	• sort students from shortest to tallest without any help.	• short students from shortest to tallest without any difficulty.

Grade 2				
Student	1-Barely or not initiated	2-Under development	3-Satisfies expectations	4-Exceeds expectations
Domain Computational Thinking	A (Level 1) Student may be able to:	A (Level 2) Student is able to:	A (Level 3) Student is able to:	A (Level 4) Student is able to:
Algorithmic Thinking	• demonstrate little or no logical thinking while solving puzzle. • describe the process of making certain tasks with some.	• demonstrate some logical thinking while solving puzzle. • describe process of making certain task with the help of the teacher.	• demonstrate logical thinking while solving puzzle. • describe process of making certain tasks.	• demonstrate effective logical thinking while solving puzzle. • clearly describe the process of making certain task.
Abstraction	• sort small number of items from smallest to biggest.	• sort large number of items from smallest to biggest with the help of teacher.	• sort large number of items.	• sort large number of times efficiently by dividing them into smaller groups.

Grade 3				
Student	1-Barely or not initiated	2-Under development	3-Satisfies expectations	4-Exceeds expectations
Domain Computational Thinking	A (Level 1) Student may be able to:	A (Level 2) Student is able to:	A (Level 3) Student is able to:	A (Level 4) Student is able to:
Algorithmic Thinking	• attempt to solve logical problem, but being able to give solution.	• provide partial solution for logical thinking problem.	• solve logical thinking problems.	• solve puzzle which involves repetition and logical instructions.
Abstraction	• describe general steps needed to sort items from smallest to biggest.	• describe the process of sorting items from smallest to biggest with some missing steps.	• describe the process of sorting items from smallest to biggest.	• describe the process of sorting items from smallest to biggest and the process and inserting new item in an already sorted set of items.

Grade 4				
Student	1-Barely or not initiated	2-Under development	3-Satisfies expectations	4-Exceeds expectations
Domain Computational Thinking	A (Level 1) Student may be able to:	A (Level 2) Student is able to:	A (Level 3) Student is able to:	A (Level 4) Student is able to:
Algorithmic Thinking	• provide incomplete logical instructions to solve logical problems. • show some attempts to solve simple puzzle.	• provide logical instructions to solve logical problems with hesitation. • shows some difficulty and challenge while solving puzzle which involves repetition.	• provide appropriate and complete logical instructions to solve logical problems. • solve puzzle which involves repetition.	• provide appropriate and complete logical instruction to solve difficult logical problems. • solve puzzle with involves repetition in noticeably short time.
Abstraction	• sort given sets of objects from smallest to biggest.	• sort given sets of objects from smallest to biggest with the minimum number of steps.	• sort given sets of objects from smallest to biggest, and insert new item in an already sorted set of item with the minimum number of steps.	• apply sorting and insertion algorithms to real world problem in an efficient manner.

Grade 5				
Student	1-Barely or not initiated	2-Under development	3-Satisfies expectations	4-Exceeds expectations
Domain Computational Thinking	A (Level 1) Student may be able to:	A (Level 2) Student is able to:	A (Level 3) Student is able to:	A (Level 4) Student is able to:
Algorithmic Thinking	• provide appropriate logical instructions to solve logical problems.	• provide appropriate logical instructions to solve logical problems which involve repetition and conditional instructions.	• provide appropriate logical instructions to solve logical problems and puzzles which involve repetition and conditional instructions.	• provide appropriate logical instructions to solve real world problems which involve repetition and conditional instructions.
Abstraction	• roughly describing the process of sorting items from smallest to biggest.	• describe the process of sorting items from smallest to biggest.	• describe the process of sorting items from smallest to biggest and the process of finding items in a sorted set of items.	• describe the process of sorting items from smallest to biggest and the process of finding items in an unordered set of items.

Grade 6				
Student	1-Barely or not initiated	2-Under development	3-Satisfies expectations	4-Exceeds expectations
Domain Computational Thinking	A (Level 1) Student may be able to:	A (Level 2) Student is able to:	A (Level 3) Student is able to:	A (Level 4) Student is able to:
Algorithmic Thinking	• identify inputs and outputs of the problem with reasonable accuracy. • define an algorithm with hesitation and unable to identify key elements for solving problem. • develop an algorithm but with many missing steps.	• identify inputs and outputs of the problem with frequent errors. • define an algorithm with hesitation and difficulty but able to list some of the identified key elements. • develop an algorithm with few missing steps using simple technique such as sequencing.	• identify all of the inputs, outputs needed to solve the problems with few errors. • define an algorithm with accuracy and confidence and list most of the identified key elements. • develop an algorithm with all required steps using simple techniques such as sequencing with only few errors.	• identify all the inputs, all the outputs correctly and any assumptions or limitations needed to solve the problems. • define an algorithm with accuracy and confidence based on the identified key elements and use it to solve similar problems. • develop an algorithm with all the required steps accurately and using advanced techniques such as sequencing, selection and iteration and able to describe it graphically.
Decomposition	• decompose problem into smaller problems but with difficulty and uncertainly.	• decompose problem into smaller problems but with frequent errors and hesitation.	• decompose problem into smaller problems with few errors.	• decompose problem into smaller problems independently and identify the main functions.
Abstraction	• identify general information from the problem with difficulty and uncertainty.	• identify important information from the problem with hesitation.	• identify important information from the problem with some errors and able to categorize them randomly.	• identify important information from the problem with confidence and accuracy and categorize them based on their priority.
Generalization	• list some connections between computational thinking with other subjects with limited understanding.	• list some connections between computational thinking with other subjects with developing understanding.	• list some connections between computational thinking with other subjects with understanding.	• list some connections between computational thinking with other subjects with high level understanding.

Grade 7				
Student	1-Barely or not initiated	2-Under development	3-Satisfies expectations	4-Exceeds expectations
Domain Computational Thinking	A (Level 1) Student may be able to:	A (Level 2) Student is able to:	A (Level 3) Student is able to:	A (Level 4) Student is able to:
Algorithmic Thinking	• use inappropriate logics to describe the algorithm. • demonstrate limited capability of designing algorithm.	• use few appropriate logics with frequent errors to describe the algorithm. • demonstrate some capability of designing algorithm with poor organization methods.	• use most of the appropriate logics with few errors to describe the algorithm and its basic element steps. • demonstrate high capability of designing algorithm with good organization methods.	• use appropriate logics accurately to describe the algorithm and search for the most efficient and effective solution. • demonstrate excellent capability of designing algorithm and organization methods and able to adapt the algorithm to the context of the problem.
Decomposition	• break down problem into modules with a lot of missing information.	• break down problem into modules with a frequent missing information.	• break down problem into modules with few missing information and explain their functionalities with hesitation.	• break down problem into modules without missing information, identify the main functionalities with confidence.
Abstraction	• define the concept of simulation with struggle and limited understanding and unable to explain the benefit of using simulation. • list few simulation and modelling tools but unable to use them.	• define the concept of simulation hesitation and frequent errors but know that simulation can be used to represent some problems. • list different simulation and modelling tools but unable to categorize them.	• define the concept or simulation with good understanding and identify what kind of problems can be solved with simulation. • list many simulation and modelling tools and categorize them correctly based on their functionalities.	• define the concept or simulation accurately with high understanding and explain how simulation is used to represent natural phenomena. • list most of the simulation and modelling tools, categorize them correctly and explain their functionalities.
Generalization	• demonstrate a little understanding of the connections between computational thinking with other subjects.	• demonstrate some understanding of the connections between computational thinking with other subjects.	• able to link computational thinking with other subjects without hesitation.	• able to link computational thinking with other subjects and identify the correlations between them.

Grade 8				
Student	1-Barely or not initiated	2-Under development	3-Satisfies expectations	4-Exceeds expectations
Domain Computational Thinking	A (Level 1) Student may be able to:	A (Level 2) Student is able to:	A (Level 3) Student is able to:	A (Level 4) Student is able to:
Algorithmic Thinking	• identify some mistakes in the algorithm. • demonstrate limited ability of understanding concept of parallel processing. • use different techniques to solve a problem with many mistakes. • represent data in various forms but with many mistakes.	• identify few mistakes in the algorithm. • demonstrate the concept of parallel processing with hesitation and uncertainty. • use different techniques to solve a problem with repeated mistakes. • represent data in various forms but with frequent mistakes and list them with many errors.	• identify many mistakes in the algorithm as well as correct these mistakes with few errors. • demonstrate the concept of parallel processing without errors and recognize some advantages of it. • use different techniques to solve the problem with few mistakes. • represent data in various forms but with few mistakes and list them with few errors.	• identify all the mistakes in the algorithm and correct them in with high accuracy. • demonstrate the concept of parallel processing with accuracy and confidence and recognize many advantages of it and able to list some examples of it. • use different techniques to solve a problem accurately. • represent data in various forms but without mistakes and list them accurately.
Decomposition	• decompose problem into modules with limited understanding of decomposition.	• decompose problem into modules with major errors.	• decompose problem into modules with minor errors and introduce the concept of usability.	• decompose problem into modules accurately and explain how usability reduce the design complexity.
Abstraction	• describe how a simulation can be used to solve a problem with reasonable accuracy.	• describe how a simulation can be used to solve a problem with frequent errors and list few simulation tools.	• describe how a simulation can be used to solve a problem with few errors and list and explain different simulation tools used to perform simple experiments.	• describe how a simulation can be used to solve a problem accurately and use simulation tools to do simple experiments and discuss the correctness of the result.
Generalization	• demonstrate a little understanding of the connections between computational thinking with other subjects.	• demonstrate some understanding of the connections between computational thinking with other subjects.	• able to link computational thinking with other subjects without hesitation.	• able to link computational thinking with other subjects and identify the correlations between them.

Grade 9				
Student	1-Barely or not initiated	2-Under development	3-Satisfies expectations	4-Exceeds expectations
Domain Computational Thinking	A (Level 1) Student may be able to:	A (Level 2) Student is able to:	A (Level 3) Student is able to:	A (Level 4) Student is able to:
Algorithmic Thinking	• define what is the complexity of the algorithm with struggle in the definition. • search in a given problem looking for some value or items with frequent errors. • define sorting concept with struggle and unable to list different sorting techniques.	• determine the complexity of the algorithm by counting the number of steps with only few errors. • search in a given problem looking for specific value such as maximum or minimum value with some errors. • define sorting concept with some errors and apply one sorting technique.	• determine the complexity of the algorithm by counting number of steps with only few errors and remove duplicate or ambiguous steps. • search in a given problem looking for specific value such as maximum or minimum value with few errors. • define sorting concept with few errors and apply multiple sorting techniques.	• determine the complexity of the algorithm by counting number of steps with no errors and replace duplicate or ambiguous steps with more efficient steps. • accurately apply different searching technique in a given problem looking for specified value. • define sorting concept accurately and apply multiple sorting techniques, and distinguish between searching and sorting.
Decomposition	• describe the concept of divide and conquer algorithm in theory with hesitation and struggle.	• describe the concept of divide and conquer technique with little hesitation.	• describe the concept of divide and conquer technique to solve large problem accurately and describe the process of usability.	• describe the concept of divide and conquer technique to solve large problem accurately and describe the process of usability in theory and gives example of it.
Abstraction	• know limited understanding and knowledge that models and simulations can be used to support learning and research.	• know reasonable understanding and knowledge that models and simulations can be used to support learning and research and list some simulations tools used to support learning and research.	• know substantial understanding and knowledge that models and simulations can be used to support learning and research and List some simulations tools and classify them inaccurately based on their application.	• know good understanding and knowledge that models and simulations can be used to support learning and research and list some simulations tools and classify them accurately based on their application.
Generalization	• demonstrate a little understanding of the connections between computational thinking with other subjects.	• demonstrate some understanding of the connections between computational thinking with other subjects.	• able to link computational thinking with other subjects without hesitation.	• able to link computational thinking with other subjects and identify the correlations between them.

Grade 10				
Student	1-Barely or not initiated	2-Under development	3-Satisfies expectations	4-Exceeds expectations
Domain Computational Thinking	A (Level 1) Student may be able to:	A (Level 2) Student is able to:	A (Level 3) Student is able to:	A (Level 4) Student is able to:
Computer Networks	• calculate the number of steps in a simple algorithm with plus or minus 1 mistake in the count. • write algorithm instruction from flow charts with some mistakes and with no control statements.	• calculate the number of steps required by simple algorithms with rare mistakes. • write algorithm instructions from flow charts containing control statements with some mistakes.	• calculate the number of steps required by complicated algorithm with some mistakes. • write algorithmic instructions and draw flow charts with control statement with little mistakes.	• calculate the number of steps required by complicated algorithms accurately. • write algorithmic instructions and draw flow charts with control statement with no mistakes.
Evaluation	• assess what certain parts of the algorithm do, but not grasp the whole picture.	• determine the functionality of the algorithm	• determine the functionality of the algorithm and compare it against some criteria.	• assess the functional correctness and prove that the algorithm works.
Decomposition	• show a basic ability to use functions with some mistakes.	• show a basic ability to use functions but more can be done to improve the structure.	• show a good ability to decompose an algorithm into functions and objects.	• clearly identify objects, functions, and design the flow of the algorithm.
Abstraction	• remove some details but keeps a lot of unnecessary details or omits some necessary information.	• remove details but keeps some of the unnecessary details.	• remove unnecessary details and is able to use some data structures.	• remove unnecessary details and uses the right data structures appropriately.
Generalization	• find patterns in some cases but misses a lot of possible outcomes.	• find patterns in most cases with some mistakes.	• find patterns with great confidence but unable to relate to real-life problems.	• find patterns in data and relates Computer Science problems to real-life problems.

Grade 10A				
Student	1-Barely or not initiated	2-Under development	3-Satisfies expectations	4-Exceeds expectations
Domain Computational Thinking	A (Level 1) Student may be able to:	A (Level 2) Student is able to:	A (Level 3) Student is able to:	A (Level 4) Student is able to:
Computer Networks	• calculate the number of steps in a simple algorithm with plus or minus 1 mistake in the count. • write algorithm instruction from flow charts with some mistakes and with no control statements.	• calculate the number of steps required by simple algorithms with rare mistakes. • write algorithm instructions from flow charts containing control statements with some mistakes.	• calculate the number of steps required by complicated algorithm with some mistakes. • write algorithmic instructions and draw flow charts with control statement with little mistakes.	• calculate the number of steps required by complicated algorithms accurately. • write algorithmic instructions and draw flow charts with control statement with no mistakes.
Evaluation	• assess what certain parts of the algorithm do, but not grasp the whole picture.	• determine the functionality of the algorithm.	• determine the functionality of the algorithm and compare it against some criteria.	• assess the functional correctness and prove that the algorithm works.
Decomposition	• show a basic ability to use functions with some mistakes.	• show a basic ability to use functions but more can be done to improve the structure.	• show a good ability to decompose an algorithm into functions and objects	• clearly identify objects, functions, and design the flow of the algorithm.
Abstraction	• remove some details but keeps a lot of unnecessary details or omits some necessary information.	• remove details but keeps some of the unnecessary details.	• remove unnecessary details and is able to use some data structures	• remove unnecessary details and uses the right data structures appropriately.
Generalization	• find patterns in some cases but misses a lot of possible outcomes.	• find patterns in most cases with some mistakes.	• find patterns with great confidence but unable to relate to real-life problems.	• find patterns in data and relates Computer Science problems to real-life problems.

Grade 11				
Student	1-Barely or not initiated	2-Under development	3-Satisfies expectations	4-Exceeds expectations
Domain Computational Thinking	A (Level 1) Student may be able to:	A (Level 2) Student is able to:	A (Level 3) Student is able to:	A (Level 4) Student is able to:
Computer Networks	• identify what parts of a program do with some mistakes but not the complete program. • write iterative code with some mistakes.	• identify what parts of a program but not the complete program. • write iterative code with little mistakes.	• identify what parts of a program do along with the complete program with some mistakes. • write iterative code and procedures with some mistakes.	• identify what parts of a program do along with the complete program with rare mistakes. • write iterative code and procedures. • recognize hard and complicated problems from easy ones.
Evaluation	• prove simple facts about algorithms.	• prove correctness of algorithms with some mistakes.	• prove correctness of algorithms to some extent.	• prove correctness of algorithms. • prove bounds on the number of steps required.
Decomposition	• show limited ability to analyze problems.	• analyze problems and divide into pieces but can improve further.	• analyze problems and divide into pieces with simple mistakes. • divide the required processing into concurrent tasks with some mistakes.	• analyze problems and divide into pieces. • divide the required processing into concurrent tasks with some mistakes. • divide the data into parallel streams for processing.
Abstraction	• identify some patterns with a large number of mistakes.	• identify patterns with some mistakes. • perform some abstraction to reduce problem complexity but keeps some unnecessary details.	• identify patterns with some mistakes. • perform some abstraction to reduce problem complexity but keeps some unnecessary details. • Test scientific hypothesis with some mistakes.	• identify patterns with some mistakes. • perform some abstraction to reduce problem complexity but keeps some unnecessary details. • able to test scientific hypothesis using models and simulation.
Generalization	• map real-life problems to Computer science with a lot of mistakes.	• map real-life problems to Computer science with a some mistakes.	• map real-life problems to Computer science problems. • use Computer Science solutions to solve other problems with some mistakes.	• map real-life problems to Computer science problems. • use Computer Science solutions to solve other problems.

Grade 11A				
Student	1-Barely or not initiated	2-Under development	3-Satisfies expectations	4-Exceeds expectations
Domain Computational Thinking	A (Level 1) Student may be able to:	A (Level 2) Student is able to:	A (Level 3) Student is able to:	A (Level 4) Student is able to:
Computer Networks	• identify what parts of a program do with some mistakes but not the complete program. • write iterative code with some mistakes.	• identify what parts of a program but not the complete program. • write iterative code with little mistakes.	• identify what parts of a program do along with the complete program with some mistakes. • write iterative code and procedures with some mistakes.	• identify what parts of a program do along with the complete program with rare mistakes. • write iterative code and procedures. • recognize hard and complicated problems from easy ones.
Evaluation	• prove simple facts about algorithms.	• prove correctness of algorithms with some mistakes.	• prove correctness of algorithms to some extent.	• prove correctness of algorithms. • prove bounds on the number of steps required.
Decomposition	• show limited ability to analyze problems.	• analyze problems and divide into pieces but can improve further.	• analyze problems and divide into pieces with simple mistakes. • divide the required processing into concurrent tasks with some mistakes.	• analyze problems and divide into pieces. • divide the required processing into concurrent tasks with some mistakes. • divide the data into parallel streams for processing.
Abstraction	• identify some patterns with a large number of mistakes.	• identify patterns with some mistakes. • perform some abstraction to reduce problem complexity but keeps some unnecessary details.	• identify patterns with some mistakes. • perform some abstraction to reduce problem complexity but keeps some unnecessary details. • test scientific hypothesis with some mistakes.	• identify patterns with some mistakes. • perform some abstraction to reduce problem complexity but keeps some unnecessary details. • test scientific hypothesis using models and simulation.
Generalization	• map real-life problems to Computer Science with a lot of mistakes.	• map real-life problems to Computer Science with a some mistakes.	• map real-life problems to Computer Science problems. • use Computer Science solutions to solve other problems with some mistakes.	• map real-life problems to Computer Science problems. • use Computer Science solutions to solve other problems.

Grade 12				
Student	1-Barely or not initiated	2-Under development	3-Satisfies expectations	4-Exceeds expectations
Domain Computational Thinking	A (Level 1) Student may be able to:	A (Level 2) Student is able to:	A (Level 3) Student is able to:	A (Level 4) Student is able to:
Computer Networks	• create algorithms with major mistakes.	• create algorithms with some mistakes.	• create algorithms with very minor mistakes • address user abilities to some extent.	• create algorithms with little or no mistakes • address user abilities to some extent.
Evaluation	• demonstrate an understanding of the various types of data structures with some help. • assess the usability of a program to some extent.	• demonstrate an understanding of the various types of data structures with little help. • evaluate the run-time complexity with some errors. • asses the usability of a program to some extent.	• demonstrate an understanding of the various types of data structures. • evaluate the run-time complexity with little errors. • asses the usability of a program to some extent.	• demonstrate an understanding of the various types of data structures. • evaluate the run-time complexity with little errors. • asses the usability of a program to some extent.
Decomposition	• decompose a problem into smaller sub problems with some mistakes.	• decomposes artifacts into smaller sub problems with some mistakes. • apply divide and conquer approach to simple problems.	• decomposes artifacts into smaller sub problems with minor mistakes. • apply divide and conquer approach to simple problems. • apply recursive approach to develop algorithms with teacher's help.	• decomposes artifacts into smaller sub problems. • apply divide and conquer approach to more complicated problems. • apply recursive approach to develop algorithms.
Abstraction	• removes unnecessary details but keeps some parts that are redundant. • identify patterns in data with major mistakes.	• removes unnecessary details with teacher's little help. • identify patterns in data with simple mistakes and teacher's help.	• removes unnecessary details. • identify patterns in data with teacher's help. • test a hypothesis with some mistakes.	• removes unnecessary details. • identify patterns in data. • test a hypothesis.
Generalization	• identify the Computer Science connection with major teacher's help, but not the solution.	• identify the Computer Science connection with some help. • identify the solution with major help.	• identify the Computer Science connection. • identify the solution with some of teacher's help.	• identify the Computer Science connection. • identify the solution with some of teacher's help.

Grade 12A				
Student	1-Barely or not initiated	2-Under development	3-Satisfies expectations	4-Exceeds expectations
Domain Computational Thinking	A (Level 1) Student may be able to:	A (Level 2) Student is able to:	A (Level 3) Student is able to:	A (Level 4) Student is able to:
Computer Networks	• create algorithms with major mistakes.	• create algorithms with some mistakes.	• create algorithms with very minor mistakes. • address user abilities to some extent.	• create algorithms with little or no mistakes. • address user abilities to some extent.
Evaluation	• demonstrate an understanding of the various types of data structures with some help. • asses the usability of a program to some extent.	• demonstrate an understanding of the various types of data structures with little help. • evaluate the run-time complexity with some errors. • asses the usability of a program to some extent.	• demonstrate an understanding of the various types of data structures. • evaluate the run-time complexity with little errors. • asses the usability of a program to some extent.	• demonstrate an understanding of the various types of data structures. • evaluate the run-time complexity with little errors. • asses the usability of a program to some extent.
Decomposition	• decompose a problem into smaller sub problems with some mistakes.	• decomposes artifacts into smaller sub problems with some mistakes. • apply divide and conquer approach to simple problems.	• decomposes artifacts into smaller sub problems with minor mistakes. • apply divide and conquer approach to simple problems. • apply recursive approach to develop algorithms with teacher's help.	• decomposes artifacts into smaller sub problems. • apply divide and conquer approach to more complicated problems. • apply recursive approach to develop algorithms.
Abstraction	• remove unnecessary details but keeps some parts that are redundant. • identify patterns in data with major mistakes.	• remove unnecessary details with teacher's little help. • identify patterns in data with simple mistakes and teacher's help.	• remove unnecessary details. • identify patterns in data with teacher's help. • Tests a hypothesis with some mistakes.	• remove unnecessary details. • identify patterns in data. • Tests a hypothesis.
Generalization	• identify the Computer Science connection with major teacher's help, but not the solution.	• identify the Computer Science connection with some help. • identify the solution with major help.	• identify the Computer Science connection. • identify the solution with some of teacher's help.	• identify the Computer Science connection. • identify the solution with some of teacher's help.

Sample Activities

Sample Activity (Grade 1):

By the end of Grade 1, the student will be able to:

Grade 1				
Domain	Computational Thinking			
Strand	Learning outcome	Example	Sample Activity	Suggested Assessment
Algorithmic Thinking	• Solve simple maze following step by step solution pattern.	• Give simple maze and ask student to solve it.	• Give students maze and ask them to solve it.	• Being able to solve maze in a given time.
	• Play guessing games with classmate to develop guessing strategy.	• Guessing the matching shape between two different groups of shapes.	• Student given an online guessing game and asked to solve it.	• Being able to play the guess game in given time.
	• Illustrate steps needed to complete simple task using simple computer graphics program.	• Steps needed to come to school.	• Student asked to draw the steps needed to come to school.	• Students can be assessed based on the completed number of steps.
Abstraction	• Sort objects in a requested order.	• Sort balls of different sizes from smallest to biggest.	• Given number of balls and ask students to sort them from smallest to biggest.	• Assessment will be based if the sorting was done correctly in the given time.

Sample Activity (Grade 4):

By the end of Grade 4, the student will be able to:

Grade 4				
Domain	Computational Thinking			
Strand	Learning outcome	Example	Sample Activity	Suggested Assessment
Algorithmic Thinking	• Provide appropriate logical instructions to solve logical problems.	• Give instruction on how to draw a snow flake by repeating some activities.	• Using code.org give instructions to the character to draw a snow flake by repeating some activities.	• If the program developed using code.org correctly draws the snow flake.
	• Illustrate step by step instructions to perform multiplications and division.	• Given step by step instructions on how to do the multiplications of the numbers 12 * 15.	• Ask students to perform the multiplications of 12 * 15 in a step by step manner.	• The multiplication result is correct and the presented steps are clear.
	• Illustrate the process of inserting new object in an already sorted set of objects.	• Given a sorted set of balls of different sizes, ask students to illustrate the steps needed to insert a new ball in the correct place.	• Given a sorted set of balls of different sizes, ask students to illustrate the steps needed to insert a new ball in the correct place.	• The student was able to list the complete steps correctly in the right order.
Abstraction	• Sort given sets of objects in an efficient way (minimum number of steps).	• Given unsorted set of balls with different sizes. Students are asked to sort them with minimum number of steps.	• Students are given unsorted set of balls with different sizes. Students are asked to sort them with minimum number of steps.	• Students were able to sort the objects with the minimum number of steps.
	• Insert new item in an already sorted set of items in an efficient way (minimum number of steps).	• Given a sorted set of balls of different sizes, ask students to illustrate the steps needed to insert a new ball in the correct place with minimum number of steps.	• Given a basketball team with sorted member from shortest to tallest. Ask student to insert new player in the correct place with minimum number of steps.	• Students were able to give the correct steps with the minimum number of steps.

Sample Activity (Grade 7):

By the end of Grade 7, the student will be able to:

Grade 7				
Domain	Computational Thinking			
Strand	Learning outcome	Example	Sample Activity	Suggested Assessment
Algorithmic Thinking	• Student is able to develop a simple understanding of an algorithm.	• Student is given a problem where it contains conditions and repetitions and his/her task is to develop algorithm/ flowchart to achieve that task.	• Given 5 grades: 20,78,49,80,77 Design an algorithm to find and display the average of students, draw flowchat Hint: 1. Repeat 5 times 2. Get student grade 3. Add grade to sum 4. Compute average=Sum/5 5. Display average Start Sum=0 Count = 0 Sum = Sum + Grade Count = Count + 1 Count < 5 No Read Grade Yes Average = Sum/(Count) Stop	• Given 10 grades, write an algorithm to find the average of student grades, find the maximum and print the average and the maximum value.
Decomposition	• Student is able to define the concept of modularity for solving large problems.	• Student is given a problem and his/ her task to divide the problem into small problems using different modules.	• Given a problem of designing a simple calculator student can design a pseudo code for addition, subtraction, multiplication and division. e.g: 1. Function Add(num1, num2) 2. display num1+num2 3. End 1. Function Multiply(num1, num2) 2. display num1*num2 3. End	• Given the length (L) and width (W) of a rectangle, write functions pseudo code to calculate and display the perimeter and area of the rectangle. 1. Function Calc_Perim(L, W) 2. return L*W; 3. End 1. Function Calc_Area (L, W) 2. return 2*L+2*W; 3. End

Grade 7				
Domain	Computational Thinking			
Strand	Learning outcome	Example	Sample Activity	Suggested Assessment
Abstraction	• Student is able to understand the concept of simulation.	• Student is able to define the concept of simulation and list some application areas where simulation can be applied.	• Definition: simulation as an imitation of the operation of a real-world process or system over time • area of Applications: Manufacturing Applications, Risk analysis, semiconductor, military application, transportation modes and Traffic, business Process Simulation, Health Care, computer Simulation, Network simulation	• Define the concept of simulation and list some area of applications.
Abstraction	• Student is able to understand the connections between Computer Science and other fields.	• Student is able to develop an understanding of the relationship between the binary number system and computer logic. Also, student learns how to convert Base 10 numbers into binary and vice versa.	• Given a number 157 in Base 10, your task is to convert it to binary number. • Hint: Divide the number by 2 every time and look for the reminder Quotient Remains 157 1 78 0 39 1 19 1 Divided by 2 9 1 4 0 2 0 1 Answer: 10011101	• Give a formative assessment of quiz at the end of the binary conversion exercise to prompt students on progress and show changes required for success of conversion application. • e.g. Convert binary code (10100101) • to Decimal number. • e.g. Convert Decimal number (176) • to binary code.
Generalization	• Student is able to define the concept of modularity for solving large problems.	• Student is given a problem and his/ her task to divide the problem into small problems using different modules.	• Given a problem of designing a simple calculator student can design a pseudo code for addition, subtraction, multiplication and division. e.g 1. Function Add(num1, num2) 2. display num1+num2 3. End 1. Function Multiply(num1, num2) 2. display num1*num2 3. End	• Given the length (L) and width (W) of a rectangle, write functions pseudo code to calculate and display the perimeter and area of the rectangle. 1. Function Calc_Perim(L, W) 2. return L*W; 3. End 1. Function Calc_Area (L, W) 2. return 2*L+2*W; 3. End

Sample Activity (Grade 10):

By the end of Grade 10, the student will be able to:

Grade 10				
Domain	Computational Thinking			
Strand	Learning outcome	Example	Sample Activity	Suggested Assessment
Algorithmic Thinking	• Calculate the number of steps required to finish the algorithm steps	• The student is given an algorithm in pseudo code and is asked to calculate the number of steps it takes to find the solution. Complex problems should typically take more steps to solve.	• The teacher can use the array search problem as startup example. Different search algorithms can be used. Alternatively, the teacher can use sample program or pseudo code for the students to evaluate the number of steps required.	• The assessment will be an ON/OFF assessment, partial credit can be given for + - 1 step mistakes.
	• Write instructions that if followed in a given order (sequences) achieve a desired effect	• The student is given a number of simple processes and is asked to provide the steps required to achieve the final output.	• A simple activity would be to take a daily process, like washing hair, preparing a sandwich, or preparing to go to school. Then, the students are asked to write down the steps involved in sequence. Reenactment of the process will help the students learn the mistakes they made in the description.	• The assessment need to measure if the student understands that the steps need to be specified in a correct order and that certain steps cannot be implied and has to be explicitly mentioned.
	• Write instructions that choose between different constituent instructions (selection) to achieve a desired effect	• The student is given a simple problem to choose between two or more options, students should write the instruction that implement the selection process.	• A simple activity like to choose going left or right while driving, choosing more salt, choosing diet or normal coke, etc.	• The assessment should measure the correct implementation of the condition statement and the actions taken based on whether the condition is true or false.

Grade 10				
Domain	Computational Thinking			
Strand	Learning outcome	Example	Sample Activity	Suggested Assessment
Evaluation	• Verify that an algorithm works (proof)	• Given an algorithm the student is asked to describe the working of the algorithm (functionality)	• For example, given an algorithm of linear search, the student needs to be able to show that the algorithm will go over all element and that the comparison is performed correctly.	• The assessment will need to consider all the elements of the solution and identify the role of each element.
	• Assess whether a solution meets the specification (criteria)	• This part relates to specific criteria and whether error checking, bounds, etc. are performed. Also, in case users make mistakes, the program should behave graciously.	• Students should be asked to write a console program with menu items and they need to make sure that the program performs the right check	• The assessment will be based on practical evaluation of the developed methods for handling user behavior or incorrect inputs.
	• Assess that an algorithm is fit for purpose	• Sometimes the algorithm will do more or less of what is required. This part related to the exact functionality of the algorithm	• The student is given an algorithm and asked to describe what cases handled by the algorithms and which are not.	• The assessment should be based on whether the student gets the right number of steps for each case. Partial credit for an off by 1 mistake.
	• Assess whether an algorithm does the right thing (functional correctness)	• Given a problem description and an algorithmic solution. The student needs to verify that the algorithm functionality is correct.	• The student is given an algorithm in pseudo code, for example multiplication using shift and addition, and is asked about the functionality of the algorithm.	• The assessment is based on how close the student describe the functionality of the algorithm in exact terms.
	• Compare and contrast simple data structures and their uses	• Different data structures may perform similar functionalities but fits different purposes. The student will learn to appreciate that various tradeoffs in using different structures.	• A great example would be to compare and contrast arrays and linked lists. The student need to identify the advantages and disadvantages of each in terms of speed, memory requirements, ease of use, etc.	• The assessment will be based on direction questioning of the advantages and disadvantages of each data structure in comparison to others.
Decomposition	• Group a collection of instructions that do a well-defined task	• Some problems are too complicated to be considered as one whole. Instead separating the problem into multiple parts can help understand it and develop solutions with ease.	• The students may be asked to analyze a simple program, divide it into; input handling subsystem, processing subsystem, and output subsystem. It is essential to identify how the data flows from one subsystem to another.	• The assessment should be based on the clear distinction of the multiple components, how the data flows, and how the results are integrated and merged together.

Grade 10				
Domain	Computational Thinking			
Strand	Learning outcome	Example	Sample Activity	Suggested Assessment
Abstraction	• Reduce complexity by removing unnecessary detail.	• Several processes involves data patterns that maybe useful for some more advanced topics. The students are required to identify such data patterns.	• A good example would be the process of student movement in and out the school. The pattern exhibited is that they mostly arrive between 7:30 and 8 in the morning, and leave between 3 and 3:30 in the afternoon.	• The assessment should be based on the ability of the student to correct identify all or most patterns in a problem.
	• Choose a way to represent artefacts (whether objects, problems, processes or systems) to allow it to be manipulated in useful ways	• Object and process modeling and the various type of modeling diagrams can be presented here.	• A good example would be to consider a process (e.g., student registration) and then the students are asked to describe the flow of data, the processing units, the start, the finish, the conditions that get checked along the way, etc.	• The assessment would be based on whether the student identifies all the elements correctly, does not miss any processing elements, the flow of data is correct, the conditions are correct, and the processing is complete.
	• Hide complexity in data, for example by using data structures	• A lot of data structure help in simplifying the complexity of the data. The purpose of this outcome is to identify how data are structured and the benefits of this structuring.	• An example of student records can be given, the student information can be grouped into one data object instead of many separate data entities. The students can be given a problem description and group the data together into meaningful structures.	• The assessment should take under consideration the correct grouping of related data and any missed opportunities for grouping.
Generalization	• Identify patterns and commonalities in problems, processes, solutions, or data	• Several problems masquerading as unrelated Computer Science problems can be discussed then pointing out that they can be considered as Computer Science ones.	• Students can be given an example of finding the phone number of a person from the phone book. The numbers are the elements of the array and finding the correct phone number is a typical search in array problem.	• The assessment is based on whether the student is able to find the correct symmetry or not. The student may need hints to come up with the solution. In this case, partial credit maybe considered.

Programming Evolution

Human Computer Interaction

Data Representation

Coding

Documentation and Deployment

Computer Practice and Programming (CPP)

Domain 3: Computer Practice and Programming (CPP)

Definition

In this domain students are taught the principles of information and computation, and how to put this knowledge to use through programming. Computer programming is the process of writing computer programs. It is the process that starts from the understanding of a real word problem that is formulated as a computer problem, followed by the development of an algorithm. Then, this algorithm is implemented in a programming language and tested on several instances of the given problem for correctness, validity and efficiency[1].

Upon completion of this domain, students are able to:

1. analyze the problem and identify the various requirements
2. understand algorithms, logic and data representation
3. translate algorithms into computer programs
4. test computer programs for correctness and validity
5. document computer programs properly

The strands to be covered are:

- **Programming Evolution:** covers the development of programming languages
- **Human Computer Interaction (HCI):** involves the study, planning, design and uses of the interfaces between people (users) and computers
- **Data Representation:** refers to the methods used internally to represent information stored in a computer
- **Coding:** implement algorithms into a programming language
- **Testing and Validation:** apply a series of test cases to a program to determine if it is working properly
- **Documentation and Deployment:** add proper internal and external documentation to the program to make it easy to understand and deploy the program on the right platform

Generic Outcomes

KG - G5 (cycle 1)

By the end of cycle 1, students will be able to:

1. understand the basic fundamental principles and concepts of computer programming.
2. apply the fundamental principles and concepts of computer programming to solve age appropriate problems.
3. umplement problem solutions using age appropriate application like games, simulations, etc.

Student understands the basic fundamental principles and concepts of computer programming and uses them to solve age appropriate problems. Then he/she implements these solutions using age appropriate computer tools.

G6 - G9 (cycle 2)

By the end of cycle 2, students will be able to:

1. analyze a given problem in order to generate a computer-based solution.
2. design, develop, test and deploy an application using appropriate software.
3. create digital story using appropriate programming tool.

Student demonstrates the ability to analyze a given problem and finds a computer based solution. Using an appropriate software tool, he/she designs, develops, tests and deploys an application for the given problem. Also he/she creates digital story using appropriate programming tool.

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1 http://csta.acm.org/java programming from analysis to program design (introduction to programming) by d.s. malik

G10 - G12 (cycle 3)

By the end of cycle 3, students will be able to:
1. demonstrate the use of a programming language to solve a variety of problems.
2. develop and deploy applications to solve real life problems.
3. implement and evaluate alternative solutions for the same problem.

Student demonstrates the ability to define the requirements of a variety of real life problems, design solutions for them and use a programming language to implement the solutions. Student is able to test and validate these solutions. Also he/she has the capability to compare and evaluate different solutions for the same problem.

G10 - G12 (cycle 3 advanced)

By the end of cycle 3A, students will be able to:
1. demonstrate the use of a programming language to solve a variety of complex problems.
2. develop and deploy comprehensive applications to solve real life problems.
3. implement and evaluate alternative and effective solutions for the same problem.
4. design, develop, publish, and present products (e.g., webpages, mobile applications, animations) using technology resources.
5. demonstrate an understanding of algorithms and their practical application.

Student demonstrates with professionalism the ability to define the requirements of a variety of real life problems, design solutions for them and use a programming language to implement the solutions. Student is able to test and validate these solutions. The students will demonstrate high capability to compare and evaluate different solutions for the same problem.

Strands Description and Technical Keywords

	Strand Title	Strand Description	Key words
1	Programming Evolution	Covers the development of programming languages.	Block - based programming, Platforms, Programming languages
2	Data Representation	Refers to the methods used internally to represent information stored in a computer	Variables, Primitive data types, arithmetic expressions, Logical expressions, array, store, Retrieve, Operator precedence
3	Human Computer Interaction (HCI)	Involves the study, planning, design and uses of the interfaces between people (users) and computers.	Objects, Elements, Visible, Non Visible, Graphical User Interface (GUI), Input, Output
4	Coding	Translating algorithms into a programming language	Sequence, drag and drop, block programming, loops, iteration, selection, control, conditional, visual programming, mobile programming, logical operators, mathematical operators, built - in function, function, modules, event driven programming, object oriented programming, object, events, behavior, property, game, array
5	Testing and Validation	Apply a series of test cases to a program to determine if it is working properly	Run program, build, clean, trace, locate errors, fix errors, debug, testing, input data, output data, compile
6	Deployment and Documentation	Choose proper names for variables, indent the program properly and comment the program to make it easy to understand	Comments - Explanation - Messages - documentation standards, naming standards, platform, framework

Strands Distribution Per Grade

Grade Domains	KG	1	2	3	4	5	6	7	8	9	10	10A	11	11A	12	12A
Computer Practice and Programming				Programming Evolution												
									Data Representation							
					Human Computer Interaction (HCI)											
	Coding															
	Testing and Validation															
					Deployment and Documentation											

Student Learning Outcomes distribution Per Grade

Domains	Strand	Cycle 1								Cycle 2					Cycle 3				Cycle 3A			
		KG1	KG2	G1	G2	G3	G4	G5		G6	G7	G8	G9		G10	G11	G12		G10A	G11A	G12A	
Computer Practice and Programming	Programming Evolution	0	0	0	0	0	0	0	0	0	0	2	2	4	4	2	2	8	4	2	2	8
	Data Representation	0	0	0	0	1	1	1	3	1	1	1	1	4	3	0	0	3	3	0	0	3
	Human Computer Interaction (HCI)	0	0	0	0	0	1	1	2	2	1	1	1	5	3	4	2	9	3	4	2	9
	Coding	2	2	2	2	2	2	2	14	3	3	3	2	11	5	3	3	11	5	3	3	11
	Testing and Validation	1	1	2	1	2	2	2	11	1	1	2	2	6	2	2	2	6	2	2	2	6
	Deployment and Documentation	0	0	0	0	0	1	1	2	2	3	3	2	10	3	3	3	9	3	3	3	9
Total									32					40				46				46
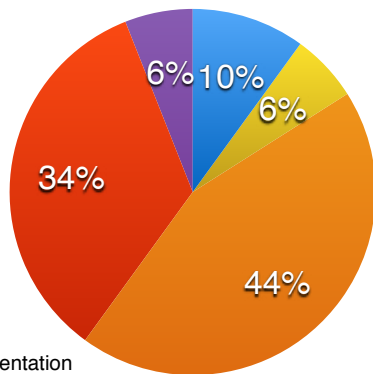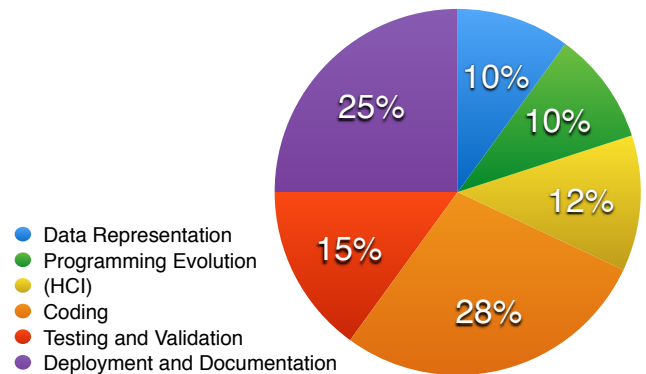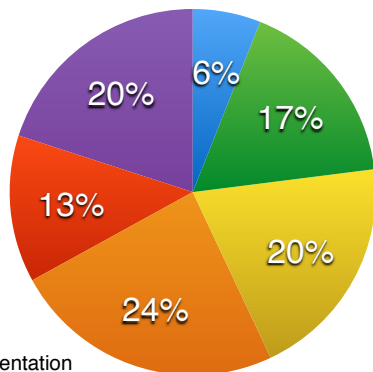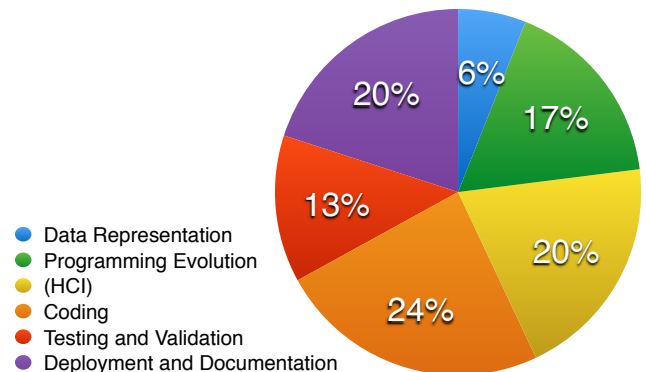
CPP *Domain Strand Distribution Per Cycle*

Percentage of outcomes as per level of difficulty and percentage wise

Grade	No of outcomes				Outcomes Percentage		
	Difficulty Level				Difficulty Level		
	1	2	3	Sum	1	2	3
KG1	3	0	0	3	100.0%	0.0%	0.0%
KG2	3	0	0	3	100.0%	0.0%	0.0%
G1	4	0	0	4	100.0%	0.0%	0.0%
G2	2	1	0	3	66.7%	33.3%	0.0%
G3	4	1	0	5	80.0%	20.0%	0.0%
G4	7	0	0	7	100.0%	0.0%	0.0%
G5	5	2	0	7	71.4%	28.6%	0.0%
Cycle 1	28	4	0	32	87.5%	12.5%	0.0%
G6	6	3	0	9	66.7%	33.3%	0.0%
G7	5	3	1	9	55.6%	33.3%	11.1%
G8	6	6	0	12	50.0%	50.0%	0.0%
G9	2	8	0	10	20.0%	80.0%	0.0%
Cycle 2	19	20	1	40	47.5%	50.0%	2.5%
G10	14	5	1	20	70.0%	25.0%	5.0%
G11	3	9	2	14	21.4%	64.3%	14.3%
G12	1	8	3	12	8.3%	66.7%	25.0%
Cycle 3	18	22	6	46	39.1%	47.8%	13.0%
G10A	13	6	1	20	65.0%	30.0%	5.0%
G11A	3	9	2	14	21.4%	64.3%	14.3%
G12A	1	8	3	12	8.3%	66.7%	25.0%
Cycle 3A	17	23	6	46	37.0%	50.0%	13.0%

Allocated Periods distribution per cycle

	Number of Periods				
	C 1	C2	C3	C3A	Total
CPP	4.65	7.75	27.9	32.6	73

Strands Evolution Per Grade

Domain	Strand	Grade 1	Grade 2	Grade 3	Grade 4	Grade 5
Computer Practice and Programming	Programming Evolution			• Student understands the general meaning of programming paradigms.	• Student understands the concept of a programming paradigms.	• Student understands difference between programming paradigms.
	Human Computer Interaction (HCI)				• Student develops understanding of the use of available characters.	• Student develops understanding of the use of available characters.
	Coding	• Student understands how to connect visual blocks to build programs using sequence and repetition.	• Student understands how to connect visual code blocks to build programs using sequence and repetition.	• Student understands and uses logical condition.	• Student understands how to implement solutions using a block based visual programming language for age appropriate problem.	• Student is able to implement solutions using a block based visual programming language for age appropriate problems.
	Testing and Validation	• Student tests the program for correctness.	• Student tests and debugs program for correctness.	• Student chooses suitable test data to ensure program correctness.	• Student understands the use of unit testing to ensure program correctness.	• Student demonstrates the ability to choose suitable testing data to ensure program correctness.
	Deployment and Documentation				• Student understands to share a creative artifact with other students.	• Student is able to share creative artifact with other students.

Domain	Strand	Grade 6	Grade 7	Grade 8	Grade 9
Computer Practice and Programming	Programming Evolution	• Student understands block based programming tools.	• Student understands block based programming tools.	• Student understands mobile programming tools.	• Student understands different platforms.
	Data Representation			• Student develops understanding of using variables.	• Student develops understanding of using variables.
	Human Computer Interaction (HCI)	• Student is understand the concepts of event driven programming .	• Student develops the ability to create friendly user interface.	• Student understand a UI appropriate for mobile device.	• Student designs a UI appropriate for mobile devices.
	Coding	• Student implements solutions using a block based programming tool.	• Student is able to implement solutions for difficult problems using a block based visual programming tool.	• Student is able to create mobile applications to address specific objectives using graphical application development environment.	• Student is able to create mobile applications to address specific objectives using graphical application development environment.
	Testing and Validation	• Student understands how to test their programs for correctness.	• Student is able to test programs for correctness.	• Student understands how to test the behavior of the application.	• Student tests the suitability of the application.
	Deployment and Documentation	• Student is able to add explanation to their programs.	• Student makes the program easy to read and understand.	• Students are able to create user friendly application.	• Student is able to create and deploy user friendly application.

Domain	Strand	Grade 10	Grade 11	Grade 12
Computer Practice and Programming	Programming Evolution	• Student develops understanding of the evolution of programming languages and compilation		
	Data Representation	• Student develops understanding of using primitive data types • Student demonstrates capability to manipulate arithmetic and logical expressions properly	• Student demonstrates knowledge of using one dimension array	• Students understand the use of multi-dimension arrays
	Human Computer Interaction (HCI)	• Student finds out the required input/output data of a given a problem	• Student demonstrates the capability to format the input/output • Student manipulates input/output files	• Student is able to design and use graphical user interface (GUI)
	Coding	• Student understands and use assignment statement • Student demonstrates the use sequence and selection statements	• Student demonstrates the knowledge to solve problem that use selection and repetition	• Student demonstrates the use of pre-defined modules and designs and implements modules
	Testing and Validation	• Student is able to test programs for correctness	• Student is able to test complex programs for correctness	• Student understands the use of unit testing
	Deployment and Documentation	• Student writes programs easy to read and understand	• Student develops user friendly application	• Student is able to develop user friendly application

Domain	Strand	Grade 10A	Grade 11A	Grade 12A
Computer Practice and Programming	Programming Evolution	• Student develops understanding of the evolution of programming languages and compilation		
	Data Representation	• Student develops understanding of using primitive data types • Student demonstrates capability to manipulate arithmetic and logical expressions properly	• Student demonstrates knowledge of using one dimension array	• Students understand the use of multi-dimension arrays
	Human Computer Interaction (HCI)	• Student finds out the required input/output data of a given a problem	• Student demonstrates the capability to format the input/output • Student demonstrates capability to work with files	• Student is able to design and use graphical user interface (GUI)
	Coding	• Student understands and use assignment statement • Student demonstrates the use sequence and selection statements	• Student demonstrates the knowledge to solve problem that use selection and repetition	• Student demonstrates the use pre-defined modules and designs and uses modules including recursive module
	Testing and Validation	• Student is able to test and validate programs for correctness	• Student is able to test complex programs for correctness	• Student understands the use of unit testing
	Deployment and Documentation	• Student writes programs easy to read and understand	• Student develops user friendly application	• Student is able to develop user friendly application

Integration between CPP domain and other domains

CPP	CT	DLC	CCC
Programming Evolution		• Internet surfing and information retrieval	• Impacts of Technology
Data Representation			
Human Computer Interaction (HCI)		• Data Representation	
Coding	• Algorithmic thinking • Decomposition • Abstraction • Generalization	• Collaboration tools	• Cyber Ethics & Laws
Testing and Validation.	• Evaluation		
Deployment and Documentation	• Generalization	• Collaboration tools	• Cyber Ethics & Laws

Scope and Sequence
Domains, Strands and Standards by Grade

<table>
<tr><td colspan="6" align="center">Grade: KG1</td></tr>
<tr><td>Domain</td><td>Strand</td><td>Standards</td><td>Learning outcomes</td><td>Integration</td><td>Level</td></tr>
<tr><td rowspan="4">3.
Computer Practice and Programming</td><td rowspan="2">(3.4)
Coding</td><td rowspan="2">(3.4.1)
Student follows a sequence of steps to perform a task.</td><td>(KG1.3.4.1.1)
Draw pictures to present a story.</td><td></td><td>1</td></tr>
<tr><td>(KG1.3.4.1.1)
Drag and drop blocks to create a story.</td><td></td><td>1</td></tr>
<tr><td rowspan="2">(3.5)
Testing and Validation.</td><td rowspan="2">(3.5.1)
Student tests the program for correctness.</td><td rowspan="2">(KG1.3.5.1.1)
Check if the sequence of steps work correctly.</td><td rowspan="2"></td><td rowspan="2">1</td></tr>
<tr></tr>
</table>

<table>
<tr><td colspan="6" align="center">Grade: KG2</td></tr>
<tr><td>Domain</td><td>Strand</td><td>Standards</td><td>Learning outcomes</td><td>Integration</td><td>Level</td></tr>
<tr><td rowspan="4">3.
Computer Practice and Programming</td><td rowspan="2">(3.4)
Coding</td><td rowspan="2">(3.4.1)
Student follows a sequence of steps to perform a task.</td><td>(KG2.3.4.1.1)
Draw pictures to present a story.</td><td></td><td>1</td></tr>
<tr><td>(KG2.3.4.1.2)
Drag and drop blocks to create a story.</td><td></td><td>1</td></tr>
<tr><td rowspan="2">(3.5)
Testing and Validation.</td><td rowspan="2">(3.5.1)
Student tests the program for correctness.</td><td rowspan="2">(KG2.3.5.1.1)
Check if the sequence of steps work correctly.</td><td rowspan="2"></td><td rowspan="2">1</td></tr>
<tr></tr>
</table>

<table>
<tr><td colspan="6" align="center">Grade: 1</td></tr>
<tr><td>Domain</td><td>Strand</td><td>Standards</td><td>Learning outcomes</td><td>Integration</td><td>Level</td></tr>
<tr><td rowspan="4">3.
Computer Practice and Programming</td><td rowspan="2">(3.4)
Coding</td><td rowspan="2">(3.4.2)
Student understands how to connect visual blocks to build programs using sequence and repetition.</td><td>(G1.3.4.2.1)
Arrange set of commands to perform tasks</td><td></td><td>1</td></tr>
<tr><td>(G1.3.4.2.2)
Repeat a single command</td><td></td><td>1</td></tr>
<tr><td rowspan="2">(3.5)
Testing and Validation.</td><td rowspan="2">(3.5.1)
Student tests the program for correctness.</td><td>(G1.3.5.1.1)
Run the program for correctness</td><td></td><td>1</td></tr>
<tr><td>(G1.3.5.1.2)
Fix errors if any</td><td></td><td></td></tr>
</table>

Grade: 2					
Domain	Strand	Standards	Learning outcomes	Integration	Level
3. Computer Practice and Programming	(3.4) Coding	(3.4.2) Student understands how to connect visual blocks to build programs using sequence and repetition.	(G2.3.4.2.1) Arrange sequential events into their logical order.		1
			(G2.3.4.2.2) Repeat a set of steps to perform a task.		1
	(3.5) Testing and Validation.	(3.5.1) Student tests the program for correctness.	(G2.3.5.1.1) Demonstrate the ability to trace a set of steps.		2

Grade: 3					
Domain	Strand	Standards	Learning outcomes	Integration	Level
3. Computer Practice and Programming	(3.1) Programming Evolution	(3.1.1) Student understands how to connect visual blocks to build programs using sequence and repetition.	(G3.3.1.1.1) Define a programming paradigms.		1
	(3.4) Coding	(3.4.3) Student understands and uses logical condition.	(G3.3.4.3.1) List different logical operators.		1
			(G3.3.4.3.2) Use selection in program.		2
	(3.5) Testing and Validation.	(3.5.2) Student chooses suitable test data to ensure program correctness.	(G3.3.5.2.1) Select data that produce output for the selected conditions.		1
			(G3.3.5.2.2) Choose test data to test the program.		1

Grade: 4					
Domain	Strand	Standards	Learning outcomes	Integration	Level
3. Computer Practice and Programming	(3.1) Programming Evolution	(3.1.2) Student understands the concept of a programming paradigms.	(G4.3.1.2.1) List programming paradigms.		1
	(3.3) Human Computer Interaction (HCI)	(3.3.1) Student develops understanding of the use of available characters.	(G4.3.3.1.1) Create interface to a story using available characters.		1
	(3.4) Coding	(3.4.4) Student understands how to implement solutions using a block based visual programming language for age appropriate problem.	(G4.3.4.4.1) Create function to accomplish a task.		1
			(G4.3.4.4.2) Modify an existing function to complete a different task.		1
	(3.5) Testing and Validation.	(3.5.3) Student understands the use of unit testing to ensure program correctness.	(G4.3.5.3.1) Test the correctness of the function.		1
			(G4.3.5.3.2) Test the whole program.		1
	(3.6) Deployment and Documentation	(3.6.1) Student understands to share a creative artifact with other students.	(G4.3.6.1.1) Share link of story with other students.		1

Grade: 5					
Domain	Strand	Standards	Learning outcomes	Integration	Level
3. Computer Practice and Programming	(3.1) Programming Evolution	(3.1.2) Student understands the concept of a programming paradigms.	(G5.3.1.2.1) Discuss the difference between programming paradigms.		1
	(3.3) Human Computer Interaction (HCI)	(3.3.1) Student develops understanding of the use of available characters.	(G5.3.3.1.1) Create interface to a story using available characters.		1
	(3.4) Coding	(3.4.5) Student implements solutions using a block based visual programming language for age appropriate problems.	(G5.3.4.5.1) Use programming techniques to solve problems.		2
			(G5.3.4.5.2) Break a sequence of steps into a hierarchy or looped sequences.		2
	(3.5) Testing and Validation.	(3.5.4) Student demonstrates the ability to choose suitable testing data to ensure program correctness.	(G5.3.5.4.1) Choose test data to test all possible paths in a program.		1
			(G5.3.5.4.2) Choose test data to test termination of loops.		1
	(3.6) Deployment and Documentation	(3.6.1) Student understands to share a creative artifact with other students.	(G5.3.6.1.1) Explore what information is appropriate to be put online.		1

			Grade: 6		
Domain	Strand	Standards	Learning outcomes	Integration	Level
3. Computer Practice and Programming	(3.1) Programming Evolution	(3.1.3) Student understands block based programming tools.	(G6.3.1.3.1) Describe concepts and features of block based programming tools.		1
	(3.3) Human Computer Interaction (HCI)	(3.3.2) Student understands the concepts of event driven programming.	(G6.3.3.2.1) Design simple graphical user interface for applications.		1
			(G6.3.3.2.2) Use event driven programming to develop applications.		1
	(3.4) Coding	(3.4.6) Student implements solutions using a block based programming tool.	(G6.3.4.6.1) Use various types of objects in applications.		2
			(G6.3.4.6.2) Use sequence, selection, and repetition techniques in programs.		2
			(G6.3.4.6.3) Create programs that respond to user-initiated events from the mouse and keyboard.		2
	(3.5) Testing and Validation.	(3.5.5) Student understands how to test their programs for correctness.	(G6.3.5.5.1) Test different events included in a program.		1
	(3.6) Deployment and Documentation	(3.6.2) Student adds explanation to their programs.	(G6.3.6.2.1) Insert meaningful comments to explain the program.		1
			(G6.3.6.2.2) Deploy the application on the chosen platform.		1

Grade: 7					
Domain	Strand	Standards	Learning outcomes	Integration	Level
3. Computer Practice and Programming	(3.1) Programming Evolution	(3.1.3) Student understands block based programming tools.	(G7.3.1.3.1) Describe categories of blocks in block based programming tools.		2
	(3.3) Human Computer Interaction (HCI)	(3.3.3) Student develops the ability to create friendly user interface.	(G7.3.3.3.1) Design graphical user interface for applications.		2
	(3.4) Coding	(3.4.7) Student implements solutions for difficult problems using a block based visual programming tool.	(G7.3.4.7.1) Use different types of variables.		1
			(G7.3.4.7.2) Enhance the layouts of applications.		2
			(G7.3.4.7.3) Create project to perform specific tasks.		3
	(3.5) Testing and Validation.	(3.5.6) Student tests programs for correctness.	(G7.3.5.6.1) Test the project for correctness and validity.		1
	(3.6) Deployment and Documentation	(3.6.3) Student makes the program easy to read and understand.	(G7.3.6.3.1) Name the variables used in programs properly.		1
			(G7.3.6.3.2) Insert useful comments to the program.		1
			(G7.3.6.3.3) Identify requirements to execute applications.		1

Grade: 8					
Domain	Strand	Standards	Learning outcomes	Integration	Level
3.
Computer Practice and Programming	(3.1)
Programming Evolution	(3.1.4)
Student understands mobile programming tools.	(G8.3.1.4.1)
Identify different platforms and programming tools for mobile devices.		1
	(3.2)
Data Representation	(3.2.1)
Student develops understanding of using variables.	(G8.3.2.1.1)
Define the different data types.		1
			(G8.3.2.1.2)
Select suitable simple data type to store data.		1
	(3.3)
Human Computer Interaction (HCI)	(3.3.3)
Student understands a UI appropriate for mobile device.	(G8.3.3.3.1)
Create simple and intuitive user interface for mobile applications.		2
	(3.4)
Coding	(3.4.7)
Student creates mobile applications to address specific objectives using graphical application development environment.	(G8.3.4.7.1)
Explain the concepts of properties, events and variables.		2
			(G8.3.4.7.2)
Set behaviors to the components of application.		2
			(G8.3.4.7.3)
Create simple mobile applications.		2
	(3.5)
Testing and Validation.	(3.5.6)
Student understands how to test the behavior of the application.	(G8.3.5.6.1)
Test different events for correctness.		1
			(G8.3.5.6.2)
Run the applications on mobile devices or emulator.		1
	(3.6)
Deployment and Documentation	(3.6.3)
Student creates user friendly application.	(G8.3.6.3.1)
Use appropriate messages in applications.		1
			(G8.3.6.3.2)
Make mobile application easy to understand.		2
			(G8.3.6.3.3)
Choose appropriate devices and platform for execution.		2

Grade: 9					
Domain	Strand	Standards	Learning outcomes	Integration	Level
3. Computer Practice and Programming	(3.1) Programming Evolution	(3.1.5) Student understands different platforms.	(G9.3.1.5.1) Compare different platforms for mobile devices.		2
	(3.2) Data Representation	(3.2.1) Student develops understanding of using variables.	(G9.3.2.1.1) Define the different data types.		1
			(G9.3.2.1.2) Select suitable simple data type to store data.		1
	(3.3) Human Computer Interaction (HCI)	(3.3.4) Student designs a UI appropriate for mobile devices.	(G9.3.3.4.1) Create concise user interface for mobile applications.		2
	(3.4) Coding	(3.4.7) Student creates mobile applications to address specific objectives using graphical application development environment.	(G9.3.4.7.1) Use advanced objects and their features in applications.		2
			(G9.3.4.7.2) Create mobile application for specific tasks.		2
	(3.5) Testing and Validation.	(3.5.7) Student tests the suitability of the application.	(G9.3.5.7.1) Judge if the application performs its intended goals.		2
			(G9.3.5.7.2) Evaluate results against initial requirements.		2
	(3.6) Deployment and Documentation	(3.6.4) Student creates and deploy user friendly application.	(G9.3.6.4.1) Make mobile application intuitive for users.		2
			(G9.3.6.4.2) Deploy the application on the appropriate mobile device.		2

Grade: 10					
Domain	Strand	Standards	Learning outcomes	Integration	Level
3. Computer Practice and Programming	(3.1) Programming Evolution	(3.1.6) Student develops understanding of the evolution of programming languages and compilation.	(G10.3.1.6.1) Describe the historical development of programming languages.		1
			(G10.3.1.6.2) List examples of computer languages (low and high level).		1
			(G10.3.1.6.3) Illustrate the use of a translator.		1
	(3.2) Data Representation	(3.2.2) Student develops understanding of using primitive data types.	(G10.3.2.2.1) Define the different data types.		1
			(G10.3.2.2.2) Select suitable simple data type to store data.		2
		(3.2.3) Student demonstrates capability to manipulate arithmetic and logical expressions properly.	(G10.3.2.3.1) Evaluate arithmetic expression.		1
			(G10.3.2.3.2) Evaluate logical expression.		1
	(3.3) Human Computer Interaction (HCI)	(3.3.5) Student finds out the required input/output data of a given a problem.	(G10.3.3.5.1) Identify the problem's input/output.		1
			(G10.3.3.5.2) Demonstrate the capability to input data.		1
			(G10.3.3.5.3) Demonstrate the capability to output data to screen.		1
	(3.4) Coding	(3.4.8) Student understands and uses assignment statement.	(G10.3.4.8.1) Use assignment to represent equation.		1
			(G10.3.4.8.2) Create programs which have assignment statements.		2
		(3.4.9) Student demonstrates the use sequence and selection statements.	(G10.3.4.9.1) Choose which type of selections to use.		2
			(G10.3.4.9.2) Create programs containing a set of sequence statements.		2
			(G10.3.4.9.3) Create programs which make decision.		3

Grade: 10					
Domain	Strand	Standards	Learning outcomes	Integration	Level
3. Computer Practice and Programming	(3.5) Testing and Validation.	(3.5.8) Student tests programs for correctness.	(G10.3.5.8.1) Choose suitable data to test the programs.		1
			(G10.3.5.8.2) Choose test data to cover all possible cases.		2
	(3.6) Deployment and Documentation	(3.6.5) Student writes programs easy to read and understand.	(G10.3.6.5.1) Name variables properly.		1
			(G10.3.6.5.2) Insert comments to explain the program.		1
			(G10.3.6.5.3) Indent the different statements properly.		1

Grade: 10A					
Domain	Strand	Standards	Learning outcomes	Integration	Level
3. Computer Practice and Programming	(3.1) Programming Evolution	(3.1.6) Student develops understanding of the evolution of programming languages and compilation.	(G10A.3.1.6.1) Describe the historical development of programming languages.		1
			(G10A.3.1.6.2) Give examples of computer languages (low and high level).		1
			(G10A.3.1.6.3) Illustrate the use of a translator.		2
	(3.2) Data Representation	(3.2.2) Student develops understanding of using primitive data types.	(G10A.3.2.2.1) Define the different data types.		1
			(G10A.3.2.2.2) Select suitable simple data type to store data.		2
		(3.2.4) Student demonstrates capability to manipulate complex arithmetic and logical expressions properly.	(G10A.3.2.4.1) Evaluate complex arithmetic expression.		1
			(G10A.3.2.4.2) Evaluate complex logical expression.		1
	(3.3) Human Computer Interaction (HCI)	(3.3.5) Student finds out the required input/output data of a given a problem.	(G10A.3.3.5.1) Identify the problem's input/output.		1
			(G10A.3.3.5.2) Demonstrate the capability to input data into memory.		1
			(G10A.3.3.5.3) Demonstrate the capability to output data to screen.		1
	(3.4) Coding	(3.4.8) Student understands and uses assignment statement.	(G10A.3.4.8.1) Use assignment to represent complex equation.		1
			(G10A.3.4.8.2) Create programs which have assignment statements.		2
		(3.4.9) Student demonstrates the use sequence and selection statements.	(G10A.3.4.9.1) Choose which type of selections to use.		2
			(G10A.3.4.9.2) Create programs containing a set of sequence statements.		2
			(G10A.3.4.9.3) Create programs which make multi-way decision.		3

Grade: 10A					
Domain	Strand	Standards	Learning outcomes	Integration	Level
3. Computer Practice and Programming	(3.5) Testing and Validation.	(3.5.9) Student is able to test and validate programs for correctness.	(G10A.3.5.9.1) Choose suitable data to test programs for correctness and validity.		1
			(G10A.3.5.9.2) Choose test data to cover all possible cases.		2
	(3.6) Deployment and Documentation	(3.6.5) Student writes programs easy to read and understand.	(G10A.3.6.5.1) Name variables properly.		1
			(G10A.3.6.5.2) Insert comments to explain the program.		1
			(G10A.3.6.5.3) Indent the different statements properly.		1

Grade: 11					
Domain	Strand	Standards	Learning outcomes	Integration	Level
3. Computer Practice and Programming	(3.2) Data Representation	(3.2.3) Student demonstrates knowledge of using one dimension array.	(G11.3.2.3.1) Demonstrate correct manipulation of one dimensional array.		2
			(G11.3.2.2.2) Identify problems solvable using arrays.		2
	(3.3) Human Computer Interaction (HCI)	(3.3.6) Student demonstrates the capability to format the input/ output.	(G11.3.3.6.1) Design menu as an interface to program.		2
			(G11.3.3.6.2) Illustrate formatting output data in a suitable way.		2
		(3.3.7) Student manipulates input/ output files.	(G11.3.3.7.1) Demonstrate the ability to read data from files.		2
			(G11.3.3.7.2) Demonstrate the ability to display data to files.		2
	(3.4) Coding	(3.4.9) Student demonstrates the knowledge to solve problem that use selection and repetition.	(G11.3.4.9.1) Use difficult condition in programs.		2
			(G11.3.4.9.2) Apply repetition to arrays to solve problems.		3
			(G11.3.4.9.3) Create complex program to solve real life problems.		3
	(3.5) Testing and Validation.	(3.5.10) Student is able to test complex programs for correctness.	(G11.3.5.10.1) Choose test data to cover all possible cases.		2
			(G11.3.5.10.2) Identify test data to test border cases.		2
	(3.6) Deployment and Documentation	(3.6.6) Student develops user friendly application.	(G11.3.6.6.1) Name arrays properly.		1
			(G11.3.6.6.2) Insert comments to explain the program.		1
			(G11.3.6.6.3) Indent the different statements properly.		1

Grade: 11A					
Domain	Strand	Standards	Learning outcomes	Integration	Level
3. Computer Practice and Programming	(3.2) Data Representation	(3.2.3) Student demonstrates knowledge of using one dimension array.	(G11A.3.2.3.1) Demonstrate correct manipulation of one dimensional array.		2
			(G11A.3.2.2.2) Identify problems solvable using arrays.		2
	(3.3) Human Computer Interaction (HCI)	(3.3.6) Student demonstrates the capability to format the input/output.	(G11A.3.3.6.1) Design menu as an interface to program.		2
			(G11A.3.3.6.2) Illustrate formatting output data in a suitable way.		2
		(3.3.8) Student demonstrates capability to work with files.	(G11A.3.3.8.1) Manipulate input data files.		2
			(G11A.3.3.8.2) Manipulate output data files.		2
	(3.4) Coding	(3.4.9) Student demonstrates the knowledge to solve problem that use selection and repetition.	(G11A.3.4.9.1) Translate complex condition into logical expression .		2
			(G11A.3.4.9.2) Combine repetition and arrays to solve problems.		3
			(G11A.3.4.9.3) Create efficient complex program to solve real life problems.		3
	(3.5) Testing and Validation.	(3.5.10) Student is able to test complex programs for correctness.	(G11A.3.5.10.1) Choose test data to cover all possible cases.		2
			(G11A.3.5.10.2) Identify test data to test border cases.		2
	(3.6) Deployment and Documentation	(3.6.6) Student develops user friendly application.	(G11A.3.6.6.1) Name arrays properly.		1
			(G11A.3.6.6.2) Insert comments to explain the program.		1
			(G11A.3.6.6.3) Indent the different statements properly.		1

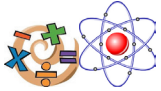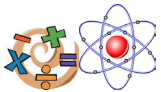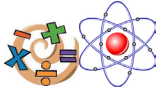|			Grade: 12		
Domain	Strand	Standards	Learning outcomes	Integration	Level
3.\nComputer\nPractice and\nProgramming	(3.2)\nData\nRepresentation	(3.2.4)\nStudents understand the use of\nmulti-dimension arrays.	(G12.3.2.4.1)\nManipulate two dimension arrays.		2
			(G12.3.2.4.2)\nIdentify problems solvable using\nmulti-dimension array.		2
	(3.3)\nHuman\nComputer\nInteraction (HCI)	(3.3.7)\nStudent designs and use\ngraphical user interface (GUI).	(G12.3.3.7.1)\nDesign GUI as a front end to\napplication.		2
			(G12.3.3.7.2)\nManipulate data via GUI.		2
	(3.4)\nCoding	(3.4.10)\nStudent demonstrates the use of\npre-defined modules and designs\nand implements modules.	(G12.3.4.10.1)\nImplement the sub-problems of large\nproblem into modules.		3
			(G12.3.4.10.2)\nDecide whether to use predefined\nmodules or implement your own\nmodules.		3
			(G12.3.4.10.3)\nCombine all these modules to solve\nthe original problem.		3
	(3.5)\nTesting and\nValidation.	(3.5.11)\nStudent understands the use of\nunit testing.	(G12.3.5.11.1)\nChoose suitable data to test each\nmodule.		2
			(G12.3.5.11.2)\nChoose suitable data to test whole\nprogram.		2
	(3.6)\nDeployment and\nDocumentation	(3.6.6)\nStudent develops user friendly\napplication.	(G12.3.6.6.1)\nName the modules properly.		1
			(G12.3.6.6.2)\nDescribe the input/output and the\nfunction of each module properly.		2
			(G12.3.6.6.3)\nDeploy the application on the\nappropriate platform.		2

Grade: 12A					
Domain	Strand	Standards	Learning outcomes	Integration	Level
3. Computer Practice and Programming	(3.2) Data Representation	(3.2.4) Students understand the use of multi-dimension arrays.	(G12A.3.2.4.1) Manipulate two dimension arrays.		2
			(G12A.3.2.4.2) Identify problems solvable using multi-dimension array.		2
	(3.3) Human Computer Interaction (HCI)	(3.3.8) Student is able to design and uses graphical user interface (GUI).	(G12A.3.3.8.1) Design user friendly GUI as a front end to application.		2
			(G12A.3.3.8.2) Manipulate data efficiently via GUI.		2
	(3.4) Coding	(3.4.11) Student demonstrates the use pre-defined modules and designs and uses modules including recursive module.	(G12A.3.4.11.1) Decompose complex problem into sub-problems.		3
			(G12A.3.4.11.2) Decide whether to use predefined modules or implement your own modules.		3
			(G12A.3.4.11.3) Combine all these modules efficiently to solve the original problem.		3
	(3.5) Testing and Validation.	(3.5.11) Student understands the use of unit testing.	(G12A.3.5.11.1) Choose suitable data to test each module.		2
			(G12A.3.5.11.2) Choose appropriate data to test the program.		2
	(3.6) Deployment and Documentation	(3.6.6) Student develops user friendly application.	(G12A.3.6.6.1) Name the modules properly.		1
			(G12A.3.6.6.2) Describe the input/output and the function of each module.		2
			(G12A.3.6.6.3) Deploy the application on the appropriate platform.		2

Student Performance Criteria

KG1				
Student	1-Barely or not initiated	2-Under development	3-Satisfies expectations	4-Exceeds expectations
Domain Digital Literacy and Competence	A (Level 1) Student may be able to:	A (Level 2) Student is able to:	A (Level 3) Student is able to:	A (Level 4) Student is able to:
Coding	• understand how to sort and arrange objects with a lot of assistance.	• understand how to sort and arrange objects with some assistance.	• understand how to sort and arrange objects with little assistance.	• understand how to sort and arrange objects independently.
Testing and Validation	• confirm without confidence that the set of items are sorted properly with extensive assistance.	• confirm that the set of items are sorted with limited assistance.	• confirm that the set of items are sorted.	• confirm with confidence that the set of items are sorted properly.

KG2				
Student	1-Barely or not initiated	2-Under development	3-Satisfies expectations	4-Exceeds expectations
Domain Digital Literacy and Competence	A (Level 1) Student may be able to:	A (Level 2) Student is able to:	A (Level 3) Student is able to:	A (Level 4) Student is able to:
Coding	• understand how to sort and arrange objects with a lot of assistance.	• understand how to sort and arrange objects with some assistance.	• understand how to sort and arrange objects with little assistance.	• understand how sort and arrange objects independently.
Testing and Validation	• confirm without confidence that the set of items are sorted properly with extensive assistance.	• confirm that the set of items are sorted with limited assistance.	• confirm that the set of items are sorted.	• confirm with confidence that the set of items are sorted properly.

Grade 1				
Student	1-Barely or not initiated	2-Under development	3-Satisfies expectations	4-Exceeds expectations
Domain Digital Literacy and Competence	A (Level 1) Student may be able to:	A (Level 2) Student is able to:	A (Level 3) Student is able to:	A (Level 4) Student is able to:
Coding	• order a set of commands in a dis - organized way.	• order a set of commands with some organization and logic.	• order a set of commands with most organization and logic.	• order a set of commands with organization and logic.
Testing and Validation	• try to test the program but unable to correct errors (if any).	• test the program and correct some errors (if any).	• test the program and correct most errors (if any).	• test the program and correct all errors (if any).

Grade 2				
Student	1-Barely or not initiated	2-Under development	3-Satisfies expectations	4-Exceeds expectations
Domain Digital Literacy and Competence	A (Level 1) Student may be able to:	A (Level 2) Student is able to:	A (Level 3) Student is able to:	A (Level 4) Student is able to:
Coding	• demonstrate limited ability to use repetitions with many errors.	• demonstrate some ability to use repetition with few errors.	• demonstrate considerable ability to use repetitions with no errors.	• demonstrate complete ability to use repetitions with confidence.
Testing and Validation	• try to check the program but unable to correct errors (if any).	• check the program and correct some errors (if any).	• check the program and correct most errors (if any).	• check the program completely and correct all errors (if any).

Grade 3				
Student	1-Barely or not initiated	2-Under development	3-Satisfies expectations	4-Exceeds expectations
Domain Digital Literacy and Competence	A (Level 1) Student may be able to:	A (Level 2) Student is able to:	A (Level 3) Student is able to:	A (Level 4) Student is able to:
Programming Evolution	• define programming paradigms with many errors.	• define programming paradigms with some errors.	• define programming paradigms with few errors.	• define programming paradigms with confidence.
Coding	• use condition and logical operations in wrong way.	• use condition and logical operations with some errors.	• use condition and logical operations with very few errors.	• use condition and logical operations with confidence.
Testing and Validation	• test very few program actions but unable to correct any errors (if any).	• test program actions to some extend and correct some errors (if any).	• test most program actions and correct most errors (if any).	• test all program actions and correct all errors (if any).

Grade 4				
Student	1-Barely or not initiated	2-Under development	3-Satisfies expectations	4-Exceeds expectations
Domain Digital Literacy and Competence	A (Level 1) Student may be able to:	A (Level 2) Student is able to:	A (Level 3) Student is able to:	A (Level 4) Student is able to:
Programming Evolution	• list one programming paradigm or none.	• list few programming paradigms with some errors.	• list most programming paradigms with few errors.	• list all programming paradigms with confidence.
HCI	• add random characters to interface in a disorganized and confusing way.	• add characters to interface but most of them are not related to the storyline.	• add to interface characters which align with the storyline, and match the scale of the set.	• add to interface characters which are very suitable to the storyline, and very well organized.
Coding	• create inappropriate functions with many errors.	• create few appropriate functions with some logical errors.	• create inefficient but appropriate functions.	• create efficient and appropriate functions.
Testing and Validation	• test programs but unable to correct most errors and all functions are considered untested.	• test programs, correct some errors and some functions can be considered as tested.	• test programs, correct most errors and most functions can be considered as tested.	• test programs, correct all errors and all functions are fully tested.
Documentation and Deployment	• understand the benefit of sharing stories but unable to do it.	• share undocumented stories with some difficulties.	• share documented stories with few difficulties.	• share well documented stories with no difficulties.

Grade 5				
Student	1-Barely or not initiated	2-Under development	3-Satisfies expectations	4-Exceeds expectations
Domain Digital Literacy and Competence	A (Level 1) Student may be able to:	A (Level 2) Student is able to:	A (Level 3) Student is able to:	A (Level 4) Student is able to:
Programming Evolution	• list very few differences between programming paradigms with many errors.	• list some differences between programming paradigms.	• list most differences between programming paradigms.	• list and discuss differences between programming paradigms.
HCI	• add to interface random characters in a disorganized and confusing way.	• add to interface characters but most of them are not related to the storyline.	• add to interface characters which aligned with the storyline, and matched the scale of the set.	• add to interface characters which are very suitable to the storyline, and very well organized.
Coding	• use sequences and loops with many errors.	• use sequences and loops with some errors.	• use sequences and loops with very few errors.	• use sequences and loops with no errors.
Testing and Validation	• choose test data randomly with no purpose and unable to correct any errors.	• choose test data to cover some cases, and correct some errors.	• choose test data to cover most cases and correct most errors.	• choose efficient test data to cover all cases and correct all errors.
Documentation and Deployment	• share fragmented and highly disorganized information so the intended purpose is not achieved.	• share un - synthesized and disorganized information so the intended purpose is not fully achieved.	• share synthesized and organized information inefficiently so the intended purpose is almost achieved.	• share synthesized, well organized information so the intended purpose is fully achieved.

Grade 6				
Student	1-Barely or not initiated	2-Under development	3-Satisfies expectations	4-Exceeds expectations
Domain Digital Literacy and Competence	A (Level 1) Student may be able to:	A (Level 2) Student is able to:	A (Level 3) Student is able to:	A (Level 4) Student is able to:
Programming Evolution	• describe Visual Programming language in a very limited way with confusing terms.	• describe Visual Programming language with limited knowledge about what it is used for.	• describe Visual Programming language properly with some knowledge about what it is used for.	• describe Visual Programming language properly with clear knowledge about what it is used for.
HCI	• identify one or two events on which the code is based.	• identify some events on which the code is based but unable to manipulate their attributes.	• identify most of the events on which the code is based, differentiate between some them and manipulate their attributes to some extend.	• identify all the events on which the code is based, differentiate between their types and manipulate their attributes.
Coding	• identify few block based visual programming but unable to use.	• identify few block based visual programming and use simple sequences and selections with some logical errors.	• identify most block based visual programming and use sequences, selections and simple repetitions with few errors.	• identify block based visual programming and use sequences, selections and simple repetitions with no errors.
Testing and Validation	• test few events randomly and unable to validate if any event is working as intended.	• test some events in the program and unable to validate if they are working as intended.	• test most events in the program and validate if they are working as intended.	• test all events in the program and validate if they are working as intended.
Documentation and Deployment	• add very few and confusing comments to the program.	• add basic comments including descriptions of some events.	• add clear comments including descriptions of most events.	• add clear comments including descriptions of all events.

Grade 7				
Student	1-Barely or not initiated	2-Under development	3-Satisfies expectations	4-Exceeds expectations
Domain Digital Literacy and Competence	A (Level 1) Student may be able to:	A (Level 2) Student is able to:	A (Level 3) Student is able to:	A (Level 4) Student is able to:
Programming Evolution	• list names of few blocks with many errors.	• list names of some blocks and describe their use with some errors.	• list names of most blocks and describe their use.	• list names of all blocks and describe their use with confidence.
HCI	• try to make own artwork.	• design interface using readymade artwork with no changes.	• design interface using modified readymade artwork.	• design interface using own artwork in a creative way to support the content.
Coding	• create projects that match few aspects of the storyboard and containing many errors.	• create projects that match most aspects of the storyboard and containing some errors.	• create projects that match most aspects of the storyboard and engage the users to some extend.	• create well-structured projects that match all aspects of the storyboard and engage the users.
Testing and Validation	• test the program but unable to correct any error (if any) or validate any result.	• test the program, correct some errors (if any) and validate some results.	• test the program, correct most errors and validate most results.	• test the program, correct all errors and validate all results.
Documentation and Deployment	• document programs in very limited and confusing way which make them unusable.	• document programs in limited way which make them difficult to use.	• document programs in acceptable way which make them useable.	• document programs properly which make them very easy to understand and use.

Grade 8				
Student	1-Barely or not initiated	2-Under development	3-Satisfies expectations	4-Exceeds expectations
Domain Digital Literacy and Competence	A (Level 1) Student may be able to:	A (Level 2) Student is able to:	A (Level 3) Student is able to:	A (Level 4) Student is able to:
Programming Evolution	• list one or no mobile programming tools with many errors.	• list few mobile programming tools with limited knowledge of their user.	• list mobile programming tools with some knowledge of their used.	• list mobile programming tools with knowledge of their use.
Data Representation	• list few data types, and use with many mistakes.	• list some data types, and use them with some mistakes.	• list some data types, and use them properly with little help from teacher.	• list all data types, and use them properly.
HCI	• understand poorly concepts of user friendly interface.	• understand concepts of user friendly interface but do not apply them.	• understand concepts of user friendly interface and apply them to some extend.	• understand concepts of user friendly interface and apply them properly.
Coding	• demonstrate limited understanding of variables, events and their properties, and create erroneous applications.	• demonstrate some understanding of variables, events and their properties, and create applications that work in some cases.	• demonstrate acceptable understanding of variables, events and their properties, and create applications that work correctly in most cases.	• demonstrate very good understanding of variables, events and their properties, and create applications that work in all cases.
Testing and Validation	• test randomly few events and unable to correct any of erroneous ones.	• test few events and correct some of erroneous ones.	• test most of events and correct the erroneous ones.	• test all events and correct the erroneous ones in a systemic way.
Documentation and Deployment	• add very poor messages or no message at all to the application.	• add few messages to the application and deploy it with assistance.	• add enough messages to the application and deploy it with limited assistance.	• add meaningful messages to the application and deploy it with no assistance.

Grade 9				
Student	1-Barely or not initiated	2-Under development	3-Satisfies expectations	4-Exceeds expectations
Domain Digital Literacy and Competence	A (Level 1) Student may be able to:	A (Level 2) Student is able to:	A (Level 3) Student is able to:	A (Level 4) Student is able to:
Programming Evolution	• describe mobile Programming tools in a very limited and confusing way.	• describe mobile Programming tools without knowing what they are used.	• describe mobile programming tools and mobile platforms.	• describe mobile programming tools and mobile platforms and discuss their differences.
Data Representation	• list few data types, and use them incorrectly.	• list some data types, and use them correctly with some mistakes.	• list some data types, and use them properly with little help from teacher.	• list all data types, and use them properly.
HCI	• create application interface that contains disorganized components and many errors.	• create application interface that contains some organized components and errors.	• create application interface that contains organized components and few errors.	• create user friendly interface that contains appropriate and well organized components.
Coding	• create incomplete and incorrect mobile application containing one or two objects with simple features.	• create mobile application, containing few objects with simple features, that matches some requirements.	• create mobile application, containing many objects, that matches most of requirements.	• create mobile application, containing many objects, that matches all requirements properly.
Testing and Validation	• test the application without knowing if it works correctly.	• test the application to some extend and correct some errors.	• test the application and correct most of the errors.	• test the application and correct all errors in systematic way.
Documentation and Deployment	• include very few and poor messages in the application.	• include few messages in the application and deploy it with some assistance.	• include meaningful messages in the application and deploy it with little assistance.	• include t meaningful messages in the application and deploy it with no assistance.

Grade 10				
Student	1-Barely or not initiated	2-Under development	3-Satisfies expectations	4-Exceeds expectations
Domain Digital Literacy and Competence	A (Level 1) Student may be able to:	A (Level 2) Student is able to:	A (Level 3) Student is able to:	A (Level 4) Student is able to:
Programming Evolution	• list one or two examples of programming languages but cannot differentiate between them and unable to use a compiler.	• list few examples of programming languages without knowing the difference between them and use a compiler with difficulty.	• list many examples of programming languages, know the difference between them and use a compiler.	• list and categorize examples of programming languages, use and describe a compiler properly.
Data Representation	• list few data types, use them incorrectly, and evaluate arithmetic and logical expressions with many errors.	• list some data types, use them correctly, and evaluate arithmetic and logical expressions with some errors.	• list some data types, use them properly, and evaluate arithmetic and logical expressions with few errors.	• list all data types, use them properly, and evaluate arithmetic and logical expressions with no errors.
HCI	• identify few of input/output but many input prompts and output descriptions are inappropriate or missing.	• identify most of input/output but most input prompts and output descriptions are inappropriate or missing.	• identify all input/output but few input prompts and output descriptions are inappropriate or missing.	• identify all input/output and all input prompts and output descriptions are appropriate.
Coding	• create programs that contain syntax and logical errors.	• create program that produce incorrect results for most input.	• create program that produce correct results for all input except for special cases.	• create program that produce correct results for all input.
Testing and Validation	• choose test cases randomly to cover few scenarios.	• choose test data to cover some scenarios.	• choose test data to cover most scenarios.	• choose test data to cover all scenarios and validate all specification cases.
Documentation and Deployment	• name all variables very poorly, and produce very badly organized programs with no comments.	• name most variables poorly, and produce badly organized programs with some comments.	• name most variables properly, and produce organized programs with enough comments.	• name variables properly, and produce well organized and documented programs.

Grade 10A				
Student	1-Barely or not initiated	2-Under development	3-Satisfies expectations	4-Exceeds expectations
Domain Digital Literacy and Competence	A (Level 1) Student may be able to:	A (Level 2) Student is able to:	A (Level 3) Student is able to:	A (Level 4) Student is able to:
Programming Evolution	• list one or two examples of programming languages but cannot differentiate between them and unable to use a compiler.	• list few examples of programming languages without knowing the difference between them and use a compiler with difficulty.	• list many examples of programming languages, know the difference between them and use a compiler.	• list and categorize examples of programming languages, use and describe a compiler properly.
Data Representation	• list few data types, use them incorrectly, and evaluate arithmetic and logical expressions with many errors.	• list some data types, use them correctly, and evaluate arithmetic and logical expressions with some errors.	• list some data types, use them properly, and evaluate arithmetic and logical expressions with few errors.	• list all data types, use them properly, and evaluate arithmetic and logical expressions with no errors.
HCI	• identify few of input/output but many input prompts and output descriptions are inappropriate or missing.	• identify most of input/output but most input prompts and output descriptions are inappropriate or missing.	• identify all input/output but few input prompts and output descriptions are inappropriate or missing.	• identify all input/output and all input prompts and output descriptions are appropriate.
Coding	• create programs that contain syntax and logical errors.	• create program that produce incorrect results for most input.	• create program that produce correct results for all input except for special cases.	• create program that produce correct results for all input.
Testing and Validation	• choose test cases randomly to cover few scenarios.	• choose test data to cover some scenarios.	• choose test data to cover most scenarios.	• choose test data to cover all scenarios and validate all specification cases.
Documentation and Deployment	• name all variables very poorly, and produce very badly organized programs with no comments.	• name most variables poorly, and produce badly organized programs with some comments.	• name most variables properly, and produce organized programs with enough comments.	• name variables properly, and produce well organized and documented programs.

Grade 11				
Student	1-Barely or not initiated	2-Under development	3-Satisfies expectations	4-Exceeds expectations
Domain Digital Literacy and Competence	A (Level 1) Student may be able to:	A (Level 2) Student is able to:	A (Level 3) Student is able to:	A (Level 4) Student is able to:
Programming Evolution	• define simple and structured data types incorrectly and use them with many errors.	• define most simple and structured data types properly and use them with some errors.	• define all simple and structured data types properly and use them with few errors.	• define and use all simple and structured data types properly with no errors.
Data Representation	• manipulate input/output files with many errors, design erroneous interfaces and format all output data inappropriately.	• manipulate input/output files with some errors, design badly organized interfaces, and format some output data inappropriately.	• manipulate input/output files with few errors, design organized interfaces, and format few output data inappropriately.	• manipulate input/output files with no errors, design well organized interfaces, and format all output data appropriately.
HCI	• create programs that contain many syntax and logical errors.	• create programs with some logical errors that produce correct results for some input data.	• create programs with few logical errors that produce correct results for most input data.	• create programs with no errors that produce correct results for all input data.
Coding	• choose test cases randomly to cover few scenarios.	• choose test data to cover and validate some scenarios.	• choose test data to cover and validate most scenarios.	• choose test data to cover and validate all scenarios.
Testing and Validation	• name few arrays properly, and produce very disorganized programs with no comments.	• name some arrays properly, and produce disorganized programs with some comments.	• name most arrays properly, and produce organized programs with comments.	• name all arrays properly, and produce well organized and documented programs.
Documentation and Deployment	• name all variables very poorly, and produce very badly organized programs with no comments.	• name most variables poorly, and produce badly organized programs with some comments.	• name most variables properly, and produce organized programs with enough comments.	• name variables properly, and produce well organized and documented programs.

Grade 11A				
Student	1-Barely or not initiated	2-Under development	3-Satisfies expectations	4-Exceeds expectations
Domain Digital Literacy and Competence	A (Level 1) Student may be able to:	A (Level 2) Student is able to:	A (Level 3) Student is able to:	A (Level 4) Student is able to:
Programming Evolution	• define simple and structured data types incorrectly and use them with many errors.	• define most simple and structured data types properly and use them with some errors.	• define all simple and structured data types properly and use them with few errors.	• define and use all simple and structured data types properly with no errors.
Data Representation	• manipulate input/output files with many errors, design erroneous interfaces and format all output data inappropriately.	• manipulate input/output files with some errors, design badly organized interfaces, and format some output data inappropriately.	• manipulate input/output files with few errors, design organized interfaces, and format few output data inappropriately.	• manipulate input/output files with no errors, design well organized interfaces, and format all output data appropriately.
HCI	• create programs that contain many syntax and logical errors.	• create programs with some logical errors that produce correct results for some input data.	• create programs with few logical errors that produce correct results for most input data.	• create programs with no errors that produce correct results for all input data.
Coding	• choose test cases randomly to cover few scenarios.	• choose test data to cover and validate some scenarios.	• choose test data to cover and validate most scenarios.	• choose test data to cover and validate all scenarios.
Testing and Validation	• name few arrays properly, and produce very disorganized programs with no comments.	• name some arrays properly, and produce disorganized programs with some comments.	• name most arrays properly, and produce organized programs with comments.	• name all arrays properly, and produce well organized and documented programs.
Documentation and Deployment	• name all variables very poorly, and produce very badly organized programs with no comments.	• name most variables poorly, and produce badly organized programs with some comments.	• name most variables properly, and produce organized programs with enough comments.	• name variables properly, and produce well organized and documented programs.

Grade 12				
Student	1-Barely or not initiated	2-Under development	3-Satisfies expectations	4-Exceeds expectations
Domain Digital Literacy and Competence	A (Level 1) Student may be able to:	A (Level 2) Student is able to:	A (Level 3) Student is able to:	A (Level 4) Student is able to:
Data Representation	• define structured data types incorrectly and use them with many errors.	• define structured data types properly and use them with some errors.	• define structured data types properly and use them with few errors.	• define and use structured data types properly.
HCI	• design and implement very disorganized and unfriendly GUI with many syntax and logical errors.	• design and implement disorganized GUI with some logical errors.	• design and implement organized GUI with few logical errors.	• design and implement well organized friendly GUI with no errors.
Coding	• create modular programs that contain syntax and logical errors.	• create modular programs that produce incorrect results for some input cases.	• create modular programs that produce correct results for most input cases.	• create modular programs that produce correct results for all input.
Testing and Validation	• choose test cases randomly to cover few specification cases but no use for unit testing.	• choose test data to cover most specification cases but no use for unit testing.	• choose test data to cover most specification cases and use unit testing to some extent.	• choose test data to cover all specification cases and use unit testing properly.
Documentation and Deployment	• create very disorganized code and very difficult to follow.	• create disorganized code and difficult to follow.	• create organized code and easy to follow to some extent.	• create well organized code and easy to follow.

Grade 12A				
Student	1-Barely or not initiated	2-Under development	3-Satisfies expectations	4-Exceeds expectations
Domain Digital Literacy and Competence	A (Level 1) Student may be able to:	A (Level 2) Student is able to:	A (Level 3) Student is able to:	A (Level 4) Student is able to:
Data Representation	• define structured data types incorrectly and use them with many errors.	• define structured data types properly and use them with some errors.	• define structured data types properly and use them with few errors.	• define and use structured data types properly.
HCI	• design and implement very disorganized and unfriendly GUI with many syntax and logical errors.	• design and implement disorganized GUI with some logical errors.	• design and implement organized GUI with few logical errors.	• design and implement well organized friendly GUI with no errors.
Coding	• create modular programs that contain syntax and logical errors.	• create modular programs that produce incorrect results for some input cases.	• create modular programs that produce correct results for most input cases.	• create modular programs that produce correct results for all input.
Testing and Validation	• choose test cases randomly to cover few specification cases but no use for unit testing.	• choose test data to cover most specification cases but no use for unit testing.	• choose test data to cover most specification cases and use unit testing to some extent.	• choose test data to cover all specification cases and use unit testing properly.
Documentation and Deployment	• create very disorganized code and very difficult to follow.	• create disorganized code and difficult to follow.	• create organized code and easy to follow to some extent.	• create well organized code and easy to follow.

Sample Activities
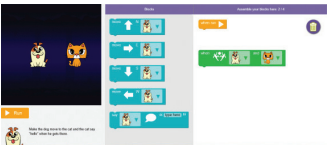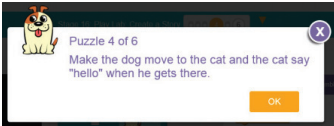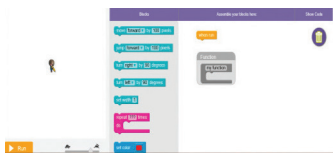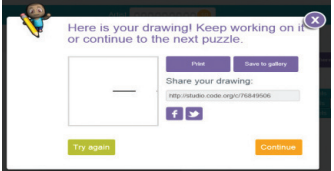
Sample Activity (Grade 1):

By the end of Grade 1, the student will be able to:

Grade 1				
Domain	Computer Practice and Programming			
Strand	Learning outcome	Example	Sample Activity	Suggested Assessment
Coding	• Arrange set of commands to perform tasks	• Given a set of puzzle, arrange them to accomplish a required task.	• Use mouse to drag and drop puzzle pieces to connect together.	• Drag and drop pieces of puzzle in the correct place.
	• Repeat a single command	• Count the number of times an action should be executed and represent it as a single repeated command.	• Give sequential command to a student and try to transform a repeated command into a loop.	• Ask students to solve puzzles using the smallest number of blocks.
Testing and Validation	• Run the program for correctness • Correct errors if any	• Run program with errors and show how to find these errors and correct them.	• Given a program for a particular maze, check if the program solves the maze.	• Students work through puzzles, find and correct bugs.
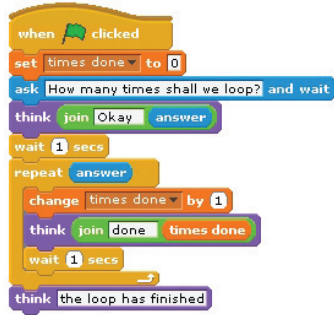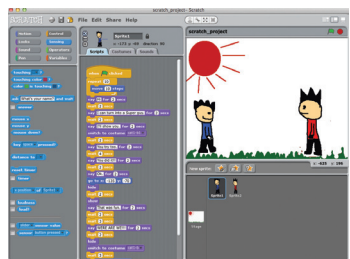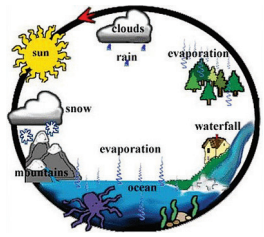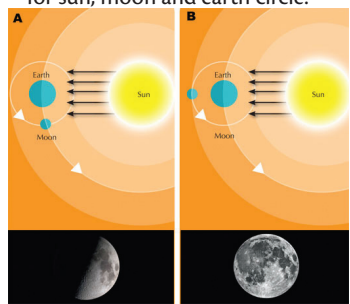
Sample Activity (Grade 4):

By the end of Grade 4, the student will be able to:

Grade 4				
Domain	Computer Practice and Programming			
Strand	Learning outcome	Example	Sample Activity	Suggested Assessment
Programming Evolution	• List programming paradigms	• Discuss different programming paradigms.	• Students describe a program in their own language.	• List example of programming paradigms.
Human Computer Interaction (HCI)	• Create interface to a story using available characters	• Use different characters to create an interface to a story.	• Students animate multiple characters using events triggered by the arrow keys to tell a story.	• Students apply a given set of instructions to design GUI.
Coding	• Create function to accomplish a task	• Use a pre-determined function to draw an image.	• Students use sample functions to draw images.	• Ask students to write functions on paper for simple shapes then combine those functions to draw a picture.
Testing and Validation	• Test the correctness of the function • Test the whole program	• Debug each function in the program.	• Find and correct errors in functions.	• Run a program.
Deployment and Documentation	• Share link of a story with other students	• Create a story and send the link to other students.	• Use function to draw a shape and share the link with other students.	• Draw a sample shape and share the link with other students.
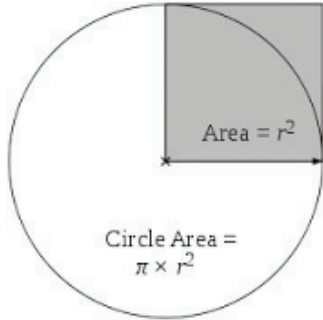
Sample Activity (Grade 7):

By the end of Grade 7, the student will be able to:

<table>
<tr><td colspan="6" align="center">Grade 7</td></tr>
<tr><td>Domain</td><td colspan="5" align="center">Computer Practice and Programming</td></tr>
<tr><td>Strand</td><td>Learning outcome</td><td>Example</td><td>Sample Activity</td><td colspan="2">Suggested Assessment</td></tr>
<tr>
<td>Programming Evolution</td>
<td>• Describe categories of blocks in block based programming tools</td>
<td>• Identity different types of blocks (motion and control blocks).</td>
<td>• Students search about the categories of blocks (motion and control) with the help of the tool used.</td>
<td colspan="2">• Ask student to compare different types of blocks.
</td>
</tr>
<tr>
<td>Human Computer Interaction (HCI)</td>
<td>• Design graphical user interface for applications</td>
<td>• Discuss the use of different elements in an interface</td>
<td>• Use different types of objects to create a suitable interface for an application</td>
<td colspan="2">• Students apply a given set of instructions to design GUI.
</td>
</tr>
<tr>
<td>Coding</td>
<td>• Use different types of variables
• Enhance the layouts of applications
• Create project to perform specific tasks</td>
<td>• Student should be able to write a program controlled by some events.</td>
<td>• Use sequence, loop, functions and conditions to create a program for water cycle in life.
</td>
<td colspan="2">• Ask students to create a project for sun, moon and earth circle.
</td>
</tr>
<tr>
<td>Testing and Validation</td>
<td>• Test the project for correctness and validity</td>
<td>• Track all sequential steps of program for correctness.</td>
<td>• Divide students into groups to test each other's application.</td>
<td colspan="2">• Test program to check if it meets the requirements.</td>
</tr>
<tr>
<td>Deployment and Documentation</td>
<td>• Insert useful comments to the program</td>
<td>• Show programs that are easy to read and understand.</td>
<td>• Given a program, discuss if it is well documented.</td>
<td colspan="2">• Add useful comments to the program.</td>
</tr>
</table>

Sample Activity (Grade 10):

By the end of Grade 10, the student will be able to:

Grade 10				
Domain	Computer Practice and Programming			
Strand	Learning outcome	Example	Sample Activity	Suggested Assessment
Programming Evolution	• Describe the historical development of programming languages • List examples of computer languages (low and high level) • Illustrate the use of a translator	• Discuss examples of programming languages (Scratch, GameSalad, VB and java). • Compile and run a program.	• Search the Inernet for different programming languages (VB, C++ and Java). • Compile and run a given program.	• list 4 or 5 programming languages classify each one as high or low. • Run a program.
Data Representation	• Define the different data types • Select suitable simple data type to store data • Evaluate arithmetic expression • Evaluate logical expression	• Give examples of data and find the suitable data type for each. • Evaluate different arithmetic and logical expression.	• Give examples of data and find the suitable data type for each (10, 3.5, 'a', "salem"). • Given a=5, b=2 find a<b, a/b, a/2 ==b, a+3*b, (a+3)*b.	• Identify which type is suitable to represent: (3, "3", ":F", 'f', 5.0/2). • Given x=3 and y=7 find (x+3.0)/2 +y, x<>y, x+y/7).
Human Computer Interaction (HCI)	• Identify the problem's input/output • Demonstrate the capability to input data • Demonstrate the capability to output data to screen	• Given a problem find out what are the input/output. • Input and output different data.	• Identify the input/output of few problems. • Read/write data from/to standard input/output devices.	• Identify the input/output of few problems. • Read/write data from/to standard input/output devices.
Coding	• Use assignment to represent equation • Create programs which have assignment statements • Choose which type of selections to use • Create programs containing a set of sequence statements • Create programs which make decision	• Use examples from math and science courses taken by students.	• Write a program to convert temperature from Celsius to Fahrenheit or Kelvin. F = C° x 9/5 + 32 K = C° + 273.15 • Write program to solve equation of second degree $ax^2 + bx - c = 0$.	• Write a program to find the area of a circle. Area = r^2 Circle Area = $\pi \times r^2$

Grade 10				
Domain	Computer Practice and Programming			
Strand	Learning outcome	Example	Sample Activity	Suggested Assessment
Testing and Validation	• Choose suitable data to test the programs • Choose test data to cover all possible cases	• Choose data according to the example.	• Assign different value to C get F and K • Choose values for a, b, and c to fully test the program (written in the coding section)	• Test the program with different values for r
Deployment and Documentation	• Name variables properly • Insert comments to explain the program • Indent the different statements properly	• Give a properly documented program. • Give an unproperly documented program.	• Document the program (written in the coding section).	• Document the program (written in the coding section).

Responsible Use & Cyber-Security

Impacts of Technology

Information Accuracy & Reliability

Cyber Ethics & Laws

Cyber Health
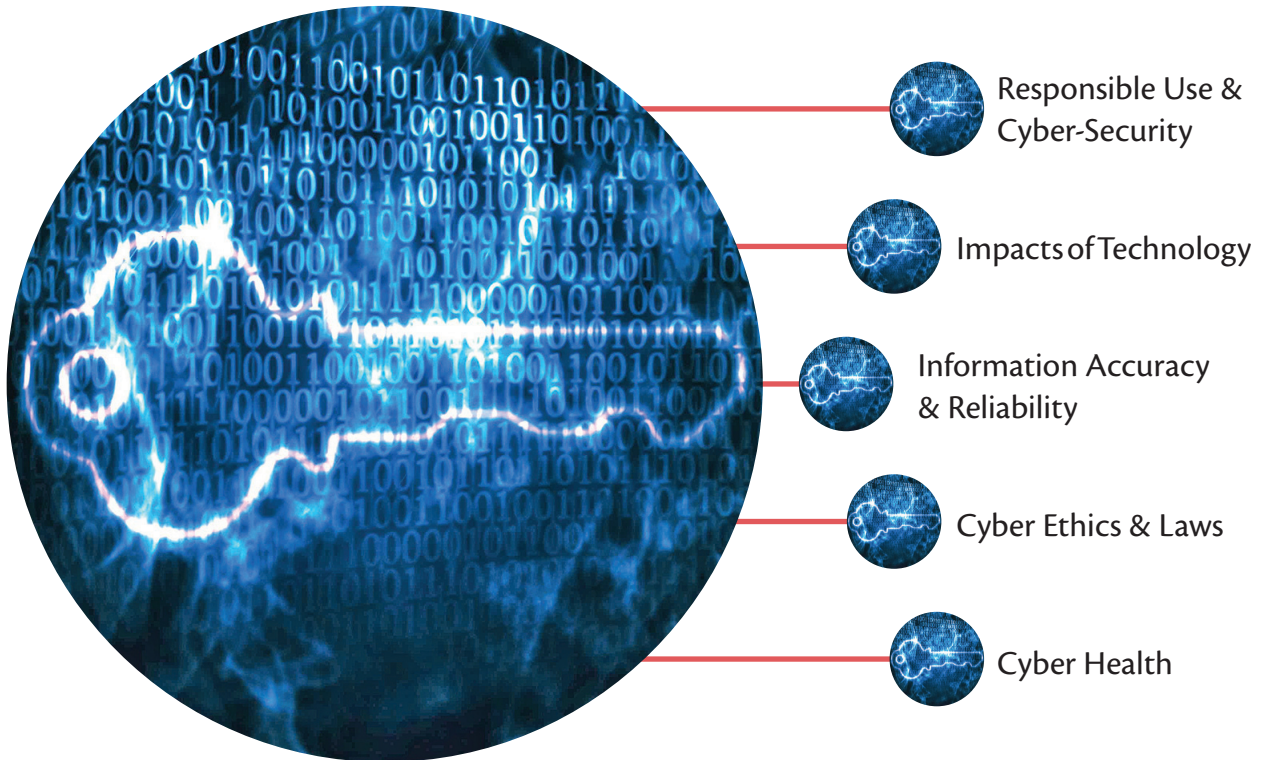
Cyber Security, cyber Safety, and Cyber Ethics (CCC)

Domain 4: Cyber Security, Cyber Safety, and Cyber Ethics (CCC)

Definition

Computers and networks are a diverse experience that affect society at all levels and goes beyond local borders. The ethical use of computers and networks is a fundamental aspect of computer science at all levels and should be seen as an essential element of both learning and practice.
The domain will encompass four expanding circles: the personal circle, community circle, global circle & future circle. At each circle, the student will be introduced with different concepts related to the strands listed below.

The strands to be covered are:

- Responsible Use & Cyber-Security
- Impacts of Technology
- Information Accuracy & Reliability
- Cyber Ethics & Laws
- Cyber Health

Few general examples are provided in the paragraphs below.

Computing, like all technologies, has a profound impact on any culture into which it is placed. The distribution of computing resources in a global economy raises issues of equity, access, and power. Social and economic values influence the design and development of computing innovations. Students should be prepared to evaluate the various positive and negative impacts of computers on society and to identify the extent to which issues of access (who has access, who does not, and who makes the decisions about access) impact our lives.

Generic Outcomes

It is essential that K-12 students understand the impact of computers on international communication. They should learn the difference between appropriate and inappropriate social networking behaviors. They should also appreciate the role of adaptive technology in the lives of people with various disabilities.

KG - G5 (cycle 1)

By the end of cycle 1, students will be able to discuss the consequences of prolong use of computers, why it is important to refer to parents and guardians when using new technology, proper and responsible use of technology and how to avoid improper use. They will also be able to discuss reliable online sources, securing online accounts with strong passwords, and sharing personal information online. Students will be able to demonstrate understanding about ergonomics basics, ethical behaviors when being online, fake websites, how to use public digital facilities responsibly, how technology affect & support people with special needs, proper/improper social networking behaviors, how to protect against data loss, and content theft.

G6 - G9 (cycle 2)

By the end of cycle 2, students will be able to discuss proper computer recycling, discuss identity theft, and evaluate information reliability on the Inernet. They will be able to discuss topics related to cyber-crimes, email etiquette, intellectual property, technology impacts on human culture, plagiarism, and cyber stalking.

G10 - G12 (cycle 3 and cycle 3 advanced)

By the end of cycle 3 and 3A, students will be able to discuss the impact of computer technology on business and commerce and describe the role that adaptive technology can play in the lives of people with special needs. They will be able to discuss cryptography, digital signatures, malicious software, computer attacks, how to cite others work, and impulse buying.

As soon as students begin using the Internet, they should learn the norms for its ethical use. Principles of personal privacy, network security, software licenses, and copyrights must be taught at an appropriate level in order to prepare students to become responsible citizens in the modern world. Students should be able to make informed and ethical choices among various types of software such as proprietary and open source and understand the importance of adhering to the licensing or use agreements. Students should also be able to evaluate the reliability and accuracy of information they receive from the Internet.

The following learning outcomes will be shared in terms of coverage between this domain and the "Cyber Security, Cyber Safety, and Cyber Ethics (CCC)" domain as fit in domain strands:

- Apply proper manners when communicating via emails
- Discuss best practices to be adopted when sending and receiving emails
- Differentiate between using school email account and personal email account
- Perform basic security setup on a home Wi-Fi router to protect their home network against intruders
- Demonstrate responsible judgments regarding allowed/not allowed access to others Wi-Fi networks
- Define reliable online sources
- Differentiate between reliable and unreliable online sources
- Discuss reliability in specific contexts giving some examples
- Describe a variety of strategies for determining the reliability of information found on the Inernet
- Discuss common types of online sources used to get information
- Perform online search using multiple search engines and document the results
- Evaluate the results of different online sources from different search engines

Strands Description and Technical Keywords

	Strand Title	Strand Description	Key words
1	Responsible Use & Cyber-Security	Covers topics related to responsible use of technology, proper exchange/share/communication of information, securing private information when being online, protecting against malware and other types of cyber-attacks, and cryptography basics and algorithms in attacks.	social networking do's/don'ts, shared resources, misusing shared resources, proper use of mobile phones, spreading rumors online, legal and ethical behaviors, what to share; when; with whom, social engineering, malware, cryptography, cryptographic protocol, cryptographic attacks, encryption, decryption, key, hashing
2	Impacts of Technology	Covers topics related to the impact of Knowledge Economy on local and global level. Furthermore, it discusses issues related to how business can be conducted online using any Internet - based application and appropriate online buying behaviors.	trustworthiness of online content, secured websites, https, disclosing information through the inernet, digital footprint, cyber - bullying, identity theft phishing, stalking, hackers, crackers, managing passwords, e-commerce, online transactions, online banking, credit card fraud, impulsive buying
3	Information Accuracy & Reliability	Covers topics related to the integrity and credibility of electronic information sources, and how students can evaluate Inernet resources. It also includes issues related to plagiarism and the tools used to detect and protect against it.	biographies of living persons, primary, secondary, and tertiary sources, medical claims, quotations, academic consensus, statements of opinion, breaking news, political views, submitting someone's work as their own, taking passages from their own previous work without adding citations, re-writing someone's work without properly citing sources, using quotations, but not citing the source, interweaving various sources together in the work without citing, citing some, but not all passages that should be cited, melding together cited and uncited sections of the piece, providing proper citations, but fails to change the structure and wording of the borrowed ideas enough, inaccurately citing the source, relying too heavily on other people's work, fails to bring original thought into the text
4	Cyber Ethics & Laws	Discuss topics related to reliable and equal access to technology including support to people with special needs, and governing communication and technology use.	accountability, acceptable use policy (AUP), intellectual property, copyrights, copyright infringement, public domain, UAE cyber laws/rules, internet bank fraud, cyber harassment, software piracy, inernet offenses, illegal access (intrusion), consequences of internet crimes, protecting oneself from being a victim, freeware, shareware, digital divide, knowledge & information sharing
5	Cyber Health	Introduce and examine physical and psychological well-being in a digital world and the consequences of improper technology usage practices and the best ways to avoid them.	ergonomics, ergo injury symptoms, prolong use of computers, eye strain, internet/online games addiction, computer wastes disposal, repetitive motion injuries (RMIs), musculoskeletal disorders (MSDs)

Strands Distribution Per Grade

Grade Domains	KG	1	2	3	4	5	6	7	8	9	10	10A	11	11A	12	12A
Cyber Security, Cyber Safety, and Cyber Ethics	Responsible Use & Cyber-Security															
	Impacts of Technology															
			Information Accuracy & Reliability													
			Cyber Ethics & Laws													
	Cyber Health															

Table 3: CCC Domain Strands Distribution across all grades

Student Learning Outcomes distribution Per Grade

Domains	Strand	Cycle 1								Cycle 2					Cycle 3				Cycle 3A			
		KG1	KG2	G1	G2	G3	G4	G5		G6	G7	G8	G9		G10	G11	G12		G10A	G11A	G12A	
Cyber Security, Cyber Safety, and Cyber Ethics	Responsible Use & Cyber-Security	1	1	2	3	3	3	3	16	2	2	1	2	7	8	5	3	16	8	5	3	16
	Impacts of Technology	0	0	1	1	1	1	1	5	1	1	1	2	5	2	5	0	7	2	5	0	7
	Information Accuracy & Reliability	0	0	0	0	1	1	1	3	1	1	1	1	4	2	2	1	5	2	2	1	5
	Cyber Ethics & Laws	0	0	0	0	2	2	2	6	3	3	3	2	11	4	2	2	8	4	2	2	8
	Cyber Health	1	1	1	1	1	1	2	8	2	1	1	1	5	0	0	0	0	0	0	0	0
Total									38					32				36				36

Table 4: Quantitative Analysis of CCC domain SLOs per Grade
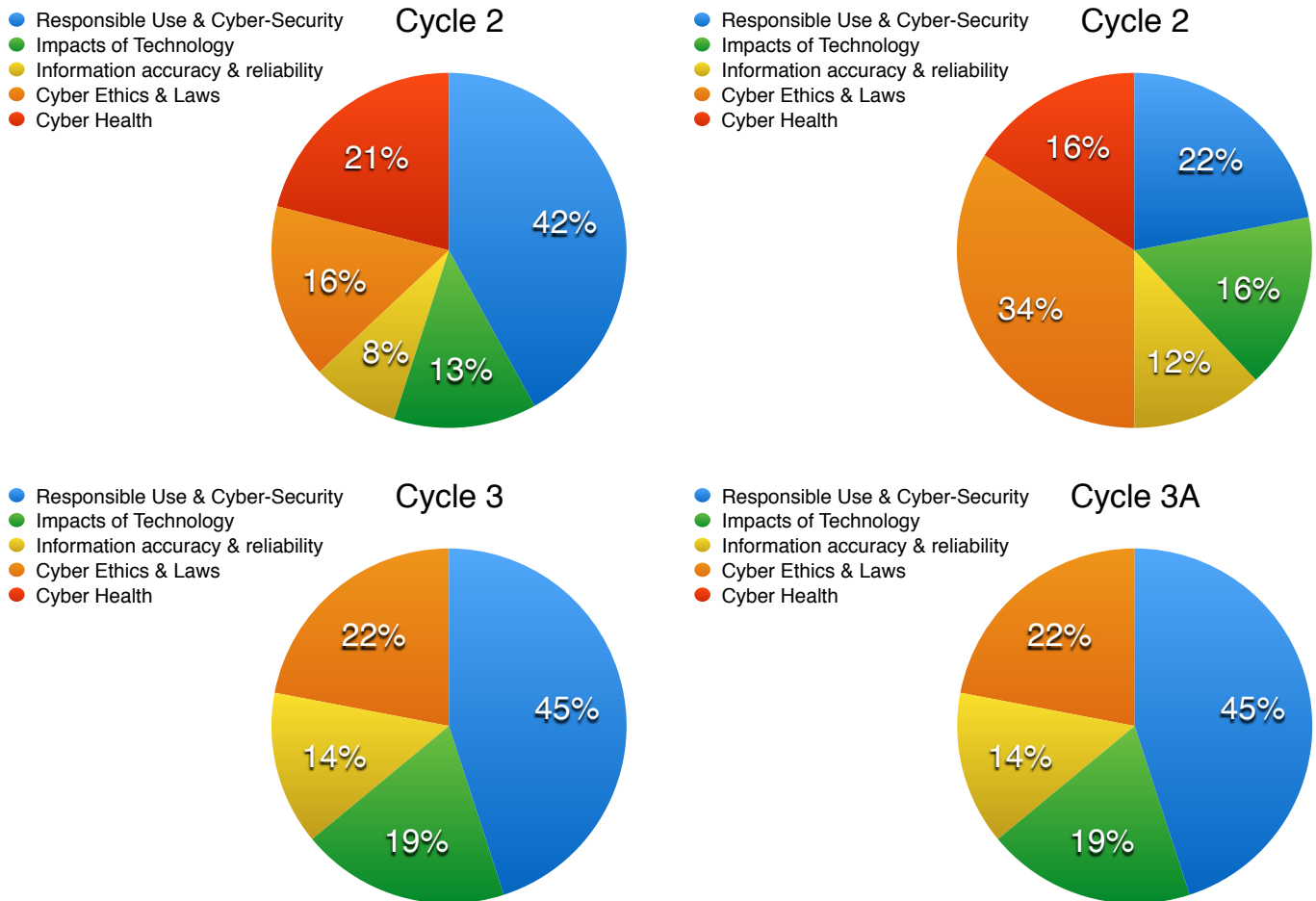
Fig. 4: CCC Domain Strand Distribution Per Cycle

Percentage of outcomes as per level of difficulty and percentage wise

Grade	No of outcomes				Outcomes Percentage		
	Difficulty Level				Difficulty Level		
	1	2	3	Sum	1	2	3
KG1	2	0	0	2	100.0%	0.0%	0.0%
KG2	2	0	0	2	100.0%	0.0%	0.0%
G1	3	1	0	4	75.0%	25.0%	0.0%
G2	3	2	0	5	60.0%	40.0%	0.0%
G3	4	4	0	8	50.0%	50.0%	0.0%
G4	2	6	0	8	25.0%	75.0%	0.0%
G5	4	5	0	9	44.4%	55.6%	0.0%
Cycle 1	20	18	0	38	52.6%	47.4%	0.0%
G6	6	3	0	9	66.7%	33.3%	0.0%
G7	4	4	0	8	50.0%	50.0%	0.0%
G8	2	5	0	7	28.6%	71.4%	0.0%
G9	1	7	0	8	12.5%	87.5%	0.0%
Cycle 2	13	19	0	32	40.6%	59.4%	0.0%
G10	6	10	0	16	37.5%	62.5%	0.0%
G11	5	9	0	14	35.7%	64.3%	0.0%
G12	3	3	0	6	50.0%	50.0%	0.0%
Cycle 3	14	22	0	36	38.9%	61.1%	0.0%
G10A	5	9	2	16	31.3%	56.3%	12.5%
G11A	4	8	2	14	28.6%	57.1%	14.3%
G12A	2	4	0	6	33.3%	66.7%	0.0%
Cycle 3A	11	21	4	36	30.6%	58.3%	11.1%

Allocated Periods distribution per cycle

	Number of Periods				
	C 1	C2	C3	C3A	Total
CCC	19.7	17.9	17.3	17.3	54.9

Strands Evolution Per Grade

Domain	Strand	Grade 1	Grade 2	Grade 3	Grade 4	Grade 5
Cyber Security, Cyber Safety, and Cyber Ethics	Responsible Use & Cyber-Security	• Students discuss basic issues related to responsible use of technology and information, consequences of inappropriate use, and examples of proper use in real life scenarios.	• Students discuss basic issues related to responsible use of technology and information, consequences of inappropriate use, and examples of proper use in real life scenarios.	• Students demonstrate understanding about proper exchange and sharing of information using digital systems and the importance of having humility, loyalty and respect for others when communicating.	• Students understand how to keep their personal information private when being online, exhibit awareness about the different threats when using online websites, and can make right decisions on what to share, when to share, and with whom.	• Students demonstrate understanding about proper exchange and sharing of information using digital systems and the importance of having humility, loyalty and respect for others when communicating.
	Impacts of Technology	• Students demonstrate knowledge of technology in everyday life.	• Students discuss how technology impacts humanity including how it affects education, culture, the workplace, and business.	• Students discuss how technology impacts humanity including how it affects education, culture, the workplace, and business.	• Students discuss how technology impacts humanity including how it affects education, culture, the workplace, and business.	• Students discuss how technology impacts humanity including how it affects education, culture, the workplace, and business.
	Information Accuracy & Reliability			• Students evaluate the accuracy, credibility, integrity, relevance, appropriateness, comprehensiveness, and biases of the different electronic information sources concerning real-world problems, aid in evaluating Inernet resources, and exhibit critical thinking skills to judge about what is right/wrong when using information taken from online sources.	• Students evaluate the accuracy, credibility, integrity, relevance, appropriateness, comprehensiveness, and biases of the different electronic information sources concerning real-world problems, aid in evaluating Inernet resources, and exhibit critical thinking skills to judge about what is right/wrong when using information taken from online sources.	• Students evaluate the accuracy, credibility, integrity, relevance, appropriateness, comprehensiveness, and biases of the different electronic information sources concerning real-world problems, aid in evaluating Inernet resources, and exhibit critical thinking skills to judge about what is right/wrong when using information taken from online sources.
	Cyber Ethics & Laws			• Students develop understanding about the privilege of using electronic information as well as the right to having equal, secure and reliable access.	• Students discuss ideas implemented in technology that support people with special needs.	• Students discuss ideas implemented in technology that support people with special needs.
	Cyber Health	• Students develop understanding about physical and psychological well-being in a digital world and the consequences of improper technology usage practices and the best ways to avoid them.	• Students develop understanding about physical and psychological well-being in a digital world and the consequences of improper technology usage practices and the best ways to avoid them.	• Students develop understanding about physical and psychological well-being in a digital world and the consequences of improper technology usage practices and the best ways to avoid them.	• Students develop understanding about physical and psychological well-being in a digital world and the consequences of improper technology usage practices and the best ways to avoid them.	• Students develop understanding about physical and psychological well-being in a digital world and the consequences of improper technology usage practices and the best ways to avoid them.

Domain	Strand	Grade 6	Grade 7	Grade 8	Grade 9
Cyber Security, Cyber Safety, and Cyber Ethics	Responsible Use & Cyber-Security	• Students understand how to keep their personal information private when being online, exhibit awareness about the different threats when using online websites, and can make right decisions on what to share, when to share, and with whom.	• Students understand how to keep their personal information private when being online, exhibit awareness about the different threats when using online websites, and can make right decisions on what to share, when to share, and with whom.	• Students apply knowledge about malware to protect themselves against different types of malicious software in particular and other possible cyber-attacks in general.	• Students apply knowledge about malware to protect themselves against different types of malicious software in particular and other possible cyber-attacks in general.
	Impacts of Technology	• Students understand future technology changes.	• Students understand future technology changes.	• Students discuss how technology impacts humanity including how it affects education, culture, the workplace, and business.	• Students discuss how technology impacts humanity including how it affects education, culture, the workplace, and business.
	Information Accuracy & Reliability	• Students evaluate the accuracy, credibility, integrity, relevance, appropriateness, comprehensiveness, and biases of the different electronic information sources concerning real-world problems, aid in evaluating Inernet resources, and exhibit critical thinking skills to judge about what is right/wrong when using information taken from online sources.	• Students realize the importance of academic integrity and demonstrate understanding about plagiarism, its consequences, how to reference or cite others work, and appreciate originality and plagiarism prevention services and tools.	• Students realize the importance of academic integrity and demonstrate understanding about plagiarism, its consequences, how to reference or cite others work, and appreciate originality and plagiarism prevention services and tools.	• Students evaluate the accuracy, credibility, integrity, relevance, appropriateness, comprehensiveness, and biases of the different electronic information sources concerning real-world problems, aid in evaluating Inernet resources, and exhibit critical thinking skills to judge about what is right/wrong when using information taken from online sources.
	Cyber Ethics & Laws	• Students develop understanding about governing communication and technology use.	• Students develop understanding about governing communication and technology use.	• Students develop understanding about governing communication and technology use.	• Students develop understanding about governing communication and technology use.
	Cyber Health	• Students develop understanding about physical and psychological well-being in a digital world and the consequences of improper technology usage practices and the best ways to avoid them.	• Students understand the effects of heavy computer and cell phone use on the sleep quality, stress levels, and general mental health of young adults.	• Students understand the effects of heavy computer and cell phone use on the sleep quality, stress levels, and general mental health of young adults.	• Students understand the effects of heavy computer and cell phone use on the sleep quality, stress levels, and general mental health of young adults.

Domain	Strand	Grade 10	Grade 11	Grade 12
Cyber Security, Cyber Safety, and Cyber Ethics	Responsible Use & Cyber-Security	• Students apply knowledge about malware to protect themselves against different types of malicious software in particular and other possible cyber-attacks in general. • Students apply cryptography basics and algorithms in attacks. Explain encryption algorithms and public key infrastructure (PKI) and offers examples of different attacks on crypto systems.	• Students apply knowledge about malware to protect themselves against different types of malicious software in particular and other possible cyber-attacks in general. • Students apply cryptography basics and algorithms in attacks. Explain encryption algorithms and public key infrastructure (PKI) and offers examples of different attacks on crypto systems.	• Students apply cryptography basics and algorithms in attacks. Explain encryption algorithms and public key infrastructure (PKI) and offers examples of different attacks on crypto systems.
	Impacts of Technology	• Students discuss how technology impacts humanity including how it affects education, culture, the workplace, and business. • Students develop understanding about how business can be conducted online using any Internet - based application and appropriate online buying behaviors.	• Students demonstrate knowledge of technology in everyday life. • Students develop understanding about how business can be conducted online using any Internet - based application and appropriate online buying behaviors.	
	Information Accuracy & Reliability	• Students realize the importance of academic integrity and demonstrate understanding about plagiarism, its consequences, how to reference or cite others work, and appreciate originality and plagiarism prevention services and tools.	• Students realize the importance of academic integrity and demonstrate understanding about plagiarism, its consequences, how to reference or cite others work, and appreciate originality and plagiarism prevention services and tools.	• Students realize the importance of academic integrity and demonstrate understanding about plagiarism, its consequences, how to reference or cite others work, and appreciate originality and plagiarism prevention services and tools.
	Cyber Ethics & Laws	• Students develop understanding about governing communication and technology use.	• Students develop understanding about the privilege of using electronic information as well as the right to having equal, secure and reliable access.	• Students develop understanding about the privilege of using electronic information as well as the right to having equal, secure and reliable access.

Domain	Strand	Grade 10	Grade 11	Grade 12
Cyber Security, Cyber Safety, and Cyber Ethics	Responsible Use & Cyber-Security	• Students apply knowledge about malware to protect themselves against different types of malicious software in particular and other possible cyber-attacks in general • Students apply cryptography basics and algorithms in attacks. Explain encryption algorithms and public key infrastructure (PKI) and offers examples of different attacks on crypto systems.	• Students apply knowledge about malware to protect themselves against different types of malicious software in particular and other possible cyber-attacks in general • Students apply cryptography basics and algorithms in attacks. Explain encryption algorithms and public key infrastructure (PKI) and offers examples of different attacks on crypto systems.	• Students apply cryptography basics and algorithms in attacks. Explain encryption algorithms and public key infrastructure (PKI) and offers examples of different attacks on crypto systems.
	Impacts of Technology	• Students discuss how technology impacts humanity including how it affects education, culture, the workplace, and business. • Students develop understanding about how business can be conducted online using any Internet - based application and appropriate online buying behaviors.	• Students demonstrate knowledge of technology in everyday life. • Students develop understanding about how business can be conducted online using any Internet - based application and appropriate online buying behaviors.	•
	Information Accuracy & Reliability	• Students realize the importance of academic integrity and demonstrate understanding about plagiarism, its consequences, how to reference or cite others work, and appreciate originality and plagiarism prevention services and tools.	• Students realize the importance of academic integrity and demonstrate understanding about plagiarism, its consequences, how to reference or cite others work, and appreciate originality and plagiarism prevention services and tools.	• Students realize the importance of academic integrity and demonstrate understanding about plagiarism, its consequences, how to reference or cite others work, and appreciate originality and plagiarism prevention services and tools.
	Cyber Ethics & Laws	• Students develop understanding about governing communication and technology use.	• Students develop understanding about the privilege of using electronic information as well as the right to having equal, secure and reliable access.	• Students develop understanding about the privilege of using electronic information as well as the right to having equal, secure and reliable access.

Integration between CCC domain and other domains

CCC	DLC	CT	CPP
Responsible Use & Cyber-Security	• Responsible Use & Cyber-Security • Impacts of Technology • Information Accuracy & Reliability • Collaboration tools • Cyber Health		
Impacts of Technology	• Responsible Use & Cyber-Security • Impacts of Technology • Information Accuracy & Reliability • Collaboration tools • Cyber Health	• Algorithmic Thinking	• Coding
Information Accuracy & Reliability	• Responsible Use & Cyber-Security • Impacts of Technology • Information Accuracy & Reliability • Collaboration tools • Cyber Health		
Cyber Ethics & Laws	• Impacts of Technology • Information Accuracy & Reliability • Collaboration tools • Cyber Health		• Documentation and Deployment
Cyber Health.	• Responsible Use & Cyber-Security • Information Accuracy & Reliability		• Human Computer Interface

Scope and Sequence
Domains, Strands and Standards by Grade

Grade: KG1					
Domain	Strand	Standards	Learning outcomes	Integration	Level
4. Cyber Security, Cyber Safety, and Cyber Ethics	(4.1) Responsible Use & Cyber-Security	(4.1.1) Students discuss basic issues related to responsible use of technology and information, consequences of inappropriate use, and examples of proper use in real life scenarios	(KG1.4.1.1.1) Realize the importance of referring to parent and guardians when using new technology		1
	(4.5) Cyber Health	(4.5.1) Students develop understanding about physical and psychological well-being in a digital world and the consequences of improper technology usage practices and the best ways to avoid them	(KG1.4.5.1.1) Understand the consequences of prolong use of computers like eyestrain		1

Grade: KG2					
Domain	Strand	Standards	Learning outcomes	Integration	Level
4. Cyber Security, Cyber Safety, and Cyber Ethics	(4.1) Responsible Use & Cyber-Security	(4.1.1) Students discuss basic issues related to responsible use of technology and information, consequences of inappropriate use, and examples of proper use in real life scenarios	(KG2.4.1.1.1) Realize the importance of referring to parent and guardians when using new technology		1
	(4.5) Cyber Health	(4.5.1) Students develop understanding about physical and psychological well-being in a digital world and the consequences of improper technology usage practices and the best ways to avoid them	(KG2.4.5.1.1) Understand the consequences of prolong use of computers like eyestrain		1

Grade: 1					
Domain	Strand	Standards	Learning outcomes	Integration	Level
4. Cyber Security, Cyber Safety, and Cyber Ethics	(4.1) Responsible Use & Cyber-Security	(4.1.1) Students discuss basic issues related to responsible use of technology and information, consequences of inappropriate use, and examples of proper use in real life scenarios	(G1.4.1.1.1) Realize the importance of referring to parent and guardians when using new technology		1
			(G1.4.1.1.2) Discuss why it is important to be responsible when using technology		2
			(G1.4.1.1.3) List main consequences of improper use of technology and how to avoid them		1
	(4.2) Impacts of Technology	(4.2.1) Students demonstrate knowledge of technology in everyday life	(G1.4.2.1.1) List common technologies used in everyday life		1
	(4.5) Cyber Health	(4.5.1) Students develop understanding about physical and psychological well-being in a digital world and the consequences of improper technology usage practices and the best ways to avoid them	(G1.4.5.1.1) Explain how prolong use of computers can cause back pain and eyestrain and how to avoid it		1

Grade: 2					
Domain	Strand	Standards	Learning outcomes	Integration	Level
4. Cyber Security, Cyber Safety, and Cyber Ethics	(4.1) Responsible Use & Cyber-Security	(4.1.1) Students discuss basic issues related to responsible use of technology and information, consequences of inappropriate use, and examples of proper use in real life scenarios	(G2.4.1.1.1) Discuss the purpose of using passwords using real life examples		2
			(G2.4.1.1.2) Demonstrate responsible use of the school network bandwidth and public services		2
			(G2.4.1.1.3) Practice responsible digital citizenship in the use of technology systems and software		1
	(4.2) Impacts of Technology	(4.2.2) Students discuss how technology impacts humanity including how it affects education, culture, the workplace, and business	(G2.4.2.2.1) List ways in which people use computers at work and in their daily lives		1
	(4.5) Cyber Health	(4.5.1) Students develop understanding about physical and psychological well-being in a digital world and the consequences of improper technology usage practices and the best ways to avoid them	(G2.4.5.1.1) Describe the concept of "Ergonomics" and its importance		1

Grade: 3					
Domain	Strand	Standards	Learning outcomes	Integration	Level
4. Cyber Security, Cyber Safety, and Cyber Ethics	(4.1) Responsible Use & Cyber-Security	(4.1.2) Students demonstrate understanding about proper exchange and sharing of information using digital systems and the importance of having humility, loyalty and respect for others when communicating	(G3.4.1.2.1) Discuss basic ethical and unethical behaviors in the digital world		1
			(G3.4.1.2.2) Discuss how to use modern digital communication and collaboration tools and devices appropriately and responsibly		1
			(G3.4.1.2.3) Create a good password to protect personal data		2
	(4.2) Impacts of Technology	(4.2.2) Students discuss how technology impacts humanity including how it affects education, culture, the workplace, and business	(G3.4.2.2.1) List different technologies that are used in different professions in their typical work environment		1
	(4.3) Information Accuracy & Reliability	(4.3.1) Students evaluate the accuracy, credibility, integrity, relevance, appropriateness, comprehensiveness, and biases of the different electronic information sources concerning real-world problems, aid in evaluating Inernet resources, and exhibit critical thinking skills to judge about what is right/wrong when using information taken from online sources	(G3.4.3.1.1) Realize that no one should assume that information on the Internet is accurate, timely, clear, and important		2
	(4.4) Cyber Ethics & Laws	(4.4.1) Students develop understanding about the privilege of using electronic information as well as the right to having equal, secure and reliable access	(G3.4.4.1.1) Explain different ways one can instill the right attitude when using the facilities made available by the public		2
	(4.5) Cyber Health	(4.5.1) Students develop understanding about physical and psychological well-being in a digital world and the consequences of improper technology usage practices and the best ways to avoid them	(G3.4.5.1.1) Explain how some computer usage practices can affect physical health and the best ways to protect oneself from such harm		1

Grade: 4					
Domain	Strand	Standards	Learning outcomes	Integration	Level
4. Cyber Security, Cyber Safety, and Cyber Ethics	(4.1) Responsible Use & Cyber-Security	(4.1.3) Students understand how to keep their personal information private when being online, exhibit awareness about the different threats when using online websites, and can make right decisions on what to share, when to share, and with whom	(G4.4.1.3.1) Identify personal information		2
			(G4.4.1.3.2) Exhibit right judgments when sharing personal information		2
			(G4.4.1.3.3) Identify possible risks, dangers, as well as advantages of making friendships & relationships online		2
	(4.2) Impacts of Technology	(4.2.2) Students discuss how technology impacts humanity including how it affects education, culture, the workplace, and business	(G4.4.2.2.1) Demonstrate understating of technological innovation and how technology is fast changing in our modern world		1
	(4.3) Information Accuracy & Reliability	(4.3.1) Students evaluate the accuracy, credibility, integrity, relevance, appropriateness, comprehensiveness, and biases of the different electronic information sources concerning real-world problems, aid in evaluating Inernet resources, and exhibit critical thinking skills to judge about what is right/wrong when using information taken from online sources	(G4.4.3.1.1) Discuss why information should be checked for accuracy on a web page		2
	(4.4) Cyber Ethics & Laws	(4.4.2) Students discuss ideas implemented in technology that support people with special needs	(G4.4.4.2.1) Explain how technology helps people with physical challenges and how they can improve their access to technology in the future		2
			(G4.4.4.2.2) Describe the role that adaptive technology can play in the lives of people with special needs		2
	(4.5) Cyber Health	(4.5.1) Students develop understanding about physical and psychological well-being in a digital world and the consequences of improper technology usage practices and the best ways to avoid them	(G4.4.5.1.1) Discuss Symptoms of Internet Addiction		1

Grade: 5					
Domain	Strand	Standards	Learning outcomes	Integration	Level
4. Cyber Security, Cyber Safety, and Cyber Ethics	(4.1) Responsible Use & Cyber-Security	(4.1.2) Students demonstrate understanding about proper exchange and sharing of information using digital systems and the importance of having humility, loyalty and respect for others when communicating	(G5.4.1.2.1) Explain how technology can be misused by comparing appropriate and inappropriate social networking behaviors		2
			(G5.4.1.2.2) Exhibit legal and ethical behaviors when using information and technology		2
			(G5.4.1.2.3) Discuss the consequences of misusing information and technology		1
	(4.2) Impacts of Technology	(4.2.2) Students discuss how technology impacts humanity including how it affects education, culture, the workplace, and business	(G5.4.2.2.1) Evaluate different applications according to ease of use for specific type of user		2
	(4.3) Information Accuracy & Reliability	(4.3.1) Students evaluate the accuracy, credibility, integrity, relevance, appropriateness, comprehensiveness, and biases of the different electronic information sources concerning real-world problems, aid in evaluating Inernet resources, and exhibit critical thinking skills to judge about what is right/wrong when using information taken from online sources	(G5.4.3.1.1) Discuss common techniques used to identify fake websites		1
	(4.4) Cyber Ethics & Laws	(4.4.2) Students discuss ideas implemented in technology that support people with special needs	(G5.4.4.2.1) Discuss how technology makes it easier to engage students with physical and learning disabilities		2
			(G5.4.4.2.2) Discuss common examples of added features or functionalities of technologies that would support usage by people with special needs		2
	(4.5) Cyber Health	(4.5.1) Students develop understanding about physical and psychological well-being in a digital world and the consequences of improper technology usage practices and the best ways to avoid them	(G5.4.5.1.1) Identify Social Problems Associated with Computer and Internet Use		1
			(G5.4.5.1.2) Setup the workplace for proper posture, appropriate distance from monitors and having proper lighting		1

Grade: 6					
Domain	Strand	Standards	Learning outcomes	Integration	Level
4. Cyber Security, Cyber Safety, and Cyber Ethics	(4.1) Responsible Use & Cyber-Security	(4.1.3) Students understand how to keep their personal information private when being online, exhibit awareness about the different threats when using online websites, and can make right decisions on what to share, when to share, and with whom	(G6.4.1.3.1) Define Identity theft		1
			(G6.4.1.3.2) Discuss known ways used by unethical people to steal personal information		1
	(4.2) Impacts of Technology	(4.2.3) Students understand future technology changes	(G6.4.2.3.1) Demonstrate ability to come up with future technologies, and the consequences of using them		1
	(4.3) Information Accuracy & Reliability	(4.3.1) Students evaluate the accuracy, credibility, integrity, relevance, appropriateness, comprehensiveness, and biases of the different electronic information sources concerning real-world problems, aid in evaluating Inernet resources, and exhibit critical thinking skills to judge about what is right/wrong when using information taken from online sources	(G6.4.3.1.1) Discuss content theft detection and best methods for prevention		2
	(4.4) Cyber Ethics & Laws	(4.4.3) Students develop understanding about governing communication and technology use	(G6.4.4.3.1) Realize that the same right/wrong actions offline still apply to the online world		2
			(G6.4.4.3.2) Discuss "Cyber Crimes" by defining relevant terminologies		1
			(G6.4.4.3.3) Describe the consequences of "cyber-crime" and how to protect oneself against it		2
	(4.5) Cyber Health	(4.5.1) Students develop understanding about physical and psychological well-being in a digital world and the consequences of improper technology usage practices and the best ways to avoid them	(G6.4.5.1.1) Explain Proper Recycling and Disposing of Computer Equipment		1
			(G6.4.5.1.2) Explain What we should do to reduce the impact of computer waste on our environment		2

Grade: 7					
Domain	Strand	Standards	Learning outcomes	Integration	Level
4. Cyber Security, Cyber Safety, and Cyber Ethics	(4.1) Responsible Use & Cyber-Security	(4.1.3) Students understand how to keep their personal information private when being online, exhibit awareness about the different threats when using online websites, and can make right decisions on what to share, when to share, and with whom	(G7.4.1.3.1) Explain why it is importance not to share personal information with everyone on the Inernet		2
			(G7.4.1.3.2) List main ways to protect against un-intentional reveal of personal information		1
	(4.2) Impacts of Technology	(4.2.3) Students understand possible computing & technology careers	(G7.4.2.3.1) Discuss the jobs of computer scientists, engineers, and information technologist in our modern world and the near future		2
	(4.3) Information Accuracy & Reliability	(4.3.1) Students evaluate the accuracy, credibility, integrity, relevance, appropriateness, comprehensiveness, and biases of the different electronic information sources concerning real-world problems, aid in evaluating Inernet resources, and exhibit critical thinking skills to judge about what is right/wrong when using information taken from online sources	(G7.4.3.1.1) Define plagiarism		1
	(4.4) Cyber Ethics & Laws	(4.4.3) Students develop understanding about governing communication and technology use	(G7.4.4.3.1) Describe how legal rights and different kinds of software licenses can be used to share and protect copyright and intellectual property		2
			(G7.4.4.3.2) Discuss the social and economic implications associated with software piracy		1
			(G7.4.4.3.2) Identify laws and regulations that impact the development and use of software		2
	(4.5) Cyber Health	(4.5.2) Students understand the effects of heavy computer and cell phone use on the sleep quality, stress levels, and general mental health of young adults	(G7.4.5.2.1) Explain how heavy use of computers and mobile phones can result in an increase in sleep disorders symptoms in young adults		1

Grade: 8					
Domain	Strand	Standards	Learning outcomes	Integration	Level
4. Cyber Security, Cyber Safety, and Cyber Ethics	(4.1) Responsible Use & Cyber-Security	(4.1.4) Students apply knowledge about malware to protect themselves against different types of malicious software in particular and other possible cyber-attacks in general	(G8.4.1.4.1) Identify main threats that can be received through emails and how to deal with them		1
	(4.2) Impacts of Technology	(4.2.2) Students discuss how technology impacts humanity including how it affects education, culture, the workplace, and business	(G8.4.2.2.1) Demonstrate knowledge of changes in information over time and the effects those changes may have on education, the workplace, and society		2
	(4.3) Information Accuracy & Reliability	(4.3.1) Students evaluate the accuracy, credibility, integrity, relevance, appropriateness, comprehensiveness, and biases of the different electronic information sources concerning real-world problems, aid in evaluating Inernet resources, and exhibit critical thinking skills to judge about what is right/wrong when using information taken from online sources	(G8.4.3.1.1) List common forms of student plagiarism		1
	(4.4) Cyber Ethics & Laws	(4.4.3) Students develop understanding about governing communication and technology use	(G8.4.4.3.1) Analyze the impact of government regulations on privacy and security		2
			(G8.4.4.3.2) Differentiate among open source, freeware, and proprietary licenses and their applicability to different types of software		2
			(G8.4.4.3.3) Discuss "Cyber Bullying" including attached implications		2
	(4.5) Cyber Health	(4.5.2) Students understand the effects of heavy computer and cell phone use on the sleep quality, stress levels, and general mental health of young adults	(G8.4.5.2.1) Explain how Frequently using a computer without breaks further increases the risk of stress, sleeping problems and depressive symptoms		2

Grade: 9					
Domain	Strand	Standards	Learning outcomes	Integration	Level
4. Cyber Security, Cyber Safety, and Cyber Ethics	(4.1) Responsible Use & Cyber-Security	(4.1.1) Students discuss basic issues related to responsible use of technology and information, consequences of inappropriate use, and examples of proper use in real life scenarios	(G9.4.1.1.1) Discuss Web Presence and the importance of having proper self-representation on the Inernet		1
		(4.1.4) Students apply knowledge about malware to protect themselves against different types of malicious software in particular and other possible cyber-attacks in general	(G9.4.1.4.1) Explain how computer viruses spread and best practices to protect against them		2
	(4.2) Impacts of Technology	(4.2.2) Students discuss how technology impacts humanity including how it affects education, culture, the workplace, and business	(G9.4.2.2.1) Discuss the positive and negative impacts of technology on human culture		2
			(G9.4.2.2.2) Discuss technology evolution from conventional devices to multipurpose devices		2
	(4.3) Information Accuracy & Reliability	(4.3.2) Students realize the importance of academic integrity and demonstrate understanding about plagiarism, its consequences, how to reference or cite others work, and appreciate originality and plagiarism prevention services and tools	(G9.4.3.2.1) Identify biased or opinionated sources of information		2
	(4.4) Cyber Ethics & Laws	(4.4.3) Students develop understanding about governing communication and technology use	(G9.4.4.3.1) Discuss "Cyber Stalking" including attached implications		2
			(G9.4.4.3.2) Exhibit legal and ethical behaviors when using information and technology		2
	(4.5) Cyber Health	(4.5.2) Students understand the effects of heavy computer and cell phone use on the sleep quality, stress levels, and general mental health of young adults	(G9.4.5.2.1) Discuss the negative effect of working in front of a computer for many hours a day such as the risk of mental illness like depression and insomnia		2
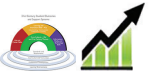
			Grade: 10		
Domain	Strand	Standards	Learning outcomes	Integration	Level
4. Cyber Security, Cyber Safety, and Cyber Ethics	(4.1) Responsible Use & Cyber-Security	(4.1.1) Students discuss basic issues related to responsible use of technology and information, consequences of inappropriate use, and examples of proper use in real life scenarios	(G10.4.1.1.1) Define "Digital Footprint"		1
			(G10.4.1.2.1) Discuss the main categories for "Digital Footprint"		1
		(4.1.4) Students apply knowledge about malware to protect themselves against different types of malicious software in particular and other possible cyber-attacks in general	(G10.4.1.4.1) Discuss the different types of malicious software including worms, viruses and Trojan horses		2
		(4.1.5) Students apply cryptography basics and algorithms in attacks. Explain encryption algorithms and public key infrastructure (PKI) and offers examples of different attacks on crypto systems	(G10.4.1.5.1) Define cryptography		1
			(G10.4.1.5.2) Explain symmetric and asymmetric algorithms		2
			(G10.4.1.5.3) Demonstrate digital signatures		1
			(G10.4.1.5.4) Illustrate sensitive data encryption		1
			(G10.4.1.5.5) Demonstrate hashing algorithms		1
	(4.2) Impacts of Technology	(4.2.2) Students discuss how technology impacts humanity including how it affects education, culture, the workplace, and business	(G10.4.2.2.1) Discuss the impact of computer technology on business and commerce		2
		(4.2.3) Students develop understanding about how business can be conducted online using any Internet - based application and appropriate online buying behaviors	(G10.4.2.3.1) Identify types of Internet transactions		1
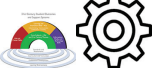
Grade: 10					
Domain	Strand	Standards	Learning outcomes	Integration	Level
4. Cyber Security, Cyber Safety, and Cyber Ethics	(4.3) Information Accuracy & Reliability	(4.3.2) Students realize the importance of academic integrity and demonstrate understanding about plagiarism, its consequences, how to reference or cite others work, and appreciate originality and plagiarism prevention services and tools	(G10.4.3.2.1) Define a cited source		1
			(G10.4.3.2.2) Define published work		1
	(4.4) Cyber Ethics & Laws	(4.4.3) Students develop understanding about governing communication and technology use	(G10.4.4.3.1) Discuss the consequences of misusing information technology		2
			(G10.4.4.3.2) Demonstrate ethical use of modern communication media and devices		2
			(G10.4.4.3.3) Discuss "Digital theft" and it implications on copyrights and suggest some deterring methods		2
			(G10.4.4.3.4) Discuss security and privacy issues that relate to computer networks		2
	(4.5) Cyber Health	(4.5.2) Students understand the effects of heavy computer and cell phone use on the sleep quality, stress levels, and general mental health of young adults	(G10.4.5.2.1) Discuss the negative effect of working in front of a computer for many hours a day such as the risk of mental illness like depression and insomnia		2

Grade: 10A					
Domain	Strand	Standards	Learning outcomes	Integration	Level
4. Cyber Security, Cyber Safety, and Cyber Ethics	(4.1) Responsible Use & Cyber-Security	(4.1.1) Students discuss basic issues related to responsible use of technology and information, consequences of inappropriate use, and examples of proper use in real life scenarios	(G10A.4.1.1.1) Define "Digital Footprint"		1
			(G10A.4.1.2.1) Discuss the main categories for "Digital Footprint"		1
		(4.1.4) Students apply knowledge about malware to protect themselves against different types of malicious software in particular and other possible cyber-attacks in general	(G10A.4.1.4.1) Discuss the different types of malicious software including worms, viruses and Trojan horses		2
		(4.1.5) Students apply cryptography basics and algorithms in attacks. Explain encryption algorithms and public key infrastructure (PKI) and offers examples of different attacks on crypto systems	(G10A.4.1.5.1) Define cryptography		1
			(G10A.4.1.5.2) Explain symmetric and asymmetric algorithms		2
			(G10A.4.1.5.3) Demonstrate digital signatures		1
			(G10A.4.1.5.4) Illustrate sensitive data encryption		1
			(G10A.4.1.5.5) Demonstrate hashing algorithms		1
	(4.2) Impacts of Technology	(4.2.2) Students discuss how technology impacts humanity including how it affects education, culture, the workplace, and business	(G10A.4.2.2.1) Discuss the impact of computer technology on business and commerce		2
		(4.2.3) Students develop understanding about how business can be conducted online using any Internet - based application and appropriate online buying behaviors	(G10A.4.2.3.1) Identify types of Internet transactions		1

Grade: 10A					
Domain	Strand	Standards	Learning outcomes	Integration	Level
4. Cyber Security, Cyber Safety, and Cyber Ethics	(4.3) Information Accuracy & Reliability	(4.3.2) Students realize the importance of academic integrity and demonstrate understanding about plagiarism, its consequences, how to reference or cite others work, and appreciate originality and plagiarism prevention services and tools	(G10A.4.3.2.1) Define a cited source		1
			(G10A.4.3.2.2) Define published work		1
	(4.4) Cyber Ethics & Laws	(4.4.3) Students develop understanding about governing communication and technology use	(G10A.4.4.3.1) Discuss the consequences of misusing information technology		2
			(G10A.4.4.3.2) Demonstrate ethical use of modern communication media and devices		2
			(G10A.4.4.3.3) Discuss "Digital theft" and it implications on copyrights and suggest some deterring methods		2
			(G10A.4.4.3.4) Discuss security and privacy issues that relate to computer networks		2

Grade: 11					
Domain	Strand	Standards	Learning outcomes	Integration	Level
4. Cyber Security, Cyber Safety, and Cyber Ethics	(4.1) Responsible Use & Cyber-Security	(4.1.4) Students apply knowledge about malware to protect themselves against different types of malicious software in particular and other possible cyber-attacks in general	(G11.4.1.4.1) Discuss different tools and software used to protect computer systems, stored data, and personal information		2
		(4.1.5) Students apply cryptography basics and algorithms in attacks. Explain encryption algorithms and public key infrastructure (PKI) and offers examples of different attacks on crypto systems	(G11.4.1.5.1) List components of public key infrastructure		1
			(G11.4.1.5.2) Identify birthday attack		1
			(G11.4.1.5.3) Illustrate mathematical attacks		2
			(G11.4.1.5.4) Define brute force attacks		1
	(4.2) Impacts of Technology	(4.2.2) Students discuss how technology impacts humanity including how it affects education, culture, the workplace, and business	(G11.4.2.2.1) Analyze the beneficial and harmful effects of computing innovations		2
			(G11.4.2.2.2) Summarize how financial markets, transactions, and predictions have been transformed by automation		2
			(G11.4.2.2.3) Summarize how computation has revolutionized the way people build real and virtual organizations and infrastructures		3
		(4.2.3) Students develop understanding about how business can be conducted online using any Internet - based application and appropriate online buying behaviors	(G11.4.2.3.1) Identify Issues when Conducting Transactions over the Internet		1
			(G11.4.2.3.2) Demonstrate understanding of "Impulse Buying"		2

Grade: 11					
Domain	Strand	Standards	Learning outcomes	Integration	Level
4. Cyber Security, Cyber Safety, and Cyber Ethics	(4.3) Information Accuracy & Reliability	(4.3.2) Students realize the importance of academic integrity and demonstrate understanding about plagiarism, its consequences, how to reference or cite others work, and appreciate originality and plagiarism prevention services and tools	(G11.4.3.2.1) Discuss how to recognize plagiarism		1
			(G11.4.3.2.2) Discuss the consequences of the plagiarism offense		2
	(4.4) Cyber Ethics & Laws	(4.4.1) Students develop understanding about the privilege of using electronic information as well as the right to having equal, secure and reliable access	(G11.4.4.1.1) Differentiate between information access and distribution rights		2
			(G11.4.4.1.2) Discuss how the unequal distribution of computing resources in a global economy raises issues of equity, access, and power		2

Grade: 11A					
Domain	Strand	Standards	Learning outcomes	Integration	Level
4. Cyber Security, Cyber Safety, and Cyber Ethics	(4.1) Responsible Use & Cyber-Security	(4.1.4) Students apply knowledge about malware to protect themselves against different types of malicious software in particular and other possible cyber-attacks in general	(G11A.4.1.4.1) Discuss different tools and software used to protect computer systems, stored data, and personal information		2
		(4.1.5) Students apply cryptography basics and algorithms in attacks. Explain encryption algorithms and public key infrastructure (PKI) and offers examples of different attacks on crypto systems	(G11A.4.1.5.1) List components of public key infrastructure		1
			(G11A.4.1.5.2) Identify birthday attack		1
			(G11A.4.1.5.3) Illustrate mathematical attacks		2
			(G11A.4.1.5.4) Define brute force attacks		1
	(4.2) Impacts of Technology	(4.2.2) Students discuss how technology impacts humanity including how it affects education, culture, the workplace, and business	(G11A.4.2.2.1) Analyze the beneficial and harmful effects of computing innovations		2
			(G11A.4.2.2.2) Summarize how financial markets, transactions, and predictions have been transformed by automation		2
			(G11A.4.2.2.3) Summarize how computation has revolutionized the way people build real and virtual organizations and infrastructures		3
		(4.2.3) Students develop understanding about how business can be conducted online using any Internet - based application and appropriate online buying behaviors	(G11A.4.2.3.1) Identify Issues when Conducting Transactions over the Internet		1
			(G11A.4.2.3.2) Demonstrate understanding of "Impulse Buying"		2

Grade: 11A					
Domain	Strand	Standards	Learning outcomes	Integration	Level
4. Cyber Security, Cyber Safety, and Cyber Ethics	(4.3) Information Accuracy & Reliability	(4.3.2) Students realize the importance of academic integrity and demonstrate understanding about plagiarism, its consequences, how to reference or cite others work, and appreciate originality and plagiarism prevention services and tools	(G11A.4.3.2.1) Discuss how to recognize plagiarism		1
			(G11A.4.3.2.2) Discuss the consequences of the plagiarism offense		2
	(4.4) Cyber Ethics & Laws	(4.4.1) Students develop understanding about the privilege of using electronic information as well as the right to having equal, secure and reliable access	(G11A.4.4.1.1) Differentiate between information access and distribution rights		2
			(G11A.4.4.1.2) Discuss how the unequal distribution of computing resources in a global economy raises issues of equity, access, and power		2

Grade: 12					
Domain	Strand	Standards	Learning outcomes	Integration	Level
4. Cyber Security, Cyber Safety, and Cyber Ethics	(4.1) Responsible Use & Cyber-Security	(4.1.5) Students apply cryptography basics and algorithms in attacks. Explain encryption algorithms and public key infrastructure (PKI) and offers examples of different attacks on crypto systems	(G12.4.1.5.1) Identify dictionary attacks		1
			(G12.4.1.5.2) Describe replay attack		1
			(G12.4.1.5.3) Define password cracking		1
	(4.3) Information Accuracy & Reliability	(4.3.2) Students realize the importance of academic integrity and demonstrate understanding about plagiarism, its consequences, how to reference or cite others work, and appreciate originality and plagiarism prevention services and tools	(G12.4.3.2.1) Describe how to properly cite others work		2
	(4.4) Cyber Ethics & Laws	(4.4.1) Students develop understanding about the privilege of using electronic information as well as the right to having equal, secure and reliable access	(G12.4.4.1.1) Explain the impact of the digital divide on access to critical information		2
			(G12.4.4.1.2) Relate issues of equity, access, and power to the distribution of computing resources in a global society		2

Grade: 12A					
Domain	Strand	Standards	Learning outcomes	Integration	Level
4. Cyber Security, Cyber Safety, and Cyber Ethics	(4.1) Responsible Use & Cyber-Security	(4.1.5) Students apply cryptography basics and algorithms in attacks. Explain encryption algorithms and public key infrastructure (PKI) and offers examples of different attacks on crypto systems	(G12A.4.1.5.1) Identify dictionary attacks		1
			(G12A.4.1.5.2) Describe replay attack		1
			(G12A.4.1.5.3) Define password cracking		1
	(4.3) Information Accuracy & Reliability	(4.3.2) Students realize the importance of academic integrity and demonstrate understanding about plagiarism, its consequences, how to reference or cite others work, and appreciate originality and plagiarism prevention services and tools	(G12A.4.3.2.1) Describe how to properly cite others work		2
	(4.4) Cyber Ethics & Laws	(4.4.1) Students develop understanding about the privilege of using electronic information as well as the right to having equal, secure and reliable access	(G12A.4.4.1.1) Explain the impact of the digital divide on access to critical information		2
			(G12A.4.4.1.2) Relate issues of equity, access, and power to the distribution of computing resources in a global society		2

Student Performance Criteria

KG1				
Student	1-Barely or not initiated	2-Under development	3-Satisfies expectations	4-Exceeds expectations
Domain Cyber Security, Cyber Safety, and Cyber Ethics	A (Level 1) Student may be able to:	A (Level 2) Student is able to:	A (Level 3) Student is able to:	A (Level 4) Student is able to:
Responsible Use & Cyber-Security	• demonstrate lack of understanding about the importance of referring to parents and guardians when using new technology.	• somewhat discuss the importance of referring to parents and guardians when using new technology but without comfort.	• generally discuss the importance of referring to parent and guardians when using new technology but fails to elaborate.	• provide important details and elaboration when discussing the importance of referring to parent and guardians when using new technology.
Cyber Health	• list limited consequences of prolong use of computers like eyestrain with hesitation.	• understand some consequences of prolong use of computers like eyestrain.	• understand the consequences of prolong use of computers like eyestrain.	• develop independent understanding of the consequences of prolong use of computers like eyestrain.

KG2				
Student	1-Barely or not initiated	2-Under development	3-Satisfies expectations	4-Exceeds expectations
Domain Cyber Security, Cyber Safety, and Cyber Ethics	A (Level 1) Student may be able to:	A (Level 2) Student is able to:	A (Level 3) Student is able to:	A (Level 4) Student is able to:
Responsible Use & Cyber-Security	• barely discuss the importance of referring to parents and guardians when using new technology.	• somewhat discuss the importance of referring to parents and guardians when using new technology but without comfort.	• generally discuss the importance of referring to parent and guardians when using new technology but fails to elaborate.	• provide important details and elaboration when discussing the importance of referring to parent and guardians when using new technology.
Cyber Health	• list limited consequences of prolong use of computers like eyestrain with hesitation.	• understand some consequences of prolong use of computers like eyestrain.	• understand the consequences of prolong use of computers like eyestrain.	• develop independent understanding of the consequences of prolong use of computers like eyestrain.

Grade 1				
Student	1-Barely or not initiated	2-Under development	3-Satisfies expectations	4-Exceeds expectations
Domain Cyber Security, Cyber Safety, and Cyber Ethics	A (Level 1) Student may be able to:	A (Level 2) Student is able to:	A (Level 3) Student is able to:	A (Level 4) Student is able to:
Responsible Use & Cyber-Security	• discuss the importance of responsible use of technology but with lots of hesitation and/or lots of mistakes.	• incompletely discuss the importance of responsible use of technology and can list few consequences of improper use and ways to avoid it.	• discuss the importance of responsible use of technology using adequate supporting details and explain some of the consequences of improper use and ways to avoid it.	• discuss the importance of responsible use of technology using many supporting details and explain many of the consequences of improper use and ways to avoid it.
Impacts of Technology	• list limited common technologies used in everyday life with a lot of mistakes.	• list some common technologies used in everyday life with some mistakes.	• list most of the common technologies used in everyday life.	• list common technologies used in everyday life.
Information Accuracy & Reliability	• define "reliable online sources" with lots of hesitation and lots of mistakes.	• give somewhat incomplete definition about "reliable online sources".	• give a sufficient definition about "reliable online sources" but does not elaborate or include details.	• give an appropriate definition about "reliable online sources" where many important details are included.
Cyber Health	• describe limited aspects of how prolong use of computers can cause back pain and eyestrain with hesitation.	• describe some aspects of how prolong use of computers can cause back pain and eyestrain and how to avoid it.	• explain how prolong use of computers can cause back pain and eyestrain and how to avoid it with some incorrect terminology.	• explain flawlessly how prolong use of computers can cause back pain and eyestrain and how to avoid it.

Grade 2				
Student	1-Barely or not initiated	2-Under development	3-Satisfies expectations	4-Exceeds expectations
Domain Cyber Security, Cyber Safety, and Cyber Ethics	A (Level 1) Student may be able to:	A (Level 2) Student is able to:	A (Level 3) Student is able to:	A (Level 4) Student is able to:
Responsible Use & Cyber-Security	• discuss responsible digital citizenship in the use of technology systems and software but with lots of hesitation and lots of mistakes. • discuss the purpose of using passwords but with limited details and without confidence.	• discuss responsible digital citizenship in the use of technology systems and software using incomplete details. • discuss the purpose of using passwords with limited details but with some confidence.	• discuss responsible digital citizenship in the use of technology systems and software using adequate supporting details. • discuss the purpose of using passwords using adequate supporting details.	• discuss responsible digital citizenship in the use of technology systems and software using many supporting details. • discuss the purpose of using passwords with elaboration and effective use of real-life examples.
Impacts of Technology	• recall with help ways in which people use computers at work and in their daily lives.	• list some examples in which people use computers at work and in their daily lives satisfactorily.	• list most of the ways in which people use computers at work and in their daily lives.	• list perfectly ways in which people use computers at work and in their daily lives.
Information Accuracy & Reliability	• Explain the difference between reliable and unreliable online sources with lots of hesitation and lots of mistakes.	• discuss the difference between reliable and unreliable online sources using incomplete details.	• discuss the difference between reliable and unreliable online sources using some details but fails to elaborate.	• discuss the difference between reliable and unreliable online sources with elaboration and using many supporting details.
Cyber Health	• describe the concept of "Ergonomics" with help.	• describe the concept of "Ergonomics" and its importance with some errors.	• describe the concept of "Ergonomics", its importance with some incorrect terminology.	• describe perfectly the concept of "Ergonomics", its importance.

Grade 3				
Student	1-Barely or not initiated	2-Under development	3-Satisfies expectations	4-Exceeds expectations
Domain Cyber Security, Cyber Safety, and Cyber Ethics	A (Level 1) Student may be able to:	A (Level 2) Student is able to:	A (Level 3) Student is able to:	A (Level 4) Student is able to:
Responsible Use & Cyber-Security	• discuss the basic ethical and unethical behaviors in the digital world but with lots of hesitation and lots of mistakes. • create a password to protect personal data with a lot of help from the teacher.	• discuss the basic ethical and unethical behaviors in the digital world and how to use modern digital communication and collaboration tools and devices appropriately and responsibly but, however, the used details are incomplete. • create an acceptable password to protect personal data but with some difficulty.	• discuss basic ethical and unethical behaviors in the digital world and how to use modern digital communication and collaboration tools and devices appropriately and responsibly using adequate supporting details. • create a good password to protect personal data with little help from the teacher.	• discuss basic ethical and unethical behaviors in the digital world and how to use modern digital communication and collaboration tools and devices appropriately and responsibly using many important supporting details. • create a strong password to protect personal data with no help.
Impacts of Technology	• recall a technology that is used in a profession in its typical work environment with help.	• list some technologies that are used in different professions in their typical work environment.	• list most of the different technologies that are used in different professions in their typical work environment.	• list faultlessly different technologies that are used in different professions in their typical work environment.
Information Accuracy & Reliability	• Identify fake websites with difficulty.	• Identify few aspects of fake websites with little accuracy.	• Identify some aspects of fake websites with adequate accuracy.	• Identify aspects of fake websites accurately.
Cyber Ethics & Laws	• demonstrate unsatisfactory level of understanding about the different ways one can instill the right attitude when using the facilities made available by the public.	• discuss different ways one can instill the right attitude when using the facilities made available by the public using little supporting details.	• discuss different ways one can instill the right attitude when using the facilities made available by the public using adequate supporting details.	• discuss different ways one can instill the right attitude when using the facilities made available by the public clearly and with elaboration.
Cyber Health	• recall a computer usage practice that can affect physical health with assistance.	• describe how some computer usage practices can affect physical health with incorrect terminology.	• explain how computer usage practices can affect physical health and also some ways to protect oneself from such harm.	• explain how computer usage practices can affect physical health and the best ways to protect oneself from such harm.

Grade 4				
Student	1-Barely or not initiated	2-Under development	3-Satisfies expectations	4-Exceeds expectations
Domain Cyber Security, Cyber Safety, and Cyber Ethics	A (Level 1) Student may be able to:	A (Level 2) Student is able to:	A (Level 3) Student is able to:	A (Level 4) Student is able to:
Responsible Use & Cyber-Security	• discuss matters related to personal information using limited details and exhibit inaccurate judgments when sharing personal information online.	• discuss issues related to personal information using little details and exhibit inaccurate judgments when sharing personal information.	• discuss issues related to personal information using adequate important details and exhibit judgments when sharing personal information online.	• discuss issues related to personal information using many important details and exhibit judgments when sharing personal information online.
Impacts of Technology	• list an example of technological innovation with help.	• list some examples of technological innovation.	• list examples of technological innovation and some aspects of how technology is fast changing in our modern world.	• analyze technological innovation and predict the effect of technology is fast pace of change on our modern world.
Information Accuracy & Reliability	• discuss "information reliability" in specific contexts with a lot of hesitation.	• discuss "information reliability" in specific contexts with a some hesitation.	• discuss "information reliability" in specific contexts with confidence using adequate supporting details.	• discuss "information reliability" in specific contexts with confidence using many important supporting details.
Cyber Ethics & Laws	• explain how technology helps people with special needs in their lives and how they can improve their access to technology in the future but with lots of hesitation and difficulty.	• explain how technology helps people with special needs in their lives and how they can improve their access to technology in the future but with some hesitation and some mistakes.	• explain how technology helps people with special needs in their lives and how they can improve their access to technology in the future with confidence and using adequate supporting details.	• explain how technology helps people with special needs in their lives and how they can improve their access to technology in the future with confidence and using many important supporting details.
Cyber Health	• Recall a symptom of Internet addiction with assistance.	• list limited symptoms of Internet addiction with use of incorrect terminology.	• discuss most symptoms of Internet addiction.	• discuss perfectly symptoms of Internet addiction.

Grade 5				
Student	1-Barely or not initiated	2-Under development	3-Satisfies expectations	4-Exceeds expectations
Domain Cyber Security, Cyber Safety, and Cyber Ethics	A (Level 1) Student may be able to:	A (Level 2) Student is able to:	A (Level 3) Student is able to:	A (Level 4) Student is able to:
Responsible Use & Cyber-Security	• discuss technology misuse and its consequences with lots of hesitation and incorrect details.	• discuss technology misuse and its consequences by comparing appropriate and inappropriate social networking behaviors with some hesitation and using few details.	• discuss technology misuse and its consequences by comparing appropriate and inappropriate social networking behaviors and how to exhibit legal and ethical behaviors when using information and technology using adequate support details.	• discuss technology misuse and its consequences by comparing appropriate and inappropriate social networking behaviors and how to exhibit legal and ethical behaviors when using information and technology using many supporting details.
Impacts of Technology	• recall with assistance an application that can provide ease of use for specific type of user.	• list some applications according to ease of use for specific type of user.	• evaluate incorrectly different applications according to ease of use for specific type of user and is able to setup the workplace for proper posture.	• evaluate different applications according to ease of use for specific type of user and is able to design and setup the workplace for proper posture, appropriate distance from monitors and having proper lighting.
Information Accuracy & Reliability	• discuss content theft detection and best methods for prevention with lots of hesitation and inaccurate details.	• discuss content theft detection and best methods for prevention with some hesitation using limited details.	• discuss content theft detection and best methods for prevention using adequate details.	• discuss content theft detection and best methods for prevention using many supporting details.
Cyber Ethics & Laws	• explain how technology and added special features to software make it easier to engage students with physical and learning disabilities but with lots of hesitation and incorrect details.	• explain how technology and added special features to software make it easier to engage students with physical and learning disabilities with some hesitation using limited details.	• explain how technology and added special features to software make it easier to engage students with physical and learning disabilities using adequate details.	• explain how technology and added special features to software make it easier to engage students with physical and learning disabilities using many supporting details.
Cyber Health	• list an example of a social problem associated with Computer and Internet use with inaccuracies.	• list some examples of social problems associated with Computer and Internet use with errors.	• identify most social problems associated with Computer and Internet use.	• identify perfectly social problems associated with Computer and Internet use.

Grade 6				
Student	1-Barely or not initiated	2-Under development	3-Satisfies expectations	4-Exceeds expectations
Domain Cyber Security, Cyber Safety, and Cyber Ethics	A (Level 1) Student may be able to:	A (Level 2) Student is able to:	A (Level 3) Student is able to:	A (Level 4) Student is able to:
Responsible Use & Cyber-Security	• describe identity theft with some hesitation.	• describe identity theft and common methods used by unethical people to steal personal information with some hesitation.	• describe identity theft and discuss known ways used by unethical people to steal personal information using adequate details.	• describe identity theft and common methods used by unethical people to steal personal information using many supporting details.
Impacts of Technology	• perform online search using few search engines with help.	• accomplish imperfectly online search using multiple search - engines and is also able to recognize with help the difference between the results of different online sources from different search engines.	• perform online search using multiple search - engines and document the results and is also able to evaluate with some errors the results of different online sources from different search engines.	• perform perfectly online search using multiple search engines and document the results and is also able to evaluate the results of different online sources from different search engines with no hesitation.
Information Accuracy & Reliability	• discuss few strategies for determining the reliability of information found on the Inernet with lots of hesitation.	• discuss few strategies for determining the reliability of information found on the Inernet with some hesitation.	• discuss a variety of strategies for determining the reliability of information found on the Inernet using adequate details.	• discuss strategies for determining the reliability of information found on the Inernet using many supporting details.
Cyber Ethics & Laws	• discuss "Cyber Crimes" with lots of hesitation.	• discuss "Cyber Crimes" and their consequences with some hesitation.	• discuss "Cyber Crimes", their consequences, and how to protect oneself against them using adequate supporting details.	• discuss "Cyber Crimes", their consequences, and how to protect oneself against them with elaboration and using many supporting details.
Cyber Health	• List a proper Recycling and disposing of Computer equipment with mistakes.	• List some proper Recycling and disposing of Computer equipment, and is able to describe an example of what we should do to reduce the impact of computer waste on our environment.	• explain proper Recycling and disposing of Computer equipment using few incorrect terminology, and is able to explain what we should do to reduce the impact of computer waste on our environment with some mistakes.	• explain proper Recycling and disposing of Computer equipment, and is able to explain what we should do to reduce the impact of computer waste on our environment.

Grade 7				
Student	1-Barely or not initiated	2-Under development	3-Satisfies expectations	4-Exceeds expectations
Domain Cyber Security, Cyber Safety, and Cyber Ethics	A (Level 1) Student may be able to:	A (Level 2) Student is able to:	A (Level 3) Student is able to:	A (Level 4) Student is able to:
Responsible Use & Cyber-Security	• explain why it is important not to share personal information with everyone on the Inernet with lots of hesitation and incorrect details. • discuss proper manners when communicating via emails with lots of hesitation and incorrect details.	• explain why it is important not to share personal information with everyone on the Inernet and list few ways to protect against un-intentional reveal of personal information. • discuss proper manners when communicating via emails and give some examples of best practices used when sending and receiving emails with some hesitation and using limited details.	• explain why it is important not to share personal information with everyone on the Inernet and list some ways to protect against un-intentional reveal of personal information using adequate supporting details. • discuss proper manners when communicating via emails and give some examples of best practices used when sending and receiving emails using adequate supporting details.	• explain why it is important not to share personal information with everyone on the Inernet and list many ways to protect against un-intentional reveal of personal information using many supporting details. • discuss proper manners when communicating via emails and give many examples of best practices used when sending and receiving emails using many supporting details.
Impacts of Technology	• provide an example of predicted future technologies with help.	• list some predicted future technologies, and is also able list the jobs of computer scientists, engineers, and information technologist in our modern world and the near future.	• predict imperfectly future technologies, and the consequences of using them, and is also able to list and discuss with hesitation the jobs of computer scientists, engineers, and information technologist in our modern world and the near future.	• predict future technologies, and the consequences of using them, and is able to discuss the jobs of computer scientists, engineers, and information technologist in our modern world and the near future.
Information Accuracy & Reliability	• discuss common types of online sources used to get information with lots of hesitation and using limited details.	• discuss common types of online sources used to get information with some hesitation with some hesitation and using few details.	• discuss common types of online sources used to get information using adequate supporting details.	• discuss common types of online sources used to get information and give examples on each type using many supporting details.
Cyber Ethics & Laws	• discuss how legal rights and different kinds of software licenses can be used to share and protect copyright and intellectual property with lots of hesitation and using limited details. • describe the social and economic implications associated with software piracy with lots of hesitation and using limited details.	• discuss how legal rights and different kinds of software licenses can be used to share and protect copyright and intellectual property and how laws and regulations that impact the development and use of software with some hesitation and using few details. • discuss the social and economic implications associated with software piracy with hesitation with some hesitation and using few details.	• discuss how legal rights and different kinds of software licenses can be used to share and protect copyright and intellectual property and how laws and regulations that impact the development and use of software using adequate supporting details. • discuss the social and economic implications associated with software piracy software using adequate supporting details.	• discuss how legal rights and different kinds of software licenses can be used to share and protect copyright and intellectual property and how laws and regulations that impact the development and use of software using many supporting details. • demonstrate high level of understanding about the social and economic implications associated with software piracy using many supporting details.
Cyber Health	• list an example of the consequences of heavy use of computers or mobile phones with major errors.	• list some examples of the consequences of heavy use of computers and mobile phones and how it can result in an increase in sleep disorders symptoms in young adults with mistakes.	• explain hesitantly how heavy use of computers and mobile phones can result in an increase in sleep disorders symptoms in young adults	• explain perfectly how heavy use of computers and mobile phones can result in an increase in sleep disorders symptoms in young adults

Grade 8				
Student	1-Barely or not initiated	2-Under development	3-Satisfies expectations	4-Exceeds expectations
Domain Cyber Security, Cyber Safety, and Cyber Ethics	A (Level 1) Student may be able to:	A (Level 2) Student is able to:	A (Level 3) Student is able to:	A (Level 4) Student is able to:
Responsible Use & Cyber-Security	• discuss the main threats that can be received through emails and how to deal with them with lots of hesitation and using limited details.	• discuss the main threats that can be received through emails and how to deal with them with some hesitation and using few details.	• discuss the main threats that can be received through emails and how to deal with them using adequate supporting details.	• demonstrate high level of understanding about main threats that can be received through emails and how to deal with them using many supporting details.
Impacts of Technology	• list an example of changes in information over time with assistance and major mistakes.	• list some examples of changes in information over time and the effects those changes may have on education, the workplace, or society with some errors.	• describe with incorrect terminology changes in information over time and the effects those changes may have on education, the workplace, and society.	• describe changes in information over time and the effects those changes may have on education, the workplace, and society.
Information Accuracy & Reliability	• identify biased or opinionated sources of information with limited accuracy.	• identify biased or opinionated sources of information with some accuracy.	• identify biased or opinionated sources of information with hesitation.	• identify biased or opinionated sources of information with confidence.
Cyber Ethics & Laws	• discuss the impact of government regulations on privacy and security with lots of hesitation and using limited details. • describe open source, freeware, and proprietary licenses with lots of hesitation and mistakes. • discuss "Cyber Bullying" with lots of hesitation and using limited details.	• discuss the impact of government regulations on privacy and security with some hesitation and using few details. • demonstrate developing understanding about open source, freeware, and proprietary licenses and their applicability to different types of software with some hesitation and using few details. • discuss "Cyber Bullying" and its implications with some hesitation and using few details.	• discuss the impact of government regulations on privacy and security using adequate supporting details. • differentiate among open source, freeware, and proprietary licenses and their applicability to different types of software using adequate supporting details. • discuss "Cyber Bullying" and its implications using adequate details.	• discuss the impact of government regulations on privacy and security using many supporting details. • demonstrate high level of understanding about open source, freeware, and proprietary licenses and their applicability to different types of software using many supporting details. • discuss "Cyber Bullying" and its implications using many supporting details.
Cyber Health	• list an example of how frequently using a computer without breaks increases the health risk with major mistakes.	• list some examples of how frequently using a computer without breaks increases the health risk with few errors.	• explain imperfectly how frequently using a computer without breaks further increases the risk of stress, sleeping problems.	• explain perfectly how frequently using a computer without breaks further increases the risk of stress, sleeping problems.

Grade 9				
Student	1-Barely or not initiated	2-Under development	3-Satisfies expectations	4-Exceeds expectations
Domain Cyber Security, Cyber Safety, and Cyber Ethics	A (Level 1) Student may be able to:	A (Level 2) Student is able to:	A (Level 3) Student is able to:	A (Level 4) Student is able to:
Responsible Use & Cyber-Security	• explain how computer viruses spread and best practices to protect against them with lots of hesitation and using limited details. • discuss "Web Presence" with lots of hesitation and using limited details.	• explain how computer viruses spread and best practices to protect against them with some hesitation and using few details. • discuss "Web Presence" and the importance of having proper self-representation on the Inernet with some hesitation and using few details.	• explain how computer viruses spread and best practices to protect against them using adequate details. • discuss "Web Presence" and the importance of having proper self-representation on the Inernet using adequate details.	• demonstrate high level of understanding about computer viruses spread and best practices to protect against them using many supporting details. • discuss "Web Presence" and the importance of having proper self-representation on the Inernet using many supporting details.
Impacts of Technology	• list an example of positive or negative impact of technology on human culture with assistance and major errors.	• list some examples of positive and negative impacts of technology on human culture. The student is also able to describe technology evolution with some mistakes.	• analyze hesitantly the positive and negative impacts of technology on human culture. The student is also able to discuss technology evolution with some incorrect terminology.	• analyze perfectly the positive and negative impacts of technology on human culture. The student is also able to evaluate perfectly technology evolution from conventional devices to multipurpose devices.
Information Accuracy & Reliability	• define "plagiarism" with lots of hesitation and using limited details.	• define "plagiarism" and list common forms of student plagiarism with some hesitation and using few details.	• define "plagiarism" and list common forms of student plagiarism using adequate details.	• define "plagiarism" and list common forms of student plagiarism with elaboration and using many supporting details.
Cyber Ethics & Laws	• discuss "Cyber Stalking" with lots of hesitation and using limited details. • exhibit legal and ethical behaviors when using information and technology with lots of help from the teacher.	• discuss "Cyber Stalking" and its implications with some hesitation and using few details. • exhibit legal and ethical behaviors when using information and technology with some help from the teacher.	• discuss "Cyber Stalking" and its implications using adequate details. • exhibit legal and ethical behaviors when using information and technology with little help from the teacher.	• discuss "Cyber Stalking" and its implications using many supporting details. • exhibit legal and ethical behaviors when using information and technology with no help.
Cyber Health	• list a negative effect of working in front of a computer for many hours a day with mistakes.	• list few negative effects of working in front of a computer for many hours a day.	• discuss the negative effect of working in front of a computer for many hours a day such as the risk of mental illness like depression and insomnia.	• discuss & evaluate the negative effect of working in front of a computer for many hours a day such as the risk of mental illness like depression and insomnia and is able to devise best ways to avoid them.

Grade 10				
Student	1-Barely or not initiated	2-Under development	3-Satisfies expectations	4-Exceeds expectations
Domain Cyber Security, Cyber Safety, and Cyber Ethics	A (Level 1) Student may be able to:	A (Level 2) Student is able to:	A (Level 3) Student is able to:	A (Level 4) Student is able to:
Responsible Use & Cyber-Security	• discuss the different types of malicious software with lots of hesitation and using limited details. • define "digital Footprint" with lots of hesitation and using limited details. • recall the definition of cryptography with major errors.	• discuss the different types of malicious software with some hesitation and using few details. • define "digital Footprint" and discuss its main categories with some hesitation and using few details. • define cryptography, symmetric and asymmetric algorithms with few errors.	• discuss the different types of malicious software using adequate supporting details. • discuss "digital Footprint" and discuss its main categories using adequate supporting details. • define cryptography, and explain symmetric and asymmetric algorithms using incorrect terminology. • demonstrate imperfectly digital signatures. • illustrate sensitive data encryption with some errors. • demonstrate hashing algorithms with minor assistance.	• discuss the different types of malicious software using many supporting details. • discuss "digital Footprint" and discuss its main categories using many supporting details. • define perfectly cryptography, and explain symmetric and asymmetric algorithms with perfect terminology. • demonstrate the use of digital signatures, sensitive data encryption, and hashing algorithms.
Impacts of Technology	• list a type of Internet Transactions with assistance. • compare a positive impact of technology on culture with major mistakes.	• list some types of Internet Transactions and some relevant impacts of computer technology on business and commerce with some errors. • compare the positive or negative impacts of technology on culture, and recall with some help the role that adaptive technology can play in the lives of people with special needs.	• identify imperfectly types of Internet Transactions and discuss the relevant impact of computer technology on business and commerce. • compare the positive and negative impacts of technology on culture, and describe with errors the role that adaptive technology can play in the lives of people with special needs.	• identify perfectly types of Internet Transactions and discuss the relevant impact of computer technology on business and commerce. • compare without hesitation the positive and negative impacts of technology on culture, and describe the role that adaptive technology can play in the lives of people with special needs.
Information Accuracy & Reliability	• define "cited source" with lots of hesitation and using limited details.	• define "cited source" with some hesitation and using few details.	• define "cited source" using adequate supporting details.	• define "cited source" using many supporting details.
Cyber Ethics & Laws	• discuss ethical use of modern communication media and devices with lots of hesitation and using limited details.	• discuss ethical use of modern communication media and devices, and the consequences of misusing information technology with some hesitation and using few details.	• discuss ethical use of modern communication media and devices, and the consequences of misusing information technology using adequate supporting details.	• discuss ethical use of modern communication media and devices, and the consequences of misusing information technology using many supporting details.

Grade 10A				
Student	1-Barely or not initiated	2-Under development	3-Satisfies expectations	4-Exceeds expectations
Domain Cyber Security, Cyber Safety, and Cyber Ethics	A (Level 1) Student may be able to:	A (Level 2) Student is able to:	A (Level 3) Student is able to:	A (Level 4) Student is able to:
Responsible Use & Cyber-Security	• discuss the different types of malicious software with lots of hesitation and using limited details. • define "digital Footprint" with lots of hesitation and using limited details. • recall the definition of cryptography with major errors.	• discuss the different types of malicious software with some hesitation and using few details. • define "digital Footprint" and discuss its main categories with some hesitation and using few details. • define cryptography, symmetric and asymmetric algorithms with few errors.	• discuss the different types of malicious software using adequate supporting details. • discuss "digital Footprint" and discuss its main categories using adequate supporting details. • define cryptography, and explain symmetric and asymmetric algorithms using incorrect terminology. • demonstrate imperfectly digital signatures. • illustrate sensitive data encryption with some errors. • demonstrate hashing algorithms with minor assistance.	• discuss the different types of malicious software using many supporting details. • discuss "digital Footprint" and discuss its main categories using many supporting details. • define perfectly cryptography, and explain symmetric and asymmetric algorithms with perfect terminology. • demonstrate the use of digital signatures, sensitive data encryption, and hashing algorithms.
Impacts of Technology	• list a type of Internet Transactions with assistance. • compare a positive impact of technology on culture with major mistakes.	• list some types of Internet Transactions and some relevant impacts of computer technology on business and commerce with some errors. • compare the positive or negative impacts of technology on culture, and recall with some help the role that adaptive technology can play in the lives of people with special needs.	• identify imperfectly types of Internet Transactions and discuss the relevant impact of computer technology on business and commerce. • compare the positive and negative impacts of technology on culture, and describe with errors the role that adaptive technology can play in the lives of people with special needs.	• identify perfectly types of Internet Transactions and discuss the relevant impact of computer technology on business and commerce. • compare without hesitation the positive and negative impacts of technology on culture, and describe the role that adaptive technology can play in the lives of people with special needs.
Information Accuracy & Reliability	• define "cited source" with lots of hesitation and using limited details.	• define "cited source" with some hesitation and using few details.	• define "cited source" using adequate supporting details.	• define "cited source" using many supporting details.
Cyber Ethics & Laws	• discuss ethical use of modern communication media and devices with lots of hesitation and using limited details.	• discuss ethical use of modern communication media and devices, and the consequences of misusing information technology with some hesitation and using few details.	• discuss ethical use of modern communication media and devices, and the consequences of misusing information technology using adequate supporting details.	• discuss ethical use of modern communication media and devices, and the consequences of misusing information technology using many supporting details.

Grade 11				
Student	1-Barely or not initiated	2-Under development	3-Satisfies expectations	4-Exceeds expectations
Domain Cyber Security, Cyber Safety, and Cyber Ethics	A (Level 1) Student may be able to:	A (Level 2) Student is able to:	A (Level 3) Student is able to:	A (Level 4) Student is able to:
Responsible Use & Cyber-Security	• discuss different tools and software used to protect computer systems, stored data, and personal information with lots of hesitation and using limited details. • recall one component of public key infrastructure with major assistance.	• discuss different tools and software used to protect computer systems, stored data, and personal information with some hesitation and using limited details. • list some components of public key infrastructure, and identify brute force attacks with major mistakes.	• discuss different tools and software used to protect computer systems, stored data, and personal information using adequate details. • list most components of public key infrastructure, and identify mathematical attacks, birthday attack, and brute force attacks with some errors.	• discuss different tools and software used to protect computer systems, stored data, and personal information using many details. • list all components of public key infrastructure, and identify perfectly mathematical attacks, birthday attack, and brute force attacks.
Impacts of Technology	• identify with assistance an Issue when Conducting Transactions over the Internet with major mistakes. • list an example of beneficial effects of computing innovations with major assistance. • list with assistance an example of how financial markets, transformed by automation with major errors. • list with major assistance one example of how computation has revolutionized the way people builds real and virtual organizations and infrastructures.	• identify some Issues when Conducting Transactions over the Internet with some errors. • list some examples of beneficial and harmful effects of computing innovations with some errors. • list some examples of how financial markets, transactions, and predictions have been transformed by automation with some errors. • list some examples of how computation has revolutionized the way people build real and virtual organizations and infrastructures with some errors.	• identify Issues when Conducting Transactions over the Internet like "Impulse Buying" while using incorrect terminology. • Analyze imperfectly the beneficial and harmful effects of computing innovations. • summarize how financial markets, transactions, and predictions have been transformed by automation using some incorrect terminology. • summarize how computation has revolutionized the way people build real and virtual organizations and infrastructures using incorrect terminology.	• identify perfectly Issues when conducting Transactions over the Internet like "Impulse Buying". • analyze perfectly the beneficial and harmful effects of computing innovations. • summarize confidently how financial markets, transactions, and predictions have been transformed by automation. • summarize perfectly how computation has revolutionized the way people build real and virtual organizations and infrastructures.
Information Accuracy & Reliability	• discuss how to recognize plagiarism with lots of hesitation and using limited details.	• discuss how to recognize plagiarism and its consequences with some hesitation and using limited details.	• discuss how to recognize plagiarism and its consequences using adequate details.	• discuss how to recognize plagiarism and its consequences using many supporting details.
Cyber Ethics & Laws	• differentiate between information access and distribution rights with lots of hesitation • discuss how the unequal distribution of computing resources in a global economy raises issues of equity, access, and power with lots of hesitation and using limited details.	• differentiate between information access and distribution rights with some hesitation • discuss how the unequal distribution of computing resources in a global economy raises issues of equity, access, and power with some hesitation and using few details.	• differentiate between information access and distribution rights with some confidence • discuss how the unequal distribution of computing resources in a global economy raises issues of equity, access, and power using some details.	• differentiate between information access and distribution rights with full confidence • discuss how the unequal distribution of computing resources in a global economy raises issues of equity, access, and power using many supporting details.

Grade 11A				
Student	1-Barely or not initiated	2-Under development	3-Satisfies expectations	4-Exceeds expectations
Domain Cyber Security, Cyber Safety, and Cyber Ethics	A (Level 1) Student may be able to:	A (Level 2) Student is able to:	A (Level 3) Student is able to:	A (Level 4) Student is able to:
Responsible Use & Cyber-Security	• discuss different tools and software used to protect computer systems, stored data, and personal information with lots of hesitation and using limited details. • recall one component of public key infrastructure with major assistance.	• discuss different tools and software used to protect computer systems, stored data, and personal information with some hesitation and using limited details. • list some components of public key infrastructure, and identify brute force attacks with major mistakes.	• discuss different tools and software used to protect computer systems, stored data, and personal information using adequate details. • list most components of public key infrastructure, and identify mathematical attacks, birthday attack, and brute force attacks with some errors.	• discuss different tools and software used to protect computer systems, stored data, and personal information using many details. • list all components of public key infrastructure, and identify perfectly mathematical attacks, birthday attack, and brute force attacks.
Impacts of Technology	• identify with assistance an Issue when Conducting Transactions over the Internet with major mistakes. • list an example of beneficial effects of computing innovations with major assistance. • list with assistance an example of how financial markets, transformed by automation with major errors. • list with major assistance one example of how computation has revolutionized the way people builds real and virtual organizations and infrastructures.	• identify some Issues when Conducting Transactions over the Internet with some errors. • list some examples of beneficial and harmful effects of computing innovations with some errors. • list some examples of how financial markets, transactions, and predictions have been transformed by automation with some errors. • list some examples of how computation has revolutionized the way people build real and virtual organizations and infrastructures with some errors.	• identify Issues when Conducting Transactions over the Internet like "Impulse Buying" while using incorrect terminology. • Analyze imperfectly the beneficial and harmful effects of computing innovations. • summarize how financial markets, transactions, and predictions have been transformed by automation using some incorrect terminology. • summarize how computation has revolutionized the way people build real and virtual organizations and infrastructures using incorrect terminology.	• identify perfectly Issues when conducting Transactions over the Internet like "Impulse Buying". • analyze perfectly the beneficial and harmful effects of computing innovations. • summarize confidently how financial markets, transactions, and predictions have been transformed by automation. • summarize perfectly how computation has revolutionized the way people build real and virtual organizations and infrastructures.
Information Accuracy & Reliability	• discuss how to recognize plagiarism with lots of hesitation and using limited details.	• discuss how to recognize plagiarism and its consequences with some hesitation and using limited details.	• discuss how to recognize plagiarism and its consequences using adequate details.	• discuss how to recognize plagiarism and its consequences using many supporting details.
Cyber Ethics & Laws	• differentiate between information access and distribution rights with lots of hesitation • discuss how the unequal distribution of computing resources in a global economy raises issues of equity, access, and power with lots of hesitation and using limited details.	• differentiate between information access and distribution rights with some hesitation • discuss how the unequal distribution of computing resources in a global economy raises issues of equity, access, and power with some hesitation and using few details.	• differentiate between information access and distribution rights with some confidence • discuss how the unequal distribution of computing resources in a global economy raises issues of equity, access, and power using some details.	• differentiate between information access and distribution rights with full confidence • discuss how the unequal distribution of computing resources in a global economy raises issues of equity, access, and power using many supporting details.

Grade 12				
Student	1-Barely or not initiated	2-Under development	3-Satisfies expectations	4-Exceeds expectations
Domain Cyber Security, Cyber Safety, and Cyber Ethics	A (Level 1) Student may be able to:	A (Level 2) Student is able to:	A (Level 3) Student is able to:	A (Level 4) Student is able to:
Responsible Use & Cyber-Security	• perform basic security setup on a home Wi-Fi router to protect their home network against intruders with a lot of help from teacher. • recall dictionary attacks with major assistance.	• perform basic security setup on a home Wi-Fi router to protect their home network against intruders with some help from teacher. • define dictionary attacks and replay attack with major mistakes.	• perform basic security setup on a home Wi-Fi router to protect their home network against intruders with little help from teacher. • define dictionary attacks, replay attack, password cracking with some incorrect terminology.	• perform basic security setup on a home Wi-Fi router to protect their home network against intruders with no help. • define perfectly dictionary attacks, replay attack, password cracking.
Information Accuracy & Reliability	• discuss responsible judgments regarding allowed and not allowed access to others Wi-Fi networks with lots of hesitation and using limited details.	• discuss responsible judgments regarding allowed and not allowed access to others Wi-Fi networks with some hesitation and using few details.	• discuss responsible judgments regarding allowed and not allowed access to others Wi-Fi networks using adequate details.	• discuss responsible judgments regarding allowed and not allowed access to others Wi-Fi networks using many details.
Cyber Ethics & Laws	• describe how to properly cite others work with lots of hesitation and using limited details. • explain the impact of the digital divide on access to critical information with lots of hesitation and using limited details.	• describe how to properly cite others work with some hesitation and using few details. • explain the impact of the digital divide on access to critical information with some hesitation and using few details.	• describe how to properly cite others work using adequate details. • explain the impact of the digital divide on access to critical information using adequate details.	• describe how to properly cite others work using many details. • explain the impact of the digital divide on access to critical information using many supporting details.

Grade 12A				
Student	1-Barely or not initiated	2-Under development	3-Satisfies expectations	4-Exceeds expectations
Domain Cyber Security, Cyber Safety, and Cyber Ethics	A (Level 1) Student may be able to:	A (Level 2) Student is able to:	A (Level 3) Student is able to:	A (Level 4) Student is able to:
Responsible Use & Cyber-Security	• perform basic security setup on a home Wi-Fi router to protect their home network against intruders with a lot of help from teacher. • recall dictionary attacks with major assistance.	• perform basic security setup on a home Wi-Fi router to protect their home network against intruders with some help from teacher. • define dictionary attacks and replay attack with major mistakes.	• perform basic security setup on a home Wi-Fi router to protect their home network against intruders with little help from teacher. • define dictionary attacks, replay attack, password cracking with some incorrect terminology.	• perform basic security setup on a home Wi-Fi router to protect their home network against intruders with no help. • define perfectly dictionary attacks, replay attack, password cracking.
Information Accuracy & Reliability	• discuss responsible judgments regarding allowed and not allowed access to others Wi-Fi networks with lots of hesitation and using limited details.	• discuss responsible judgments regarding allowed and not allowed access to others Wi-Fi networks with some hesitation and using few details.	• discuss responsible judgments regarding allowed and not allowed access to others Wi-Fi networks using adequate details.	• discuss responsible judgments regarding allowed and not allowed access to others Wi-Fi networks using many details.
Cyber Ethics & Laws	• describe how to properly cite others work with lots of hesitation and using limited details. • explain the impact of the digital divide on access to critical information with lots of hesitation and using limited details.	• describe how to properly cite others work with some hesitation and using few details. • explain the impact of the digital divide on access to critical information with some hesitation and using few details.	• describe how to properly cite others work using adequate details. • explain the impact of the digital divide on access to critical information using adequate details.	• describe how to properly cite others work using many details. • explain the impact of the digital divide on access to critical information using many supporting details.

Sample Activities

Sample Activity (Grade 1):

By the end of Grade 1, the student will be able to:

Grade 1				
Domain	Cyber Security, Cyber Safety, and Cyber Ethics			
Strand	Learning outcome	Example	Sample Activity	Suggested Assessment
Responsible Use & Cyber-Security	• Discuss why it is important to be responsible when using technology • List main consequences of improper use of technology and how to avoid them	• The teacher will read few of the school rules for safe and ethical Internet use and will ask the students to follow one during the class-time. • The teacher will introduce different consequences related to health, safety, copyright infringement, & identity theft.	• One of the school's rules will be about switching off the computer after completing the class. The students will be reminded to switch off the computers by the end of each class. • The teacher will introduce different scenarios and ask the students of the best actions, one example is below: a) A Senior High School Internet policy emphasizes that students must never download video and audio of educational materials larger than 5MB. What is the best reason for the school to have such a policy? • To eliminate the risk of harming the school's network infrastructure • To prevent students from overwhelming the Internet bandwidth • To restrict students from downloading educational videos and music • To stop students from downloading irrelevant materials to the school network	• The teacher will remind the students at the start of the class that the computer need to be switched off by the end of the class. Students who will do will be awarded. • The students will be asked to list some possible consequences for different technology use scenarios.
	• Explain how prolong use of computers can cause back pain and eyestrain and how to avoid it	• The screen brightness level can be used to notice that high brightness can cause clear eye pain. • Improper chair sitting can be used to demonstrate the pain that can be caused on the back and neck if prolonged.	• The teacher will ask the students to increase the screen brightness to the maximum and then lower them and discuss with them which level feels more comfortable. The teacher then can highlight the importance of proper use over the long term.	• The students will be asked how good practices of taking breaks while using computers can help to avoid effects on one's health.

Sample Activity (Grade 4):

By the end of Grade 4, the student will be able to:

Grade 4				
Domain	Cyber Security, Cyber Safety, and Cyber Ethics			
Strand	Learning outcome	Example	Sample Activity	Suggested Assessment
Responsible Use & Cyber-Security	• Identify personal information	• The students will recognize that their names, ages, birthdates, family relations and other identifying information are important and should be shared responsibly.	• The teachers will ask the students to write some personal information using word processing tool and then discuss with them how to share the information with others.	• The students recognize personal information items.
	• Exhibit right judgments when sharing personal information	• The students will recognize that their names, ages, birthdates, family relations and other identifying information are important and should be shared responsibly.	• The teachers will ask the students to write some personal information using word processing tool and then discuss with them how to share the information with others.	• The students recognize personal information items.
Impacts of Technology	• Demonstrate understating of technological innovation and how technology is changing fast in our modern world	• Science and technology on fast forward: http://undsci.berkeley.edu/article/0_0_0/whathassciencedone_03 • Accelerating change: http://en.wikipedia.org/wiki/Accelerating_change	• After examining the accelerating change in technological innovation and the single technology advance on multiple different scientific and technological advances like the Cathode Ray tube. The students will visit the following link: http://undsci.berkeley.edu/article/cellphone • To explore how many advances in diverse technologies and science can combine and converge to create a single innovate technological product like the smartphone.	• Mention 3 technologies and scientific advances that make-up the smartphones we use today.
Information Accuracy & Reliability	• Discuss why information should be checked for accuracy on a web page	• In this lesson, teachers first lead students in a discussion around the guiding question: What kinds of sources should you use? Next, teachers help students to understand that no matter their task - be it informational report writing or argument - their information should be fact-based and the sources reliable.	• The teacher can use a fictitious website to demonstrate accurate and inaccurate information about the human body. For example he will list that a human has two hands (true) and 4 eyes (untrue). • Useful examples: http://eduscapes.com/tap/topic32.htm	• The students can check 4 age-appropriate science facts as true or untrue after reading them.

Grade 4				
Domain	Cyber Security, Cyber Safety, and Cyber Ethics			
Strand	Learning outcome	Example	Sample Activity	Suggested Assessment
Cyber Ethics and Laws	• Explain how technology helps people with physical challenges and how they can improve their access to technology in the future	• The teacher will watch the following video with the students about assistive technology: http://youtu.be/rXxdxck8Gic • And then discuss with them how assistive technology can enrich life's of people with physical challenges in the present and the future.	• A group discussion will be based on an online video on assistive technologies. • See the following useful link: http://www.edutopia.org/assistive-technology-class-school-participation	• The student can explain how he/she can help physically challenged person using technology available or developed in the future.
	• Describe the role that adaptive technology can play in the lives of people with special needs	• The teacher will watch the following video with the students about assistive technology: http://youtu.be/rXxdxck8Gic And then discuss with them how assistive technology can enrich life's of people with physical challenges in the present and the future.	• A group discussion will be based on an online video on assistive technologies. • See the following useful link: http://www.edutopia.org/assistive-technology-class-school-participation	• List 3 assistive technologies available nowadays.
	• Discuss symptoms of Internet addiction	• The students will watch the following video about Internet addictions symptoms and effects: http://youtu.be/iOUsiXgtHGQ • Then they will have a group discussion.	• A group discussion about Internet addictions based upon a video. The students then will be asked to reflect back on their own.	• List 3 effects of Internet addictions.

Sample Activity (Grade 7):

By the end of Grade 7, the student will be able to:

Grade 7				
Domain	Cyber Security, Cyber Safety, and Cyber Ethics			
Strand	Learning outcome	Example	Sample Activity	Suggested Assessment
Responsible Use & Cyber-Security	• Explain why it is important not to share personal information with everyone on the Inernet • List main ways to protect against un-intentional reveal of personal information	• Give two examples where personal information should not be shared (e.g. someone call and ask for it, filling a form in non - popular website, etc). • List two ways to protect against un-intentional reveal of personal information.	• 1) Read about a real case story and discuss it in the classroom. 2) Visit some selected websites and explore the different forms they have to discuss the kind of information required to be filled. • Use the Internet to do a research about revealing personal information via social media such as FaceBook, Instagram, twitter, and others.	• Describe two scenarios where it is recommended not to share personal information. • Analyze a given scenario to identify a threat caused by sharing personal information.
Impacts of Technology	• Demonstrate ability to come up with future technologies, and the consequences of using them • Discuss the jobs of computer scientists, engineers, and information technologist in our modern world and the near future	• 10 Future Technologies That Will Change The World https://www.youtube.com/watch?v=lMymFYJWW5M • Top 10 IT Jobs In Demand for 2013 | Hottest Tech Skills https://www.youtube.com/watch?v=4-0yxQO2ozM	• Watch the video in the link https://www.youtube.com/watch?v=lMymFYJWW5M • and summarize the 10 examples mentioned in the video discussing the futuristic consequences of using them. • Watch the video in the link https://www.youtube.com/watch?v=lMymFYJWW5M • and write an essay about the example jobs mentioned in the video.	• Discuss three examples of future technologies, and the consequences of using them. • List top five IT jobs currently in demand.
Information Accuracy & Reliability	• Discuss common types of online sources used to get information	• Google search results, Wikipedia, Google scholar, Google images, YouTube, Khan Academy.	• Provide links to web sources about certain math topic. The links should include video tutorials on YouTube, video tutorials from Khan Academy, and general tutorials from different websites.	• Evaluate a search task on the Inernet.

Grade 7				
Domain	Cyber Security, Cyber Safety, and Cyber Ethics			
Strand	Learning outcome	Example	Sample Activity	Suggested Assessment
Cyber Ethics & Laws	• Describe how legal rights and different kinds of software licenses can be used to share and protect copyright and intellectual property • Discuss the social and economic implications associated with software piracy • Identify laws and regulations that impact the development and use of software	• Cover topics like public domain, software piracy, freeware, shareware, accountability. • Explain that reducing software piracy not only increases software companies' revenue, but it can also stimulate the economy. It also would contribute to creating new IT jobs. Also, explain that increased revenues can be used to support essential social services. • Cover topics related to Acceptable Use Policy (AUP), UAE Cyber Laws/Rules, and Intellectual property.	• List three free software and three similar shareware software. Discuss them in terms of use. • Write a short essay about software piracy in the US (has lowest piracy rates) and Vietnam (has highest piracy rates in the world). • Divide the students into groups and ask each group to use the Inernet and come up with three laws of software development commonly used worldwide.	• Compare between freeware and shareware giving some examples/ Define public domain and give an example URL/ Define Copyright Infringement. • List five social and economic implications associated with software piracy. • Define Intellectual property/ Discuss the main elements of an AUP/ List three laws of software development commonly used worldwide.
Cyber Health	• Explain how heavy use of computers and mobile phones can result in an increase in sleep disorders symptoms in young adults	• Using computers for long hours, using computing devices before bed time.	• Conduct an Inernet research about how does long use of computers and Inernet can cause sleep disorders.	• Evaluate an essay assignment discussing how does long use of computers and Inernet can cause sleep disorders.

Sample Activity (Grade 10):

By the end of Grade 10, the student will be able to:

Grade 10				
Domain	Cyber Security, Cyber Safety, and Cyber Ethics			
Strand	Learning outcome	Example	Sample Activity	Suggested Assessment
Responsible Use & Cyber-Security	• Discuss the different types of malicious software including worms, viruses and Trojan horses • Define "Digital Footprint" • List two categories for "Digital Footprint" • Define cryptography • Explain symmetric and asymmetric algorithms • Demonstrate digital signatures • Illustrate sensitive data encryption • Demonstrate hashing algorithms	• A table that compare between the three types of malware. • Definition, real examples. • Define cryptography. • Explain symmetric and asymmetric algorithms. • Demonstrate digital signatures. • Illustrate sensitive data encryption. • Demonstrate hashing algorithms.	• Ask students to use the Inernet and give three examples of each type, which caused big damage in the past. • List two categories of "Digital Footprint". • Ask students to refer to any encryption demo website (example: http://www.vincentcheung.ca/ jsencryption/) and let them exchange secret messages. Only those who will get the key can decrypt the message and reveal the message. Let students visit the website http://caligatio.github.io/jsSHA/ • they should realize that hashing is not reversible (one way) and does not require a key.	• A quiz. • Devise a rubric to assess students understanding based on the suggested activities.
Cyber Ethics & Laws				

Grade 10				
Domain	Cyber Security, Cyber Safety, and Cyber Ethics			
Strand	Learning outcome	Example	Sample Activity	Suggested Assessment

Impacts of Technology	• Identify ypes of Internet transactions
	• Compare the positive and negative impacts of technology on culture
	• Discuss the impact of computer technology on business and commerce
	• Describe the role that adaptive technology can play in the lives of people with special needs
		• Online banking, wire transfers, online bill payment, and credit card transaction.
		• Influence of social media, reduced face-to-face interactions, working from home, less TV use, etc.
		• On small business: mobility, productivity, need for training, employee flexibility, increased stress, distraction. e-commerce, banner ADs, Google AdSense https://www.apple.com/education/special-education
		• Assisstive word processing, text to speech technology, What types of learning problems does assistive technology address? See http://www.readingrockets.org/article/assistive-technology-kids - learning-disabilities-overview.
		• Assess in variety of fields:
		  1. autism spectrum disorders
		  2. blindness and low vision
		  3. deafness and hard of hearing
		  4. communication disorders
		  5. mobility impairment
		  6. learning disabilities
		  7. cognitive disabilities
			• Ask the students to use the Inernet and visit different UAE bank websites and record the types of online transaction they can offer:
			  1. EmiratesNBD: http://www.emiratesnbd.com/en /index.cfm/personal - banking/ways - of - banking/online - banking/
			  2. NBAD: http://www.nbad.com/en - ae/personal - banking.html
			  3. ADCB: http://www.adcb.com/waystobank /about - inet - banking/adcbactive - Inernet - banking.asp
			• Refer students to the online article "The Impact of Social Media on UAE Society"on the link: http://www.ecssr.ac.ae/ECSSR/print/ ft.jsp?lang=en&ftId=/FeatureTopic/Fatma - AlSayegh/FeatureTopic_1698.xml and ask them to identify five effects of technology on UAE society.
			• Ask the students to use the Inernet and research about e-commerce in the UAE. Students should identify real example on how commerce changed by adopting e-commerce in UAE market.
			• Ask students to discuss three examples on how adaptive technology can play in the lives of people with special needs/Ask students to identify two features in windows that support people with special needs.
				• Devise a rubric to assess students understanding based on the suggested activities.

Information Accuracy & Reliability	• Define a cited source • Define published work	• How to cite a source. • How to identify a published work.	• Ask students to use the Inernet and show examples of cited sources and published work.	• Devise a rubric to assess students understanding based on the suggested activities.

Sample Activities with different format

Sample Activity (Grade 1):

Activity:	Prolong use of computers can cause back pain and eyestrain
Time:	30 minutes
Description:	The teacher will ask the students to increase the screen brightness to the maximum and then lower them and discuss with them which level feels more comfortable. The teacher then can highlight the importance of proper use over the long term.
Level:	1
Topics:	Explain how prolong use of computers can cause back pain and eyestrain and how to avoid it
Prior Knowledge:	Basic computer usage & interaction.
Planning Notes:	• Students will need time to familiarize themselves with the Monitor settings and how they can change them. • The teacher needs to check beforehand that the screens can provide the brightness level feature.
Teaching/Learning Strategies:	The setting is a computer lab with suitable computer monitors; no special setup is needed beyond that.
Assessment and Evaluation:	The students will be asked how good practices of taking breaks while using computers can help to avoid effects on one's health.
Accommodations:	Students need to preferably use the computer monitors individually. If this is not possible then they can exchange places and repeat the activity steps individually.

Sample Activity (Grade 4):

Activity:	Assistive Technology
Time:	45 minutes
Description:	The students will watch a video guided by the teacher about assistive technology, then have a group discussion how assistive technology can enrich life's of people with physical challenges in the present and future.
Level:	2
Topics:	Explain how technology helps people with physical challenges and how they can improve their access to technology in the future.
Prior Knowledge:	Internet search and basic research skills.
Planning Notes:	• Internet access is required. • The suggested links are: Suggested video about assistive technology: http://youtu.be/rXxdxck8Gic • Teacher can prepare an illustrative poster of different physical challenges and related assistive technology used nowadays to overcome them.
Teaching/Learning Strategies:	• The setting is a classroom/computer lab. • A projector to show the video is preferable.
Assessment and Evaluation:	• Students discuss types of assistive technology available. They can first repeat the one mentioned in the video and then think about other technologies. • Each student/group explain an one type of assistive technology (assigned by the teacher). • Each student/group do a quiz about new future types of assistive technologies. The student/group can use search engines to accomplish this task.
Accommodations:	Students use the Internet individually or by groups on the lab computers.

Sample Activity (Grade 7):

Activity:	10 Future Technologies That Will Change the World
Time:	45 minutes
Description:	Students watch the video in the link (https://www.youtube.com/watch?v=lMymFYJWW5M); summarize the 10 examples mentioned, and discussing the futuristic consequences of using them. Each student asked to choose his/her favorite future technology and to justify his/her selection. The teacher asks students to elaborate more on their favorite future technology through submitting a take-home assignment.
Level:	2
Topics:	Demonstrate ability to come up with future technologies, and the consequences of using them.
Prior Knowledge:	Internet search and basic research skills.
Planning Notes:	• Students will need time to watch the video and discuss its content with their colleagues. • The video is to be viewed online and hence, Inernet access is required and YouTube website is not blocked by school. However, the video can be viewed offline if the teacher is able to download it. • The video will play for about 11 minutes.
Teaching/Learning Strategies:	The setting is a classroom/computer lab, so no special setup is needed.
Assessment and Evaluation:	• Students discuss future technologies and the futuristic consequences of using them in groups. • Each student/group explains the selection of his/her favorite technology. • Each student/group submits homework about the future technology he/she/they selected.
Accommodations:	Students watch the movie on a projector connected to the teacher computer or they watch it individually or by groups on the lab computers.

Sample Activity (Grade 10):

Activity:	Types of Internet Transactions
Time:	45 minutes
Description:	Students use the Inernet and visit different UAE bank websites. They record the types of online transaction that those banks can offer.
Level:	2
Topics:	Identify Types of Internet Transactions.
Prior Knowledge:	Internet search and basic research skills.

Planning Notes:	• Internet access is required.
	• The suggested links are:
	  1. EmiratesNBD: http://www.emiratesnbd.com/en/index.cfm/personal - banking/ways - of - banking/online - banking/
	  2. NBAD: http://www.nbad.com/en - ae/personal - banking.html
	  3. ADCB: http://www.adcb.com/waystobank /about - inet - banking/adcbactive - Inernet - banking.asp
	• Teacher to prepare a sheet containing a table used to compare the transaction services provided by the three banks. Another option is to have a complete list of transaction services under each bank and students tick the services provided by each particular bank.

Teaching/Learning Strategies:	The setting is a classroom/computer lab, so no special setup is needed.
Assessment and Evaluation:	• Students discuss types of transactions available in the three websites. • Each student/group explains an one type of the transaction services (assigned by the teacher). • Each student/group does a quiz about type of transaction services.
Accommodations:	Students use the Inernet individually or by groups on the lab computers.

CST standards Sample Implementation Scenario

The implementation of the standards document and building curricula based on it is a key issue that worth discussions and agreement. The authors of this document believe that the evolution of the different domains over the three cycles should be in an essence that is conferment with the grade span description outlined in section 3. As it currently stand, the committee suggest the following percentage of various domains per cycle:

Planned %				
	C1	C2	C3	C3A
DLC	60	40	15	15
CT	15	20	25	35
CPP	15	25	45	35
CCC	10	15	15	15

As such, the estimated number of periods divided between different cycle.

# of Periods					
	C1	C2	C3	C3A	Total
DLC	18.6	12.4	9.3	14.0	54.3
CT	4.7	6.2	15.5	32.6	58.9
CPP	4.7	7.8	27.9	32.6	72.9
CCC	3.1	4.7	9.3	14.0	31.0
					217

The above calculation was made based on the assumptions of the following number of weeks per term (Term 1(T1): 11 weeks, Term 1(T2): 10 weeks, and Term 1(T3): 10 weeks) and assuming that 1 hour (Period) will be allocated to classes of cycle 1 (C1) and cycl2 (C2), 2 periods for cycle 3 (C3), and 3 hours for advanced cycle 3 (C3A) as shown below.

# of Weeks		C1	C2	C3	C3A	
T1	11	11	11	22	33	
T2	10	10	10	20	30	
T3	10	10	10	20	30	
		31	31	62	93	217

	Weekly Contact HRs
C1	1
C2	1
C3	2
C3A	3

The below charts summarize the quantitative analysis of number of periods per domain per cycle along with percentages.

of Periods per Domains per Cycle

Legend:
- DLC
- CT
- CPP
- CCC

Data values:
- Cycle 3 A: CCC 14, CPP 33, CT 33, DLC 14
- Cycle 3: CCC 9.3, CPP 28, CT 16, DLC 9.3
- Cycle 2: CCC 4.7, CPP 7.8, CT 6.2, DLC 12
- Cycle 1: CCC 3.1, CPP 4.7, CT 4.7, DLC 19

of Periods Percentage of Domains per Cycle

Legend:
- DLC
- CT
- CPP
- C3

Data values:
- Cycle 3 A: C3 15, CPP 35, CT 35, DLC 15
- Cycle 3: C3 15, CPP 45, CT 25, DLC 15
- Cycle 2: C3 15, CPP 25, CT 20, DLC 40
- Cycle 1: C3 10, CPP 15, CT 15, DLC 60

Domains Scaffolds

DLC Scaffolding Chart

Cycle 3/3A

Produce different multimedia products using different types of tools like animation tools, web authoring tools and video and audio editing tools

Select the most effective tools to collaborate successfully with peers

Explain different hardware, functions, software and utilities of network systems

Cycle 2

Explain the computer organization and compare computer performances

Create animated stories using multimedia tools

Perform effective search methods on the web

Practice collaboration activities using age appropriate tools and sites and Exhibit abilities in technical writing and enhanced computer skills.

Cycle 1

Introduce basic keyboarding skills

Safely and correctly perform basic operations involving a personal computer

Identify the basic components of a personal computer

Launch and use specified software to create and edit word document, presentation and spreadsheet

Search the Internet for information based on specified keywords

Applying communication tools (email)

Computer Operation	Productivity Tools	Internet Surfing & Information Retrieval	Collaboration tools	Computer Network

CT Scaffolding Chart

Cycle 3 /3A

Organize algorithmic solution into logical modules	Demonstrate the ability to evaluate algorithm working, complexity and structure	Use various decomposition and parallelization techniques		Analyze data and identify patterns through models and simulation

Cycle 2

Express problem solutions as a sequence of steps				
Identify various elements of a problem		Decompose a problem into sub problems that are easier to solve than the original problem	Show basic ability to simulate and model natural processes and systems	

Cycle 1

Demonstrate the ability to use logical thinking tools				
Demonstrate the ability to follow steps of simple processes	Differentiate various artifacts based on certain parameters			

| Algorithmic Thinking | Evaluation | Decomposition | Abstraction | Generalization |

CPP Scaffolding Chart

Cycle 3/3A

Demonstrate the use of a programming language to solve a variety of problems

Implement and evaluate alternative solutions for the same problem

Develop and deploy applications to solve real life problems

Cycle 2

Analyze a given problem in order to generate a computer-based solution

Design, develop, test and deploy an application using appropriate software

Create digital story using appropriate programming tool

Cycle 1

Understand the basic fundamental principles and concepts of computer programming

Apply the fundamental principles and concepts of computer programming to solve age appropriate problem

Implement problem solutions using age appropriate application like games, simulations, etc

Programming Evolution	Data Representation	HCI	Coding	Testing & Validation	Deployment & Documentation

CCC Scaffolding Chart

Cycle 3/3A

Responsible Use & Cyber-Security
- Apply cryptography basics and algorithms in attacks, and explain encryption algorithms
- Discuss the different types of malicious software and different protection
- Discuss Web Presence and the importance of having proper self-representation on the Internet

Impacts of Technology
- Demonstrate knowledge of technology in everyday life
- Understand online buying behaviors information
- Discuss the impact of computer technology on business and commerce

Information Accuracy & Reliability
- Realize the importance of academic integrity and demonstrate understanding about plagiarism, its consequences, how to reference or cite others work, and appreciate originality and plagiarism prevention services and tools

Cyber Ethics & Laws
- Understand privilege of using electronic and the right to having equal, secure and reliable access
- Discuss security and privacy issues related to use of modern communication media and devices

Cycle 2

Responsible Use & Cyber-Security
- Explain how computer viruses spread and best practices to protect against them
- Exhibit awareness about the different threats when using online websites by making right decisions on what to share, when to share, and with whom

Impacts of Technology
- Discuss how technology affects education, culture, the workplace, and business
- Understand future technology changes

Information Accuracy & Reliability
- Evaluate the accuracy, credibility, integrity, relevance, appropriateness, comprehensiveness, and biases of the different electronic information sources concerning real-world problems
- Define plagiarism and list common forms of student plagiarism

Cyber Ethics & Laws
- Exhibit legal and ethical behaviors when using information and technology
- Develop understanding about governing communication and technology use
- Discuss ideas implemented in technology that support people with special needs

Cyber Health
- Understand the effects of technology on the sleep quality, stress levels, and general mental health

Cycle 1

Responsible Use & Cyber-Security
- Understand how to keep personal information private when being online
- Demonstrate understanding about proper exchange and sharing of information using digital systems and the importance of having humility, loyalty and respect for others when communicating
- Discuss consequences of inappropriate use of technology and information giving some examples from real life scenarios

Impacts of Technology
- Discuss how technology impacts humanity

Information Accuracy & Reliability
- Discuss technology that support people w/special needs
- Exhibit the ability to computer devices with group members in a class while completing a given task
- Exhibit ways to instill the right attitude when using the public digital facilities
- Aid in evaluating Internet resources, and exhibit critical thinking skills to judge about what is right/wrong when using information taken from online sources

Cyber Health
- Understand physical and psychological impact of digital world and the best ways to avoid them

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Responsible Use & Cyber-Security	Impacts of Technology	Information Accuracy & Reliability	Cyber Ethics & Laws	Cyber Health

Computer Science and Technology Integration into other Curricula

Gaining Technology Skills While Learning the Content of the Core Curriculum

Anyone who has taken a training course in the use of a spreadsheet, for example, knows how quickly we forget the skills unless we can apply them in our work on a regular basis. Whether technology instruction takes place in the classroom or in the computer lab, it is important that students be able to apply their newly acquired skills to subject matter learning. For example, a student who has gathered data for a science project and needs to organize the data in a database will see a reason for learning about the features and function of a database. This is context - sensitive learning in which technology skills instruction is centered on the curriculum.

Initial technology skills instruction needs to be provided by someone who is proficient in the use of that technology tool. Although some teachers are skilled enough with technology to teach their students to use the tools within the context of the curriculum content, other teachers may not be prepared to do this. A possible solution is for a staff person with technology expertise (such as an instructional technology specialist, library teacher, or another classroom teacher acting as a mentor) to provide mentoring or to co - teach alongside the teacher.

As technology tools become an integral part of the learning environment, and as students gain the knowledge and skills to use them appropriately, new opportunities for learning open up. Dynamic geometric applets, for example, can help students visualize and understand complex mathematics concepts. Simulation software enables students to investigate models of real - world problems such as climate change and population growth. Basic tools such as spreadsheet and database applications can be applied across the curriculum to analyze and solve problems. Even basic word processing software can encourage students to organize their thoughts and revise their work.

The following scenarios show how technology can be applied in the classroom so that students acquire these skills while addressing the standards of the curriculum frameworks. These scenarios can be conducted by the UAE MOE schools using a tailor made technology toolkit. To evaluate the progress in the technology integration into various subjects, schools can participate in a dedicated project where certain schools can receive instructional technology grants from the Ministry, and some excellent teachers can be nominated and receive awards for taking part of this project.

Each scenario features a lesson unit on a specific curriculum topic. Several criteria were used to select these lesson units.
   a) The lesson needed to have a clear curriculum focus that was aligned with the Ministry's Curriculum Frameworks.
   b) The lesson had to integrate learning technology skills with learning the curriculum content.
   c) The lesson also had to address the fact that students have varying abilities, backgrounds, and interests.
   d) The lesson needed to have a way to evaluate/assess how much students had learned.
   e)

First, The authors of this document demonstrate below an example of how the CST standards document is lined with recently developed **MoE Math Standards Framework (Grades 1 - 9)** followed by Examples of Integrated Learning Scenarios for CST standards:

Intersections between this document and Math Document

In the following tables, the intersection between recent MoE Mathematics Standard document and Computer Science and Technology document for various strands per grade are shown.

Grade 1

Math \ CST	DLC	CT	CPP	CCC
Counting		▓	▓	
Place Value	▓	▓	▓	
Addition and subtractions		▓	▓	
Patterns	▓	▓	▓	
Location	▓	▓	▓	
2D and 3D Geometric Shapes	▓			
Measurement		▓	▓	
Time and Money	▓	▓	▓	▓
Sorting and Classification		▓	▓	
Statistics and Data	▓	▓	▓	

Grade 2

Math \ CST	DLC	CT	CPP	CCC
Counting		▓	▓	
Place Value		▓	▓	
Addition and subtractions		▓	▓	
Patterns	▓	▓	▓	
Expressions, Equations, and Inequalities		▓	▓	
2D and 3D Geometric Shapes	▓	▓	▓	
Measurement	▓	▓	▓	
Time and Money		▓	▓	▓
Statistics and Data	▓	▓	▓	

Grade 3

Math / CST	DLC	CT	CPP	CCC
Place Value		■	■	
Addition and subtractions		■	■	
Multiplication and Division		■	■	
Distinguish situations involving multiplication and division operations		■	■	
Fractions	■	■	■	
Patterns		■	■	
Expressions, Equations, and Inequalities		■	■	
2D and 3D Geometric Shapes	■	■	■	
Measurement	■	■	■	
Time and Money		■	■	
Lines and Angles	■			
Statistics and Data	■	■	■	

Grade 4

Math / CST	DLC	CT	CPP	CCC
Place Value		■	■	
Multiplication and Division		■	■	
Fractions	■	■	■	
Decimals		■	■	
Expressions, Equations, and Inequalities		■	■	
2D and 3D Geometric Shapes	■	■	■	
Measurement	■	■	■	
Time and Money	■	■	■	
Lines and Angles	■	■	■	
Statistics and Data	■	■	■	

Grade 5

Math \ CST	DLC	CT	CPP	CCC
Place Value		●	●	
Multiplication and Division		●	●	
Fractions	●	●	●	
Decimals		●	●	
Expressions, Equations, and Inequalities		●	●	
2D and 3D Geometric Shapes	●	●	●	
Measurement	●	●	●	
Time and Money	●	●	●	●
Lines and Angles	●	●	●	
Polygons	●	●	●	
Surface Area and Volume	●	●	●	
Statistics and Data	●	●	●	

Grade 6

Math \ CST	DLC	CT	CPP	CCC
Fractions		●	●	
Decimals		●	●	
Ratio, Proportion, Percent and Rate	●	●	●	
Integers		●	●	
Expressions, Equations and inequalities	●	●	●	
2D and 3D Geometric Shapes	●	●	●	
Time and Money	●	●	●	
Lines and Angles		●	●	
Polygons		●	●	
Transformations	●	●	●	
Circles	●	●	●	
Surface Area and Volume	●	●	●	
Statistics and Data	●	●	●	

Grade 7

Math \ CST	DLC	CT	CPP	CCC
Ratio, Proportion, Percent and Rate	●	●	●	
Integers		●	●	
Rational Numbers	●	●	●	
Exponents, Roots and Real Numbers	●	●	●	
Expressions, Equations and inequalities	●	●	●	
Functions	●	●	●	
Time and Money	●	●	●	
Lines and Angles		●	●	
Polygons		●	●	
Transformations	●	●	●	
Circles	●	●	●	
Surface Area and Volume	●	●	●	
Congruence				

Grade 8

Math \ CST	DLC	CT	CPP	CCC
Ratio, Proportion, Percent and Rate	●	●	●	
Integers		●	●	
Rational Numbers	●	●	●	
Exponents, Roots and Real Numbers	●	●	●	
Expressions, Equations and inequalities	●	●	●	
Functions	●	●	●	
Time and Money	●	●	●	
Lines and Angles		●	●	
Polygons		●	●	
Transformations	●	●	●	
Circles	●	●	●	
Surface Area and Volume	●	●	●	
Congruence				

Grade 9

Math \ CST	DLC	CT	CPP	CCC
Ratio, Proportion, Percent and Rate	▨	▨	▨	
Integers		▨	▨	
Rational Numbers	▨	▨	▨	
Exponents, Roots and Real Numbers	▨	▨	▨	
Expressions, Equations and inequalities	▨	▨	▨	
Functions	▨	▨	▨	
Time and Money	▨	▨	▨	
Lines and Angles		▨	▨	
Polygons		▨	▨	
Transformations	▨	▨	▨	
Circles	▨	▨	▨	
Surface Area and Volume	▨	▨	▨	
Congruence				

Examples of Integrated Learning Scenarios for CST standards

Integrated Learning Scenario #1

Reciprocating Art
Grades 1 - 4 Art

Instructional objective: The student will be able to use the principles and elements of design to create artwork collaboratively with students in another country.

Project description: In this art project the teacher can work with a school at another country, e.g., Japan so that Emiratis and Japanese students could collaborate to create unique artwork. A translator helped the teacher use e - mail and language translation software to communicate with the Japanese principal and determine the exchange process. A group of Japanese students and a group of Emirati students each created a background for a painting. They then exchanged artwork through collaboration tools (e.g. regular mail) and finished each other's paintings. The Emirati students used technology to communicate with the Japanese students, creating a video to send messages in English and Japanese. The teachers communicated through e - mail. The completed artwork was sent back to the original schools through regular mail or any other file sharing facility.

Evaluation: To evaluate the students' work, the teacher used peer review, artwork critique, and evaluation of the finished products.

Evidence of effectiveness: The students were deeply involved in the process of critiquing, comparing, and contrasting the artwork. Their families also valued the students' participation in the project. Many Emirati families framed their child's work from this art exchange project. In fact, some have framed the correspondence from this project as well as the artwork and have placed them next to each other. Of course, all of the vocabulary had to be translated. The Japanese writing next to the Emirati writing is a piece of art onto itself. Many families thought so as well. The idea of accepting cultural differences and knowing that one culture is not better than the next but can be learned from is important for the students to understand. This was accomplished through discussion and student activities.

CST Domains/ standards addressed
1. Digital Literacy and Competence: Demonstrate proficiency in the use of computers and applications, as well as an understanding of the concepts underlying hardware, software, operation, and connectivity, communication, productivity, and collaboration.
2. Computational Thinking: Demonstrate the ability to use technology for research, critical thinking, problem solving, decision making, Data representation, creativity, and innovation that is vital in the 21st century. Computational thinking also consists of some very specific problem solving skills such as the ability to think logically, algorithmically and recursively.

Related Standard:
Use a variety of age-ppropriate technologies (e.g., drawing program, presentation software, etc.) to communicate and exchange ideas.

Integrated Learning Scenario #2

Becoming Scientists
Cycle 1: Science and Technology/Engineering

Instructional objective: At the conclusion of this unit, students will be able to demonstrate their understanding of the properties of light and sound through classroom instruction and authentic data collection activities.

Project description: This project involved the development of simulation program that address the curriculum standards for the study of light and sound. Each unit followed the same format, integrating the use of science probes with the teaching unit. To ensure that students were highly motivated to conduct the investigations, the students were given fictitious scenarios presenting problems that could only be solved after sound and light data had been collected and analyzed. The result of integrating technology in this way was that students became deeply engaged in this authentic learning experience.

Evaluation: Student learning of the science content standards was evaluated using classroom quizzes and rubric scoring of their works. The technology benchmarks were evaluated by observation of student use of Tablets (e.g. iPads) and sensor use, the accuracy and organization of graphed information, and the use of word processing tools.

Evidence of effectiveness: The integration of data collection into the study of physics brings authenticity to the learning experience. The teachers and students will express overwhelming enthusiasm for these learning activities. At the conclusion of both units will become clear to the teaching staff that when learning becomes authentic, deeper understanding of the content is achieved.

CST Domains/ standards addressed

1. Digital Literacy and Competence: Demonstrate proficiency in the use of computers and applications, as well as an understanding of the concepts underlying hardware, software, operation, and connectivity, communication, productivity, and collaboration.
2. Computational Thinking: Demonstrate the ability to use technology for research, critical thinking, problem solving, decision making, Data representation, creativity, and innovation that is vital in the 21st century. Computational thinking also consists of some very specific problem solving skills such as the ability to think logically, algorithmically and recursively.

Related Standards:

   a) Use content - specific technology tools (e.g., environmental probes, sensors, measuring devices, simulations) to gather and analyze data.
   b) Use spreadsheets and other applications to make predictions, solve problems, and draw conclusions.
   c) Create projects that use text and various forms of graphics, audio, and video (with proper citations) to communicate ideas.

Integrated Learning Scenario #3

SELECT Math
Grade 7 Mathematics

Instructional objective:	Students will be able to identify and distinguish between part-to-part and part - to - whole ratios and recognize situations in which ratios are a useful form of comparison.
Project description:	This investigation focused on the part-to-part and part - to - whole meaning of fractions. Students informally explored rates and ratios using proportional reasoning to determine how to combine orange juice concentrate and water to make enough orange juice for a given number of people. The students used virtual manipulative, such as online fraction circles and visual models, to help them solve problems and check their solutions.
Evaluation:	To evaluate students' progress in meeting the mathematics standards, the teacher assessed the students' ability to represent a ratio graphically and to write part-to-part and part - to - whole ratios from a graphical representation. To evaluate the students' progress in meeting the CST technology standards, the teacher will check whether the students are able to independently access the Web site, use the mouse, and enter the data. The teacher will also evaluate how efficiently the students are able to use Microsoft Word's drawing tools to represent each given mixture.
Evidence of effectiveness:	The students should be excited about using the technology, and they are to be focused on how they could use the technology to evaluate the orange juice recipes. In their minds the technology is doing the work for them. The teacher will make references throughout the year to the orange juice problems because the strategies students used truly stayed with them. Every student will feel successful solving these problems when they used the technology.

CST Domains/ standards addressed
1. Digital Literacy and Competence: Demonstrate proficiency in the use of computers and applications, as well as an understanding of the concepts underlying hardware, software, operation, and connectivity, communication, productivity, and collaboration.
2. Computational Thinking: Demonstrate the ability to use technology for research, critical thinking, problem solving, decision making, Data representation, creativity, and innovation that is vital in the 21st century. Computational thinking also consists of some very specific problem solving skills such as the ability to think logically, algorithmically and recursively.

Related Standards:
Use a variety of computing devices (e.g., probeware, handheld computers, digital cameras, scanners) to collect, analyze, and present information for curriculum assignments.

Integrated Learning Scenario #4

Humanities: Discover Africa
Grade 6: Social Studies

Instructional objective:	The students will be able to determine, through research and comparison, which African countries are developed and which are developing.
Project description:	This Africa unit integrated research, technology, art, and music to reach its goals. After studying the continent of Africa, each student chose a country to study in depth. Students researched their countries and entered their data into a shared spreadsheet, which the class used to sort and rank the countries by various attributes. The students used what they learned to create PowerPoint projects, which were shared using SMART Board technology. During the time that students were researching Africa, the art and music teachers provided activities to help make students more aware of African customs. In art class, students discussed and constructed African masks, while in music class they explored African drumming.
Evaluation:	The PowerPoint presentations and spreadsheets are graded as rough copy outlines and later as finished products. The teacher informally assess each student's ability to judge which stage of development a country was in and used data to argue the case for the country he or she studied. The teachers also evaluate each student's ability to collect data on a specific country, add the data to a spreadsheet, and sort the data across several fields.
Evidence of effectiveness:	The use of technology for this unit allowed students to produce higher quality work in a shorter period of time. Having computers available at virtually any time allowed the students to work on their projects during periods of down time. The fact that the projects would be presented to the class will motivate the students to do their most careful work. Some of the PowerPoint presentations will be shared with parents as well. Having the ability to burn CDs or USB flash drives and take digital pictures allowed teachers to share the students' works with their parents.

CST Domains/ standards addressed
1. Digital Literacy and Competence: Demonstrate proficiency in the use of computers and applications, as well as an understanding of the concepts underlying hardware, software, operation, and connectivity, communication, productivity, and collaboration.
2. Computational Thinking: Demonstrate the ability to use technology for research, critical thinking, problem solving, decision making, Data representation, creativity, and innovation that is vital in the 21st century. Computational thinking also consists of some very specific problem solving skills such as the ability to think logically, algorithmically and recursively.

Related Standards:
   a) Collect, organize, and analyze digital information from a variety of sources, citing sources.
   b) Use and modify databases and spreadsheets to analyze data and propose solutions.
   c) Plan, design, and develop a multimedia product to effectively present research findings and creative ideas, citing sources.

Integrated Learning Scenario #5

The Imaginary Bus Trip
Grades 10 - 12 English Language Arts

Instructional objective: Students will use the Web to research the historical and cultural contexts for the literature they are studying and then write a travelogue or travel brochure presenting their findings.

Project description: In this online lesson, students are asked to take an imaginary bus trip to the time and place in which a story, poem, or play they are studying is written. When the students read a play, for example, they ventured back to seventeenth - century Japan. Students are first asked to find as much information online as they could on their own; however, search sites were provided for students who were having trouble finding the information. Students can be asked to look for historical events, cultural events, and movements, and to pay attention to the food and fashions of the time. The students can be also asked to write a travel program or travel brochure to present their findings and make a connection to the work of literature the class is reading. The unit also can include a short lesson on assessing the validity of Web sites and online information.

Evidence of effectiveness: Students can comment on this assignment and how it can help them understand the literature a bit more deeply and that it can add to their appreciation of the text. In their written analysis of the literature, the teacher found references to details learned in this assignment and an appreciation for nuances in the text that required an understanding of the historical and cultural contexts.

CST Domains/ standards addressed
1. Digital Literacy and Competence: Demonstrate proficiency in the use of computers and applications, as well as an understanding of the concepts underlying hardware, software, operation, and connectivity, communication, productivity, and collaboration.
2. Cyber Security, Safety, and Ethics: Demonstrate the responsible use of technology and an understanding of ethics and safety issues in using electronic media at home, in school, and in society.

Related Standards:
   a) Write correct in - text citations and reference lists for text and images gathered from electronic sources.
   b) Evaluate the authenticity, accuracy, appropriateness, and bias of electronic resources, including Web sites.
   c) Devise and demonstrate strategies for efficiently collecting and organizing information from electronic sources.
   d) Select the most appropriate search engines and directories for specific research tasks.
   e) Use a variety of media to present information for specific purposes (e.g., reports, research papers, presentations, newsletters, Web sites, podcasts, blogs), citing sources.

Integrated Learning Scenario #6

The Small Programmer
Grades 10 - 12 Simulating Abu Dhabi Airport

Instructional objective: Students will use algorithms and coding to write a small simulator for an airport flight arrival and departure to help people to get information about the air traffic status.

Project description: In this lesson, students are asked to write an algorithms and code to simulate the arrival and departure of airplanes to Abu Dhabi Airport and find out if a trip will be delayed or not given the current traffic status. Students should enter information about air traffic status regularly like (departure location, time of departure, time of arrival…etc), then the simulator will help users to get useful and valuable information about airplanes departure and arrival times for any journey in Abu Dhabi airport. Users can start their inquiries based on any related information about journeys (no. of journey, departure location, destination …etc) to get useful information. Users have option to use local or GMT time. Daily reports about percentage of delays journeys should be shown with simple analyzing.

Evidence of effectiveness: Students can deliver a documented simulator to present services and features about the simulator. Students can deliver electronic user manual for the simulator. Students can show reports of feedbacks, complaints, evaluation and suggestions from users. Students can show how they can collect information about airplanes traffic status and responds from users.

CST Domains/ standards addressed
1. Digital Literacy and Competence: Demonstrate proficiency in the use of computers and applications, as well as an understanding of the concepts underlying hardware, software, operation, and connectivity, communication, productivity, and collaboration.
2. Computer Practice and Programming: Demonstrate the ability to write computer code for problem solving, accomplish certain tasks, and decision making, and have the opportunity to progress to the next level of excellence in these activities.

Related Standards:
   a) Evaluate the authenticity, accuracy, appropriateness, and bias of electronic resources, including Web sites.
   b) Demonstrate writing a code in a suitable programming language derived from an algorithm.
   c) Devise and demonstrate strategies for efficiently collecting and organizing information from different sources.
   d) Select the most appropriate programming language specific to a research task.
   e) Use a variety of media to present information for specific purposes (e.g., open source code, reports, presentations, Web sites), citing sources.
   f)

List of Software Requirements:

Learning Resources for Digital Literacy

Cycle One	Cycle Two	Cycle Three
• Microsoft Word 2013 • Microsoft PowerPoint 2013 • Microsoft Excel 2013 • Rapid Typing • Microsoft Paint • Google chrome	• Microsoft PowerPoint 2013 • Microsoft Excel 2013 • Microsoft Access 2013 • Microsoft publisher • Adobe Photoshop • Google chrome • Online software for designing social networks such as blogs or wiki	• Adobe Flash CC • Adobe Dreamweaver • Sony Vegas • current online collaboration apps • Suitable network Operating System

Learning Resources for Programming

Cycle	Software / Hardware	Professional Development
Cycle 1: KG - G5	• Internet access • Code.org • Kudo	• Code.org • Kudo
Cycle 2: G6 - G9	• Scratch • GameSalad (Paid) • App Inventor • Internet Access	• Scratch • GameSalad • App Inventor
Cycle 3: G10 - G12	• Java • C++ • Python	• Java • C++ • Python

Possible Industrial Certification

Cycle One	Cycle Two	Cycle Three
• IC3 • Digital literacy from Microsoft	• IC3 • MOS CERTIFICATION	• Adobe certifications • CISCO certifications • Cyber C3 Certification Program (http://www.uaecyber.com)

Guidelines for book Authors (DLC Domain)

1. Unify all scientific terminologies across all grades and present it in both English and Arabic languages.
2. Ensure the use of most recent versions of the application introduced in each grade.
3. Design DLC domain's examples and activities based on an English applications' interface.
4. It is strongly recommended to link DLC domain with CCC domain whenever appropriate.
5. It is strongly recommended Design units that gradually increase difficulty while moving up in grades.
6. It is strongly recommended to provide different examples and assignments to solve real life problem or situation to produce well - designed presentations.
7. It is strongly recommended design activities to provide for different students levels and needs.
8. It is strongly recommended to provide examples of challenge activities and assignments.
9. It is strongly recommended create link in each unit with other subjects specially math, science and languages.
10. It is strongly recommended to present materials in an attractive way that provide interactive learning.
11. It is strongly recommended to provide well structure assessment using different question types and tools.
12. It is strongly recommended to Create suitable links with 21 century skills, STEM, Math, finance, innovation and humanity.
13. It is strongly recommended to Use Learning outcomes to develop unit contents.
14. It is strongly recommended that each unit should reflect some links with UAE identity and culture through different contexts and levels.

General Guidelines for Book Authors (CT)

1. Ensure that logical sequences are followed while writing the contents of the book and avoid any linguistic, scientific and intellectual errors. In addition, make sure that there shall be a smooth transition of difficulty levels of the presented materials and between grades and cycles.
2. Provide various examples and exercises that meet the objectives and outcomes of the subjects which will enable students to gain high level of understanding of the presented scientific materials. Wherever possible, provide a multimedia content that will attract students and make it as an interactive activity during the learning process.
3. Educational material should be presented clearly and in an interesting manner without repetition away from the monotony and boredom.
4. Learning of presented materials should be done through exploration, participation, development, analysis, conclusion, discussion, and justification.
5. Make sure that each topic should contain concise and precise objectives and should be clearly formulated and associated with scientific article.
6. Use proper educational and assessment tools as well as images as much as possible especially in lower grades (Cycle I and Cycle II) to define and clarify the concepts.
7. Take into consideration that students have different capabilities and understanding levels while presenting the scientific materials.
8. Make sure that by the end of Cycle III, students must have the knowledge and skill requirements for the stage of university education.
9. Unify all terminologies across all grades and present them in both English and Arabic languages.
10. Link scientific experiments when using simulation and modeling with real-life problems.
11. Whenever appropriate, link identity, cultural and environmental of UAE through unit contexts.

Guidelines for Book Authors (CPP Domain)

1. Emphasize the importance of writing codes properly.
2. Focus on the software development cycle.
3. For cycle 3 an object oriented programing language (e.g. JAVA) must be used.
4. Focus on Practical activities in ascending order of difficulty.
5. Include example of group projects.
6. Use real examples from math, science subjects and students life.
7. CT and CPP should be directly connected (before coding an algorithm must be developed)
8. Give 3 to 4 type of questions from the following:
   - MCQ, true/false questions
   - Simple programming questions
   - Tracing and correction given erroneous programs/piece of code.
   - Difficult programming questions

Guidelines for Book Authors (CCC Domain)

1. The topics within the CCC domain are mostly knowledge based which calls for engaging activities in the classroom.
2. There is a very close connection with the DLC domain and many of the Student Learning Outcomes (SLOs) introduced here calls for some skills and knowledge covered in the DLC domain.
3. The SLOs described here cover most of the commonly recognized topics in the domain. However, if the time allocated is not enough to cover all the SLOs, then those marked by the icons can be considered as extended SLOs and can be skipped.
4. Drill activities in the book can include open - ended questions as well as close ended ones. Multiple - choice questions (both single and multiple select types) are ideal for the topics indicated in the CCC domain.
5. Many SLOs are built on others. Therefore, it is important to retain the sequence suggested here.
6. The SLOs suggested for the advanced program (advanced G10, G11, and G12) are the same ones suggested for the regular grades. However, the author can include more challenges within the topics and activities in the textbook.
7. Whenever appropriate, link identity, cultural and environmental of UAE through unit contexts.
8. The table below provides further description and common technical keywords used
9. under each strand.

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7. The CSTA Standards Task Force, K-12 Computer Science Standards Revised 2011.
8. ISTE and CSTA Computational Thinking Leadership Toolkit, first edition.
9. ISTE and CSTA Computational Thinking Teacher Resources, second edition.
10. P Curzon, M Dorling, T Ng, C Selby, J Woollard, Developing computational thinking in the classroom: a framework, Computing At School 2014.
11. Exploring Computer Science: Curriculum Mapping to Learning Standards State Standards Edition, Center for Technology in Learning at SRI International.
12. Exploring Computer Science: Curriculum Mapping to Learning Standards CSTA Edition, Center for Technology in Learning at SRI International. ISTE/NETS Edition
13. Exploring Computer Science: Curriculum Mapping to Learning Standards ISTE/NETS Edition, Center for Technology in Learning at SRI International.
14. Exploring Computer Science: Curriculum Mapping to Learning Standards CA CTE Edition, Center for Technology in Learning at SRI International.
15. CT Vocabulary and Progression Chart, Computer Science Teachers Association (CSTA) and the International Society for Technology in Education (ISTE).

Useful Sites

1. Teen Internet Safety Tips: http://teens.webmd.com/features/teen-Internet-safety-tips
2. McAfee Security Advice Center: http://home.mcafee.com/advicecenter/
3. McAfee 10-Step Internet Safety Plan for Your Family: http://promos.mcafee.com/en-US/PDF/McAfeeInternetSafetyPlan.pdf
4. McAfee Do's and Don'ts of Online Shopping: http://promos.mcafee.com/en-US/PDF/shopping_eBook.pdf
5. McAfee A Parent's Guide to Social Networking: http://promos.mcafee.com/en-US/PDF/SocialNetworkinge-guide.pdf
6. Microsoft Computer and Internet Security: http://www.microsoft.com/security/default.aspx
7. Microsoft "Security Tips and Talk" Consumer Blog: http://blogs.microsoft.com/cybertrust/category/tips-talk/
8. Microsoft Security Intelligence Report: http://www.microsoft.com/security/sir/default.aspx
9. PayPal What You Need to Know to Stay Protected and Secure: https://cms.paypal.com/us/cgi-bin/marketingweb?cmd=_render-content&content_ID=security/online_security_center
10. Symantec Family Resources: http://www.symantec.com/norton/familyresources/index.jsp
11. Symantec Family Safety Blog: Ask Marian: http://community.norton.com/t5/Ask-Marian/bg-p/askmarian
12. Symantec OnlineFamily.Norton: https://onlinefamily.norton.com/familysafety/loginStart.fs
13. Trend Micro: http://www.trendmicro.com/us/about-us/index.html
14. Anti-Phishing Phil game: http://cups.cs.cmu.edu/antiphishing_phil/
15. Anti-Phishing Working Group (APWG): http://www.antiphishing.org/
16. Center for Safe and Responsible Internet Use: http://csriu.org/
17. CyberSmart! Curriculum: https://www.commonsensemedia.org/educators/curriculum
18. Enough is Enough: http://www.enough.org/
19. ESET Securing Our eCity Resources: http://www.securingourecity.org/resources.php
20. Federal Communications Commission (FCC)-Privacy and Online Security: http://reboot.fcc.gov/privacy-and-online-security
21. Federal Communications Commission (FCC)-OnGuard Online (Safety Tips from the Government): http://www.onguardonline.gov/
22. Federal Communications Commission (FCC)-YouAreHere (Resources for Kids, Parents, and Teachers): http://www.ftc.gov/youarehere
23. Generation YES: http://www.genyes.com/
24. GetNetWise: http://getnetwise.org/
25. Identity Theft Resource Center: http://www.idtheftcenter.org/
26. ICSA Labs (division of Verizon Business): http://www.icsalabs.com/icsa/icsahome.php
27. Identity Theft Resource Center: http://www.idtheftcenter.org/
28. iKeepSafe Internet Safety Coalition: http://www.ikeepsafe.org/
29. International Cyber Security Campaign-Japan: http://www.nisc.go.jp/security-site/eng/index.html
30. JustAskGemalto: http://www.justaskgemalto.com/
31. Multi-State Information Sharing and Analysis Center-Cyber Security Awareness resources: http://www.msisac.org/awareness/

32. MySecureCyberspace: https://www.mysecurecyberspace.com/
33. NASCIO: http://nascio.org/
34. National Center for Victims of Crime: http://www.ncvc.org/
35. National Crime Prevention Council: http://www.ncpc.org/
36. National Institute of Standards and Technology (NIST): http://www.nist.gov/information-technology-portal.cfm
37. National Initiative for Cybersecurity Education (NICE): http://csrc.nist.gov/nice/
38. NetSmartz: http://www.netsmartz.org/index.aspx
39. NYS Division of Homeland Security and Emergency Services' Office of Cyber Security: http://www.dhses.ny.gov/ocs
40. PointSmartClickSafe: http://www.pointsmartclicksafe.org/
41. Savvy Cyber Kids: http://savvycyberkids.org/
42. WiredSafety.org: http://www.stopcyberbullying.org/
43. Yahoo!: Teaching Children About Online Risks: http://elearnmap.ipgkti.edu.my/resource/edu3053/artikel/Teaching+Children+About+Online+Risks.htm
44. Google for Education:https://www.google.com/edu/programs/exploring-computational-thinking/index.html#!lessons-and-examples
45. http://www.brighthub.com/computing/windows-platform/articles/6469.aspx
46. http://www.palmbeachschools.org/multicultural/documents/Chapter2ProgramModels.pdf
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60. http://www.appinventor.org/
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62. http://code.google.com/p/blockly/
63. http://www.scratchjr.org/
64. http://csunplugged.org/

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