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# ICT Curriculum Development for Primary and Secondary Schools

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## Challenge in ICT Education

*From On Developing ICT Curriculum and its implementation in higher Education, Lukito Edi Nugroho, postgraduate program of information technology Gadjah Mada University*

### 1) Broad and multidimensional spectrum of ICT Coverage

Theoretical – application, hardware – software, computer technology – social aspects. It is difficult to cover all aspects of ICT in a curriculum.

### 2) Rapid advancement of ICT

Shorter technology cycle, faster product obsolescence. It is difficult for education to catch up

### 3) Selecting reference model for ICT Curriculum Development

A reference as guideline is needed to assist ICT Curriculum development. It clusters ICT fields and maps them into curriculum elements. Which reference should be used?

### 4) Achieving and maintaining relevance in ICT Education

In order to thrive in the 21<sup>st</sup> century, students need digital age proficiencies. Educational system needs to make parallel changes in order to prepare their students for the world beyond the classroom. This relevance was published as enGauge 21<sup>st</sup> Century Skills ( [www.ncrel.org/engauge/skills/skill.htm](http://www.ncrel.org/engauge/skills/skill.htm) )

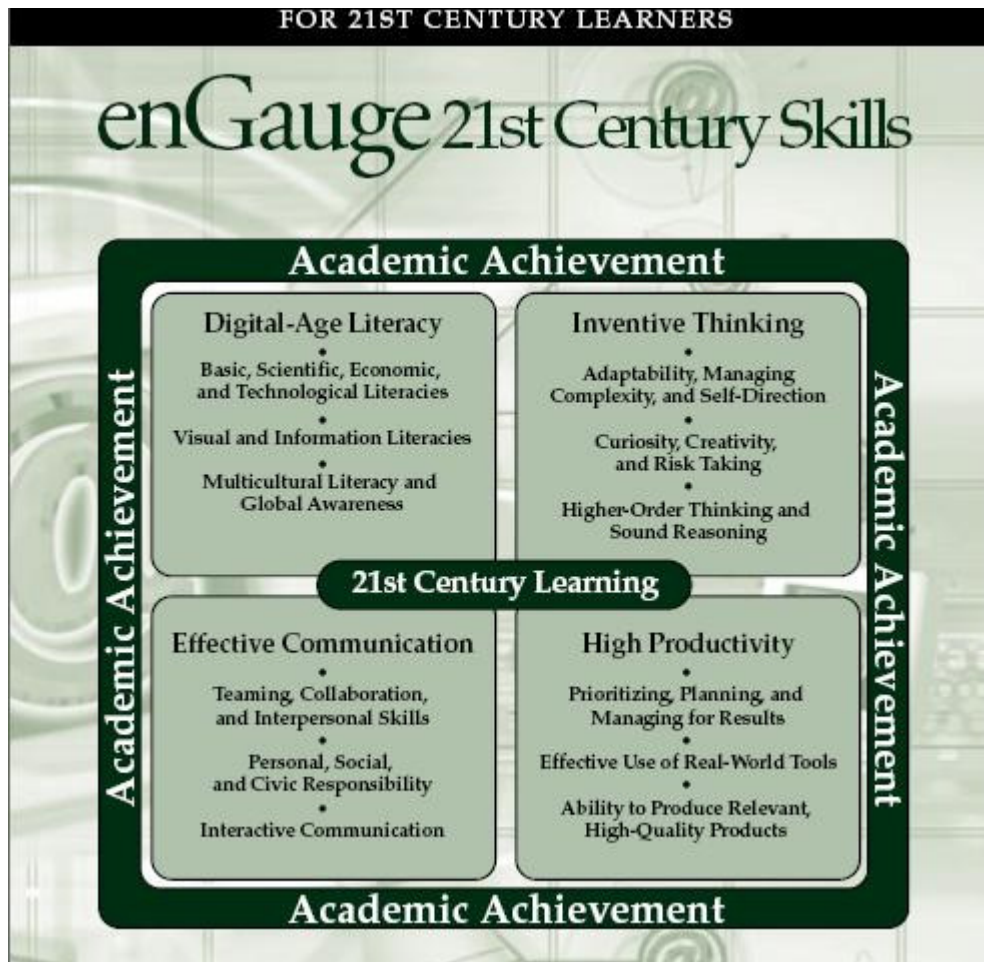
### 5) Strategies for overcoming resource limitation in ICT Education

Networking in ICT Education is a prospective approach for sharing of learning materials, dissemination of education program, optimization of good lecturers and their expertise, and increase awareness of ICT.

## enGauge 21<sup>st</sup> Century Skills

<http://www.metiri.com/21st%20Century%20Skills/PDFtwentyfirst%20century%20skills.pdf>

The enGauge 21<sup>st</sup> Century Skills were developed through a process that included literature reviews, research on emerging characteristics of the Net Generation, a review of current reports on workforce trends from business and industry, analysis of nationally recognized skill sets, input from educators, data from educator survey, and reactions from constituent groups.

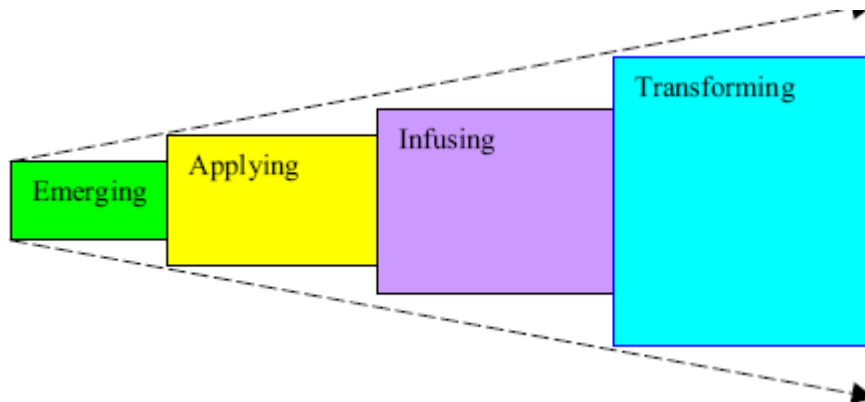


# Reference Model of ICT Curriculum Development

## UNESCO models of ICT Development

<http://unesdoc.unesco.org/images/0012/001295/129538e.pdf>

### A continuum of approaches to ICT development



- **Emerging**

This is the beginning stages of ICT development characterized by institutions purchasing or acquiring donated computing equipment and software. In this stage administrator and teachers are only beginning to explore the possibilities and consequences of ICT usage in management and curriculum.

- **Applying**

Schools which have appreciated the contribution of ICT to learning enter into this phase. Teachers use ICT for routine tasks in the school. Teachers adapt the curriculum to increase the use of ICT in teaching and learning. Teachers however still dominate the learning process.

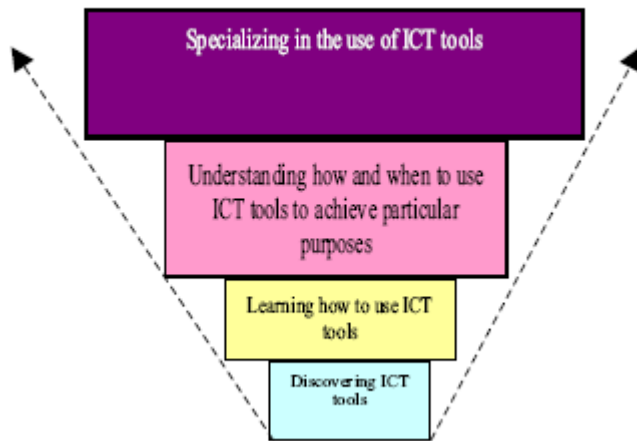
- **Infusing**

At this stage a range of computer based technologies are employed in laboratories, classrooms. Teachers explore new ways of in which ICT will change their productivity and professional practice. The curriculum begins to merge subject areas to reflect real world applications. Some ICT infusion is visible as multimedia in teaching, specialized software in solving problems.

- **Transforming**

This is the stage where ICT becomes an integral though invisible part of daily personal productivity and professional practice. The focus of the curriculum is learner-centered and integrates teaching and learning in real applications.

## Stages of teaching and learning with and through ICT



- **Discovering ICT tools**

In this stage teachers and learners are discovering ICT tools and their general functions and uses. At this stage, emphasis is on ICT literacy and basic skills. This stage of discovering ICT tools is linked to the emerging approach in ICT development.

- **Learning How to use ICT Tools**

This is the stage where learners and teachers begin to make use of ICT tools in different disciplines and is linked to the applying approach in the ICT Development.

- **Understanding how and when to use ICT Tools to achieve particular purposes**

This stage implies the ability to recognize situations where ICT will be helpful, choosing the most appropriate tool for a particular task, and using these tools in combination to solve real problems. For example using excel by students to plot graphs of statistical data generated from a classroom exercise. Another example again, is use of excel by a teacher to process grades obtained from a class test. This stage is linked with the infusing and transforming approaches in the ICT development.

- **Specializing in the use of ICT tools**

This stage involves specializing in ICT. In this stage students study ICT as a subject to become specialist. After their study, they become professionals as opposed to the general knowledge in the use of ICT.

### **ICT Curriculum Module**

Those two models above are useful in developing the structure of a curriculum designed for both teachers and students to improve their knowledge and skills in ICT. The design supplies four curriculum areas tied to the four stages of teaching and learning, allowing schools to progress from

- **ICT literacy**

This stage is designed for students to discover ICT tools and their general functions and uses. This module comprises nine units:

A1. Basic concepts of ICT

A2. Using the computer and managing files

A3. Word processing

A4. Working with spreadsheet

A5. Working with database

A6. Composing documents and presentations

A7. Information and communication

A8. Social and ethical issues

A9. Jobs and/with ICT

- **Application of ICT in subject areas**

This stage is designed for students to learn how to use ICT tools in the different subjects studied in school. This module comprises three groups.

#### **Group 1**

S1. ICT in Languages

S2. ICT in Natural Sciences

S3. ICT in Mathematics

S4. ICT in social sciences

S5. ICT in art

## Group 2

B1. Measurements

B2. Modeling and simulation

B3. Robots and feedback devices

B4. Statistics

B5. Creating graphics

B6. Music

## Group 3

E1. Spreadsheet Design

E2. Database Design

- Infusing ICT across the curriculum

This stage is designed primarily to aid understanding of how and when to use ICT tools to achieve particular purposes, but without being restricted to particular subjects. This module comprises eight subjects.

C1. Encouragement to reading

C2. Are we becoming genetically modified?

C3. Antarctica 2000

C4. Multimedia and languages

C5. The parking garage problem

C6. The 1920s and its excesses

C7. Le village prologue

C8. Society's problems

- ICT specialization

This stage is designed for students who plan to go into professions that use ICT such as engineering, business, and computer science, or who plan to advance to higher education. The module covers the use of advanced tools and techniques for the ICT specialist. This module contains three sub-modules.

#### Specialization Preparation

- SP1. Introduction to programming
- SP2. Top-down program design

#### General Specialization

- GS1. Foundations of programming and software development
- GS2. Advanced elements of programming

#### Vocational Specialization

- VS1. Business information systems
- VS2. Process control systems
- VS3. Project management