

# Layering information literacy: A taxonomy of literacies for academic and lifelong learning

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**Abstract** - *The technological advancement and proliferation of information resources has precipitated the increase of information stored in electronic format, providing wider and varied information choices to individuals. Lack of necessary computer competencies and skills are contributing factors in hindering the users from accessing, retrieving, evaluating and selecting relevant information from electronic sources for academic purposes. The inadequacy of literacies such as computer, basic, and media literacies in their individuality makes it imperative for the contemporary literate student to be equipped with skills from multiple layers of literacy that fit together in order to access, use and critically evaluate the information from varied existing sources. We examine the role of information literacy and how different types of literacy concepts and models integrate to promote the effectiveness of academic and lifelong learning. A taxonomy of literacy for academic and lifelong learning based on basic literacy, information literacy, computer literacy, media literacy and visual literacy is proposed.*

**Keywords:** Lifelong learning, Information literacy, computer literacy, digital literacy, visual literacy, metaliteracy.

## 1 Introduction

Individuals who depend solely on traditional literacy may find it difficult to integrate into the information age which is now dominated by information technology gadgets that aid in information access, storage, creation and sharing. Undoubtedly information explosion cannot promote an informed society on its own, instead, the importance of information literacy cannot be over-emphasised in developing a multi-literate student whose information skills should go beyond traditional literacy. Currently, information literacy is no longer understood in standalone terms [28], but in relation to other emerging literacies. A number of authors, such as [31], [36] and [14] have made efforts comparing information literacy with other types of literacy. A literacy spectrum comprising of alphabetic, functional, social, information and digital literacies is proposed by [31] while [36] and [32] also regard information literacy as an integral component of the

electronic literacy spectrum grouped as computer literacy or information and communication technology literacy [32].

Information literacy has also been discussed from the perspective of learning styles [37], where it could support distance teaching and learning. [10] reports current efforts made by various researchers who attempt to establish connections between information literacy with other important literacies.

This paper gives an overview of the types of literacy skills that are related to information literacy, and the connections that exist among them.

## 2 Defining Literacy

According to [12] the term literacy is still most commonly used to refer to the acquisition of the basic competencies of reading, writing, and numeracy (3Rs) which are important in everyday life. Traditionally, literacy means the ability to write, manipulate numbers, read, understand, and use information. This meaning is tied to those basic skills required by an individual to function sufficiently in an industrialised society. With the emergence of new forms of technologies and with an increase in information access and demands, there has been a rethink on what literacy means. Literacy has a broader meaning that encompasses a range of knowledge, skills and abilities relating to reading, mathematics, science and technology [16], [1], [21]. An individual's literacy is now related to both information and technological terms [12], [17].

The 3Rs literacy is no longer adequate for students in institutions of higher learning who engage in advanced academic practices. These practices require the students to (1) read information from different sources and present it in various formats, (2) interpret and understand what they have read, (3) derive new meanings from it, and, (4) use and share it with others [12]. This type of literacy is information literacy. The literacy spectrum comprises of alphabetic literacy (the ability to write), functional literacy (ability to read and write), social literacy (ability to communicate in a cultural context), information literacy (one's ability to locate, critically evaluate and use information) and digital

information literacy (being able to apply information literacy in the digital environment) [31], [32]. The connections among these various literacies are the subject of this paper and are explored in subsequent sections.

### 3 Information Literacy

Interpreting information literacy (IL) as one of the many literacies has brought many positive ideas likely to resolve the confusion between information literacy and related literacies [21]. Information literacy refers to the ability to determine the information needs, to access and critically evaluate information, and to use it effectively to solve problems [33]. Therefore, the purpose of information literacy is to empower and enable an individual to effectively access, evaluate and use appropriate and relevant information regardless of how the information is packaged [7]. The main goal of information literacy is to equip students with appropriate educational skills in traditional literacy, library skills, computer skills and critical thinking skills. An information literate person should have a set of abilities to identify what information is needed, understand how the information is organised, identify the best sources of information for a given need, locate those sources, evaluate the sources critically, and share that information [24]. Information literacy is the knowledge of commonly used research techniques that every individual student in institutions in higher learning should acquire [32]. Two information literacy frameworks, the relational model [5] and Seven Pillars standards of Information [30] define skills that an information literate individual should possess. Both frameworks consist of seven basic information skills. Table 1 summarises ideas from these two frameworks by mapping the latter framework on the former. The relational framework uses category one to seven while the Seven Pillars framework uses descriptive terms.

The relational framework presents general ideas of information literacy skills required which are further refined in the Seven Pillars' framework. However, the relational framework takes into account the use of technology as an aspect of information literacy. According to [6] both the relational and Seven Pillars framework are equally important. However, they do not focus on how information literate students structure and manage their own information resources [17].

Poor information literacy contributes to poor education [9]. For example, [19] argues that students often lack the skills necessary to succeed in this rapidly changing technological environment due to a lack of appropriate information literacy skills. The authors suggest that faculties need training and support to make use of new technologies for effective teaching and learning. Current information literacy practices have been criticised for a number of deficiencies. Information literacy still struggles from both an academic and a practical standpoint to gain a foothold in related fields, notably education, where its implications are particularly obvious [28]

yet the role of information literacy in lifelong learning cannot be over emphasized. Regardless of a lot of research that shows the benefits of information literacy in higher education, its application seems not to amount to anything [19]; [12].

Information literacy has remained an expression that is unfamiliar to many teachers [28]. This impinges negatively on the information literacy of students. Secondly, research indicates that information literacy is not yet fully integrated with technological based literacies like computer literacy [19]. Information literacy leans towards certain types of technology and this causes it to lag behind technological development or be equated to existing computer literacy [15]. Where strategies of information literacy exist, these have confused information literacy with or reduced computer, digital or information and communication technology (ICT) literacy [12]. Although these literacies are inter-related, there are critical differences among them and they should be treated as such. According to [15] current standard definitions of information literacy are insufficient for the revolutionary social technologies currently prevalent online and suggest a reframing of these definitions to include meta-literacy.

**Table 1: Relational model and Seven Pillars**

Relational Model		Seven Pillars	
Category	Skill	Pillar	Skill
<b>One</b>	Ability to retrieve, use and communicate information using information technology	<b>Identify</b>	Ability to identify a personal need for information
<b>Two</b>	Ability to find information stored in information sources	<b>Scope</b>	Ability to assess current knowledge and identify gaps
<b>Three</b>	Ability to use processes to find and make decisions about information needs	<b>Plan</b>	Ability to construct strategies for locating information
<b>Four</b>	Ability to collect, manipulate, store and retrieve information	<b>Gather</b>	Ability to locate and access information one needs
<b>Five</b>	Ability to use information critically to build a knowledge base	<b>Evaluate</b>	Ability to compare and evaluate information obtained from different sources
<b>Six</b>	Ability to integrate	<b>Manage</b>	Ability to organize, apply,

	personal experience with new information		and communicate information to others in a professionally and ethically ways.
<b>Seven</b>	Ability to wisely use information to benefit self and others	<b>Present</b>	Ability to apply the knowledge gained: presenting the results of their research, synthesising new and old information and data to create new knowledge and disseminating it in a variety of ways

This stems from the fact that a number of other literacies share the same skills with information literacy. In view of this, in this information age, information literacy can no longer be treated in isolation of other literacies [15]. Researchers like [10] had earlier made efforts to establish connections of information literacy and visual literacy, media literacy, computer literacy, digital literacy and network literacy. This prompted [9] to advocate for the integration of information literacy and technologically based literacy into e-information while [15] propose metaliteracy. The following subsections briefly discuss various literacies that are connected to information literacy.

### 3.1 Metaliteracy

Metaliteracy is a new concept in information or library science cycles. The emergence of social media and collaborative online communities has led to the reframing of information literacy as meta-literacy [20]. Information online takes many forms and is produced and communicated through multiple modalities [20], therefore, the need for metaliteracy. The proponents of metaliteracy argue that students need rich print and media experiences to prepare them for their digitally enhanced world [20]. From this perspective, metaliteracy is an integrated framework of information literacy with other literacies that seek to foster multi-literacy skills in students at institutions of higher learning. Besides unifying multiple literacy types, metaliteracy emphasises particularly on information production and sharing in participatory digital environments [20]. Metaliterate students are expected to apply various literacy skills to enhance their studies anywhere at any time where they have access to social networking.

The purpose of metaliteracy is to provide a spectrum of skills that makes it possible to link information literacy to other related literacies. This broadens the scope of information literacy from a set of discrete skills to a literacy form that enables individuals to actively produce and distribute knowledge in collaborative online communities [20]. Metaliteracy plays a vital role in the reconceptualization of information literacy and the perspective of e-learning which is also vital for the academic and lifelong learning. The emergence of social media facilitates meta literacy preparing the students to be both users and co-creators of information.

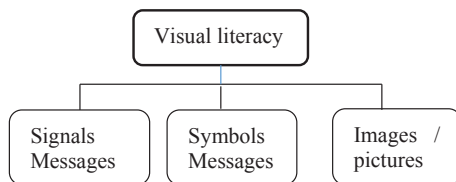
### 3.2 E- Information Literacy

E-information is another contemporary literacy which has more relevance to the information age than the traditional information literacy and mainly discussed in relation to other literacies. According to [19], e-information literacy is the ability to locate, evaluate and effectively use needed information with a set of skills and attitudes for lifelong learning. E-information literacy seems to be an extension of traditional information literacy to the current information society by full utilisation of the capabilities of information and communication technologies [19]. This makes e-information more relevant and of major importance to learning in this new environment of continuous technological change. The use of the Internet among various individuals from different social strata has been found to be linked to e-information (e-literacy for short) skills [18]. E-information skills depend on computer or information technology skills [18],[19]. Therefore, individuals who lack e-information literacy can hardly benefit from the Internet to better their academic studies and their chances of being lifelong learners dwindle. The following subsection examines visual literacy and how it relates to information literacy.

### 3.3 Visual Literacy

Visual literacy skills are as important as the other literacy skills in students' academic life [4] and hence the need to develop this type of literacy in students in institutions of higher learning. Visual literacy results from a system for expressing, recognising, understanding, and learning visual messages that are negotiable by all people [1]. Visual literacy involves developing a set of skills an individual needs to be able to interpret the content of visual images, examine social impacts of those images and discuss purpose, evidence and ownership [2]. Students who are visually literate have abilities to interpret, negotiate and make meaning from information presented in the form of images. Visual literacy skills are typically important in research where symbols and pictures may be the primary source of information or means of communication. The use of visual literacy in particular, symbolism; understanding signs, symbols and signals to express many words or phrase in one image, can be used effectively in developing writing [2]. Academic research makes use of images and symbols, therefore, students

involved in academic research need to be acquainted with this form of visual literacy. Unlike verbal and oral communication, visual communication does not have a fixed vocabulary that students can use. This makes it imperative for students involved in academic research to have visual literacy skills. Visual stimuli are easily produced, pervasive, sophisticated and powerful in informing and persuasion [2]; [14]. Visual literacy is crucial in that it enables students to apply their visual senses in order to understand, create and use images for different but beneficial study purposes. Figure 1 shows the components of visual literacy. Visual literacy is also related to media literacy, which is outlined below.



**Figure 1: Visual literacy**

### 3.4 Media Literacy

Media is the means through which all forms of information are made available to users or readers. This includes all media; television and film, radio and recorded music, print media, and Internet. Media literacy is the ability of an individual to access, analyse and evaluate the power of images, sounds and messages (of all types) and to communicate competently on a personal basis using the media available [12]. A media literate student has the ability to analyse, evaluate and create messages in a wide variety of media types and systems. Information technologies, like computers are commonly used to create and transmit messages in various forms. This means that students should be able to access and understand media in print, sound or digital format and also be to create or to express themselves using a variety of media. Media literacy promotes independent critical thinking and helps media recipients become active, conscientious consumers, rather than remaining passive and subservient to the images and values that dominate the media [18]. Students involved in academic research also need media literacy skills in order to face the challenges related to media communication. The following section is an outline of computer literacy.

## 4 Computer Literacy

The term computer literacy has many connotations. According to [29] computer literacy can be classified in three overlapping approaches: 1) programming skills and ability to do computing; 2) the critical competencies limited to general knowledge about, and awareness of computers and their uses; and 3) the ability to use computer applications and related technologies. These authors further identify four key computer literacy skills each of these approaches seek to

develop. Table 2 illustrates the skills and indicators that a computer literate person should exhibit.

**Table 2: [29]'s computer literacy**

Computer skill	Indicators
Computer systems	Knowledgeable to use hardware and programs (software) necessary for computer applications
Computer application	Ability to responsibly evaluate, select, and implement a variety of practical computer application to do meaningful and efficient work based on an understanding of general types of applications, capabilities and limitations of types of applications, and social impact of specific applications
Computer attitudes	One's feeling about the personal and societal use of computers in appropriate ways – responsible use of computers.
Computer programming	Skilful use of programming languages to direct the operation of the computer. Problem solving strategies like algorithms, flowcharts, languages are required.

Hardware literacy is a set of basic operations one needs to know in order to use a computer to complete simple tasks. Software literacy refers to the invisible set of general-purpose procedures and instructions that the computer or telecommunications hardware required in order to perform its functions properly. Applications literacy refers to the knowledge of, and the skills necessary to efficiently use various special-purpose software packages that are on the market. This means that functional literacy should exist before the critical and rhetorical literacies are acquired [27]. These computer literacy perspectives' main objective is to make all university undergraduate regardless of their programmes of study acquaint themselves with basic computer technology and related technologies. Although, functional computer skills are vital, a computer literacy programme whose intention does not go beyond this level is far from addressing the current computing challenges undergraduate students face. Institutions of higher learning spend considerable time developing functional literacy to majority of the students at the expense of critical literacy. This marginalises students who need these other computer literacy skills which are key to e-information literacy.

Critical computer literacy is meant to make a student aware of contextual elements of computer use, understand the institutional forces that shape technology use, and is capable of analytic reflection upon popular beliefs about the role of computers in society [27]; [23]. This addresses [29]'s computer application and attitudes skills that seek a long term goal of acquiring computer technology competencies. This



perspective looks at higher order computer literacy skills that a student should possess and this is most likely to be affected by the forms of usage of computers in the programme of study being pursued. This type of computer literacy is more likely to aid students in their information literacy. According to [27] computer literacy programmes that address critical literacy are expected to infuse information literacy skills.

Rhetorical computer literacy intends to develop students' higher order skills in computing such as computer programming, systems development and also the ability to evaluate existing interfaces [27]. This type of literacy tallies with [27]'s computer programming and problem solving skills that each computer literate person may need. Students who are rhetorically computer literate are expected to possess multiple skills that would help them to design user interfaces, reflect on their own work, evaluative and judge own and other students' work [27]. Students with these skills view interfaces as social actions as opposed to technical ones. The ultimate results of rhetorical computer literate student are both technical skills and knowledge that lead them to pursue information technology careers. From [28] and [12]'s arguments, a student who is computer literate is expected to have basic knowledge and skills in the efficient use of hardware, software and applications that would result in that particular student realising the benefits of using a computer.

From [29]'s perspective, computer literacy means an understanding of computer characteristics, capabilities, and applications as well as an ability to implement this knowledge in the skilful, productive use of computer applications suitable to individual roles in society. In this regard computer literacy becomes the knowledge and ability to use computers and related technology efficiently, with a range of skills covering levels from elementary use to programming and advanced problem solving [25]. In this paper, an individual who is computer literate is one who is able to use computer hardware, software, applications and the network technologies like the Internet, world-wide web, electronic mail and databases to meet information requirements for the programme of study.

#### 4.1 Digital Literacy

The concept of literacy has evolved to include visual, electronic and digital forms of expression and communication [14]. Digital literacy now plays an important role in computer literacy and is relevant in the way information is accessed, processed and communicated. Digital literacy has become synonymous to computer literacy. This causes attention to be paid more to digital technology at the expense of how these could be used gainfully. However, in this research, digital literacy is regarded as an essential component of computer literacy.

Digital literacy represents a person's ability to perform tasks effectively in a digital environment, with digital

information represented in numeric form and primarily for use by a computer [13]. A digital literate student has the ability to locate, organize, understand, evaluate, and analyze information using digital technology. Digital literacy is related to other literacies: network literacy, visual literacy and media literacy. Therefore, digital literacy plays a crucial role in connecting different available literacies.

In academic circles, the purpose of digital literacy is to enable students to acquire a working knowledge of current high-technology and an understanding of how it can be used in their field of study [13]; [12]. Digital literacy has an immediate application to academic research where students need to use baseline computer literate skills to access information highways using electronic tools. When applied in academic research, digital literacy skills enable students to constructively contribute to both societal culture and human behaviour. For example, contributing to academic social groups makes an individual student to be aware of the culture of that particular group and the required codes of conduct [35]; [34]. Implicitly, digital literacy helps students to communicate and keep abreast with societal trends through social networking services including Web 2.0 technologies. Digital literacy has become a central enabling agent in the educational enterprise as a result of a number of trends [34]; [16]. To develop meaningful digital literacy skills, an individual should possess base-line computer and information skills. The following section focuses on network literacy, a concept related to digital literacy and is vital in information literacy.

#### 4.2 Network Literacy

Network literacy is a contemporary literacy which has so far received a lot of publicity with regard to library sciences [14] This arose from network technology (local area networks, Intranet, Internet and telecommunications) with multimedia, digital storage and digital delivery that makes information to be networked and tremendously extending the usefulness of information resources and services availability [19]; [14]. Information and communication technology networks have facilitated networking of information across the globe making it easier for its access at negligible costs. Network literacy is the ability to identify, access and use electronic information from the information network [19]. Network literacy is information literacy based on network technology in a network environment. This forms a crucial overlap between information literacy and ICT or computer literacy. According to [13] network literacy means linking to what other people have written and inviting comments from others; it means understanding a kind of writing that is a social, collaborative process rather than an act of solitary individual in solitary. This definition regards network literacy as learning how to write with awareness that anyone may read the information. In this sense, network literacy is a non-technical-computer skill that involves the understanding of the ways in which people read, write and participate actively

in the distributed, collaborative environment of the Internet in its current form [11]. Students' network literacy can be promoted through the e-mail, blackboards, Web 2.0 interactive platforms and social networking like Facebook, YouTube, twitter, iEARN (international education and resource networks), and other web-based discussion platforms. These allow information to be created and commented on by different people. For example, students involved in research can create academic writings then post them for editing by others. This gives these students a chance to interact with professionals or experts. By developing network literacy individual students become more intelligent editors and contributors of information rather than being intelligent consumer of information [21]. Besides developing, the 3Rs, these tools give students more chances to interact through writing and reading. Furthermore, this literacy allows students to improve their ICT skills and research skills.

## 5 E-Learning

Academic and lifelong learning are now tied to e-literacy, e-learning or technological based access to and organisation of information for one's success. Students cannot retrieve and evaluate the information that will be required for problem solving and decision making in the workplace and in society despite the publicity given to technological advances and their potential to facilitate access to information [22]. The perennial problem is that students in institutions of higher learning seem to be information illiterate from a technological standpoint. At the core of e-learning are the issues that other literacies deal with and are normally treated independently. According to [26] e-learning can change education by making learning more flexible and more tailored to individual needs. However, to achieve this, students should possess the required capabilities. To be effective as both academic and lifelong learners, students should be well versed in information literacy, media literacy (including print and digital), visual literacy, computer or ICT literacy (including digital and network literacies). These literacies should be fostered in students in an organised way that gives all the literacies deserved attention to be as integrated as possible.

## 6 Layering of literacy for academic & lifelong learning

From the foregone discussions of different literacies, the diagram, in Figure 3, shows how these literacies could possibly be layered and then acquired by students in higher education. Figure 3 shows our conceived connection of different literacies into a layered hierarchy of literacy.

The layering of the literacies revolves around information literacy rooted in basic traditional literacy, computer literacy, media literacy and visual literacy. The literacy hierarchy increases from basic traditional literacy

through information literacy, fused with relevant components of computer literacy, media literacy and visual literacy. Removal of redundancies that exist among different literacies indicates that the main literacies that lead to academic and lifelong learning should provide for e-learning. This could only be achieved by providing a balanced combination of the major literacies that are related to information literacy.

In this taxonomy, we regard traditional literacy as the basis for all literacies. This should be acquired through formal schooling supported other means. Traditional literacy can be enhanced through various means while an individual acquires other literacies. For example, computer literacy skills are influenced by one's basic literacy. At the same time when one attains proficiency in computer technology as medium, it translates to increased proficiency in traditional literacy. This applies to media and visual literacies that also depend on the basic literacy. Institutions of higher learning further basic literacy through a variety of activities like note taking and assignments.

Currently, different electronic devices have replaced paper and pen, while number crunching has quietly disappeared. A variety of literacy skills start to blossom as an individual starts to interact with technology that provides media for presenting information. Computer literacy skills required range from those addressing functional skills to those that develop critical thinking in students. Computer literacy plays an important role in information literacy; it is not just computer literacy. Functional literacy is primarily needed for students to use different types of computers to access networks for social networking, to create and share academic information with peers or tutors, research purposes. Digital literacy focuses on those aspects associated with learning how to effectively find, use, summarize, evaluate, create, and communicate information while using digital technologies. The digital technologies span traditional computers. Use of mobile electronic gadget and their use to support learning should not be left to chance but explicitly provide a classroom environment.

Once students become digitally literate they could overcome the barriers of technology on communication. This is manifested through student communicating and collaborating efficiently with other students or those who possess the same knowledge and skills with them. Digital literacy depends on network literacy and vice versa. Network literacy will help students to link with appropriate people for ideas, help or sharing their academic work, accessing on-line learning material, digital libraries, simple web searches. This depends on students' ability to use digital tools, media like e-mail, social networks. These skills can be acquired through various means. However, this paper recommends that institutions of higher education actively provide a balanced curriculum in all literacies that are interacted with traditional information literacy.

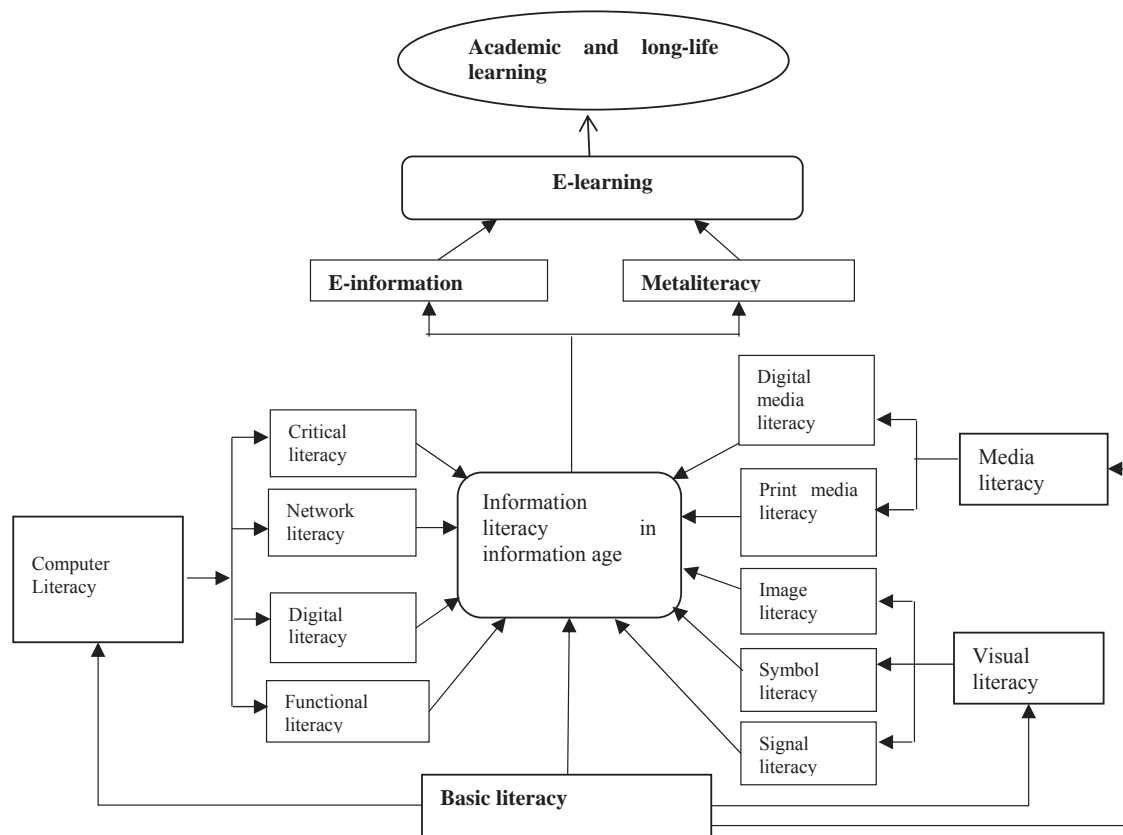


Figure 2: Taxonomy of literacy for academic and long-life learning

Computer literacy for information literacy is an area which requires students to have exposure to the relevant media used in this area. This important process should not be the job of the computer science personnel or the information services personnel for they tend to be biased towards their area of specialisation, but requires active participation of all individuals with integrative skills in these literacies.

According to [26] information literacy fused with relevant technology evolves into e-information literacy and is also a very important component of this taxonomy. E-information literacy raises the level of use of information technology resources to support students' academic life. The emphasis is to push information literacy skills of an individual to a level where one enjoys the benefits of using the internet and web to support research. E-information skills are not acquired by coincidence, but through teaching in a contextual way.

Information literacy can be fused with computer literacy, media literacy and visual literacy to form metaliteracy. This taxonomy adopts this perspectives and further indicate that e-learning rely much on both e-information and metaliteracy [15]. Unlike e-information, metaliteracy seeks to develop a

multi-literate student proficient in the use of information skills, computer/ICT skills, media skills and visual skills. The ultimate goal of this taxonomy to provide academic and lifelong learning skills derived from basic interacting literacies. Information literacy enhances the mastery of content in learners and gives them the learning autonomy thus contributing to lifelong learning. Coupled with the abilities for ICT utilisation and fluency in technology, information literacy greatly extends the individual's competencies and skills needed for academic and lifelong learning.

However, care should be taken when imparting different types of literacies. An integrated approach should be adopted that will make students aware of the relationship between these various forms of literacy and their importance to their current and future studies. It should also be noted that some computer skills should be discouraged. For example piracy, hacking and data theft. Good information skills emphasise social responsibility in the use of technology. When sharing information, students should be aware of the negative effects brought by malware, exposure to offending materials found on the Internet.

## 7 Conclusions

This paper discussed the role played by different literacies in preparing students involved in academic studies. It focused on academic and lifelong learning starting with the traditional literacy (3Rs). Traditional literacy, although no longer sufficient to address modern students' academic requirements, is still a basic requirement for an individual to break into other literacies. In order for a student to be an effective information user and communicator there are basic information, computer, media and visual skills that must be provided in the right combination. Our literacy taxonomy shows how these important literacies interact with information literacy, through e-information and metaliteracy to e-learning, with the student emerging as an academic and lifelong learner.

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