ABSTRACT

Information skill is a way of learning through engaging with information. Information skill includes ‘library research skills’ and ‘IT literacy’ but it is broader than these. Information skills are not just about finding and presenting information, it is about higher order analysis, synthesis, critical thinking and problem solving. It involves seeking and using information for independent learning, lifelong learning, participative citizenship and social responsibility.” (Lupton 2004).

Information skills include various behaviours like: need for information, the resources available, how to find information, the need to evaluate results, how to work with the results, ethics and responsibility of use, how to communicate or share your findings, how to manage your findings.

Information may be available on paper, digitally, through other media such as broadcast or film, or from a colleague or friend. It may or may not be conveniently closed to hand and easily accessible, and quantifying your need and making a decision about the use of an information source may be tempered by the ease and speed with which an answer can be obtained. It focuses on six levels, defining, locating, selecting, organizing, presenting and assessing.

Knowledge comprehension is more like experiential learning. It is the way of learning that how it is shaped through a learner's cognitive processes. As the metaphor of development infers, cognitive constructivist hypotheses expect that knowledge is a thing made by the mind processes instead of got from a source. It can be characterized as scholarly capacity shaped through an individual's encounters and collaborations with the earth (O'Mara et al., 2006; Valentine et al., 2004). According to Valentine et al., (2004) students, who are more involved with the utilization of their experiences are liable to take part in more accomplishment related practices, which may
incorporate managing data, get ready assignments, finishing homework, concentrating on for tests, and taking an interest in class exercises.

Secondary school students from the Punjab were the population of the study. Six districts from the whole province were randomly selected. Two instruments were used to collect data. The information skills instrument was developed based on Information literacy skills continuum, k-12 (1998). Cronbach’s alpha value obtained for the whole scale was $\alpha = .92$. Knowledge comprehension instrument was developed to check academic understanding of the students. Cronbach’s alpha value obtained for the whole scale was $\alpha = .92$. Collected data was analysed by using descriptive statistics, correlation and independent sample t test.

Results of the study revealed that there is no significant difference between the information skills of males and females. It was also clear that information skills of the science and arts students are not significantly different from each other. Knowledge comprehension of males was slightly better than females.

There is statistically significant positively strong relationship between levels of information skills and knowledge comprehension of secondary school students. This means students with good information skills automatically build good understanding of their academic subjects.

The findings of this study may help teachers to adopt appropriate teaching methodologies and curriculum developers to modify or plan curriculum according to the need of students.
CHAPTER 1

INTRODUCTION

The concepts like knowledge oriented society or the information society highlight the idea that the world is globalized. This growing globalization has made information richer and concurrently made difficult to grab all required knowledge. For the purpose to acquire information individuals required some type of specific skills. In formal educational system students are frequently needed to explore and utilize the information independently to know about the topic. It refers to the acquisitions of the capability to find, assess and utilize the information commendably. According to Aberton (2005) in learning three things are important:

1. Individual activity
2. Communication with fellows
3. Individual identity and development

Learning occurs best in situated environment where learner is interacting with the resources, fellows and sometimes with teacher. Digital environment provides learners with the support needed to learn better.

This is now extensively recognized as key competence for effective contribution in contemporary society. According to Marais (1992) Information skill has been characterized as, the procedure of acquiring learning of certain attitudes and aptitude in information. It is a significant determinant of the way in which individuals grow, live, work and interact in an information society.

It is becoming recognized largely that information skill is crucial in today's work environment. Information skills are characterized as the way of learning while interacting with the information (Bruce 1995, 2000). It is the experiences of seeking,
finding, assessing, selecting, arranging and utilizing information to learn, analyze, integrate, make new information, communicating decisions and resolving issues.

Perkins, Jay and Tishman’s (1992) descriptions of thinking dispositions correlate well with this approach and allow us to situate information skill within a broader educational context. They define seven dispositions all of which have parallels in definitions of information skills. Those dispositions are:

- Inclination to discover alternative views
- Tendency to speculate
- Urge to investigate
- Search for relations
- Provision of justifications
- To exercise control of mental processes
- Being reflective

The twenty-first century has been named as the information period, attributable to the blast of information and the information sources. According to Dunlap & Lowenthal (2011) these abilities empower individuals to apply their insight from the familiar environment to the new situation. Due to the excessive amount of information it has become challenging for students to interact with the available information. It becomes essential for students to develop certain skills which can enable them to learn better. Such skills or aptitudes can be termed as information skills or information aptitude. Information aptitudes equip them with the basic abilities important to become independent learners. These aptitudes are likewise basic for practical learning. Teaching of such skills is important for educational process because these skills can help students in self-improvement and lifelong learning. During the academic years of study, information skill ought to be embedded as one learning habit or mode in order
to prepare students for future. Claxton and Carr (2004) supported practical collaboration of academic study with information skill for students’ lifelong learning. These abilities are generic and can be utilized across numerous ranges of school curriculum at all levels. There is expanding acknowledgment of the need to teach and learn such abilities.

The significance of obtaining information skill increases the self-learning opportunities for the students. Scholastic performance is specifically connected to focus aptitudes, for example, perusing, composing, and thinking skill development. Rockman (2004) discussed, “Just as writing shapes and enhances thought, clarifies thinking, and facilitates learning, so does information skills”. National curriculum for literacy (2007) also focuses on the development of the “attitudes of lifelong learning”.

In formal education context, research into student’s information skills experiences has originated as the need for information to the comprehension of the information. It has also its roots in increasing emphasis on encouraging students to develop learning oriented behavior rather being performance oriented. In formal educational it becomes important to set up a relationship between informal abilities and learning is suggested through our basic practices of involving students to discover and utilize information in activities and assignments (Lupton, 2008). This practice has become the basic motive for the following study by highlighting various questions for example: what is the relationship between learning and information skill? How to develop self-learning attitude in students? What ways can help students to groom as lifelong learners? As by investigating such question we clearly can anticipate that students are by one means or other learning through utilizing information.
Statement of the Problem

Numerous research studies have revealed that information skill is a necessary requirement for the students. It is fundamental for students to create abilities in utilizing information as a piece of knowledge, attitudes and behaviors vital for learning. Students who know about information sources and information administrations and who have the confidence to approach them are satisfied in their learning. Those students, who have ability to use the information, are more satisfied independent learners, than the individuals who are incapable to pursue their information needs.

The present study aimed to find out relationship between levels of information skills and knowledge comprehension of secondary school students. This study was intended to explore that how these skills contribute towards their knowledge and learning.

Objectives of the Study

The study has explored the following objectives:

1. Explore various levels of information skills of secondary school students.
2. Identify the levels of knowledge comprehension.
3. Investigate the relationship between levels of information skills and knowledge comprehension of secondary school students.

Research Questions

This study has explored the following research questions:

1.1. What are the different levels of information skill which secondary school students possess?
2.1. What are different levels of knowledge comprehension of secondary school students?

3.1. Is there any significant relationship between levels of information skill and knowledge comprehension of secondary school students?

3.2. Is there any significant difference between levels of information skill and knowledge comprehension due to gender variable?

3.3. Is there any significant difference between levels of information skill and knowledge comprehension due to study areas of science and arts?

**Significance of the study**

Following research study will try to find out the relationship of students’ level and applicability of information skills. This may help in discovering aspects that are contributing in the development of information skills of secondary school students. Results of the study may provide opportunities for students to recognize and develop their status of information skills. It may help them to use these skills confidently and competently which can contribute into their knowledge comprehension. This might also help in deciding the suitable strategies that teachers can adopt for the development of information skills. This study can also contribute in providing an insight of learning of secondary school students. It may offer a structure for the effective teaching method selection and interesting and relevant learning experiences of information skills across the curriculum in secondary schools.
Operational definition of terms

Information skill (IS)

Information skill is the capability to deal with the information. It is more like realizing the need for information, gaining required information, managing the information and using that information to fulfill the task.

Knowledge comprehension

It is more like academic self-concept. It refers to academic accomplishment of the students. How much they have learned from the given learning experiences.
CHAPTER 2

REVIEW OF LITERATURE

The idea of “information skill” initially started as “information literacy”. It was presented by Paul Zurkowski in 1974. As indicated by Zurkowski, Individuals are information skilled if they can use the learned information while working or studying. They have learned strategies for using the extensive variety of information. They are well aware of additional sources (primary & secondary) to mold data/information to answers various issues (Behrens, 1994; Bruce, 1997).

Burchinal (1976) refined information skill as a set of abilities and connected with the abilities that incorporate finding and utilizing information, the utilization of information for critical thinking, choice making efficient and viable information use. Hamelink (1976) utilized the term to indicate the requirement for the common people. He views information expertise as the capacity to acquire an individual and free perspective of events (Behrens, 1994; Bawden, 2001).

Kulthau (1987) depicted information skill is not a discrete set of abilities, but rather a method for learning. Information skill suggests the intellectual capabilities included in utilizing information, as distinctive from the specialized expertise required for utilizing information technologies that hold or convey information. Hargittai (2002), in his investigation of online skills defines skill as the capability to complete a task and the amount of time spent for completing it. The skill is a capacity learned in performing particular task, in other words skill can be learned or developed. People with low information skill may invest an excess of time and energy in obtaining information owing to problems they may experience when looking for information.
particularly in electronic data assets. To obtain information in the library sources and open web, not only formal information abilities are required as well as substantial information skills are also required who viewed that advanced computer skills don't naturally change into abilities in search and retrieving of information (Thomas, 2004, Gui, 2007).

Being information skilled, one must have the capacity to identify that when information is required and also can find, assess and utilize effectively the required information. Information skilled individuals are the individuals who have figured out in what way to learn (American Library Association, 1998). According to Ministry of Education and National Library New Zealand (2002) information skill is a wide concept that holds information skill, information and communication technologies skill, and library skill alongside the critical thinking, cognitive abilities, attitude and the ideals that empower students to work successfully in the information scenario. Information skill incorporates learning of one's information requirements and concerns, the capacity to recognize find, assess, sort out, utilize and present information to confront the issues or issue on hands. This is an essential for effective participation in the information culture and is an important indicator of essential learning (UNISIST, 2003).

Concept of information skill

The idea of information skill can be categorize in two ways. Firstly it relates with those skills which students must use in their study period, and it incorporates the learners' capacity to utilize the library and library resources along with online sources keeping in mind the objective to advance their scholarships; the capacity to carry out literary searches to what so ever depth, complexity and quality is required for a specific curriculum or a discipline; the capacity to show it as per the contentment of
teachers and the evaluators by method for references and citations while utilizing
information. This methodology boosts the improvement of a learner, who has
capability to perform efficiently as a member of academic circle. Secondly, the
classification, as indicated by Lock (2003), concerned about the extent or degree to
which learners are equipped to take part in whatsoever work they may pick after the
completion of formal education. This classification needs an understanding and
awareness of the method in which information is created. Some researchers like
Dunlap & Lowenthal (2011) concentrates on the ways in which information is gained,
organized, distributed, especially by means of learning about use of information in
work environment. It incorporates the basic examination of the content validity of
information. With the objective to know whether a student has learned information
skill, a few philosophies must be developed with which to evaluate the learning of the
student. It is also called benchmarking.

**Information Skill as an Evolving Concept**

The idea of information skills is developed in last two decades as changing
needs of education. This idea has evolved from library instruction to a broad vision of
teaching and learning. Marcum (2002) appreciates Patricia Breivik with developing “a
comprehensive model and program” of information skills in the late 1980’s that
proved a useful initiative in Education.” He further describes that Breivik’s idea of
information skills “as an essential in lifelong learning rather than a matter of library
instruction.” This definition spreads beyond the classroom learning and increases the
traditional comprehension of critical thinking. Presidential Committee on Information
Skills of the American Library Association (ALA) in 1989 released a report stressing
on growing needs of information age. It subsequently encouraged teachers to give
learners a more compound set of skills that they can utilize when they move in to the
practical life. This reformation of the instructional process effectively involves learners in the procedure of "knowing," distinguishing," "discovering," "assessing," "arranging" and "utilizing data adequately to address the issue or issue close by. The Middle States Commission on Higher Education has highlighted the significance of libraries in schools and colleges since its first measures for accreditation were published in 1919.

Simmons (1992) further tracked the development of the Commission's developing interest in and specificity about libraries and resource based learning. The expression information skill, in any case, initially appeared in the Commission's standards in 1994, joined by an exceptionally essential definition consistent with what had been presented by the ALA's Presidential Committee in 1989. The Association of College and Research Libraries (ACRL) broadened the idea in 2000 when it published Information Literacy Competency Standards for Higher Education, the result of a multi-institutional team. These principles illustrated what it implies for a school or college student to be information skilled. This report was distributed extensively in the advanced education group, and it significantly influenced the task force that created Characteristics of Excellence in Higher Education. While the changed models still incorporate the idea of resource-based learning, they highlight the need for information skills learning experiences in everyday education and specifically in general education.

**Information Skill Models**

There are several information skill models that have been propagated by different authors, theorists and academics.
The Seven Pillars of Information Literacy

The Seven Pillars of Information Literacy Model was developed by the Society of College, National and University Libraries (SCONUL) Ireland advisory committee on information skill in 1999. The model has proposed seven skill levels that incorporate:

- the capacity to perceive the need for information
- the capacity to recognize the way in which the information gap can be addressed
- the capacity to develop techniques for finding information
- the capacity to find information
- the capacity to compare and assess information obtained from different sources
- the capacity to sort out, apply and present information to others according to situation
- the capacity to synthesise and expand existing information, adding to the generation of new knowledge (Society of College, National and University Libraries, 1999).

The Big6 Skills

As indicated by MacDonald and Darrow (2003), the Big6 Skills Model is one of the popular models amongst the most well-known models in the field. This model is a process model that illustrates how individuals of all ages tackle an information problem. It has six stages that students follow in their information:

1. Problem-solving procedure
2. Task definition
3. information seeking techniques
4. access to information
5. utilization of information
6. synthesis and assessment of the collected information (Eisenberg and Berkowitz, 1990).

Information Search Process Model

Another popular model is the Information Search Process model by Kuhlthau (1993). This model exhibits how people approach the research procedure and how peoples’ confidence increases at every stage. The model has seven stages, which incorporate 1) initiation, 2) selection, 3) pre-focus investigation, 4) formulation, 5) collection, 6) presentation and 7) appraisal (Kuhlthau, 1993).

Pathways to Knowledge

The Information Inquiry Model by Pappas and Tepe outlines pathways to learning. It intends to urge students to constantly investigate and reassess information as they go about their information searching or retrieval process. The model comprises of six stages, in particular 1) appreciation and enjoyment, 2) pre-search, 3) search, 4) interpretation, 5) communication and 6) assessment (Pappas and Tepe, 2002).

Research Process Model

Research Process Model developed by Stripling and Pitts (1988) provide guidelines to students through the stages of writing a research paper. It comprised on simple to complex steps, starts from the selection of a research topic and ends with the presentation of final topic (Stripling & Pitts, 1988).
Technological Competence and Information Skill

Information skill is more than mechanical ability or on-line research. It supports basic thinking and reflection in the setting of the increasingly vast amount of information. This is accessible through an extensive variety of technologies. According to McLoughlin & Lee (2010) information skills are helpful in developing own knowledge, self-monitored learning experiences. Such skills can facilitate students to explore materials and resources more independently. Dunlap & Lowenthal (2011) argues that online learning skills have vast potential to support learning. By using information skills individuals can create and build knowledge, they can collaborate and interact with others, for the purpose of making learning more flexible and independent. (Greenhow et al. (2009), McLoughlin & Lee, 2010)

Students today require the abilities that will empower them to explore the developing universe of information. That help them to choose properly the credible and reliable information they need. That enables them to read and think critically and independently as they create their own particular ideas. That afterwards makes them to utilize that refined information for their academic careers. With the increasing growth of distance or distributed learning, technologies keep on extending the spaces where learning can occur outside the walls of classrooms and libraries. Either at home, the cyber cafe, or wireless locations freed from customary ideas of place. (McLoughlin & Lee, 2010)

As Adler (1999) focused on the impact of the Internet and its intelligent, dynamic and decentralized nature. It creates a dilemma in light of the fact that the Internet environment makes less distinction than the traditional media, between the users and content. Therefore, the evaluative aptitudes of information skills users turn
out to be considerably more important as they play an active and effective role in the society.

As technologies keep on changing learning, it is imperative to separate the technological tools used to evaluate information from the comprehension and utilizing the content of that information. Innovation is a piece of the general process however not an endpoint. At the end of the day, information skill requires a comprehension of innovation. It concentrates on content and delivering of that content through educational agencies like libraries, classrooms, and distance learning situations etc (Greenhow et al. (2009), McLoughlin & Lee, 2010). In the standards, developed by American library association, “Characteristics of Excellenc”, perceive this as discrimination in between the content and tools, especially evaluating the essential components of general education.

Relative to this standard, an authorize institution is characterized by general education requirements assuring that students are capable in technological abilities fitting to the subjects and information skills. In contemporary education it is difficult to avoid technologies. Rather, teachers connect with students in the process of exploring the knowledge that bridges the gap between information, innovation, and the frameworks. That has been created for managing and disseminating information. Dunlap & Lowenthal (2011) argues that information skills can develop problem solving skills and metacognitive awareness among students. Greenhow et al., (2009) believes that use of information skills is a key factor in effective learning. These skills ensure flexible and long term learning.
Curriculum models for teaching information skills

Similarly as with all objectives for students’ learning, every institute decides the best procedures and strategies for meeting its information skills objectives. By taking into account its main goals, objectives, and general curricular design. These methodologies include selecting the best educational modules, curriculum model and providing support to that model, for example, incentives and professional development opportunities.

Breivik (1992) noticed that students, whose instruction mostly relies on lectures, course books, are not well prepared for the problem solving, critical thinking which is required to work in complex world of work. This perspective is shared by Whitmire (1998), who focuses on the use of the library and its resources,” rather than only lectures or passive type of learning. Findings of her researches showed it is one of the vital components in expanding learners' critical thinking and basic deduction aptitudes. Keats & Schmidt, (2007) described that the introduction of Web 2.0 technologies, which introduced interactive learning environment of communication, discussion and sharing can be used to shift learning paradigm (from teacher centered to learner centered) . Accorting to McLoughlin & Lee, (2011). Technology should a tool of learning and self-monitoring rather than just a mean of delivery.

Hence, institutes are supposed to shape students’ learning experiences and encouraging them to learn through the utilization of tasks that are intended to make efficient utilization of information sources and libraries. In fact students should be encouraged through this procedure to better comprehend the interaction between their area of the study and other general subjects. As information skill has advanced over the passage of time, two important curriculum models for building up information skill in students have developed:
1. The different or compartmentalized curriculum models

2. The distributed or integrated curriculum models

It is likely to join these two models to accomplish the institutional learning goals for information skills. In addition, information skills have important part in formal extra-curricular programmes of any institution.

The Separate or Compartmentalized Curriculum Model

Information skills are imparted as a separate course in the different or compartmentalized curriculum. It can appear in the educational modules at the junior or higher educational stages. Subsequently information skill first turned into a prerequisite for the students in the 1994 for accreditation. Various alternatives for separate or compartmentalized curriculum have developed. For instance, a few institutions at present give greater importance to their information skill instruction by including them in the initial two years of school, either in a repeated or different course all through the general educational curriculum. Though, this kind of instruction gives just a basic benchmark of abilities. Learners require more particular guidelines as they proceed in their significant areas of study.

A few educators urge students to utilize collaborative on-line tutorials that give basic-level instruction in picking, seeking, and assessing information sources. Through this sort of general instruction accessible on-line to students, teachers can focus on more particular, course-related or critical thinking techniques for developing information skills. A few institutions give separate bibliographic instruction courses which offer students some assistance with understanding the library organization, information resources, administrations, in what way to access relevant materials, and how to assess these information sources. These programmes additionally can give
instruction to train about subject specific resources. This sort of instruction is mostly restricted to bibliographic sources. On the other hand, the idea of information skills expands past materials accessible in library. It incorporates technology classes and library resource sessions and virtual libraries (Nichols, 2002).

Another idea is to offers a guideline and introductory programmes for graduate students. This include: presentations during orientations, course related lectures, open workshops, individual and group consultations and workshops oraganised on demand (Bornstein, 2002). Courses in the separate or compartmentalized curriculum focus the first phases of the information skill: recognising the information need, searching the information, and assessing the information.

**The distributed or integrated curriculum models**

Following this model, institutes integrate information skill across the curriculum. Information skill is usually distributed in subjects or disciplines. It is taught in a more oraganised and specific manner. This is more like making compulsory for all the students by including these skills in the curriculum of different subjects at different class levels. In this type of model, many subjects and co-curricular activities talk about a core set of information skill.

In actual reality this skill must be addressed and strengthened at different levels throughout the academic career of the students. If the students take various information skill courses, the general curriculum ought to comprise of reciprocal and continuously advanced components.
Teaching of information skills

Different definitions give helpful benchmarks and they concentrate fundamentally on skills development. As per Bent et al (2007) information skills teaching is a complex learning process as compared to simple skill learning. Information skills can be considered as" a singular's state of mind to student’s learning and research. So they are better ready to manage, utilize, make and integrate information in a smart and ethical way. They further expresses that this thought illustrates information skill as changing individuals’ learning attitudes.

Considering information skill into the curriculum models is not inconsequential. It is competed as set of aptitudes or skills. It comprised of individual and individualized collection of information, behaviour and habits of learning. It is more extensive point of view of realizing which includes learners in learning particular aptitudes or skill. These are some kind of interactive practices and create more extensive awareness to learning (Town 2003). Information skills as a part of curriculum can permit students with more individual growth and latest information. Along with it permits instructors to know and apply multiple pedagogical methodologies.

Information skills, Critical Thinking and Memory

Lambert and Cuper (2008) depicts critical thinking as a vital aptitude and a critical prerequisite for every single student to create and completely comprehend information. Students with little critical thinking skills are usually secure lower academic grades (Quitadamo, Faiola, Johnson, & Kurtz, 2008). As indicated by Lucariello (2012) understanding the gap between the information presented and the students’ capacity to comprehend the information is an essential part to change of teaching methodologies in the classroom (Dewey & Bento, 2009).
Khan (2011) describe Standardized testing as an apparatus to extract information which students have acquired throughout the academic year through remembrance of the material. Information skill is more like an action research which deals with the gap between comprehension of lesson and student’s capacity to concentrate. It also finds out causes behind lack of comprehension. It helps in distinguishing the reasons for such gaps and continues to following up on these reasons. It precedes with sharp perception closes on reflection and solution of the issue. Figure explains it in detail:

![Diagram](image)

Fig. 2.1: *Information skills, Critical Thinking and Memory*

**Levels of Information Skills**

Doyle (1992) portrayed the indicators of information skilled individual as who can perceive his information needs, can make inquiries in view of information needs, perceives the different information sources, seek deliberately, can get to the
distinguished resources, integrating information into definitely known body of
learning, utilization of information in basic critical thinking. The Information skill
process is more like Kolbs' Learning Cycle. It begins with preparation phase and
finishes with application phase to encourage the unique interpretation of the learning.
The information procedure is an arrangement of material and scholarly phases that
anybody pass through to finish an information assignment. Every phase normally
needs the utilization of a few information aptitudes. The procedure is for the mostly a
part of learning and critical thinking. Information skill is separated into six levels
(American Library Association, 2000, California School Library Association, 2004,
New South Wales, Department of Education and Training, 2007).

These levels are as follows:

1. Defining
2. Locating
3. Selecting
4. Organizing
5. Presenting
6. Assessing

A brief description of the levels of information skill is given below:

1. **Defining** At first level student can brainstorm about the task and understands
the need and purpose of the task. He identifies the keywords and interprets
those keywords and ideas in the task. At this level student is capable to
simplify the meaning of tasks and words then relate it to his learning.

2. **Locating** At the second level of information skills he outlines his knowledge
and remembers the related information and expertise from his previous
learning experiences. He recognizes strengths and limits of contemporary
knowledge and decides that extra information is required or not. He can specify a research to the convenient scope and recognize potential sources like: organisations, places, people, electronic and print materials etc. He recognises the comparative value of these sources and can select the useful sources as per need, to locate sources and suitable tools and capture details of the selected sources that are to be used.

3. **Selecting** Learners at the third level of information skill are able to analyse usefulness, credibility and relevancy of the information. He can utilize specific search words to find out possibly suitable information within the selected sources. Scan each one of the source for the information and find sources that associates with the given task. He can evaluate and consider confidentiality and copyrights of the selected information. Make choice whether the information is and opinion or a fact and find out contradiction and prejudice present in the selected sources. He can develop a structure for concluding and recording the information. He is able to summarize information.

4. **Organising** At fourth level of information skill student is able to decide whether he has enough information according to the task requirement and he can organize information in the structural parts. Revise and review these structures according to the purpose of the task and adjust them accordingly.

5. **Presenting** At the fifth level of information skill student can classify the need of the diverse forms of task presentation, he can recongnise who audience is? He selects the appropriate presentation styles. Its forms suitting to the subject matter and the addressees. Then prepare and present information.

6. **Assessing** Sixth level of information skill is the highest level. At this level student is capable to judge the degree to which the final result meets the
requirement and nature of completed task. He appraises how he went with the each step if the information processes in completing the task. He can discover and measure his learning and knowledge and set special targets for the advance improvement of information skills.

Fig.2.2: Levels of information skills

**Ability to recognize need of the information**

In this phase student is similar to a blank slate with no reasonable learning of the personal information requirements. Mostert (2004) depicts "need" as judgment of something is insufficient or missing. The situation can likewise be viewed as to some degree that a person needs keeping in mind the objectives to work efficiently. As indicated by Belkin (2007), information need is available while an instability, gap or
inadequacy in an individuals’ intellectual situation is perceived. Belkin (2007) discusses that this deficit keeps away an individual from comprehending his surroundings; it is depicted as (ASK) anomalous state of knowledge, at the end of the day a gap in one's capacity to understand the situation. MacDonald and Darrow (2003) contrast this phase with the task descriptions defined in the Big6 Skills model, selection and origination in Kuhlthau's model “Information Seeking Process”. In task description, explained in the Big6 Skills model, a student decides about the issue very precisely and decides particular information requirements identified with the issue. As it were, the stage asks what information is required with a specific end goal to take care of the current issue. This is like origination and determination described in the information seeking process model. According to this learner first gets idea of absence of the learning important to fulfill a task, this is followed by sentiments of vulnerability and anxiety. The students, at this phase, are to perceive information need. Considerations are uncertain and questionable focusing on the extensive issue.

As explained by Kuhlthau (1993), learner is directed to hunt down information so as to discuss an issue as observed. A learner might in this manner talk about the current issue with colleagues e.g. peer and specialists, search distinctive sources to find out a topic for research and additional information need. It drives the learner to investigate general information sources in order to build their understanding about the subject by conceptualizing, talking about the issue with colleagues, considering conceivable points, and accepting uncertainty. Then learner decides about the research topic for further exploration.

Contemplations at this phase focus on measuring themes that can better explain his or her exploration intrigues and projects requirements in view of the available time and information. The topic of the research with the best obvious
possibility for achievement eventually gets selected. At the point when choice is put off or delayed, anxiety or confusion are expected to strengthen till a decision is taken. Feelings of ambiguity offer pathway to a momentary feeling of excitement over a choice. Activities include consulting so as to scan for information to make preliminary inquiries of the library and different sources. As said before, methodologies would include examining feasible ideas with companions or specialists and utilizing diverse sources to illustrate conceivable points. In Research process model (1988), by Strippling and Pitts’ otherwise called REACTS, picking a vast area of subject and receiving an outline of that theme is recognized as reviewing, it involves actuality discovering and providing details about information. This process monitored through deducing a theme and building up a mission, which tends to suggesting conversation starters (e.g. is the picked theme will meet the consumers' search habits) also discovering solutions to such inquiries. It additionally involves investigating different types of writing and perusing, surveys etc. Pappas and Tepe (2002) mentioned in their model to this stage as enjoyment and appreciation. According to them enjoyment and appreciation, it encourages interest and creative energy, which thus prompt revelation in information seeking behaviour.

In this way learner take in more about the general topic and recognize a few feasible focus areas while as yet being not able to explain the precise information that is required. The learner would in this way feel doubtful, confused and uncertain, undermined, and subsequently make a move through reading to acquire information notes making and bibliographic references. Procedures that a student would utilize for information seeking incorporate compressing notes, posting conceivable emphases of the subject, and consolidating a few topics to frame one core interest. The learner then
continues to the following stage, which is discovering courses that help to address the information gap.

**Ability to address the information gap**

Baker (2005) thinks about this phase to as concentration formulation. Kuhlthau (1993) takes note of that the investigation or research phase in the model is the most troublesome phase for the users and the mostly are misjudged by intermediaries. Sentiments of instability, confusion and uncertainty are often possible in this phase. The task is to explore information identifying with the general theme keeping in mind the end goal to develop ones close to personal comprehension. Reflections are on turning out to be adequately informed about the theme to shape a focus or an individual perspective. An incompetence to this state precisely what information is required creates correspondence difficult between the information seeker or learner and the source. Activities incorporate finding information important to the general subject, perusing, and connecting new information to already learned or known information.

Formulation refers concentrating additionally on a particular theme inside of a point. Feeling uncertain is reduced and confidence level is started to develop. The task is to add to an attention area taking into account the information experienced in investigation. Examinations get to be clearer as a more engaged and clear idea of the topic is framed. He further clarifies the formulating inquiries to direct research and plan for the research is production phase of the research process model, includes inspecting and sorting out (breaking down) information. The learner then sorts out the information to apt the research assignment according to the situation.
Pappas and Tepe (2002) in their model clarify that the pre-inquiry phase empowers the students to make an association between their subject and knowledge that they now have and to investigate the connections between subtopics. This assists students to conceptualize and get some information about their topic and what they need to know.

**Capacity to develop systems for finding Information**

This phase suggests expressing information requirements to coordinate the accessible sources. By adding to a proper system for information needs, accepting the standards of the development and construction of databases. According to Baker (2005) student needs multiple techniques and strategies for information search. They need to consult literature, journals, articles etc. to develop new ideas. They are in need to consult all type of resources, print and electronic both, for example databases, searching the Online Public Access Catalog (OPAC) etc.

The sources discovered would give student a thought on the most specific method to limited his/her wide range of interest. Ennis (2003) as cited in Choo, Detlor and Turnball (2000) and Wilson (1999) call this chaining and browsing. Chaining process can be forward or in reverse. Here student is much clear about the idea of information search. He can search through books, titles, headings etc. Having finished this action, the student proceeds onward to the next level or activity.

**Ability to locating and accessing the information**

The fourth phase demands students to build the capacity to add to a suitable search strategy, for example, the utilization of Boolean administrators, information and communication technologies, proper indexing and abstracting facilities,
references, databases, and current awareness routines to stay with the latest information.

Eisenberg and Berkowitz (1990) indicate to this phase as finding and getting to the information. This is more concerned with the learners’ development to select the most fitting investigative methods an exploration plan and distinguishing keywords for search, equivalent words and associated terms for the needed information. The student from that point builds a search methodology utilizing suitable guidelines for the information access tool chosen.

Kuhlthau (1993), then again, refers this as accumulation. This is a connection between the information seeker and the source works most adequately and productively. As of right now, the task includes gathering applicable data on the specific topic. The student will have a vibrant ability to know clear and can indicate the requirement for specific information. Reflections are on searching for information to strengthen the focused area, characterizing and/or broadening the main topic through information, gathering appropriate information, and arranging information in notes. Activities concentrate on utilizing the library and different resources to gather appropriate information, and bringing these records with bibliographic references. Procedures that are utilized incorporate utilizing keywords to find out critical information thoroughly seeking different sorts of materials, for example, references, periodicals, life histories, utilizing files, and asking for help from the expert.

Ennis (2003) alludes to this as take out, this is a movement of efficiently working concluded through a specific source or sources keeping in mind the end goal to distinguish materials of interest. This is accomplished by specifically counseling
the source(s) or by in an indirect way looking through book indices, records or online databases.

**Ability to link and assess the information**

The fifth means that students ought to know about inclination and power matters, in other terms, peer review procedure of academic publishing and fitting the selected information coordinating the information requirement. This is contrasted with "assessment" in Big6 skills model, inquiry conclusion in information search process, assessing confirmation/taking notes and incorporating a book reference in the research process model, and explanation in the pathways to knowledge model.

Eisenberg and Berkowitz (1990) clarify that the student evaluates the amount, quality and relevance of the list items to figure out if elective information access instruments or investigative strategies ought to be used, recognizes the gaps in the information recovered, and figures out whether the inquiry procedure ought to be updated. The student repeats the inquiry utilizing the modified system when essential, compresses the primary thoughts removed from the information accumulated and searches at and analyzes information from different sources to assess the information’s reliability, validity, precision, power, timeliness and perspective.

The student must have the capacity to perceive the social, physical, or different settings inside which the information was made and ought to comprehend the effect of connection when interpreting information. In search closure, Kuhlthau (1993) indicates that the student is to wrap up the quest for information. Students’ contemplations are immersed in distinguishing whether this would expand excess to entire resources. At this phase, learner could feel a releasing sense, satisfaction, or frustration. The learner confirms sources for information that may have left
unobserved from the beginning and checks information and references significant to the concentrated area and the research questions. Systems would incorporate coming back to the library to whole up the inquiry and handling the important books while composing to recheck data. Baker (2005) clarifies that assessing proof or taking notes and assembling a reference index' in the research process model includes judging data on the premise of authority, importance, predisposition and different components.

Ellis' model of information search behavior mentions to this as discriminating. This implies the student filters and chooses among the sources filtered by seeing differences between the nature and quality of the information presented. Need of sources and sorts of sources can be made by fundamental criteria, to be specific substantive theme, methodology or point of view, and level, quality, or kind of conduct. The separating procedure is prone to rely upon the person's experiences with the sources, verbal suggestions from individual contacts, or audits in distributed sources.

**Ability to organise, communicate and apply the information**

This stage calls for researchers and students to refer to bibliographic references in their scholastic work, develop an individual bibliographic framework, apply information to the current issue, impart information adequately utilizing the fitting medium, and to comprehend issues relating to copyright and literary theft (SCONUL, 1999). This is like information use in the Big6 skills model and communication in the pathways to knowledge model.

As indicated by Pappas and Tepe (2002), the correspondence stage permits students to sort out, apply and present new knowledge that is material to their research process or information needs. In applying information, students pick a suitable
correspondence pattern. In sharing learning, they create structure, alter, update and utilize the best tool (e.g. video, report, liveliness, and so on.) and pass on the information.

In imparting information to others, the student must comprehend social, moral, ethical, and financial issues encompassing information. Furthermore, the learner requires to record security in the print and electronic situations. He is needed to distinguish and articulate issues of privacy to information. He is also required to recognize and talk about issues of censorship and to speak freely. He also shows comprehension of intellectual properties, copyright and the reasonable utilization of copyrighted materials. To keep away from issues of copyright violation, the student should recognize the utilization of information sources by selecting a proper reference style in project reports and theories.

**Ability to synthesise the information**

Synthesis in Big6 skills model, the presentation in information search process and form conclusions or sort out information in a plan, make and portray last item in the research process model contrast positively with the seventh phase of seven pillars model. As indicated by Eisenberg and Berkowitz (1990), arranging information implies that the students combines information and relates what he or she has figured out to what he/she definitely knows.

The student picks a communication mode and structure that best support the purpose of the outcome and the target group. This involves composing a sketch that connects different sections of information into a rational whole and amending the sketch various times to enhance comprehension before submitting it. In Kuhlthau's (1993) model, this phase comes under presentation. The target is to finish the search
and to achieve the task. A good feeling is common, with contentment if the search has
gone well and disappointment on if it has not. At last, the student needs to combine
ideas into feasible, valuable essential order with assisting proof and coordinate the
earlier and new information, containing words and thoughts, in a way that support the
reasons of the student.

In building up inferences and arranging information in a framework, Stripling
and Pitts (1988) clarify that the learner, researcher or scientist reaches determinations
by adding to an individual point of view in light of the acquired information,
Illustrating intelligent conclusions and confirmations. In making and showing the last
product, are of the perspective this ought to consider whether the paper is refined. The
above abilities can be instilled in learners by teaching them in the formal classroom
setting in their particular courses. On the off chance that the unit or subject of
information curriculum is to be communicated in the formal classrooms and checked,
it must be implanted in the educational curriculum in teaching departments.

**Knowledge comprehension**

Term knowledge comprehension is more like an umbrella term for a large
group of related epistemological and psychological speculations about the way of
learning and how it is shaped through a learner's cognitive processes. As the metaphor
of development infers, cognitive constructivist hypotheses expect that knowledge is a
thing made by the mind processes instead of got from a source. It can be characterized
as scholarly capacity shaped through an individual's encounters and collaborations
with the earth (O'Mara et al., 2006; Valentine et al., 2004). According to Valentine et
al., (2004) students who are more involved with the utilization of their experiences are
liable to take part in more accomplishment related practices, which may incorporate
managing data, get ready assignments, finishing homework, concentrating on for
tests, and taking an interest in class exercises.

Idea of knowledge comprehension is some way or another relates with
scholastic self-concept and academic comprehension of students. This idea is more
like connected with applied teaching perspective. It is critical to comprehend the
thought that what knowledge comprehension speaks to and its particular relationship
to various academic results. Learning appreciation is created and molded through the
student's collaborations with others like fellows, parents and teachers. In this way it is
flexible that student develops through instructing.

Concept of knowledge comprehension and part of experiences in building this
comprehension was joined in functional psychology by James (1842–1910) and
Dewey (1859–1952). According to functionalists, this comprehension is retention and
reconstructing of learner's related experiences. Learner alters these recreations of
experiences according to the need, assignment or set objective. This idea likewise
portrays that individual develop their understanding uniquely in contrast to the same
learning experience.

According to Cain and Oakhill (1999) and Nation et al. (2005) there are
numerous ways that students exhibit their comprehension. They find and review data,
draw on the information of content structures and content organizers, compose short
intellectual responses, think profoundly and express thoughts verbally, perceive
causal connections, make consistent associations, translate illustrations and pictures
and recognize different perspectives and particular points of interest. It has been
found that people who are weak in building or developing their understanding have
powerless metacognition aptitudes.
Knowledge comprehension as experiential learning

Idea of knowledge comprehension is linked with the works of Piaget (1896 – 1980), John Dewey (1859-1952) and Lewin (1890-1947). It is more like drawn from the Lewin's social psychology, Piaget's genetic epistemology, cognitive developmental psychology and Dewey's pragmatic philosophy frame and its view on learning and progress (Kolb, 1984). This construct is identified with experiential learning hypothesis for two reasons: firstly, both thinks learner as a focal element. Secondly, both focus on development of learning experiences and comprehension in view of past experiences. As indicated by Dewey (1897) learning is best seen as process instead of product. It is more like reshaping the experiences. Experiential learning is a comprehensive procedure and synergetic interaction between the learner and environment. Learner builds information and comprehension through the cooperation between individual experiences and events in the external environment (Corbett 2005, 2007, Poltis 2005).

It includes two methods of developing meaning or comprehension:

1. Concrete Experience (CE)
2. Abstract Conceptualization (AC)

It depicts further two methods of changing new encounters:

1. Reflective Observation (RO)
2. Active Experimentation (AE).

These modes are characterized as learning spiral. Reflections and perceptions are the effect of concrete experiences while the dynamic conceptualization is the
consequence of absorption of these reflections (Kolb & Kolb, 2011b&c, Joy & Kolb, 2009).

**Experiential Learning Models**

Learning and experience are associated with one another. Experience and its significance in learning can be evident through these models. These models bring the idea of learning and experience brings from hypothetical grounds into viable reality.

**David Kolb's idea of Experiential Learning**

Lewis and Williams (1994) highlights David Kolb's idea of experiential learning as a standout amongst the major works linking theory to genuine practice. Kolb depicts experiential learning as a four section process, where the learner is asked to:

1. connect oneself with the another experience
2. dynamically think about that new experience
3. hypothesize that experience
4. incorporate it with previous encounters

Lewis and Williams, (1994) states that, as indicated by Kolb, the learner must keep spiraling through the four sections to increase complex learning. A learner may start anywhere in the cycle at any level of information concerning the topic. The facilitator's responsibility is to guide them through every part in a perpetually expanding level, extending their learning of a subject. Kolb (1984) considers any one learning style to be a fragmented type of incomplete information at each of the four phases of the cycle must be arranged by the learner. For Kolb (1984) learning turns
into a procedure where point of views are not altered and permanent components of thought but rather are shaped and re-framed through experience.

**Boud and Walker's Stages in Experiential Learning**

Boud and Walker (1992) take experiential learning as a placement or preparation for learning before that learning has occurred. This includes two essential parts of Kolb's model experience and reflection. It additionally includes a third: planning for the occasion that they feel is imperative in having learning to happen. More prominent use can be made of learning events if the learners get ready for learning beforehand. While considering arrangement for a learning occasion, the facilitator needs to concentrate on what experiences the learners bring and what they need to realize. Learners carry with them a purpose, which could possibly have the capacity to be verbalized and which impacts their way to deal with the learning event (Boud & Walker, 1992).

**Experiential Learning as Process model**

According to Dean (1993) experiential learning is training for creating and using learning experiences. This training includes following steps:

1. **Planning**—preparation for the learning
2. **Involvement**—execution of the preparation
3. **Internalization**—performing the leaning task
4. **Reflection**—creating a meaningful activity
5. **Generalization**—connecting new learning with old experience
6. Application—problem solving by using one learning experience in other situation

7. Follow-up—feedback and evaluation

He further states experiential learning as a facilitator for the experiences to transform them into learned experiences. The main ideas of his model identifies with alternate hypotheses of experiential learning in that there should be some sort of experience (contribution and internalization) and a reflection showed on that specific experience.

Laura Joplin's Five Stage Model

Laura Joplin (1981) portrays the Kolb's experiential learning as activity reflection process. In any case, she includes three different stages that are like Boud and Walker's and Dean's stages of experiential learning. Stages proposed by her are as per the following:

1. First stage is center, which characterizes the undertaking to be finished and centers the learner's consideration on that assignment.

2. Second is activity, where that student must get to be included with the topic in a physical, mental, or enthusiastic way.

3. Third and fourth stages are support and feedback. These are available all through the learning knowledge and are given by the teacher or fellow learners.

4. The fifth and last stage is questioned, where the learners and facilitator sort and request the data and ponder its suggestions.
Joplin focuses that experience alone is inadequate to be called experiential instruction and it is the reflection process which transforms experience into experiential training.

**Methods for Experiential Learning**

To encourage activity and reflection in the exhibition or workshop, the health and security authority needs to utilize methods that are not conventional. They have to utilize techniques that benefit from the learners' experiences and join those experiences to the learning occasion.

According to Chickering (1977) classroom-based experiential learning approaches should be more than the conventional strategies for teaching, examination, or demonstrations. They should be dynamic, experienced based and identified with the member's past and conceivable future experiences. It take us beyond credit hours and schedule time to competence, working learning and knowledge, and information connected to employments, family connections, group obligations, and extensive social concerns. There must be an advancement of competency-based systems that have identifiable results of achievement from experience (Kolb, 1984). Teachers must make a learning domain where student realize, where the members turn out to be actually included in the exercises (Remnet, 1989). Dynamic as opposed to latent association in the action makes for more significant and permanent learning (Darkenwald & Merriam, 1982). Conventional methods in Freire's (1970) terms, is the place what the educator says is the right path and there is no other state of mind or doing. Students bank the information for use later and do not think about that information for validity. What Freire (1970) recommends is for the instructor to make an issue posing environment, to frame a dialog between the student and the educator. In this way, the instructor will reflect with the student and will re-structure thoughts.
and considering the idea of the student’s reflection. The students are not any more passive listeners; they are presently basic co-investigators in dialog with the teacher. Now students are not just arrives a requirement for dynamic involvement, there should be a dynamic reflection as well. Reflective exercises, for example, keeping the learning portfolios, questioning sessions, guided reflection and time for consideration taking after experience-based classroom exercises, according to Boud and Walker (1992) build up the learner's dynamic inclusion in the reflection process.

**Characteristics of Experiential Learning**

At the point when adding to a learning activity it is good to comprehend what qualities make the action an experiential learning event? Burnard (1989) depicts a few underlining properties that characterize an experiential learning action:

1. Action—the learner is not an inactive repository but rather a dynamic member; and there is physical development, not simply sitting.

2. Reflection—adapting just happens after the activity is reflected upon.

3. Phenomenological—articles or circumstances are depicted without assigning out qualities, implications or understandings, the learner must credit intending to what is going on and the facilitator's importance must not be consequently forced upon the student.

4. Subjective human experience—a perspective of the world that is of the learner's not the facilitator's.

5. Human experience as a wellspring of learning—experiential adapting then is an endeavor to make utilization of human experience as a component of the learning procedure.
Joplin (1981) investigates that experiential projects comprise of a few overall qualities:

1. Student-based instead of educator based—the learning experience begins with the student’s thoughts and ideas as opposed to the instructor's or the books.
2. Personal not indifferent nature—individual experiences and self-improvement are esteemed in the classroom.
3. Process and product orientation—stress is put as much on learning as it is on the right response.
4. Evaluation for internal and external reasons—appraisal is thought as a learning experience that the students can figure out how to do all alone.
5. Holistic comprehension and component investigation—students are asked to completely comprehend the substance through the examination of essential sources of the material and experiences.
6. Organized around experience—the students past experiences are considered while making the educational plans, and additionally the new experiences that will be given in the classroom, lab and on a field trip.
7. Perception-based instead of hypothesis-based—experiential learning underlines student's capacity to explain or clarify a subject as opposed to discuss a specialist's confirmation.
8. Individual-based instead of group-based—socializing aptitudes are pushed, on the other hand, emphasis is set on the individual learning inside of the group as opposed to overall group, this more criterion-referenced as opposed to norm-referenced.

These qualities can serve as a catalyzer for the facilitator in developing an experiential learning experience that will boost the student's learning.
Knowledge Comprehension and Experience in Learning as an Affective perspective

The affective side is regularly ignored part of learning. Boud et al. (1993) trust that today's learning experiences incline more towards the cognizance and to the expository, prompting an absence of stress on individuals as a complete being. How learners feel about what they are realizing is pretty much as critical as their subjective engagement. Boud et al (1993) belief if a learner denies their feelings, then they are not getting the most out of the learning event. They must acknowledge their sentiments and trust that those feelings will outline their activities. It is difficult to have intellectual experience without a going with affective component (Remnet, 1989).

The facilitator of learning must consider every one of the areas of learning—intellectual, affective and psychomotor. No one perspective is discrete and autonomous of the rest and no one perspective ought to be great over the rest (Boud et al., 1993). This implies having an all-encompassing perspective of learning and understanding that there is something else more to learning than insight. As Enns (1993) proposes that instead of dismissing conventional ideas of basic considering, we ought to extend our thoughts of basic speculation to incorporate affective component, for example, relating to others and appreciating individual differences, subjective angles, for example, characterizing issues plainly, captivating in intelligent examination, and combining thoughts and behavioral components, for example, gathering information, listening effectively, and applying learning to new circumstances.
Knowledge comprehension and learning styles

Experiential learning hypothesis characterizes learning as the procedure whereby information is made through the change of experience. For Kolb (1984) knowledge results from the mixture of getting a grip on and changing background. There are two methods of getting the grip on experience.

1. Concrete Experience (CE)
2. Abstract Conceptualization (AC)

Two methods of changing background:

1. Reflective Observation (RO)
2. Active Experimentation (AE).

As per the four-stage learning cycle, appeared in Figure, concrete or early experiences are the critical for reflections and perceptions. These reflections are absorbed and refined into unique ideas from which new relationship to act can be drawn. These affiliations can be tried and function as advisers in creating new ideas and experiences.
In getting a grip on experience a few of us see new information through encountering the solid, considerable, sensory characteristics of the world, depending on our faculties and connecting with ourselves into the actual reality. Others have a tendency to see, handle, or grab hold of new information through typical representation or unique conceptualization – considering, breaking down, or methodically arranging, as opposed to utilizing sensation as a supporter. Likewise, in changing or preparing background a few of us tend to deliberately watch other people who are included in the experience and think about what happens, while others hop right in and begin doing things. The observers support intelligent perception, while the practitioners support dynamic experimentation. Every measurement of the learning procedure presents us with a decision. Since it is basically incomprehensible, for instance, at the same time drive a car (Concrete Experience) and examine a driver's manual about the car's working (Abstract Conceptualization), we resolve the dispute by choosing. As a result of our inherited equipment, our specific past
backgrounds, and the needs of our present situation, we formulate our own mechanism of selection. We solve this confusion between active, passive and concrete, abstract by using our developed mechanism of election. This mechanism of selection is called as our learning style. Some learning styles are as follows:

**Diverging** The Diverging style's overwhelming learning capacities are Concrete Experience (CE) and Reflective Observation (RO). Individuals with this learning style are best at survey concrete circumstances from a wide range of perspectives. It is marked as diverging due to the fact that a man with it performs better in circumstances that call for generation of thoughts, for example, a conceptualizing or brainstorming session. Individuals with a Diverging learning style have wide social motives and like to assemble and collect information. Exploration demonstrates that they are keen on individuals, have a tendency to be creative and passionate, have wide social intrigues, and have a tendency to spend significant time in expressions of the human experience. In formal learning circumstances, individuals with the diverging style like to work in groups, listening with a receptive outlook and accepting customized or individual feedback.

**Assimilation** The assimilating style's overwhelming learning capacities are Abstract Conceptualization (AC) and Reflective Observation (RO). Individuals with this learning style are best at comprehension an extensive variety of data and putting into brief intelligent structure. People with an assimilating style are less centered on individuals and more keen on thoughts and theoretical ideas. For the most part, individuals with this style think that it’s more imperative that a hypothesis have functional soundness than practical worth. The assimilating learning style is essential for viability in information and science professions. In formal learning circumstances,
individuals with this style incline toward readings, addresses, investigating scientific models, and have capability to think things through.

**Converging** The converging style’s prevailing learning capacities are Abstract Conceptualization (AC) and Active Experimentation (AE). Individuals with this learning style are best at discovering applied uses for thoughts and hypotheses. They can take care of issues and settle on choices taking into account discovering answers for inquiries or issues. People with a converging learning style want to manage specialized assignments and issues as opposed to with social issues and interpersonal issues. These learning abilities are vital for viability in authority and innovation professions. In formal learning circumstances, individuals with this style want to try different things with new thoughts, renovations, research center assignments, and applications.

**Accommodating** The accommodating style's predominant learning capacities are Concrete Experience (CE) and Active Experimentation (AE). Individuals with this learning style can gain from basically "hand-on" experience. They appreciate completing plans and including themselves in new and testing experiences. Their propensity may be to follow up on gut sentiments instead of on coherent examination. In taking care of issues, people with an accommodating learning style depend more vigorously on individuals for data than all alone specialized examination. This learning style is vital for viability in real life arranged vocations, for example, advertising or deals. In formal learning circumstances, individuals with the accommodating learning style want to work with others to complete assignments, to set objectives, to do field work, and to test out distinctive ways to deal with finishing a project.
Learners who battle with understanding process have inefficient systems and use them purposefully. They are typically ignorant of what comprehends do and demonstrated how and when to apply a little collection of comprehension methodologies. Equipping students with precise direction in perception procedures can be a viable approach to offer them some assistance with overcoming troubles in comprehension writings (Graham & Bellert, 2004). The more unambiguous understanding technique and self-administrative guideline will ensure the higher probability that the learner will make remarkable growth in comprehension or understanding (Manset-Williamson & Nelson, 2005). As learners turn out to be more able and sure of their understanding, the less support they require from the instructor (Duke & Pearson, 2002).

**Knowledge Building and Constructivism**

Most of the time knowledge building is confused with learning. Learning is unobservable process which takes place within a human. It is more individualized phenomenon. Knowledge building is making knowledge for public use. It is more
socialized or making it public. Knowledge building is concerned with, “how knowledge can be created? How it can be transferred? And which type of knowledge is persistent?” Knowledge building, alternatively, is considered as deep constructivism because it involves complex cognitive processes of perception, learning, association and reasoning.

Cognitive development and cognition is established first by Mark Baldwin (1861-1934) and Jean Piaget (1896-1980) who did remarkable contributions in the field. Constructivism proposes that knowledge is generated when experiences and ideas interact. Jean Piaget explained a mechanism by which individuals internalize knowledge. He argued that knowledge is constructed when an individual go through the processes of assimilation and accommodation, two basic concept of Piaget’s schema theory. The process of assimilation refers to fit new information with already existing ideas while accommodation involves changing or developing new schemas to construct knowledge.

**Schema Theory**

Reed (2004), as he cited in Thorndike 1984, describes schema theory as a cluster of knowledge that represents a general procedure, object, precept, events, sequence, or social situation. Schema theory refers to a collection of models presuming that we encode such knowledge clusters into memory and use them to comprehend and store our experiences. Bartlett in England argued that new information interact with prior information in schema, so people construct knowledge by integrating prior knowledge with new information and combining knowledge into clusters, experiences are encoded, interpreted and formed a knowledge structure as
broad general categories. Schema is an active process in which experiences are matched to best fit.

According to Rumelhart, as cited in Reed (2004), schema theory denotes how knowledge is represented and about how that representations facilitates the use of knowledge in various ways. Piaget elaborates, schema as a cognitive unit which organize, store and interpret information. Schema theory presupposes that individual exhibits the capabilities of recurrence to remember and retrieve; he can prioritize, compare and judge experiences.

According to Glasersfeld, (1989), “it is crucial not to be rash and too simplistic in interpreting Piaget. His theory of cognition involves two-fold instrumentalism. Action schemes, on sensory-motor level, help individuals to learn through interaction with their practical world and this can be utilitarian while operative schemes, on the reflective abstraction level, help individuals to attain complex and conceptual level of thinking and reflects more epistemic.

**Genetic Epistemology**

Genetic epistemology is a concept about origin of knowledge by Jean Piaget. Knowledge building and its validity is strongly related to the way it is constructed, first hand experiences or secondary sources. Knowledge according to genetic epistemology is a biological function and is operative. It is subject to change and transformation through cognitive development proceeds by the adaptation of the environment (assimilation) and adoption of the environment (accommodation). It is movement to recognizing and coordinating one’s own actions and experiences.
Social Constructivism and Knowledge Building

The constructivist considers the interaction between the individual learner and the environment as a means of creating knowledge. Clancy (1986) as quoted in Ertmer and Newby (1993) cited by Perera (2011) highlights that knowledge as understanding present situation of the learner or individual by investigating history of his interactions with the environment. This prior experience could be an individual’s sensory experiences with the world or with others. However, it is important to note that constructionist considers knowledge as an individually mediated product and the environment is viewed as that individual’s prior experiences. Social constructivist in contrast views knowledge as a socially mediated product (Stahl, 2000). He further states, the environment here would be the other learners who bring their prior experiences from different cultural contexts. These different cultural and associated environments that learners represent will have a significant impact on the co-creation of knowledge mediated within that group.

Increasing efficiency in knowledge building

Commonly it is gained through experience, this experience can be conscious or spontaneous both. According to Kant, as cited in Stumpf (1988), experience is beginning of knowledge construction but it does not mean that all knowledge arises from experience. It depends on impressions and our own faculty of knowledge supplies from itself.

Knowledge is constructed into logical structures, if knowledge is organized, interpreted in a logical fashion, it will enhance efficiency to build and retrieve knowledge.
• Clear and better understanding of psychological and historical basis of knowledge can help to understand knowledge building better.

• Although, knowledge building is a genetic process, a matter of adaptation between an individual and environment but it can be develop and enhance which is known as evolutionary epistemology.

• Building new knowledge depends on prior experiences, strong and validated experiences can foster process of knowledge building.

Knowledge comprehension is expected as scholastic comprehension of secondary school students. This is produced through the change of experience (Kolb 1984 referred to in Kolb & Kolb 2005). It divides students at three levels:

1. **Literal** This level spotlights on perusing the information. It includes distinguishing the essential and important data. With direction, students can recognize the dynamic and less imperative thoughts. It deals with the question: What did the source or writer says? Or information is about what?

2. **Interpretive** At this level student's focus changes to finding for some hidden meaning, taking a look at what is suggested by the material under study. It helps students to link parts of information keeping in mind the end goal to make inductions about the writer's goal and message. Guiding students to perceive these apparent connections improves comprehension and reduce the danger of being overwhelmed by the complexities of the content being seen, heard or read. This level deals with the question: What was the meaning of idea discussed in the information? Or what does the author mean by discussing an idea in this specific way?
3. **Applied** Understandings at the literal and interpretive levels are joined, recognized and rebuilt at the connected level to express feelings, draw new experiences and form up new concepts and ideas. Supporting students through the applied level demonstrates to them how to arrange and combine ideas, to find some hidden meaning and to build up a more profound comprehension of the ideas, standards and suggestions displayed in the content. Questions addressed at this level are: How would the author's message apply to different circumstances given? What are the ways to use this information in other situations as well?
CHAPTER 3
RESEARCH METHODOLOGY

Following research study has used quantitative research method. Survey was used to collect data from the selected sample. This chapter further discusses about population, sample of the study and research design in detail.

Research Design

The study was survey research design and is correlational in nature. It used two questionnaires to investigate the relationship between two variables i.e. levels of information skill and knowledge comprehension of secondary school students.

Population

Population of the study was consisting on all secondary school students (9th class and 10th class) of Punjab. Total number of secondary schools in thirty six districts of Punjab was comprised of 4425 both male and female.

Sample and Sampling Technique

Sampling of the study was multi stage:

Stage 1: District selection
Stage 2: School selection
Stage 3: Student selection

Sampling was completed by following procedure:

Stage 1: District selection

a. Province of the Punjab was divided into three zones, respectively northern, central and southern on the basis of geographical location.

b. These zones comprise on 10, 14, 12 districts.

c. Nine districts were selected randomly (lottery method) from these zones.
d. Three districts were selected from each zone.

**Stage 2: Selection of Schools**

From each districts two schools (one boy, one girl) were randomly selected.

**Stage 3: Selection of students**

To select students following procedure was adopted:

a. Students were selected through cluster sampling technique.

b. From each school, two sections of class 9th (one science, one art) and two sections of class 10th (one science, one art) were selected.

c. The students were selected as an intact group form science and arts sections.
Figure 3.1: Distribution of sample

Table 3.1:
Summary of selected School

<table>
<thead>
<tr>
<th>Sr. no</th>
<th>Zone</th>
<th>District</th>
<th>Boys school</th>
<th>Students Selected</th>
<th>Girls school</th>
<th>Students selected</th>
<th>total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Central Zone</td>
<td>Lahore</td>
<td>1</td>
<td>400</td>
<td>1</td>
<td>400</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Sheikhupura</td>
<td>1</td>
<td>400</td>
<td>1</td>
<td>400</td>
<td>2</td>
</tr>
<tr>
<td>2</td>
<td>Northern Zone</td>
<td>Sargodha</td>
<td>1</td>
<td>400</td>
<td>1</td>
<td>400</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Faisalabad</td>
<td>1</td>
<td>400</td>
<td>1</td>
<td>400</td>
<td>2</td>
</tr>
<tr>
<td>3</td>
<td>Southern Zone</td>
<td>Multan</td>
<td>1</td>
<td>400</td>
<td>1</td>
<td>400</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Rahim Yar Khan</td>
<td>1</td>
<td>400</td>
<td>1</td>
<td>400</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td></td>
<td></td>
<td>6</td>
<td>2400</td>
<td>6</td>
<td>2400</td>
</tr>
</tbody>
</table>
Instrument of the study

Two instruments were used for data collection, which were as follows:

1. Information skill questionnaire

   This questionnaire was adapted based on Information literacy skills continuum, k-12 (1998). This continuum is developed on the nine prescribed standards of American Library Association and Association of Educational Communications and Technology.

This questionnaire was supposed to measure six levels information skill of students. Total 22 statements discovered the following levels of information skill:

   Level 1 Defining: This section revealed information about participant’s strategies to define and understand the problems or assignments.

   Level 2 Locating: This part of questionnaire analyzed student’s capabilities to search the related and required information using various sources of information for example using library, internet and others.

   Level 3 Selecting: This part helped to find out abilities to judge and sorting of information which is relevant and is of use.

   Level 4 Organizing: This part asked about the information management of students that how they deal with it. It inquired about their way to organize the collected information.

   Level 5 Presenting: This section discovered their decision about the way to present the information and to whom they are presenting it.

   Level 6 Assessing: This part of questionnaire is self-evaluation, this part checked student’s performance.
Reliability and validity of the Questionnaire

Panel of experts had assured the content validity of the instrument. Experts were experienced teachers and researchers. They rated instrument as useful, easy to understand and valid for the problem under study. Instrument was pilot tested in 4 schools, 300 students.

Cronbach’s alpha for information skill questionnaire was found 0.925.

Table 3.2

Reliability coefficient, Mean and Standard Deviation for IS

<table>
<thead>
<tr>
<th>No of Items</th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>Cronbach Reliability</th>
<th>Alpha</th>
</tr>
</thead>
<tbody>
<tr>
<td>22</td>
<td>73.65</td>
<td>19.506</td>
<td></td>
<td>0.925</td>
</tr>
</tbody>
</table>

Statements in each subscale were as follows:

Table 3.3

Statements in each subscale of IS

<table>
<thead>
<tr>
<th>Sr. No</th>
<th>Subscale</th>
<th>No of items</th>
<th>Item serial number in instrument</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Defining</td>
<td>2</td>
<td>7, 15</td>
</tr>
<tr>
<td>2</td>
<td>Locating</td>
<td>7</td>
<td>1, 2, 6, 18, 19, 22</td>
</tr>
<tr>
<td>3</td>
<td>Selecting</td>
<td>3</td>
<td>3, 8, 20</td>
</tr>
<tr>
<td>4</td>
<td>Organizing</td>
<td>3</td>
<td>4, 5, 13</td>
</tr>
<tr>
<td>5</td>
<td>Presenting</td>
<td>3</td>
<td>9, 11, 15</td>
</tr>
<tr>
<td>6</td>
<td>Assessing</td>
<td>3</td>
<td>21, 10, 12</td>
</tr>
</tbody>
</table>

Factor analysis

Exploratory Factor analysis (EFA) was carried out to reduce the data set into a few factors (Field, 2009). Before performing EFA the suitability of data was important as Foster (2001) suggested that “for factor analysis the number of respondent should not be less than 100 and there should be at least twice as many respondents as variable”. Data for this research is justified in the light of Foster’s
recommendation. Principal component analyses (PCA) sought 5 factors while researcher has created 6 factors.

Factor loading is given below:

<table>
<thead>
<tr>
<th>Statement No</th>
<th>F1</th>
<th>F2</th>
<th>F3</th>
<th>F4</th>
<th>F5</th>
</tr>
</thead>
<tbody>
<tr>
<td>IS9</td>
<td>.813</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IS11</td>
<td>.785</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IS19</td>
<td>.696</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IS17</td>
<td>.644</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IS5</td>
<td>.536</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IS22</td>
<td>.398</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IS3</td>
<td></td>
<td>.785</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IS12</td>
<td></td>
<td>.753</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IS21</td>
<td></td>
<td>.603</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IS10</td>
<td></td>
<td>.600</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IS20</td>
<td></td>
<td>.780</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IS7</td>
<td></td>
<td>.692</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IS6</td>
<td></td>
<td>.479</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IS1</td>
<td></td>
<td></td>
<td>.837</td>
<td></td>
<td></td>
</tr>
<tr>
<td>IS8</td>
<td></td>
<td></td>
<td>.659</td>
<td></td>
<td></td>
</tr>
<tr>
<td>IS13</td>
<td></td>
<td></td>
<td>.562</td>
<td></td>
<td></td>
</tr>
<tr>
<td>IS2</td>
<td></td>
<td></td>
<td>.495</td>
<td></td>
<td></td>
</tr>
<tr>
<td>IS4</td>
<td></td>
<td></td>
<td>.459</td>
<td></td>
<td></td>
</tr>
<tr>
<td>IS14</td>
<td></td>
<td></td>
<td>.390</td>
<td></td>
<td></td>
</tr>
<tr>
<td>IS15</td>
<td></td>
<td></td>
<td></td>
<td>.721</td>
<td></td>
</tr>
<tr>
<td>IS16</td>
<td></td>
<td></td>
<td></td>
<td>.697</td>
<td></td>
</tr>
<tr>
<td>IS18</td>
<td></td>
<td></td>
<td></td>
<td>.570</td>
<td></td>
</tr>
</tbody>
</table>

It is obvious from the above item loading table that all items have loading value above .3 which proves the instrument a valid and reliable for the situation under study.

**Knowledge comprehension**

This instrument was developed by researcher to find out the knowledge comprehension of the secondary school students. This questionnaire was aimed to check secondary school student’s academic understanding. This instrument comprised on 37 items further divided into three subscales to deeply probe about student’s academic understanding. The subscales were: 1) Literal, 2) Interpretive, 3) Applied.

Statements’ probing about literal scale exposed student’s superficial understanding about the lesson and content. Interpretative section inquired
about how better they understand their content or lesson and can explain other than read words. Section dealing the applied part of the questionnaire discovered student’s higher order understanding regarding lessons and content they are reading. It inquired about their ability to apply their knowledge in other situations. Basically this section dealt with the creativity of the students.

**Validity, reliability of the instrument**

Questionnaire was reviewed by the panel of expert researchers and teachers to ensure the content validity of the instrument. They reported it as simple, practical and suitable instrument for the variable under study. The instrument was pilot tested in 4 schools, on 300 students. It was easy to understand for secondary school student no ambiguity reported.

Cronbach’s alpha for knowledge comprehension questionnaire was 0.92

<table>
<thead>
<tr>
<th>Table 3.5: Mean, Standard Deviation and Reliability of KC</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>No of Items</strong></td>
</tr>
<tr>
<td>-----------------</td>
</tr>
<tr>
<td>37</td>
</tr>
</tbody>
</table>

Number of statements in each subscale is given below:

**Table 3.6: Statements in each subscale of KC**

<table>
<thead>
<tr>
<th>Sr. No</th>
<th>Subscale</th>
<th>No of items</th>
<th>Serial No in scale</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Literal</td>
<td>18</td>
<td>1,2,3,4,5,7,9,11,13,15,18,20,21,22,23,25,26,37</td>
</tr>
<tr>
<td>2</td>
<td>Interpretive</td>
<td>9</td>
<td>8,10,17,24,28,31,33,34,35</td>
</tr>
<tr>
<td>3</td>
<td>Applied</td>
<td>10</td>
<td>6,12,14,16,19,27,29,30,32,36</td>
</tr>
</tbody>
</table>
Factor Analysis

Exploratory Factor analysis (EFA) was carried out on the data of 300 participants. Principal component analyses (PCA) sought 3 factors as researcher has also developed 3 factors to measure the variable. Factor loading is as follows:

Table 3.7: Factor loading for KC

<table>
<thead>
<tr>
<th>Statement No.</th>
<th>F1</th>
<th>F2</th>
<th>F3</th>
</tr>
</thead>
<tbody>
<tr>
<td>KC7</td>
<td>.782</td>
<td></td>
<td></td>
</tr>
<tr>
<td>KC10</td>
<td>.758</td>
<td></td>
<td></td>
</tr>
<tr>
<td>KC16</td>
<td>.717</td>
<td></td>
<td></td>
</tr>
<tr>
<td>KC14</td>
<td>.699</td>
<td></td>
<td></td>
</tr>
<tr>
<td>KC33</td>
<td>.690</td>
<td></td>
<td></td>
</tr>
<tr>
<td>KC6</td>
<td>.671</td>
<td></td>
<td></td>
</tr>
<tr>
<td>KC12</td>
<td>.671</td>
<td></td>
<td></td>
</tr>
<tr>
<td>KC29</td>
<td>.646</td>
<td></td>
<td></td>
</tr>
<tr>
<td>KC36</td>
<td>.629</td>
<td></td>
<td></td>
</tr>
<tr>
<td>KC27</td>
<td>.624</td>
<td></td>
<td></td>
</tr>
<tr>
<td>KC34</td>
<td>.601</td>
<td></td>
<td></td>
</tr>
<tr>
<td>KC32</td>
<td>.587</td>
<td></td>
<td></td>
</tr>
<tr>
<td>KC35</td>
<td>.585</td>
<td></td>
<td></td>
</tr>
<tr>
<td>KC24</td>
<td>.577</td>
<td></td>
<td></td>
</tr>
<tr>
<td>KC30</td>
<td>.571</td>
<td></td>
<td></td>
</tr>
<tr>
<td>KC31</td>
<td>.559</td>
<td></td>
<td></td>
</tr>
<tr>
<td>KC17</td>
<td>.557</td>
<td></td>
<td></td>
</tr>
<tr>
<td>KC8</td>
<td>.514</td>
<td></td>
<td></td>
</tr>
<tr>
<td>KC9</td>
<td>.485</td>
<td></td>
<td></td>
</tr>
<tr>
<td>KC25</td>
<td>.457</td>
<td></td>
<td></td>
</tr>
<tr>
<td>KC19</td>
<td>.413</td>
<td></td>
<td></td>
</tr>
<tr>
<td>KC26</td>
<td></td>
<td>.784</td>
<td></td>
</tr>
<tr>
<td>KC22</td>
<td></td>
<td>.775</td>
<td></td>
</tr>
<tr>
<td>KC18</td>
<td></td>
<td>.738</td>
<td></td>
</tr>
<tr>
<td>KC21</td>
<td></td>
<td>.637</td>
<td></td>
</tr>
<tr>
<td>KC3</td>
<td></td>
<td>.637</td>
<td></td>
</tr>
<tr>
<td>KC20</td>
<td></td>
<td>.625</td>
<td></td>
</tr>
<tr>
<td>KC28</td>
<td></td>
<td>.616</td>
<td></td>
</tr>
<tr>
<td>KC23</td>
<td></td>
<td>.576</td>
<td></td>
</tr>
<tr>
<td>KC37</td>
<td></td>
<td>.569</td>
<td></td>
</tr>
<tr>
<td>KC4</td>
<td></td>
<td>.526</td>
<td></td>
</tr>
<tr>
<td>KC13</td>
<td></td>
<td>.508</td>
<td></td>
</tr>
<tr>
<td>KC11</td>
<td></td>
<td>.503</td>
<td></td>
</tr>
<tr>
<td>KC5</td>
<td></td>
<td>.494</td>
<td></td>
</tr>
<tr>
<td>KC1</td>
<td></td>
<td></td>
<td>.682</td>
</tr>
<tr>
<td>KC2</td>
<td></td>
<td></td>
<td>.674</td>
</tr>
<tr>
<td>KC15</td>
<td></td>
<td></td>
<td>.347</td>
</tr>
</tbody>
</table>

Table shows item loading is more than .3 so it is obvious that scale is appropriate for the variable under study.
Scoring procedure

Instruments used in the study were consisted on 5 point Likert scale items. Each statement in both scales were assigned weightage as Never 1, sometimes 2, neutral 3, frequently 4, always 5. Each student was assigned a code id and data was coded as well.

Data collection

Data for the study was collected from 6 districts of Punjab. From these 6 districts 12 schools were taken randomly and 2400 students were chosen as subject of the study. Two questionnaires were used to collect data from science and arts secondary school students.

Data analysis

Coded data was analysed by using SPSS 20.0 grid sheet. Descriptive statistics and correlation coefficient statistical techniques were applied to analysed data.
<table>
<thead>
<tr>
<th>Objective 1</th>
<th>Statements</th>
<th>Research questions</th>
<th>Instrument</th>
<th>Data source</th>
<th>Analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Explore various levels of information skills among secondary school students.</td>
<td>What are the different levels of information skills and knowledge comprehension which secondary school students have?</td>
<td>Questionnaire</td>
<td>Secondary school students</td>
<td>Mean score</td>
</tr>
<tr>
<td>objective 2</td>
<td>Identify the levels of knowledge comprehension.</td>
<td>What are different levels of knowledge comprehension?</td>
<td>Knowledge comprehension test</td>
<td>Secondary school students</td>
<td>Mean score</td>
</tr>
<tr>
<td>Objective 3</td>
<td>Investigate the relationship between levels of information skills and knowledge comprehension of secondary school students.</td>
<td>Is there any significant relationship between levels of information skills and knowledge comprehension of secondary school students?</td>
<td>Questionnaire</td>
<td>Secondary schools students</td>
<td>Correlation and Independent sample-test</td>
</tr>
</tbody>
</table>
CHAPTER 4
DATA ANALYSIS AND INTERPRETATION

This study has examined the relationship between levels of information skill and knowledge comprehension of secondary school students. Study was conducted to find out the difference and relationship between levels of information skill and knowledge comprehension on the basis of gender and field of study (science, arts). This chapter provides answers to the research questions in an accurate way. Each research questions is dealt separately using relevant statistical technique.

Demographical variables

A brief and comprehensive detail of the categorical data is presented here, In order to get an overview of detailed data. Table 4.1 gives details about number of participants in different categories (e.g. gender, grade level, field of study) and their percentages in total group.

Table 4.1 Demographic information of Participants

<table>
<thead>
<tr>
<th>Demographic variable</th>
<th>F</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>1571</td>
<td>65</td>
</tr>
<tr>
<td>Female</td>
<td>829</td>
<td>35</td>
</tr>
<tr>
<td>Grade</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9th</td>
<td>1267</td>
<td>53</td>
</tr>
<tr>
<td>10th</td>
<td>1131</td>
<td>47</td>
</tr>
<tr>
<td>Field of study</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Science</td>
<td>965</td>
<td>38</td>
</tr>
<tr>
<td>Arts</td>
<td>685</td>
<td>26</td>
</tr>
<tr>
<td>Computer science</td>
<td>747</td>
<td>29</td>
</tr>
</tbody>
</table>
Overview of IS subscales

Table 4.2 displays an overview of the subscales/levels of major variable of the study. Range (minimum and maximum), frequency distribution, mean value, standard deviation, skewness and kurtosis are given in this table. Values of skewness are within the range of +1 to -1. This shows that the data set is fulfilling the normality assumption for continuous data.

Table 4.2 IS subscale

<table>
<thead>
<tr>
<th>Range</th>
<th>N</th>
<th>Min</th>
<th>Max</th>
<th>Mean</th>
<th>SD</th>
<th>Skewness</th>
<th>Kurtosis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Defining</td>
<td>2400</td>
<td>17</td>
<td>18</td>
<td>3.48</td>
<td>1.122</td>
<td>.700</td>
<td>10.586</td>
</tr>
<tr>
<td>Locating</td>
<td>2400</td>
<td>5</td>
<td>6</td>
<td>3.59</td>
<td>1.039</td>
<td>-.603</td>
<td>-.514</td>
</tr>
<tr>
<td>Selecting</td>
<td>2400</td>
<td>8</td>
<td>9</td>
<td>3.63</td>
<td>1.046</td>
<td>-.256</td>
<td>-.115</td>
</tr>
<tr>
<td>Organizing</td>
<td>2400</td>
<td>4</td>
<td>5</td>
<td>3.59</td>
<td>1.218</td>
<td>-.505</td>
<td>-1.056</td>
</tr>
<tr>
<td>Presenting</td>
<td>2400</td>
<td>12</td>
<td>13</td>
<td>3.46</td>
<td>1.231</td>
<td>-.221</td>
<td>.272</td>
</tr>
<tr>
<td>Assessing</td>
<td>2400</td>
<td>4</td>
<td>5</td>
<td>3.40</td>
<td>1.227</td>
<td>-.265</td>
<td>-1.141</td>
</tr>
</tbody>
</table>

Overview of KC subscale

Descriptive overview of knowledge comprehension subscale is presented in the table 4.3. It shows minimum and maximum range, the frequency distribution,
skewness, kurtosis, mean and standard deviation of the data set. Skewness values fall within the range of +1 to -1 which shows normality of the continuous data.

Table. 4.3 KC subscale

<table>
<thead>
<tr>
<th></th>
<th>Range</th>
<th>N</th>
<th>Min</th>
<th>Max</th>
<th>Mean</th>
<th>SD</th>
<th>Skewness</th>
<th>Kurtosis</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Literal</td>
<td>2400</td>
<td>4</td>
<td>5</td>
<td>3.48</td>
<td>.956</td>
<td>.039</td>
<td>-1.257</td>
<td></td>
</tr>
<tr>
<td>Interpretive</td>
<td>2400</td>
<td>5</td>
<td>6</td>
<td>3.74</td>
<td>.825</td>
<td>-.302</td>
<td>.454</td>
<td></td>
</tr>
<tr>
<td>Applied</td>
<td>2400</td>
<td>7</td>
<td>8</td>
<td>3.85</td>
<td>.801</td>
<td>-.353</td>
<td>.630</td>
<td></td>
</tr>
</tbody>
</table>

Relationship between Information skill and Knowledge comprehension

The result of the below table 4.4 shows the degree of relationship between information skill and knowledge comprehension of secondary school students. This relationship was examined by using Pearson product-moment correlation coefficient. There is strong positive correlation between the two variables, r=.823, n=2400, p<.05. This shows that knowledge comprehension is strongly associated with the information skill.

Table. 4.4 Relationship between IS and KC

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>R</th>
</tr>
</thead>
<tbody>
<tr>
<td>Information Skill</td>
<td>2400</td>
<td>.823</td>
</tr>
<tr>
<td>&amp; Knowledge Comprehension</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
**Relationship between levels of information skill and knowledge comprehension**

Table 4.5 shows the relationship between levels of information skill (defining, locating, selecting, organizing, presenting, assessing) and knowledge comprehension is statistically significant. There is positively moderate relationship between defining (level of information skill) and KC, $r=.487$, $n=2400$, $p<.05$. Locating (level of information skill) and KC have positive strong relationship, $r=.772$, $n=2400$, $p<.05$. Positive and strong correlation exist between KC and selecting (level of information skill), $r=.717$, $n=2400$, $p<.05$. Knowledge comprehension and organizing (level of information skill) have moderate but positive relationship, $r=.675$, $n=2400$, $p<.05$. Strong positive correlation is present between presenting (level of information skill) and knowledge comprehension, $r=.715$, $n=2400$, $p<.05$. Assessing (level of information skill) and KC are strongly positive correlated, $r=.722$, $n=2400$, $p<.05$.

*Table. 4.5 Relationship between levels of IS and KC*

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>R</th>
</tr>
</thead>
<tbody>
<tr>
<td>Defining and KC</td>
<td>2400</td>
<td>.487</td>
</tr>
<tr>
<td>Locating and KC</td>
<td>2400</td>
<td>.772</td>
</tr>
<tr>
<td>Selecting and KC</td>
<td>2400</td>
<td>.717</td>
</tr>
<tr>
<td>Organizing and KC</td>
<td>2400</td>
<td>.675</td>
</tr>
<tr>
<td>Presenting and KC</td>
<td>2400</td>
<td>.715</td>
</tr>
<tr>
<td>Assessing and KC</td>
<td>2400</td>
<td>.722</td>
</tr>
</tbody>
</table>

**Difference in levels of Information skill due to Gender**

Table 4.6 clarified the difference in levels of information skill due to gender, independent sample t-test was applied. In the table 4.6 it is obvious that in defining (first level of IS) males ($M=3.52$, $SD=1.100$) are better than females ($M=3.40$, $SD=1.100$).
SD=1.160). In locating (second level of IS) males (M=3.69, SD=.983) are slightly different than females (M=3.41, SD=1.118). Selecting, the third level of IS, females (M=3.48, SD=1.087) are low than males (M=3.71, SD=1.015). At the level of organizing (fourth level of IS) there is no significant difference between males (M=3.62, SD=1.198) and females (M=3.51, SD=1.253). In presenting information (fifth level of IS) males (M=3.57, SD=1.166) are comparatively than females (M=3.24, SD=1.323). At the sixth level of IS, assessing information, males (M=3.53, SD=1.193) are superior to females (M=3.16, SD=1.255).

Table 4.6 Gender difference in levels of information skill

<table>
<thead>
<tr>
<th>IS-subscale</th>
<th>Gender</th>
<th>N</th>
<th>Mean</th>
<th>SD</th>
<th>Df</th>
<th>t-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Defining</td>
<td>Male</td>
<td>1571</td>
<td>3.52</td>
<td>1.100</td>
<td>2397</td>
<td>2.558</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>829</td>
<td>3.40</td>
<td>1.160</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Locating</td>
<td>Male</td>
<td>1571</td>
<td>3.69</td>
<td>.983</td>
<td>2397</td>
<td>6.356</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>829</td>
<td>3.41</td>
<td>1.118</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Selecting</td>
<td>Male</td>
<td>1571</td>
<td>3.71</td>
<td>1.015</td>
<td>2397</td>
<td>5.122</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>829</td>
<td>3.48</td>
<td>1.087</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Organizing</td>
<td>Male</td>
<td>1571</td>
<td>3.62</td>
<td>1.198</td>
<td>2397</td>
<td>2.138</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>829</td>
<td>3.51</td>
<td>1.253</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Presenting</td>
<td>Male</td>
<td>1571</td>
<td>3.57</td>
<td>1.166</td>
<td>2394</td>
<td>6.112</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>829</td>
<td>3.24</td>
<td>1.323</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Assessing</td>
<td>Male</td>
<td>1571</td>
<td>3.53</td>
<td>1.193</td>
<td>2397</td>
<td>7.055</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>829</td>
<td>3.16</td>
<td>1.255</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Gender difference in levels of Knowledge comprehension**

Results of the table 4.7 below showed mean difference in levels of knowledge comprehension on the basis of gender. Independent sample t-test was applied to find out mean difference in knowledge comprehension of males and females. In basic
understanding of information, Literal (first level of KC) males (M=3.63, SD=.934) are different from females (M=3.20, SD=.934). Males (M=3.81, SD=.819) are good in interpreting information (second level of KC) than females (M=3.59, SD=.817). In applying information (third level of KC) in different situations females (M=3.74, SD=.854) are weak than males (M=3.91, SD=.765).

*Table. 4.7 Gender difference in the levels of KC*

<table>
<thead>
<tr>
<th>KC-subscale</th>
<th>Gender</th>
<th>N</th>
<th>Mean</th>
<th>SD</th>
<th>Df</th>
<th>t-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Literal</td>
<td>Male</td>
<td>1571</td>
<td>3.63</td>
<td>.934</td>
<td>2397</td>
<td>10.852</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>829</td>
<td>3.20</td>
<td>.934</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Interpretive</td>
<td>Male</td>
<td>1571</td>
<td>3.81</td>
<td>.819</td>
<td>2397</td>
<td>6.134</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>829</td>
<td>3.59</td>
<td>.817</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Applied</td>
<td>Male</td>
<td>1571</td>
<td>3.91</td>
<td>.765</td>
<td>2397</td>
<td>5.051</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>829</td>
<td>3.74</td>
<td>.854</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Levels of Information skill and field of study**

Table 4.8 showed the mean difference in levels of information skill due to study area (science, arts) independent sample t-test is applied. Results shows that arts students (M=3.55, SD=1.046) scored higher in defining information (first level of IS) than science students (M=3.42, SD=1.177). Similarly in locating information (second level of IS) arts students (M=3.79, SD=.922) are significantly better than science students (M=3.44, SD=1.098). Science students (M=3.44, SD=1.048) are comparatively low in selecting information (third level of IS) than arts students (M=3.87, SD=.992). Arts students (M=3.78, SD=1.149) scored high in organizing information (fourth level of IS) as compare to science students (M=3.44, SD=1.256). In Presenting information (fifth level of IS) Arts students (M=3.75, SD=1.078) are
good than science students (M=3.22, SD=1.298). In assessing information (sixth level of IS) arts students (M=3.69, SD=1.175) scored higher than science students (M=3.19, SD=1.228).

**Table. 4.8 Difference in Levels of information skill due to study area**

<table>
<thead>
<tr>
<th>IS-subscale</th>
<th>Area of study</th>
<th>N</th>
<th>Mean</th>
<th>SD</th>
<th>Df</th>
<th>t-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Defining</td>
<td>Science</td>
<td>1332</td>
<td>3.42</td>
<td>1.177</td>
<td>2387</td>
<td>-2.692</td>
</tr>
<tr>
<td></td>
<td>Arts</td>
<td>1068</td>
<td>3.55</td>
<td>1.046</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Locating</td>
<td>Science</td>
<td>1332</td>
<td>3.44</td>
<td>1.098</td>
<td>2387</td>
<td>-8.179</td>
</tr>
<tr>
<td></td>
<td>Arts</td>
<td>1068</td>
<td>3.79</td>
<td>.922</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Selecting</td>
<td>Science</td>
<td>1332</td>
<td>3.44</td>
<td>1.049</td>
<td>2387</td>
<td>-10.142</td>
</tr>
<tr>
<td></td>
<td>Arts</td>
<td>1068</td>
<td>3.87</td>
<td>.992</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Organizing</td>
<td>Science</td>
<td>1332</td>
<td>3.44</td>
<td>1.250</td>
<td>2387</td>
<td>-6.859</td>
</tr>
<tr>
<td></td>
<td>Arts</td>
<td>1068</td>
<td>3.78</td>
<td>1.149</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Presenting</td>
<td>Science</td>
<td>1332</td>
<td>3.22</td>
<td>1.296</td>
<td>2387</td>
<td>-10.521</td>
</tr>
<tr>
<td></td>
<td>Arts</td>
<td>1068</td>
<td>3.75</td>
<td>1.078</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Assessing</td>
<td>Science</td>
<td>1332</td>
<td>3.19</td>
<td>1.228</td>
<td>2387</td>
<td>-9.506</td>
</tr>
<tr>
<td></td>
<td>Arts</td>
<td>1068</td>
<td>3.67</td>
<td>1.175</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Levels of knowledge comprehension and field of study**

Table 4.9 showed the mean difference in levels of knowledge comprehension due to study area (science, arts) independent sample t-test is applied. It is obvious from the results of table 4.9 that arts students were better in comprehending information than science students. At literal level (first level of KC) arts students (M=3.72, SD=.920) were significantly different from science students (M=3.30, SD=.945). Arts students (M=3.85, SD=.844) scored higher than science students...
(M=3.65, SD=.798) at interpretive level (second level of KC). Science students
(M=3.80, SD=.821) are significantly low in applying information (third level of KC)
than arts students (M=3.92, SD=.768).

Table 4.9 Knowledge comprehension and area of study

<table>
<thead>
<tr>
<th>KC-subscale</th>
<th>Area of study</th>
<th>N</th>
<th>Mean</th>
<th>SD</th>
<th>Df</th>
<th>t-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Literal</td>
<td>Science</td>
<td>1332</td>
<td>3.30</td>
<td>.945</td>
<td>2387</td>
<td>-10.910</td>
</tr>
<tr>
<td></td>
<td>Arts</td>
<td>1068</td>
<td>3.72</td>
<td>.920</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Interpretive</td>
<td>Science</td>
<td>1332</td>
<td>3.65</td>
<td>.798</td>
<td>2387</td>
<td>-6.056</td>
</tr>
<tr>
<td></td>
<td>Arts</td>
<td>1068</td>
<td>3.85</td>
<td>.844</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Applied</td>
<td>Science</td>
<td>1332</td>
<td>3.80</td>
<td>.821</td>
<td>2387</td>
<td>-3.625</td>
</tr>
<tr>
<td></td>
<td>Arts</td>
<td>1068</td>
<td>3.92</td>
<td>.768</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
CHAPTER 5

SUMMARY, FINDINGS, DISCUSSION AND RECOMMENDATIONS

This section presents conclusions, discussion and recommendation of the study drawn on the basis of data analysis.

Summary

Information skills are characterized as the way of learning while interacting with the information (Bruce 1995, 2000). The twenty-first century has been named as the information period, attributable to the blast of information and the information sources. The significance of obtaining information skill increases the self-learning opportunities for the students. It is fundamental for information to create abilities in utilizing information as a component of the information, attitudes and behaviors vital for learning.

The idea of “information skill” initially started as “information literacy”. As indicated by Zurkowski, Individuals are information skilled if they can use the learned information while working or studying. Burchinal (1976) refined information skill as a set of abilities and connected with the abilities that incorporate finding and utilizing information, the utilization of information for critical thinking, choice making efficient and viable information use. Information skill suggests the intellectual capabilities included in utilizing information, as distinctive from the specialized expertise required for utilizing information technologies that hold or convey information. Information skill incorporates learning of one's information requirements
and concerns, the capacity to recognize find, assess, sort out, utilize and present information to confront the issues or issue on hands.

Doyle (1992) portrayed the indicators of information skilled individual as who can perceive his information needs, can make inquiries in view of information needs, perceives the different information sources, seek deliberately, can get to the distinguished resources, integrating information into definitely known body of learning, utilization of information in basic critical thinking. The Information skill process is more like Kolbs' Learning Cycle.

At the second level of information skills he outlines his knowledge and remembers the related information and expertise from his previous learning experiences. Learners at the third level of information skill are able to analyse usefulness, credibility and relevancy of the information. At fourth level of information skill student is able to decide whether he has enough information according to the task requirement and he can organize information in the structural parts. Prepare and present information.

Activities incorporate finding information important to the general subject, perusing, and connecting new information to already learned or known information. According to Baker (2005) student needs multiple techniques and strategies for information search. Here student is much clear about the idea of information search.

Reflections are on searching for information to strengthen the focused area, characterizing and/or broadening the main topic through information, gathering appropriate information, and arranging information in notes.

In applying information, students pick a suitable correspondence pattern. In imparting information to others, the student must comprehend social, moral, ethical,
and financial issues encompassing information. This means students who have strong information skill or who can confidently deal with information have good academic understanding/ knowledge comprehension.

The present study aimed to find out relationship between levels of information skills and knowledge comprehension of secondary school students. Students studying in class 9th and 10th in the province of Punjab were the population of the study. Six districts from the three zones (northern, southern, and central) were randomly selected. From each district two schools (one girl, one boy) were randomly selected. From each school both classes (class 9th and class 10th) from two fields of study (science and arts) were also randomly selected. Data was collected through two instruments, one for information skills and one for knowledge comprehension. Collected data was analysed by descriptive statistics tests, correlation and independent sample t-test.

All other levels of information skill e.g. locating, selecting, organizing, presenting and assessing information have positive and strong relationship with knowledge comprehension of secondary school students.

Male students are better in defining problem, location for required resources and selecting needed information than female students. In presenting and assessing information males are slightly better than female students.

Arts students showed better information skill handling than science students. In all other levels of information skill, selection of appropriate information, logical organization of information, presentation of information and assessment of the collected information arts students dominated on science students.
Arts students considered themselves better in interpreting information than science students. Teaching of information skill can be one answer.

Findings of the study exposed that male students have comparatively better information skill than female students. Males are better in defining information.

Results of the study showed that arts students have better skills in information dealing than science students. Arts students showed their strength on almost all levels of information skill as compared to science students. Arts students are significantly good in recognizing the need of information, better in locating the information from various sources. Arts students are good in understanding ethical and legal issues of information and using that information to upgrade their knowledge base as compared to science students.

There was statistically significant positively strong relationship between levels of information skills and knowledge comprehension of secondary school students. Information skilled students will be able to build powerful information partnership between the subjects/ areas of study.

Findings

Levels of IS and Secondary school students

It can be decided that secondary school students of Punjab province exhibited all six levels of information skill. Results of the analyzed data showed secondary school students are not that good in defining (M=3.48) information or problem given. Students expressed strength in locating (M=3.59) information. They were confident that they can easily locate the required resources and information. They reached at average level on other levels with very minute difference. They stated that they were
average in organizing (M=3.59), presenting (M=3.46) and assessing (M=3.40) information. They felt confused in dealing at these levels of information.

Levels of KC and Secondary school students

Results indicated that students have exhibited all three levels (Literal, M=3.48, Interpretive, M=3.74, and Applied, M=3.85) of knowledge comprehension. Overall they were confident that they can understand the text in better way. They were comfortable when they are required to comprehend the text or information. They can accurately answer the question and queries. Interpretation of text or information was quite challenging for the secondary school students. With guidance and support they can apply information in other than academic situations.

Relationship between IS and KC

Results from analyzed data lead to the conclusion that there was strong but positive relationship between information skill and knowledge comprehension of secondary school students (r=.823). This means students who have strong information skill or who can confidently deal with information have good academic understanding/ knowledge comprehension.

Relationship between levels of information skill and knowledge comprehension

Relationship between all the levels of Information skill with knowledge comprehension was statistically significant on either 0.01 levels (2-tailed) or 0.05 levels (2-tailed). Defining (first level of information skill) has positive but moderate relationship with knowledge comprehension. It means defining has moderately significant contribution in developing academic understanding of secondary school students. All other levels of information skill e.g. locating, selecting, organizing, presenting and assessing information have positive and strong relationship with
knowledge comprehension of secondary school students. This lead towards the conclusion that all these levels significantly contribution in developing academic understanding of secondary school students.

**Gender and levels of Information skill**

Analyzing data set lead to the conclusion that males have good command in information handling as compared to females. Male students are better in defining problem (M=3.52), location for required resources (M=3.69) and selecting needed information (M=3.71) than female students. While in organizing information there is no difference in males and females. In presenting and assessing information males are slightly better than female students.

**Gender and knowledge comprehension**

The result of analysis showed that males have better knowledge comprehension (M=3.63) as compared to females (M=3.20). Males are confident and better in basic understanding. Males considered themselves better in interpreting information (M=3.81) in their own words. It was obvious that males can easily apply information (M=3.91) in different situations other than learned. Overall males showed that they are better in knowledge comprehension than females.

**Levels of Information skill and field of study**

Secondary school students were divided into two groups, science and arts. Arts students showed better information skill handling than science students. Arts students claimed they were good in defining problem (M=3.55), locating the sources (M=3.79) and required information. In all other levels of information skill, selection of appropriate information (M=3.87), logical organization (M=3.78) of information,
presentation of information (M=3.75) and assessment of the collected information (M=3.67) arts students dominated on science students.

Levels of knowledge comprehension and field of study

To find out the Knowledge comprehension of secondary school students due to area of study, which were divided into two groups science and arts, independent sample t-test was applied. Science students were comparatively weak in understanding (M=3.30) the basic idea of given text or content. Arts students considered themselves better in interpreting (M=3.85) information than science students. They also considered themselves better in applying information (M=3.92) in different situations than science students.

Discussion

National curricula of almost all subjects focuses on various competencies to be developed in students up till secondary and higher secondary level. Developing logical reasoning, problem solving, critical thinking, communication skill and scientific attitude are few of them. These attributes are considered as indicators of successful individuals. National Literacy Curriculum (2007), which aims to equip children with the abilities of modern age. It also emphasize on the development of creative and analytical thinking, problem solving, assessment abilities, independent learning attitude and skills. Most specifically it focuses on creating awareness of science, technology, media and ICT. This curriculum intends to prepare students for life through promoting lifelong learning.

Information skills are vital to develop in order to survive in this digital age. These skills starts from realization of one’s information need and continue till the understanding of the information (Mcloughin & Lee, 2010). These skills are key
factor in academic understanding and new knowledge building. Through the development of these skills students can be more aware of their cognitive process and responsible for their learning (Greenhow et al., 2009). National curriculum (2007) focuses on lifelong learning and life skill development. Remolding teaching and learning strategies can help to support and develop following skills. Clearly specifying information skills in learning and teaching strategies and embedding these skills in curriculum can help to improve knowledge comprehension of students (Dunlap & Lowenthal, 2011).

For the purpose question arises what could be an effective way to transform these competencies into students? How these competencies can be learned more efficiently? Teaching of information skill can be one answer. Present study has focused on finding different levels of information skill and its contribution towards the academic understanding of secondary school students. The study tried to find out that are these levels exist in students? If yes, then to what extent they do.

**Levels of Information skill in secondary school students**

Although the overall score of information skill revealed that students fall in category of good information skill. They showed their knowledge about different levels of information skill but they fall at average or below average level. They have not reached more than average level on any of the level of information skill. Lupton (2004) confirmed in his research that information skills development catalyzes higher order thinking, analysis and problem solving. There can be various reasons behind this lack of skill. To be information literate or information skilled digital fluency is important. Digital fluency is the ability to know, understand, construct and communicate information with the relevance of context. Through this study it is
observed that students have familiarity of the digital media and content but they really need guidance for meaningful use. This skill or fluency cannot be learned in isolation. It is important to embed this skill within the curriculum to generate desired outcomes. Student’s levels of information skill are discussed below in detail:

**Defining**

First level of information skill requires students to understand the problem given or topic assigned. Student is able to understand the main theme or need of the information. Students showed average capability to understand the topic. This means most of the students are unable to understand the main theme or idea of the topic or information they are dealing with. Advanced computer skills sometimes do not confirm student’s information search and information retrieval abilities. Along with computer skills students need open web search and digital library search abilities (Thomas 2004, Gui 2007). Students do not feel confident to identify the main concept of the information. One reason of not being able to define the concept could be that they do not consider this a separate area of skill at all. Anxiety can be another reason; they feel anxious when they are asked to define certain piece of information. In our daily observation we feel that even high achievers feel difficulty in discussing any information or topic. According to Adler (1999) technology and media keep on changing. Students must update themselves in order to get along with media and technology. By providing appropriate support in pedagogy and classroom configuration can help in improving learning process.

**Locating**

Overall student’s locating level seems satisfactory. This means they understand the various sources of information. They are able to use library effectively
and use of technology (computer, digital sources etc.). They can differentiate between primary sources of information and secondary sources of information (Baker 2005, Ellis 2003, Detlor & Turnball 2000, Wilson 1999). They can chalk out complete information search plan with some assistance. Students feel confident if they are required to search any information, this conveys an idea that they can use variety of sources like books, videos, magazines, newspapers, maps etc. Students have become skilled, they can easily retrieve and manipulate the information by using technology (Palfrey & Gasser 2008, Tapscott 2009, Ito 2010). Results of the study showed students use multiple sources to fulfill their information need. As it is proven from the researches, students need to be more diverse in locating information. Students tend to have high critical thinking and problem solving who consult books internet and digital sources (Breivik 1992, Whitmire 1998). They can consult books independently if they are given certain topic. Students feel relax while surfing through internet, opening multiple browsers and online information sources. They can easily recognize the steps involved in research process.

Selecting

Results demonstrate that students have fair comment in deciding appropriateness of resource to the topic. They are comfortable in selection of suitable book or online source with reference to their topic. From the multiple preselected sources (book or digital source) they can compare and contrast which one is more appropriate than the other source. This is quite strong sign that students have good idea about how deal with information from multiple sources. Town (2003) has confirmed this in his study that students learn and develop skills while interacting with multiple sources. They are aware of their learning need. Not only they can select
appropriate information but they know important concepts, key words within the text. They can easily choose what idea should come first and what should come next. According to Dewey and Bento (2009), Lucarieello (2012) students with well-developed information skills can identify their information gap (gap between known and new information) and they have capacity to understand the information to bridge up this gap (Kuhlthau 1993, Baker 2005). They are well aware of the sequence of the text. They feel themselves very good in note taking and vigilant in picking up the information relevant to their purpose or requirement.

**Organizing**

Results of the study indicated students were fairly better in organizing information. They recognize the relationships exist within the text. They can create list of required information from selected sources. They can logically associate pieces of information with each other. According to Lambert and Cuper (2008) Information skills develop critical thinking in students. To organize selected information they need to comprehend it. Their study lead towards the conclusion that when student can organize information (which is fourth level of information skills) is more likely to develop better knowledge comprehension (Eisenberg & Berkowitz 1990). For students at this level, Verification can be made easily by illustrating various examples in the given texts. They also express that they have idea of copying or plagiarism of the text and they know how to avoid this behavior. It is easy for them to rewrite the text or information. It is easy for them to discuss about that organized information. Khan’s (2011) research highlighted that comprehension is easy when they reflect (rewrite or organize) the information. On the other hand they feel hesitant when they are asked to discuss any unprepared information. They feel difficult to express any
random opinion on the information other than prepared one. This behavior exhibits they do not have good command on dealing that information in multiple ways. Several studies proved that this can be overcome by arranging workshops, consultations and assigning individual or group projects (Bornstein 2002, Dewey & Lucariello 2012).

**Presenting**

Generally, results of this level discovered students as good in presenting any information in any form (written, oral). They are very well aware of the audience to whom they are supposed to present this information. Those audiences are teachers, fellow students or examiner. They can differentiate between them and they can easily handle their audience. So they confidently select the information best suiting to their purpose and audience (Pappas & Tepe 2002). Here they are able to add any graphical or illustrative data as well in order to support their presentation (Khan 2011). They can prepare or present this information with help of technology (MS word, power point, charts, and paper assignments). It is stress-free for them to logically organize information and display in front of people.

**Assessing**

Results indicated that at this highest level of information skill students feel themselves good in assessing their work. They already have criteria for the purpose, it is easy to judge that they have met the target or not. They are also open for feedback from the peers and teachers as Keats and Schmidt (2007) has confirmed. According to them information skilled students give respect and regard to their suggestions. They consider it as a positive element in learning. For them it is important to evaluate your work to improve. It is easy for them to check the credibility of collected information
by developing a checklist (MacDonald & Darrow 2003). It helps them to ensure either they have met the standard / requirements or needed to do more. It includes both personal reflection and constructive feedback from the others including teachers, experts and peers. This process proved as key factor for teaching and learning (Greenhow et al 2009, McLoughlin & Lee, 2010).

**Knowledge comprehension and secondary school students**

Students mostly have their own concept of what they wanted to understand, however, it is not strong in the start. To develop an understanding, students need to have the intention to understand. That is obvious but its importance was not accepted in educational research until Marton and his contemporaries presented the concept of deep and surface approaches to learning (Marton & Booth, 1997). The approach depends on a purpose, either to seek the deep, primary meaning, or to depend on surface aspects and avoid personal involvement in the learning. These different intentions inevitably lead to contrasting learning processes.

Present study tried to find about students ways of understanding the text and ideas. Its levels are discussed below in detail:

**Literal**

Students expressed that they have very good command at this basic level of understanding. At this level student said they can understand the main idea of the text or content given. They can easily memorize the facts and information provided. It is not difficult for them if they are asked to reproduce the memorized ideas and information (Cain & Oakhill 1999, Nation et al 2005). They find it easy if they have to learn information from the provided text. Separate key terms and isolated pieces of
information are also easy to understand. This refers to the basic structure of mind; students do understand information in multiple formats. Who feel strong in this level are only can understand the whole text.

Connected paragraphs with similar patterns are easy to understand for these learners. This refers these students are good in remembering certain information. They can remember and memorize things easily with keeping purpose in mind (Lewis & Williams 1994).

**Interpretive**

Result of this level revealed that students feel they are not good in interpreting information. It is not that difficult for them to describe the text in their own words. They need different type of cognitive structure to perform this type of task. At this level they are able to develop new conceptual structure of ideas (Boud & Walker 1992). They feel less confident to interconnect the ideas in a way which is different than they have already read. To restructure and to reframe memorized facts knowledge need effort and a very clear picture of concepts and ideas. They needed to use multiple experiences (Dean 1993). In this area students feel little under pressure. One reason could be that they are not trained in this regard or lack of opportunities to express themselves other than reproduction of content.

**Applied**

It is obvious from the drawn results that students are below average when it comes the phase of application of the knowledge. Students are rarely in the position to apply knowledge from one situation to other. They feel it hard to isolate meanings, ideas and use them to form a new whole. This refers to problem solving competency
of students. This is unfortunately little weak in our secondary school students. They lack in abilities to thinking in various direction at a time in order to solve the problem. In other words this can be said that knowledge learned in one situation is difficult for these students to use in other less similar situation. So they do not feel easy to create a new idea by using multiple different ideas. It becomes easy when they are provided with certain steps or stages to follow for the application of ideas or learning (Burnard 1989, Boud & Walker 1992).

**Gender and student’s Levels of Information skill**

Findings of the study exposed that male students have comparatively better information skill than female students. Males are better in defining information. They are good in dealing with important themes and main purpose of the given topic or text. Female students have accepted they are not that good like males in searching information using multiple resources and sources, for example: library books, magazines, online resources. Males consider themselves as good in collecting information as per need and purpose. They can logically arrange information understanding the issue of copying and plagiarism. They rate themselves as very keen in sequencing information as females.

As far as organization and presentation are concerned there is no difference in males and females. Both are equal on average in this area of skill. Both are aware of the use of media, selecting information and building relationship between the information. They both understand the ethics to use information and are aware of communicating that information in a healthy way. They can admire others work by using it in ethical manner. They are cognizant to communicate accurate information in a presentable manner in order to create new knowledge or understanding. Both are
good in inculcating multiple types of media into the information to make it more convincing. When it comes to assessing information males are again at lead on females. Males have better idea about making judgments against a purpose. They have more open behavior for feedback than females. Males are good in reflecting and checking on the achievement or resources to analyze the credibility. Males are good in re-considering resources and materials to make best out of it. Females have weak temperament towards reflections and judgments. Males rate themselves superior in managing content and data than females. It is difficult for the females to track down changes in documents and information. Bigger reason for this difference could be that females are less interactive with media and resources than males. Other reason, which could be a factor in this difference between female and male attitude towards information, is lack opportunities and socialization. Males are more socialized and informed as compared to females. Giving targets and making them compulsory can help to improve in this situation and minimize this difference (Khan 2011, Greenhow et al. 2009).

**Gender and student’s Knowledge comprehension**

It is obvious from the findings that males have comparatively better understanding capacity than females. Mostly female students feel difficult to understand the text. They hardly keep the facts and knowledge in their memories for a long time period. Males are better in understanding knowledge and recalling that knowledge when needed. Though there are significant differences between male students and female students in the particular processes involved in developing academic understanding.
The way both groups build their understanding and collect or recall the information and use of that information in various similar or different situations is considerably different. They build meanings and relationships of the similar text in different way from each other. This phenomenon is concluded by many researches (e.g. Reed 2004, Perera 2011). They way females synthesize the idea and information is not better than males. Males are more efficient in applying their learned knowledge in different situations. Male students are more self-organized in their ideas and transforming them into different forms than female students.

**Area of study and levels of Information skill**

According to Hall (2009), “Online learning resources offer opportunities for the learners to “personalize their online existence, and to develop their own critical identities through their control of a range of tools”. Results of the study showed that arts students have better skills in information dealing than science students. Arts students showed their strength on almost all levels of information skill as compared to science students. Students having arts as area of study has expressed that they are more self-directed learning and have better control on their learning.

They have claimed to be better in understanding of ideas and purpose of the information than science students. Arts students are significantly good in recognizing the need of information, better in locating the information from various sources. They can judge the information according to the purpose. When individuals are actively interacting with environment it becomes easy to deal with information or to solve problem (Stahl 2000). According to the findings of the present study arts students are also good in sequencing information in a logical way. They are better in presenting information as per requirement. Arts students are good in understanding ethical and legal issues of information and using that information to upgrade their knowledge.
base as compared to science students. Interest and involvement in technology could be one reason of this difference. Arts students, especially students with computer science as their subjects, usually get assignment and task relevant to technology, which make them more aware in this regard.

**Knowledge comprehension and area of study**

Overall findings indicate that arts students have better academic understanding than science students. Arts students are good in reading and grasping the main idea of the text as compared to science students. Science students feel comfortable when it is just to memorize the factual information or knowledge. Usage of knowledge in different situations and problem solving is easy for arts students. Having new and multiple tasks can be one reason of this difference. Knowledge comprehension is catalyzed through multiple and changed experiences as proved by Kolb and Kolb (2005).

Reed (2004) concluded in his study that critical and logical thinking involves the application of one’s own knowledge base. It includes creating new combination on the basis of previously learned concepts. In this regards arts students are in lead to science students. Arts students are more comfortable playing with ideas while science students concentrate more on understanding the content or text. Arts students deal with various subjects, for example literature, psychology, civics etc, which include critical analysis and comparisons. So they are more in practice of using information as compared to science students. Many researches has concluded that this idea lead the students towards knowledge comprehension and higher probability that learner will be more independent in understanding concepts (e.g. Graham & Bellert 2004, Williamson & Nelson 2005).
Relationship between levels of Information skills and knowledge comprehension

There is statistically significant positively strong relationship between levels of information skills and knowledge comprehension of secondary school students. This means students with possess good information skills will automatically build good understanding of their academic subjects, as concluded by Duke & Pearson (2002). They are in better position to not only understand the academic information but can apply this information in their daily life as well. Information skilled individual will be in better position to understand gap in knowledge and need for research, this is confirmed by the Results of Dewey and Bento (2009) and Lucariello’s (2012) research. He/she will be capable of judgment that how much this content is accurate, valid and comprehensive. Greenhow et al. (2009) and McLoughlin and Lee (2010) concluded that independent opportunities for learning, interactive environment can be a supportive factor to strengthen information skills and enhance knowledge comprehension. The results of present study also indicate that students with good information skills are those competent learners which are targeted in every subject’s national curriculum. If they have good developed skills then they would be in a position to understand about understanding, how it can be build? Where else we can use it?

According to Dunlap and Lowenthal (2011) information skills can creat metacognitive awareness among students. The study concludes that information skilled students will be able to build powerful information partnership between the subjects/ areas of study. These skills indicate individual’s behavior in digital environment, this can be observed and measured through aptitude and standardized
tests. Such skills focus on learner’s cognitive structure development. Information skilled individual has a balance between his/her mind, expression and motor activity. According to Buckingham’s (2003) information skill requires an interrelationship between four factors:

1. Representations
2. Language
3. Production
4. Audiences

According to him these factors provide thinking pattern which enable the students to frame a cognitive structure and in both academic and everyday situations. In the era of extraordinary opportunities for digital market interactions, social and political endeavors, lifelong learning and collaboration, the digitally literate individual must be an active and ever-observant participant, constantly evaluating those opportunities for their benefits and their disadvantages.

**Recommendations**

- Lifelong learning is a burning issue now a day. Study programs are being redesigned and implemented to achieve the target. Information skill is the missing element in this planning and implementation. By incorporating information skills in our national curriculum will help to achieve our described targets more effectively.

- A major shift in our teaching learning process is required. Shifting our focus from teaching to learning by embedding or as a separate component information skills in national curriculum will be helpful. This would give opportunities to students to exercise their potentials across the subjects.
• Information skills are considered as century skill. Most of the world has integrated it as compulsory field of learning along with other subjects. This step should also made compulsory not only at school level but at higher education as well.

• Online interactive learning system (e.g. moodle is popular system now a days) can be introduced in schools, which can help to develop information skills and knowledge comprehension.

• Special in-service training programs should be arranged to teach teachers how to develop information skills and better academic understanding among students in order to improve learning.

• In pre-service programs information skill can be made compulsory as a part of curriculum in order to prepare better teachers for better future.

**Recommendations for future researches**

• Present study was limited. It has only focused on quantitative aspect. It could be mix method study to get better insight into the problem.

• The study has just looked into the student’s experiences while experts, teacher’s understandings/opinion and observations can provide broader picture of the problem under study.

• A comparative analysis can be conducted by involving private sector along with public sector.

• It may be helpful to conduct experimental study to get more precise results which could help in better planning.