

HANDOUTS for LECTURES

LIS 665 Teaching Information Technology Literacy

Fall 2011

Dr. Diane Nahl

Modern Learning Theories	2
Gagne's Nine Learning Events	4
Instructional Design Model	5
Needs Assessment Worksheet	6
User-Based Bibliographic/Information Literacy Instructional Design	8
Writing Integrated Learning Outcomes & Information Searching Competence Taxonomy	9
Integrated ACS Outcomes	10
Identify Learning Domains	11
Model Integrated ACS Outcomes	12
Composing Integrated ACS Outcomes	13
Affective Outcomes	15
Action Verbs for Writing Learning Outcomes	16
Active Learning Principles	18
Active Learning Model	19
Active Learning Exercise: Question Analysis Chart	20
Task Analysis Technique	21
Information Problem Solving Model	22
Information Management Taxonomy	23
Nine Search Statement Error Types	24
Error Prevention Techniques	25

MODERN LEARNING THEORIES

Each approach to gaining the attention of learners to engage their understanding and provide useful experiences has strengths and limitations. Motivation is key to sparking an interest and desire to learn, and each approach treats this driving force.

Behavioral Theories	Cognitive Theories
Based on reinforcing appropriate behavior and introducing new material built on what students have learned.	Based on thinking and reasoning skills for learning complex ideas.
Learning is defined as a change in behavior.	Learning is defined as the process of gaining or changing insights, outlooks, perspectives or thought patterns.
External environment influences learning.	The <i>needs, interests, values and feelings</i> of learners influence their learning.
Learning occurs in small steps reinforced by small successes.	Students learn through discovery.
Know whether students have learned by observing changes in their behavior.	Internalization of knowledge and <i>attitudes</i> must be inferred from observed behavior. There is more to learning than observed behavior.
The instructor designs the learning environment.	The instructor manages and facilitates the instruction.
Learners are passive and respond to stimuli.	Learners actively process, store and retrieve information for their own use.
Used mostly for sensorimotor skills or limited precise outcomes.	Used mostly for cognitive and <i>affective</i> domain outcomes. Learners comprehend by stating in own words and applying.

MODERN LEARNING THEORIES

Constructivist Theories	Humanist Theories
Based on the idea that learners create their own unique education because learning is based on prior knowledge and pursuit of <i>intrinsic</i> goals	Based on the idea that each person is unique and has important perspectives, <i>feelings, values and concerns</i> that need to be addressed
Learning is defined as interactive, dialogic and reflective	Learning is defined as personal and is <i>intrinsically</i> driven
Social context influences learning and is important because learning is social (What situation is the learner in? What does the learner need to be able to do? What is the learner's purpose?)	Social context dictates members' learning practices (What is important to this person? What does this person value?)
Active learning is necessary, include a variety of learning strategies	Freedom of choice is necessary to allow learners to serve personal goals
Collaborative learning is valuable	Collaborative learning must be egalitarian
Emphasis on concepts vs. procedures, concept analysis	Emphasis on individual perspective, sense of mastery and self-satisfaction
Mental models, analogies, metaphors (flow of information, research process, Boolean logic, databases, the Web, the Internet, computers, etc.)	Meaningful activities and material with high relevance
Demos, examples (good and bad that need fixing) and samples for worksheet exercises, writing search strategies and getting feedback, verbalizing search strategies aloud	Personally engaging methods are necessary to foster learning, e.g., journaling, service learning, collaborative learning, active learning, interning, field exercises
Instructor mentors peer interaction and continuity of building on known concepts	Instructor facilitates interaction with material and/or group members

Gagne's Nine Events of Instruction

1. Gaining attention

Motivate students, giving them reason to pay attention
Tell students why it is important to learn this material
Relate it to other courses, their future work or career, and personal life

2. Informing learners of objectives/outcomes

Let students know what is expected of them
Assists in lesson design, test and evaluation items

3. Stimulating recall of prerequisite learned capabilities

Relate new information to previously learned information
Help students make connections to concepts learned elsewhere
Helps instructor evaluate whether students have assumed knowledge

4. Presenting stimulus material

Presentation of content through selected methods and techniques
Use a variety of material: readings, assignments, exercises, discussions, etc.

5. Providing learning guidance

Assist students in moving knowledge from short-term to long-term memory
Involve students in thinking, talking and working with material in a variety of ways

6. Eliciting performance

Provide practice activities
Help students apply theory to actual practice

7. Providing feedback

Let student know how well they do on exercises
Describe what needs to improve and why

8. Assessing performance

Evaluate student learning using formative and summative methods

9. Enhancing retention and transfer

Provide opportunities to apply knowledge in a variety of situations
Provide several opportunities for repetitions of processes
Require application of accumulated knowledge

Gagne, R.M. 1977. The conditions of learning, 3rd ed. New York: Holt, Reinhart & Winston.

Six Phases of Instructional Design

1: RECOGNIZE THE LEARNER'S NEED

- What do you expect students to be able to *feel* and know/think/*understand* and *do*?
- What do you want learners to get out of this instruction?

2: ANALYZE THE PRESENT SITUATION-- Needs Assessment

- What do students currently *feel* and know/think/*understand* and *do*?

3: DEVELOP INSTRUCTIONAL GOALS

- What should I teach?
- What will they do?

4: IMPLEMENT INSTRUCTIONAL PLAN

- How should I teach?
- How will we know they are learning?

5: ASSESS THE OUTCOMES

- To what degree did students attain the learning goals?
- Was their learning successful?

6: REVIEW ASSESSMENT DATA & REVISE AS APPROPRIATE

- Was my teaching successful?
- What can be changed to improve results in the future?

Grassian, Esther S. & Joan R. Kaplowitz. 2009. Planning for Information Literacy Instruction. Ch. 7 in *Information Literacy Instruction: Theory and Practice*, 2nd Ed. New York: Neal-Schuman: 111-127 (124-5).

Needs Assessment Worksheet

1. Gather information directly from learners

Who are the learners?

What is their experience so far? What do they already know that is related to this instruction and which of these is the most important?

What difficulties are the learners experiencing? What is the problem that might be solved through instruction?

What do they need to be able to do?

2. Conduct a performance analysis

Are deficiencies due to need for different:

knowledge

skills

attitudes

signage, handouts, or other aids

other:

3. Identify discrepancies

Identify "the gap" between where they are and where they need to be

Identify "what is" i.e., the reality of where they are

Identify "what should be" in ideal terms

4. Identify resources and constraints on those resources

What resources are available?

What constraints exist?

5. Identify priorities and goals.

What will the successful learner:

Do (sensorimotor skills)

Think (cognitive skills)

Feel (affective skills)

6. Write overall instructional goal statement

Your instructional goal statement must include:

- a. the target group
- b. the cause of the problem
- c. the kind of problem (need new skills, knowledge, attitude, etc.)
- d. statement of what will be different when the goal is achieved

User-Based Bibliographic/Information Literacy Instructional Design

Keyed to Instructional Design Stages

- 1: Obtain structured self-reports from student users (recognize and analyze need--needs assessment)
- 2: Extract learning outcomes using content analysis (needs assessment)
- 3: Classify user outcomes in the BI taxonomy of skills (needs assessment)
- 4: Expand outcomes into ACS units (develop goals)
- 5: Create performance exercises and test items for ACS objectives (develop goals)
- 6: Pre-test students to determine skill level (needs assessment baseline data)
- 7: Administer instruction and exercises (implement instructional plan)
- 8: Post-test students to determine change in skill level (assess outcomes)
- 9: Obtain new self-reports to identify new needs (assess outcomes, needs assessment)

Writing Integrated Learning Outcomes [formerly behavioral objectives]

Each integrated objective must include **SAOAC** and **ACS** and **ACRL**:

- a) **Situation** (What activity will stimulate students to perform what I intend to teach?)
- b) **Ability** [verb] (What skills do learners use while performing this activity?)
- c) **Object** (What is the outcome of the learners' performance?)
- d) **Action** (How will learners accomplish the task?)
- e) **Constraints** (Are special tools needed? What criteria will be used to define success or level of proficiency? What minimum value should be obtained?)

SAOAC Example: Given a list of information sources (**Situation**), learners will classify (**Ability**) (**Cognitive**) the list (**Object**) (product) by identifying primary and secondary sources (**Action**) (**Sensorimotor**) with ninety percent accuracy (**Constraint or Target**).

Litzinger, Mary Ellen. Instructional Design. Chapter Two in *Sourcebook for Bibliographic Instruction*. Chicago: Bibliographic Instruction Section, Association of College and Research Libraries, ALA, 1993, 17-27, p.22.

ACS Taxonomy of Learning Outcomes for Information Searching Competence

Skill Level	Affective Domain	Cognitive Domain	Sensorimotor Domain
Level 3 Advanced	A3 Feeling Empowered as a Searcher	C3 Acquiring Familiarity and Intuition with Disciplinary Knowledge	S3 Practicing Careful Documentation Routines
Level 2 Intermediate	A2 Being Supportive of the System Environment	C2 Understanding Search Strategy	S2 Identifying Implicit Features of the Information Setting
Level 1 Basic	A1 Showing Acceptance of Information Structure	C1 Decoding Information Displays and Terminology	S1 Recognizing Information Elements and Locations

Leon A. Jakobovits and Diane Nahl-Jakobovits. Measuring Information Searching Competence. *College & Research Libraries* 51 (5) (September 1990): 448-462.

Integrated ACS Outcomes

AFFECTIVE [values, feelings]	COGNITIVE [thinking, deciding]	SENSORIMOTOR [actions, moves]
Students value knowing about hierarchical relationships among subject terms.	Students define correctly cross reference designations, including, Narrower, Broader, Use For, Use, and Related terms.	Students trace paths successfully through cross reference structure.
Students strive for accuracy in typing search statements.	Students know how to correct syntax input errors.	Students type search statements accurately.
Students feel in control when using command language.	Students predict correctly the consequences of a given command.	Students read keyboard template to select correct function key.
Students show persistence in locating materials, without giving up too soon.	Students know the procedures to follow when material is not in its call number location on the shelf.	Students check surrounding shelves and sorting shelves before going to the Circulation Desk.
In using databases, students are concerned with the time period covered in the source.	Students interpret dates of coverage given on title screens, correctly placing the date wanted within the dates listed.	Students consistently look for dates of coverage on title screens of databases.
Students show willingness to take initiative in translating into their own words the content of databases.	Given explanations of the content of various databases, students will connect their topics to the appropriate database.	Students click on the correct database in the title list.

Identify the learning domain (ACS) and level (1-3) for each objective:

The user will be able to:

- 1] Explain the appropriate use of different types of periodical literature.
- 2] Make positive statements about expectations for the success of library research projects.
- 3] Match characteristics of types of periodical literature.
- 4] Define terminology related to database searching.
- 5] Be willing to learn the distinguishing characteristics of different types of sources.
- 6] Identify characteristics of types of periodical literature.
- 7] Demonstrate confidence in using various types of print and online information sources.
- 8] Identify information elements within citations.
- 9] Recognize the usefulness of bibliographic control for periodical information.
- 10] Appreciate the opportunity to experiment with new search tools.
- 11] Use controlled vocabularies to construct search statements.
- 12] Show enthusiasm when given library research assignments.
- 13] Accept a librarian's suggestion about appropriate sources.
- 14] Evaluate a source of information using established analytic criteria.

Model Integrated ACS Outcomes

INSTRUCTIONAL GOAL

Students will compose accurate bibliographic citations for term paper assignments.

PERFORMANCE INDICATOR

1. Students will distinguish between essential and non-essential elements in formatting bibliographic citations. ([ACRL 2.5.c,d](#))

OUTCOMES

1.S Sensorimotor Outcome

Given an entry from a periodical database, the learner will compose a complete and correct bibliographic citation.

- a. abbreviations are acceptable
- b. any standard bibliographic style may be used
- c. partial credit will be given if one component is incorrect (essential components include: ...)
- d with ninety percent accuracy.

1.C Cognitive Outcome

Given an entry from a periodical database, the learner will extract only the essential components to compose a bibliographic citation.

1.A Affective Enabling Outcome

Given a rating instrument, learners will demonstrate that they value using correct reference style.

Composing Integrated ACS Outcomes

Write an Instructional Goal that encompasses these ACS outcomes. Then write the SAOAC elements to complete the integrated outcomes.

INSTRUCTIONAL GOAL

STUDENTS:

ACRL Standard Three

The information literate student evaluates information and its sources critically and incorporates selected information into his or her knowledge base and value system.

ACRL PERFORMANCE INDICATOR 2:

The information literate student articulates and applies initial criteria for evaluating both the information and its sources.

Students apply evaluation criteria to retrieved citations to determine which items to print or save.

AFFECTIVE OUTCOME:

Students are willing to select only relevant and authoritative items to print or save.

COGNITIVE OUTCOME:

Students are able to assess the relevance and credibility of each item retrieved.

SENSORIMOTOR OUTCOME:

Students are able to mark items to be printed or saved.

Composing Integrated ACS Outcomes

Complete the missing elements to create integrated outcomes.

A. INSTRUCTIONAL GOAL

STUDENTS:

STANDARD:

PERFORMANCE INDICATOR:

AFFECTIVE OUTCOME:

Students will value knowing about hierarchical relationships among subject terms.

COGNITIVE OUTCOME:

Students will define correctly syndetic structure codes.

SENSORIMOTOR OUTCOME:

Students will trace paths successfully through syndetic structure.

B. INSTRUCTIONAL GOAL

STUDENTS:

STANDARD:

PERFORMANCE INDICATOR:

AFFECTIVE OUTCOME:

Students feel in control when searching with field codes.

COGNITIVE OUTCOME:

Students correctly predict the consequences of using a given field code.

SENSORIMOTOR OUTCOME:

Students read dialog box to select correct field code.

Affective Outcomes:
Affective Target Behaviors That Enable
Cognitive and Sensorimotor Outcomes

Involve learners in:

- 1) Maintaining a positive attitude and disposition.
- 2) Being in a positive state of mind and mood.
- 3) Being willing to comply with instructions.
- 4) Trusting the established process and procedures.
- 5) Resolving to overcome felt resistance.
- 6) Defeating rigid presuppositions.
- 7) Being interested in the instructor's intention and purpose.
- 8) Valuing being accurate, paying attention to detail and order, double-checking.
- 9) Developing the motivation to learn.
- 10) Being willing to cultivate new motives and thought processes.
- 11) Facing challenges with determination and self-discipline.
- 12) Wanting to develop proficiency, mastery.
- 13) Striving to be up to date, au courant, keeping up, staying ahead, staying out front, in the know, up on things.
- 14) Maintaining perseverance and persistence.
- 15) Monitoring expectations, assumptions, and imaginings.
- 16) Restoring composure after regression (shame, frustration, anger, regret, resentment, compulsive thoughts of self-deprecation, negative self-talk, etc.)
- 17) Resuming progress after lapses in coordination, logic, or rationality.
- 18) Overcoming intimidation, fear, and technophobia.
- 19) Appreciating the benefits, advantages, and uses of resources.

Action Verbs for Creating Measurable Learning Outcomes

AFFECTIVE VERBS

Accepts
 Acclaims
 Advocates
 Alert to
 Agrees with
 Appreciates the importance of
 Appreciates the value of
 Approves
 Assumes responsibility for
 Attempts
 Attentive to
 Attracted to
 Avoids
 Calm
 Careful
 Challenges
 Chooses to
 Confidence in
 Continues to
 Cooperates
 Copes with
 Courteous
 Defends
 Develops positive relationship to
 Devoted to
 Disagrees
 Disputes
 Encourages
 Engages in
 Explores a new perspective
 Feels comfortable with
 Feels confident
 Feels free to
 Finds pleasure in
 Follows along
 Friendly tone
 Helps out of concern for
 Identifies with
 Joins in
 Listens to
 Obeys
 Optimistic about
 Participates enthusiastically
 Participates in
 Patience

Perceives
 Perseveres
 Persists
 Picks
 Praises
 Receptive to
 Resists
 Satisfied
 Selects
 Self-corrects
 Expresses sense of accomplishment
 Sense of direction
 Sensitive to
 Shares out of interest
 Shows preference for
 Shows tolerance of
 Shows curiosity
 Shows enthusiasm
 Supports
 Takes initiative
 Values
 Voluntarily engages in
 Volunteers
 Wants to
 Willing to answer
 Willing to engage in
 Willing to respond to

COGNITIVE VERBS

Analyzes
 Assesses
 Changes
 Classifies
 Compares
 Defines
 Describes
 Designs
 Develops
 Diagnoses
 Differentiates
 Discriminates
 Distinguishes
 Estimates
 Evaluates
 Explains
 Formulates

Integrates
Judges
Organizes
Plans
Qualifies
Rates
Ranks
Recalls
Reviews
Revises
Solves
Sorts
Surveys
Verifies

SENSORIMOTOR VERBS

Accumulates
Activates
Adds
Adjusts
Advises
Aids
Aligns
Amends
Applies
Arranges
Assembles
Assigns
Builds
Checks
Cites
Collects
Completes
Conducts
Constructs
Controls
Coordinates
Copies
Corrects
Counts

Creates
Demonstrates
Diagrams
Documents
Encodes
Enters
Extracts
Gathers
Gives
Groups
Guides
Helps
Identifies
Informs
Initiates
Inspects
Installs
Instructs
Lists
Locates
Logs
Matches
Measures
Modifies
Monitors
Names
Observes
Opens
Operates
Presses
Recognizes
Records
Scans
Scores
Sequences
States
Traces
Troubleshoots
Types

Active Learning Principles

- Let users perform steps themselves.
- Let learners work together to plan and execute steps
- Guide users orally, with brief written instructions on screen, or concise handouts
- Follow-up on their progress intermittently
- Avoid touching user's keyboard and mouse
- Point to screen areas to orient a user's focus
- Create opportunities for small successes by chunking instructional content
- Reassure learners by validating their small steps
- Model positive self-regulatory sentences
- Allow users to overhear you helping someone else
- Design the information retrieval environment to emphasize what you want users to value

Active Learning Model

Discovery Learning

Instructional Design:

1. Preliminary hands-on practice
2. Explanation and discussion
3. Follow-up hands-on practice

Learner's Process: Do//Listen, Observe, & Discuss//Do Again

1: Uninformed Practice:

Assign preliminary exploration of a source/tool.

2: Active Listening:

Explain the formal aspects of a tool or process.

Invite discussion.

Ask questions.

Get responses.

3: Informed Practice:

Follow-up with more hands-on.

Active Learning Exercise: Question Analysis Chart

GEOGRAPHY	TIME SPAN	TARGET/ INTEREST GROUPS	IMPLICATIONS	DISCIPLINES
NATIONAL	HISTORICAL OVERVIEW	WOMEN	HEALTH	SOCIOLOGY
INTERNATIONAL	CURRENT YEAR	LABOR	ECONOMIC	PSYCHOLOGY
REGIONAL	SPECIFIC EVENT	CHILDREN	POLITICAL	ENVIRONMENTAL STUDIES
LOCAL	DECADE	TEACHERS	SOCIAL	AMERICAN HISTORY
SPECIFIC PLACE	CENTURY	POLITICIANS	PSYCHOLOGICAL	LITERATURE
etc.	etc.	etc.	etc.	etc.

- 1: Using the research topic for this course, analyze your question by charting all of the possibilities that apply to your topic. Be specific, e.g., U.S. instead of national).
- 2: Reformulate your research problem into a concise question.
- 3: Select one element from each column and create a research question using all five of the elements.

Cerise Oberman *Research Strategies* (Winter 1983):22-30.

Task Analysis Technique

- 1] What is the problem?
- 2] What general skills are necessary?
- 3] What specific skills are necessary for each general skill?
- 4] What attitudes, behaviors, actions or knowledge is necessary to accomplish each specific skill?

1] **PROBLEM: Teach Students How to Avoid Plagiarism**

2], 3] & 4] GENERAL, SPECIFIC and AFFECTIVE SKILLS			
Ethical Reasoning Skills	Information Research Skills	Documentation Skills	Writing Skills
Valuing other's written work.	How to find out what others have said on a subject.	How to document the bibliographic elements and the location of information in sources.	How to quote relevant passages and cite references in text.
	How to search the online catalog.	How to use a style manual to construct complete citations.	How to use a style manual to format citations in text, and bibliography or notes.
	How to select and search relevant databases and indexes.	How to take accurate and complete bibliographic notes on sources.	How to clearly state one's own ideas as distinct from the ideas in the cited references, i.e., distinguish the ideas and reports of others from those of the student.
	How to select and search relevant Web sites.	How to evaluate the reliability of retrieved information.	How to comment on, synthesize, and organize retrieved information in the text.

**Summary of Kuhlthau's Six-Stage Model
of the Information Search Process**

ISP STAGES	ISP TASKS	AFFECTIVE Feelings	COGNITIVE Decisions	SENSORIMOTOR Actions
1. Initiation	Recognize need	Uncertainty	General Vague	Seeking background information
2. Selection	Identify	Optimism	Scheduling Planning	Conference with others
3. Exploration	Investigate	Confusion/ Frustration	Becoming informed about a topic	Seeking relevant information
4. Formulation	Formulate	Clarity	Narrowed focus	Selecting ideas
5. Collection	Gather	Sense of direction & confidence	Defining & supporting focus	Making notes of relevant information
6. Presentation	Complete	Relief Satisfaction or Disappointment	Clearer More focused	Personalized synthesis of topic

Kuhlthau, Carol Collier. *Seeking Meaning: A Process Approach to Library & Information Services*. Norwood, New Jersey: Ablex, 1992; 2nd Edition 2004.

Information Management Taxonomy of Solutions for Users' Affective Symptoms

Affective Function	Users' Affective Symptoms	Information Management Solutions
<p style="text-align: center;">3</p> <p style="text-align: center;">REASSURING</p> <p style="text-align: center;">CONSOLING</p> <p style="text-align: center;">(to promote acceptance and support)</p>	<p style="text-align: center;">Feeling enthusiasm vs. displeasure</p> <p style="text-align: center;">Feeling empowered vs. helpless</p> <p style="text-align: center;">Accepting vs. rejecting</p>	<p style="text-align: center;">Affirming to users the eventual outcome as being successful</p> <p style="text-align: center;">Affirming the principle that "users are never at fault"</p> <p style="text-align: center;">Presenting lifelong information literacy as an attainable goal</p>
<p style="text-align: center;">2</p> <p style="text-align: center;">ADVISING</p> <p style="text-align: center;">COACHING</p> <p style="text-align: center;">(to strengthen information intentionality)</p>	<p style="text-align: center;">Experiencing fun vs. tedium</p> <p style="text-align: center;">Feeling confident vs. anxious</p> <p style="text-align: center;">Experiencing clarity vs. confusion</p>	<p style="text-align: center;">Sharing convenient tips & information with users</p> <p style="text-align: center;">Giving feedback (what will happen if...)</p> <p style="text-align: center;">Identifying something on a diagram or analyzing an example</p>
<p style="text-align: center;">1</p> <p style="text-align: center;">ORIENTING</p> <p style="text-align: center;">ENCOURAGING</p> <p style="text-align: center;">(to overcome resistance to information seeking)</p>	<p style="text-align: center;">Being patient vs. impatient</p> <p style="text-align: center;">Feeling guided vs. lost</p> <p style="text-align: center;">Being thankful vs. complaining</p> <p style="text-align: center;">Being realistic vs. disappointed</p> <p style="text-align: center;">Feeling being taken care of vs. being uncared for</p>	<p style="text-align: center;">Telling users how long things take (secs., mins.)</p> <p style="text-align: center;">Telling users about common errors from generational lists</p> <p style="text-align: center;">Showing concern for users' technical difficulty</p> <p style="text-align: center;">Being told what is reasonable to expect</p> <p style="text-align: center;">Being told where something needed can be found</p>

Nine Search Statement Error Types

Error Type	Example
1. Making a Boolean inversion	dolphins <u>OR</u> migrate dreams <u>AND</u> daydreams
2. Not using Boolean operators	dolphins migrate [<u>AND is missing</u>] dreams daydreams [<u>OR is missing</u>]
3. Using common natural language	airplanes <u>AND pollution of air</u> <u>dolphins migrate to different places to find more food</u>
4. Omitting concepts	dolphins [<u>migrate is missing</u>] dreams [<u>sleep is missing</u>]
5. Adding unnecessary concepts	white tigers <u>AND world</u> air <u>OR habitat</u>
6. Using inappropriate alternate terms	dolphins <u>OR whales</u> daydreams <u>OR wondering</u>
7. Neglecting word form variations	dolphins <u>OR migrate</u> white tigers <u>AND extinction</u>
8. Misspelling or inappropriate syntax	dolphins <u>OR porpises</u> <u>AND migration</u> dreams <u>AND daydreams:</u>
9. Using "funny" Boolean logic	(dreams <u>OR daydreams</u>) <u>AND (daydreams OR dreams)</u>

Error Prevention Techniques

- Show users typical errors
- Show consequences of typical errors, let them test what happens with and without Boolean operator
- Show how to solve the problem when an error occurs
- Prepare error awareness materials and use in instruction
- Demonstrate error correction steps at the workstation
- Have students discuss errors and strategies for avoiding and correcting them
- Arrange the environment so you can better monitor progress
- Create user-tested labels, signs, prompts, help screens, error messages, online tutorials, handouts, etc.