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Assessment and qualification system

COGNITIVE SKILLS

Sources: Taxonomy of Learning Domains. Benjamin Bloom, Ed.D., University of Chicago (USA). Convention of the American Psychological Association meeting in Boston (USA) in 1948.
Bloom, B.S. (Ed.) (1956) Taxonomy of Educational objectives: The classification of Educational Goals: Handbook I, cognitive domain. New York, Toronto: Longmans, Green

Introduction

Educating students to fit into a future of constant change, is to educate them to think and ask good questions, to adapt and to generate and select. At the end of a learning process, students must have acquired new skills and knowledge.
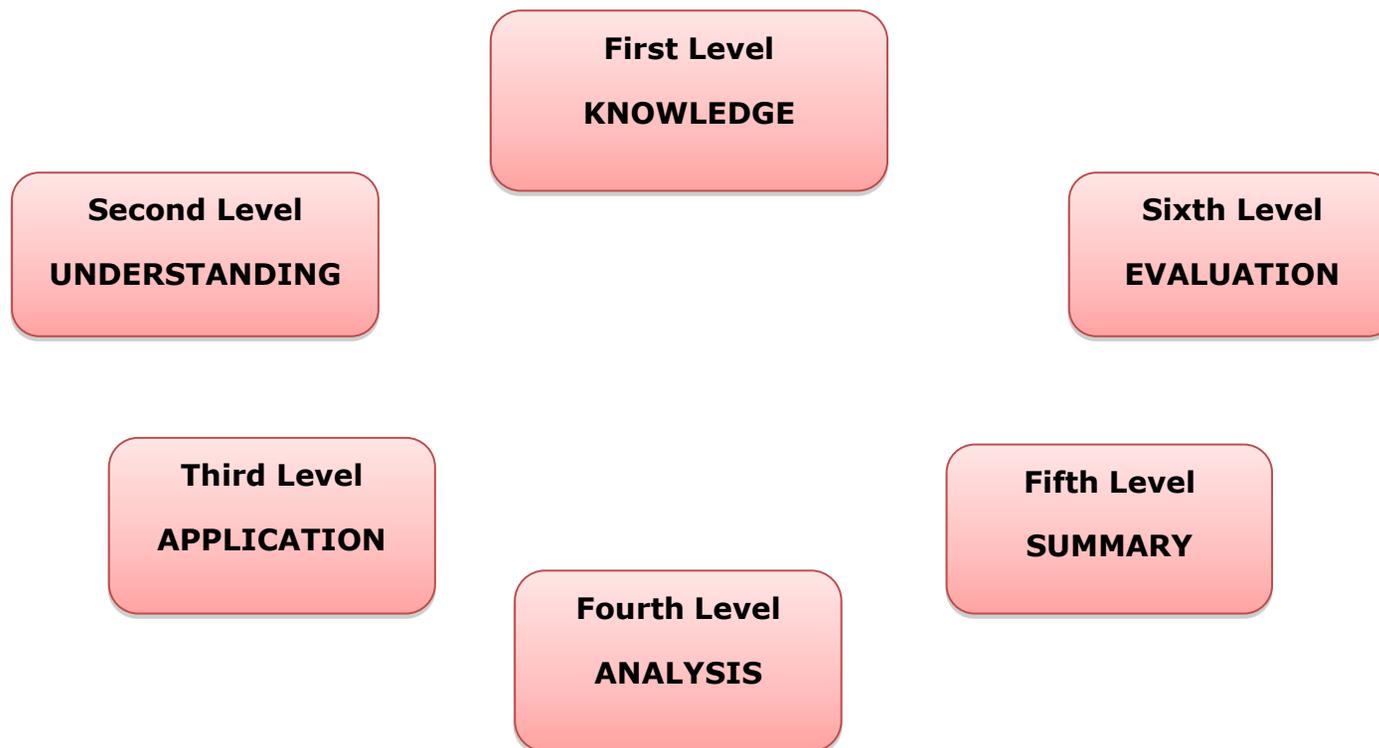
Develop Learning Objectives clearly and unequivocally established, it is the first step to properly select other components of this process of education, such as content, practices, methods, and especially ways of assessing students.
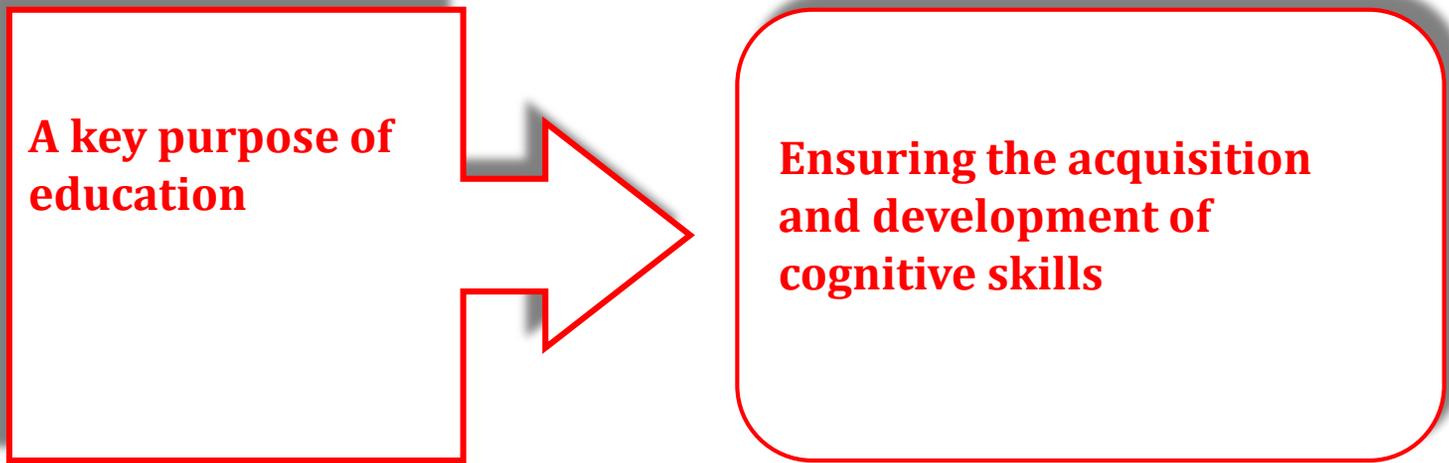
A key purpose of education → **Ensuring the acquisition and development of cognitive skills**

The Cognitive Domain, involves learning and skill development and intellectual attitudes. In these processes, what and how to evaluate in the field is a priority. In this content we provide concepts essential to take into consideration to create assessment tools for cognitive thinking skills.

Six levelsor domain are classified in the work of Bloom's taxonomy. Let's see what they are.

First Level

KNOWLEDGE

Second Level

UNDERSTANDING

Sixth Level

EVALUATION

Third Level

APPLICATION

Fifth Level

SUMMARY

Fourth Level

ANALYSIS

KNOWLEDGE
Recall previously learned material as facts, terms, basic concepts and answers.

UNDERSTANDING
Demonstrate understanding of facts and ideas by organizing, comparing, translating, interpreting, with descriptions and explaining the main ideas.

APPLICATION
Solve or resolve problems by applying acquired knowledge, facts, techniques and rules differently.

ANALYSIS
Review and fragmentation of information in different parts by the application of criteria identifying causes, reasons and consequences, make inferences and find evidence to support generalizations.

SUMMARY
Compile information and relate in various ways by combining elements with a new pattern proposing various alternative solutions, up to build and create new things.

EVALUATION
Expose and hold opinions making judgments about information, validate ideas about quality work based on established criteria.

Deepening Concepts I

KNOWLEDGE

Knowledge is defined as the recall of previously learned material. This may involve remembering a wide range of items from specific data to elaborate theories, but all that is needed is to bring back to mind the appropriate information in advance. Knowledge represents the lowest level of cognitive performance.

Examples of learning objectives for this level

To know common terms, specific facts, methods and procedures, basic concepts, principles.

Related verbs

Write-describe-number-identification-tag-read-play-select-do lists, make posters, defined.

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Deepening Concepts II

UNDERSTANDING

Is defined as the ability to grasp the meaning of items or things. This can be demonstrated passing or translating material from one form to another (words to numbers), interpreting material (explaining or summarizing), and estimating future trends (predicting consequences or effects). These results go a step further than simply recall information, and represent the lowest level of understanding.

Examples of learning objectives for this level

Understanding facts (realities) and principles; interpret verbal material, interpret charts and graphs, translate verbal material to mathematical formulas to estimate future consequences implied in data, justify methods and procedures.

Related verbs

Sort-quote-converting-describe-discuss-estimate, explain, generalize, give examples, explain, illustrate, paraphrase, summarize.

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Deepening Concepts III

APPLICATION

Is defined as the ability or capacity to use the material learned in specific situations, new. This may include items such as applying rules, methods, concepts, principles, laws and theories. Learning outcomes in this area require a higher level of understanding that outlined in the understanding.

Examples of learning objectives for this level

Apply concepts and principles to new situations, apply laws and theories to practical situations, solve mathematical problems, construct tables and charts, demonstrate the proper use of a method or procedure.

Related verbs

Wear-pick-calculate-build-control-determine-established-include-project-production-supply-link-fix-download-application-solving-using-show-tell--apply-help-administration.

Deepening Concepts IV

ANALYSIS

Is defined as the ability to separate material into component parts so that its organizational structure can be understood. This may include identification of the parties, the analysis of the relationship between the parties, and the recognition of the organizational principles involved. Learning outcomes here represent a higher intellectual level than required for the understanding and application because it is necessary to understand the content and structural form of the material.

Examples of learning objectives for this level

Recognizing tacit assumptions, recognize errors in logic or reasoning, distinguish between facts and inferences, evaluate the importance of the facts, analyze the organizational structure of a work (art, music, writing).

Related verbs

Analyze, categorize, discriminate, distinguish, illustrate, compare-contrast, clear-spread-limit-prioritize-subdivide-building diagrams.

Deepening Concepts V

SUMMARY

It refers to the ability to unite different parts to form a new whole. This may involve the production of a unique or peculiar communication (essay or speech), a plan of operations (research proposal) or a set of abstract relations (schemes for classifying information). Learning outcomes in this area stress creative behaviors with greater emphasis on the formulation of new patterns or structures.

Examples of learning objectives for this level

Write a well-organized essay, give a well-structured speech, writing a creative short story (or poem or music), propose a plan for an experiment, integrate learning from different areas in a plan to solve a problem, formulate a new scheme for classifying objects (or events or ideas).

Related verbs

Create, adapt, anticipate, plan, categorize, hypothesize, invent, combine, develop, compare, communicate, compile, compose, contrast-express-make-integrate-code-rebuild-reorganize-check-structured-replace-validate-facilitate - generate-add-start-reinforcing.

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Deepening Concepts VI

EVALUATION

The assessment has to do with the ability to judge the value of materials such as statements, novels, poems, research reports, for a particular purpose and finally arrive at personal conclusions substantiated. The trial must be based on defined criteria, which can be internal (organization) or external (relevance or purpose) The student can determine the criteria or receive from others.

Learning outcomes in this area are the highest in the cognitive hierarchy because they also contain elements of all other categories also involve conducting thoughtful value judgments based on clearly defined criteria.

Examples of learning objectives for this level

Examples of learning objectives for this level to judge the logical consistency of written material, how well the conclusions are supported with data, the value of a work (art, music, writing) using external standards of excellence and others.

Related verbs

 Rate-compare-contrast-end-criticize-decide-set-read-judge-justify-help.

CATEGORY	KNOWLEDGE	UNDERSTANDING	APPLICATION	ANALYSIS	SUMMARY	EVALUATION
	Collect Information	Application Confirmation	Knowledge use	(High Order) Break, Break Down	(Higher Order) Collect, Integrate	(Higher Order) Judge the result
Description Skills to be demonstrated at this level are	Observation and remembering information, knowledge of dates, events, places. Knowledge of the concept principal; domain of the subject.	Understanding the information. Meaning; move the knowledge to a new contexts; Interpret facts, compare, contrast, order, group, infer the causes. Predict the consequences .	Making use of information. Use methods, concepts, theories, in new situations, solve problems,using skills or knowledge	Find patterns; organize parties; recognize hidden meanings. Identify components	Use old concept to create other new. Predict findings from. Relate knowledge from diverse areas.	Compare and discriminate between ideas. Give value to the presentation of theories. Choose based on reasoned arguments. Verify value of evidence, recognize subjectivity.

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CATEGORY	KNOWLEDGE	UNDERSTANDING	APPLICATION	ANALYSIS	SYNTHESIS	EVALUATION
	Collect Information	Application Confirmation	Knowledge use	(Higher Order] Divide, Breakdown	(Higher Order) Collect, Integrate	(Higher Order) Judge the result
What does the Student	The student recalls and recognizes information and ideas as well as principles about the same way they learned them.	The student clarifies, understand or interpret information based on prior knowledge.	The student selects, transfers and uses data and principles to complete a task or solve a problem.	the student classifies and relates the assumptions, hypotheses, evidence, or structure of a question or statement.	The student creates, integrates and combines ideas into a product, plan or proposal.	The student assesses, evaluates, or criticism based on standards and criteria.
Examples of Indicator Words	-Defined -List -Names -Identify -Describes -Examines	-Predicts -Associated -Difference -Extends -Distinguishes -Explains -Compare	-Applied -Shows -Illustrated -Point -View -Used -Computing -Estimated	-Separates -Arrangement -Connecting -Divided -Analyzes -Categorizes -Compare	-Combines -Integrates -Replaces -Plans -Up -Adjust -Designs -Develops	-Decide -Establishes gading -Measured -Recommended -Justified -Discriminate -Supports -Selected
Examples of tasks	Describe the food groups and identify at least two foods from each group, makes an acrostic poem about healthy food,	Write a simple menu for breakfast, lunch and dinner using the food guide.	What would you ask to customers of a supermarket if you were doing a survey of food consumed? (10 questions)	Prepare a report of what people in your class eat for breakfast	Compose a song and dance to sell bananas	Make a booklet about 10 important eating habits, which can be carried out by the whole school to eat healthy.

This classification does not imply that students should start at the species level rises to another level. Rather, it means that the learning process can start at any point and lower taxonomic levels will be covered by the structure of the learning task.

Thinking skills are essential. While much of the knowledge that we teach will be obsolete in a few years, thinking skills, once acquired, will remain with our students throughout their lives.
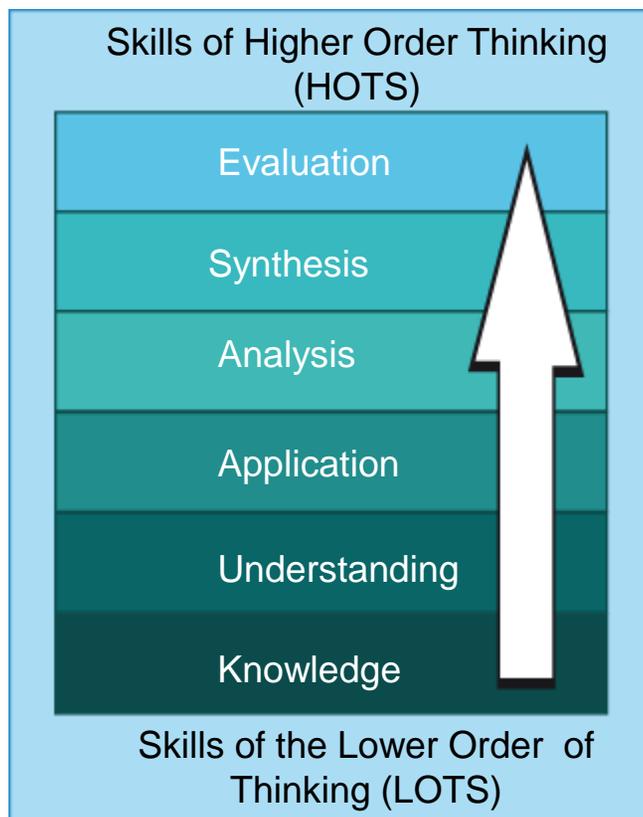
In the 90, a former student of Bloom, Lorin Anderson and David R. Krathwohl, Taxonomy reviewed and published his master updated in December 2000.

One of the key aspects of this review is to change the substance of the original proposal to verbs to mean the shares for each category
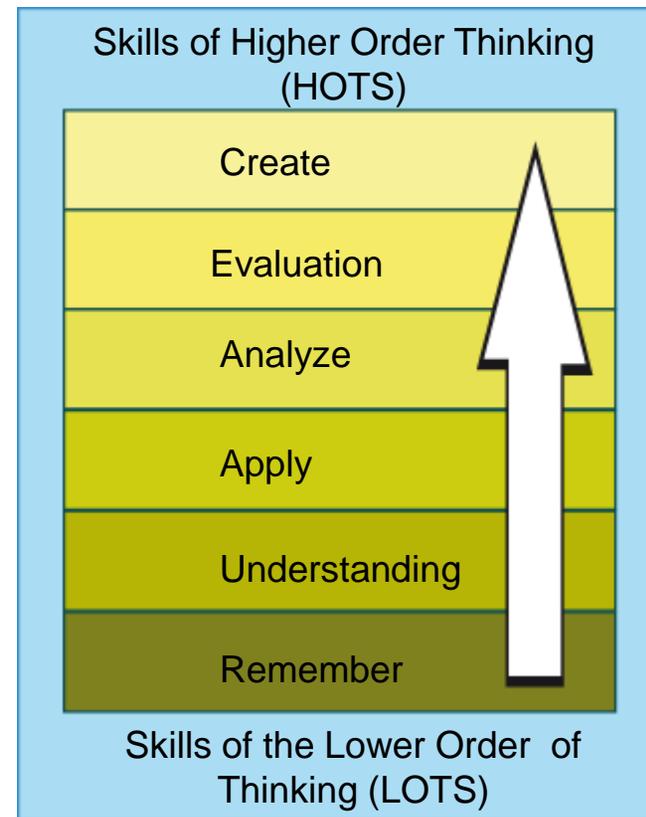
Another aspect was to consider the synthesis with a broader view and relate it to create (assuming that all synthesis is itself a creation), also modified the sequence in which different categories are presented.

Here are the new definitions of the categories in ascending order.
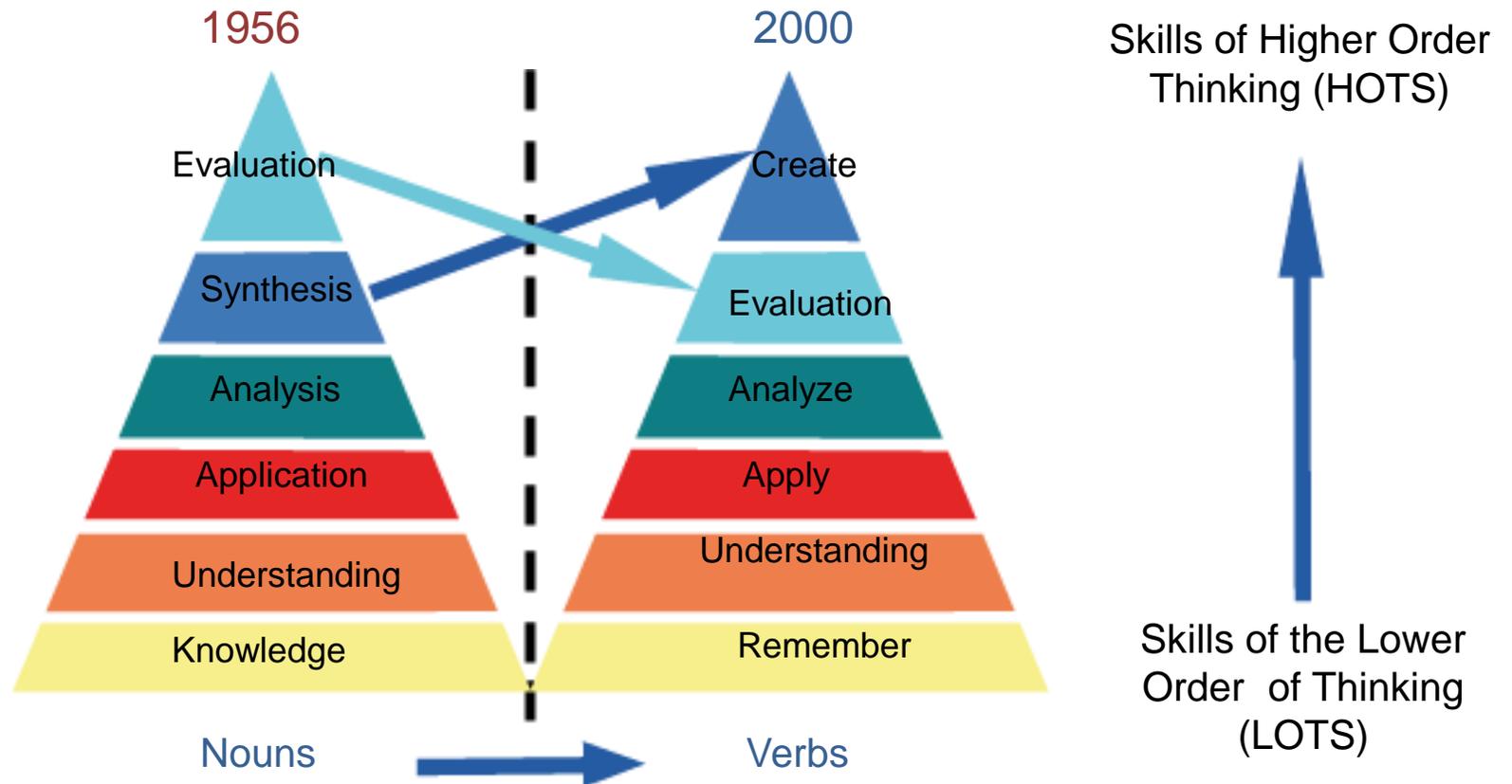
Original scheme

Skills of Higher Order Thinking (HOTS)

- Evaluation
- Synthesis
- Analysis
- Application
- Understanding
- Knowledge

Skills of the Lower Order of Thinking (LOTS)

New scheme

Skills of Higher Order Thinking (HOTS)

- Create
- Evaluation
- Analyze
- Apply
- Understanding
- Remember

Skills of the Lower Order of Thinking (LOTS)

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See this update in another schema
Bloom's Taxonomy

The Industrial education was focused on the Skills of the Lower Order of Thinking. In Bloom's taxonomy these are related to issues such as recall and understanding.

Pedagogy and the teaching of XXI century are focused on to pull students from the Skills of the Lower Order of Thinking (LOTS) to the Higher Order of Thinking Skills (HOTS).

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The XXI Century Teaching lays out the students' learning, building on knowledge and understanding to remember to use and apply skills, to analyze and evaluate processes, outcomes and consequences, to develop, create and innovate.

Skills of the Lower Order
of Thinking(LOTS)

Knowledge Acquisition

Understanding

Depth of Knowledge

Apply

Analyze

Knowledge Creation

Evaluate

Create

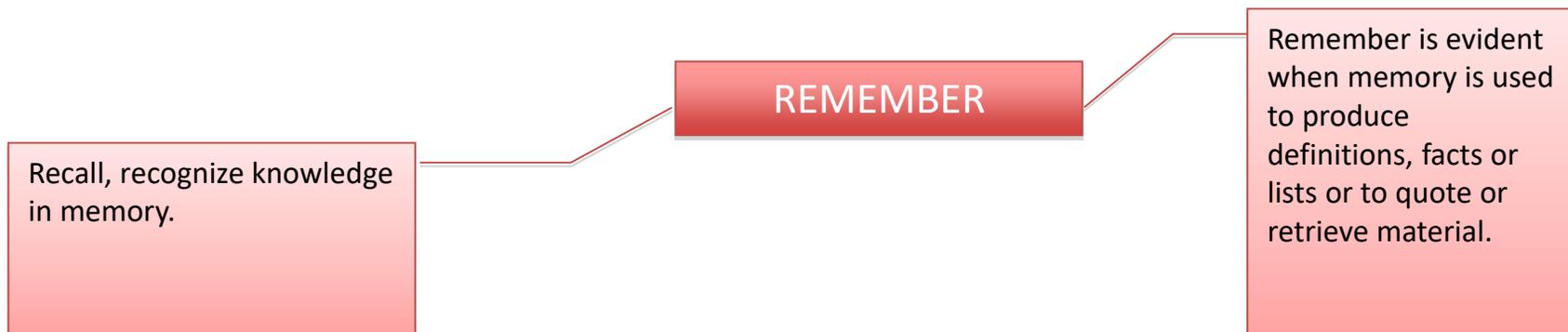Skills of Higher Order
Thinking(HOTS)

The modern concept of Bloom's taxonomy for a digital age level deepens. Let your new explanations.

REMEMBER

Although remember what they learned is the lowest levels of the taxonomy is crucial for learning

Remember not necessarily have to occur as an independent activity, such as memorizing facts, values and quantities.

Recall or retention is enhanced if applied in higher-order activities

REMEMBER

Remember is evident when memory is used to produce definitions, facts or lists or to quote or retrieve material.

Recall, recognize knowledge in memory.

Key to this element of the taxonomy for digital media is the recovery of material. The increase in the amount of knowledge and information means it is impossible and impractical for the student (or teacher) to try to remember and keep all the current knowledge relevant to their learning.

UNDERSTANDING

Understanding knowledge builds relationships and links. Students understand concepts and processes and can explain or describe. Can summarize and rephrase in their own words.
There is a clear difference between remembering, remembering facts and knowledge in various forms such as lists, organize bullets, highlighting, etc., And understand what it is constructing meaning.
Understanding is to establish relationships and build meaning from different types of functions, whether written or graphic.

Two examples of remembering, not understanding.

One can simply observe a young child can count from 1 to 10 but can not tell how many fingers I have raised. Also the student can recite the first 20 elements of the periodic table in the correct order, but nothing can be said about every one to relate their position in the table according to the number of electrons in its outer orbital, and starting from there, explain their behavior.

APPLY

Implement is to carry out or use a procedure for the development of a representation or a deployment. Apply relates and refers to situations where material is studied and used in the development of products such as models, presentations, interviews and simulations.

ANALYZE

To analyze is to break into parts the conceptual material and determine how they relate or interact with each other, or a complete structure, or a particular purpose. Mental actions of this process include differentiation, organize and allocate, as well as the ability to differentiate between components.
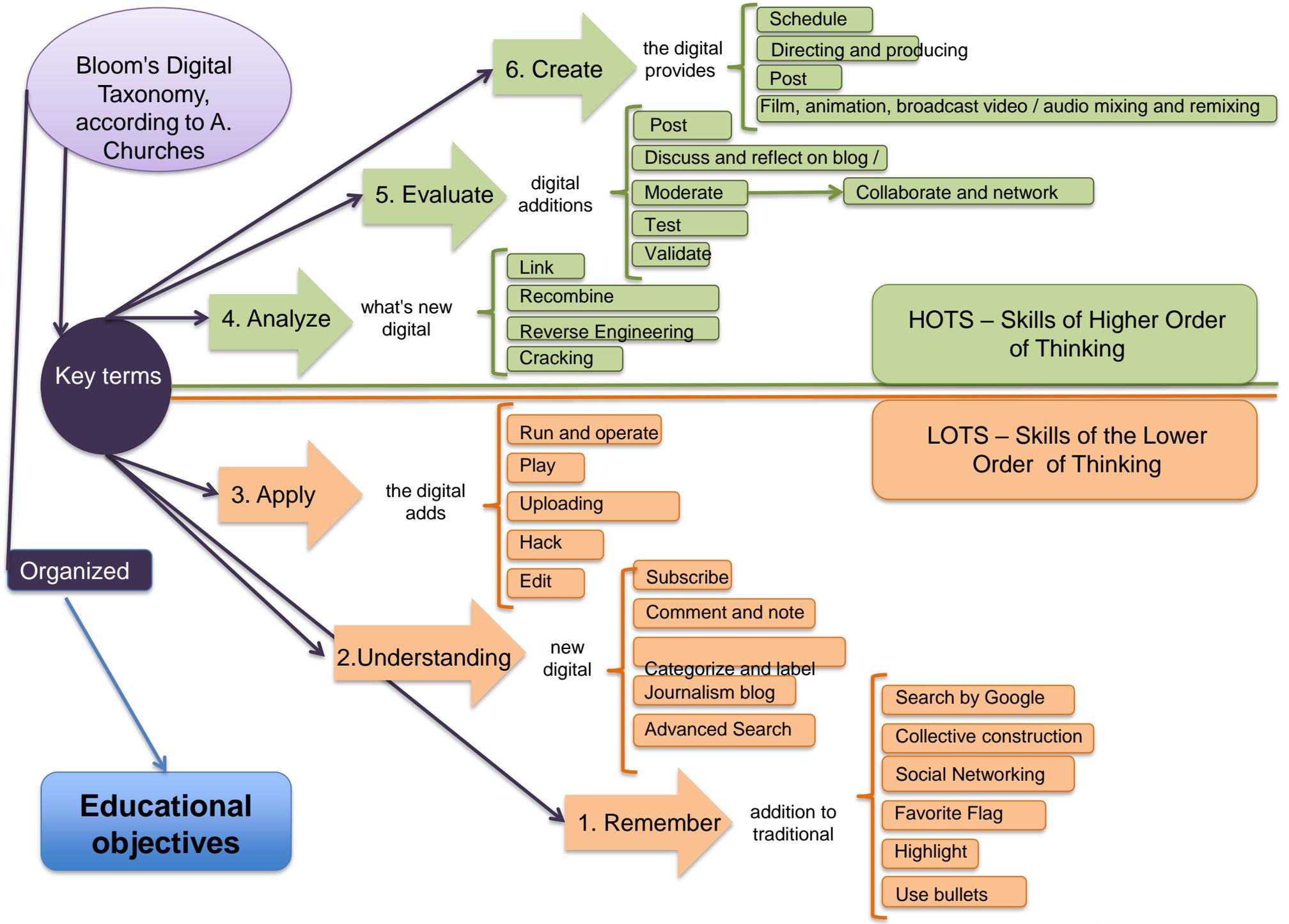
EVALUATE

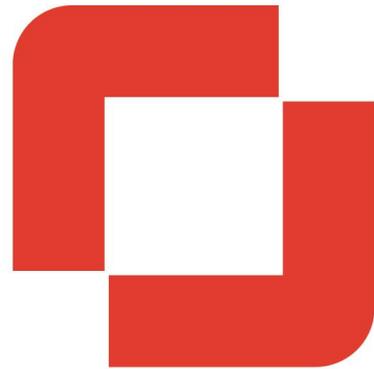Evaluate is to make judgments based on criteria and standards using testing and criticism.

CREATE

To create is to bring together the elements into a coherent and functional form, generate, plan, to reorganize elements into a new pattern or structure.

Category	Memorize Pick information	UNDERSTANDING Confirmation explanation	APPLY Making use of knowledge
Examples of Indicator Words	-Defined -List -Names -Identifies -Repeat -Who -What -When -Where -Features -Describes -Includes -Reviews -Appointment	-Predicts -Associated -Estimated -Difference -Extends -Resume -Describes -Plays -Discusses -Extends -Contrasts -Distinguishes -Explains -Paraphrasing -Illustrates -Compare	-Applied -Complete -Illustrates -Shows -Reviews -Adjust -Tells -Change -Classified -Experience -View -Computing -Resolved -Build -Estimated

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Category	ANALYZE (Higher order) Divide, Breakdown	EVALUATE (Higher order) Judge the outcome	CREATE (Higher order) Collect, Integrate
Examples of Indicator Words	- separates - orders - explains - connecting - divided - compare - selected - explains - inferred - arranged - classified - analyzes - categorizes - compare - contrasts	- decide - establishes grading - test - measured - judges - explains - values - critical - justified - supports - convinces - concludes - selected - predicts - argues	- combines - integrates - reorders - raises - invents - what if? - prepared - generalizes - up - adjust - designs - hypothesis raises - invents - develops - rewrites

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Bloom's Digital Taxonomy, according to A. Churches

Key terms

Organized

Educational objectives

6. Create — the digital provides
- Schedule
- Directing and producing
- Post
- Film, animation, broadcast video / audio mixing and remixing

5. Evaluate — digital additions
- Post
- Discuss and reflect on blog /
- Moderate → Collaborate and network
- Test
- Validate

4. Analyze — what's new digital
- Link
- Recombine
- Reverse Engineering
- Cracking

HOTS – Skills of Higher Order of Thinking

LOTS – Skills of the Lower Order of Thinking

3. Apply — the digital adds
- Run and operate
- Play
- Uploading
- Hack
- Edit

2. Understanding — new digital
- Subscribe
- Comment and note
- Categorize and label
- Journalism blog
- Advanced Search

1. Remember — addition to traditional
- Search by Google
- Collective construction
- Social Networking
- Favorite Flag
- Highlight
- Use bullets

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