

Bloom's Digital Taxonomy

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Synopsis:

This is an update to Bloom's Revised Taxonomy to account for the new behaviours, actions and learning opportunities emerging as technology advances and becomes more ubiquitous. Bloom's Revised Taxonomy accounts for many of the traditional classroom practices, behaviours and actions but does not account for the new processes and actions associated with web 2.0 technologies and increasing ubiquitous computing.

Introduction and Background:

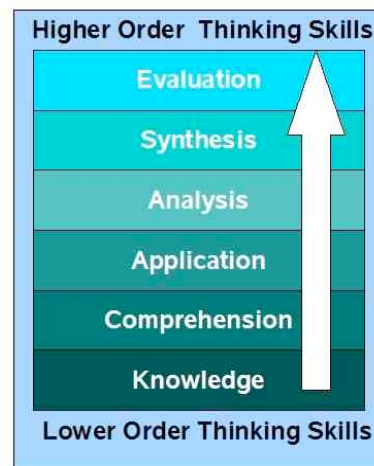
Bloom's Taxonomy

In the 1950's Benjamin Bloom developed his taxonomy of cognitive objectives, Bloom's Taxonomy. This categorised and ordered thinking skills and objectives. His taxonomy follows the thinking process. You can not understand a concept if you do not first remember it, similarly you can not apply knowledge and concepts if you do not understand them. It is a continuum from Lower Order Thinking Skills (LOTS) to Higher Order Thinking Skills (HOTS). Bloom describe each category as a noun. They are arranged below in increasing order, from lower order to higher order.

Lower Order Thinking Skills (LOTS)

- Knowledge
- Comprehension
- Application
- Analysis
- Synthesis
- Evaluation

Higher Order Thinking Skills (HOTS)



Drawing 1: Bloom's Taxonomy

Bloom's Revised Taxonomy

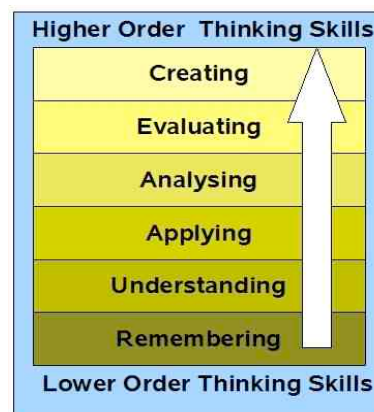
In the 1990's, a former student of Bloom, Lorin Anderson, revised Bloom's Taxonomy and published this- Bloom's Revised Taxonomy in 2001.

Key to this is the use of verbs rather than nouns for each of the categories and a rearrangement of the sequence within the taxonomy. They are arranged below in increasing order, from lower order to higher order.

Lower Order Thinking Skills (LOTS)

- Remembering
- Understanding
- Applying
- Analysing
- Evaluating
- Creating

Higher Order Thinking Skills (HOTS)



Drawing 2: Bloom's Revised Taxonomy

Bloom's Revised Taxonomy Sub Categories

Each of the categories or taxonomic elements has a number of key verbs associated with it

Lower Order Thinking Skills (LOTS)

- Remembering - *Recognising, listing, describing, identifying, retrieving, naming, locating, finding*
 - Understanding - *Interpreting, Summarising, inferring, paraphrasing, classifying, comparing, explaining, exemplifying*
 - Applying - *Implementing, carrying out, using, executing*
 - Analysing - *Comparing, organising, deconstructing, Attributing, outlining, finding, structuring, integrating*
 - Evaluating - *Checking, hypothesising, critiquing, Experimenting, judging, testing, Detecting, Monitoring*
 - Creating - *designing, constructing, planning, producing, inventing, devising, making*
- ### **Higher Order Thinking Skills (HOTS)**

The elements cover many of the activities and objectives but they do not address the new objectives presented by the emergence and integration of Information and Communication Technologies in to the classroom and the lives of our students.

This revision is fundamentally based on the revised taxonomy proposed by Anderson et al, but is more inclusive of digital technologies and digital cognitive objectives.

Bloom's as a learning process.

Bloom's in its various forms represents the process of learning. It has been simplified in some case like the three story intellect (Oliver Wendell Holmes and Art Costa), but it still essentially represents how we learn.

Before we can **understand** a concept we have to **remember** it

Before we can **apply** the concept we must **understand** it

Before we **analyse** it we must be able to **apply** it

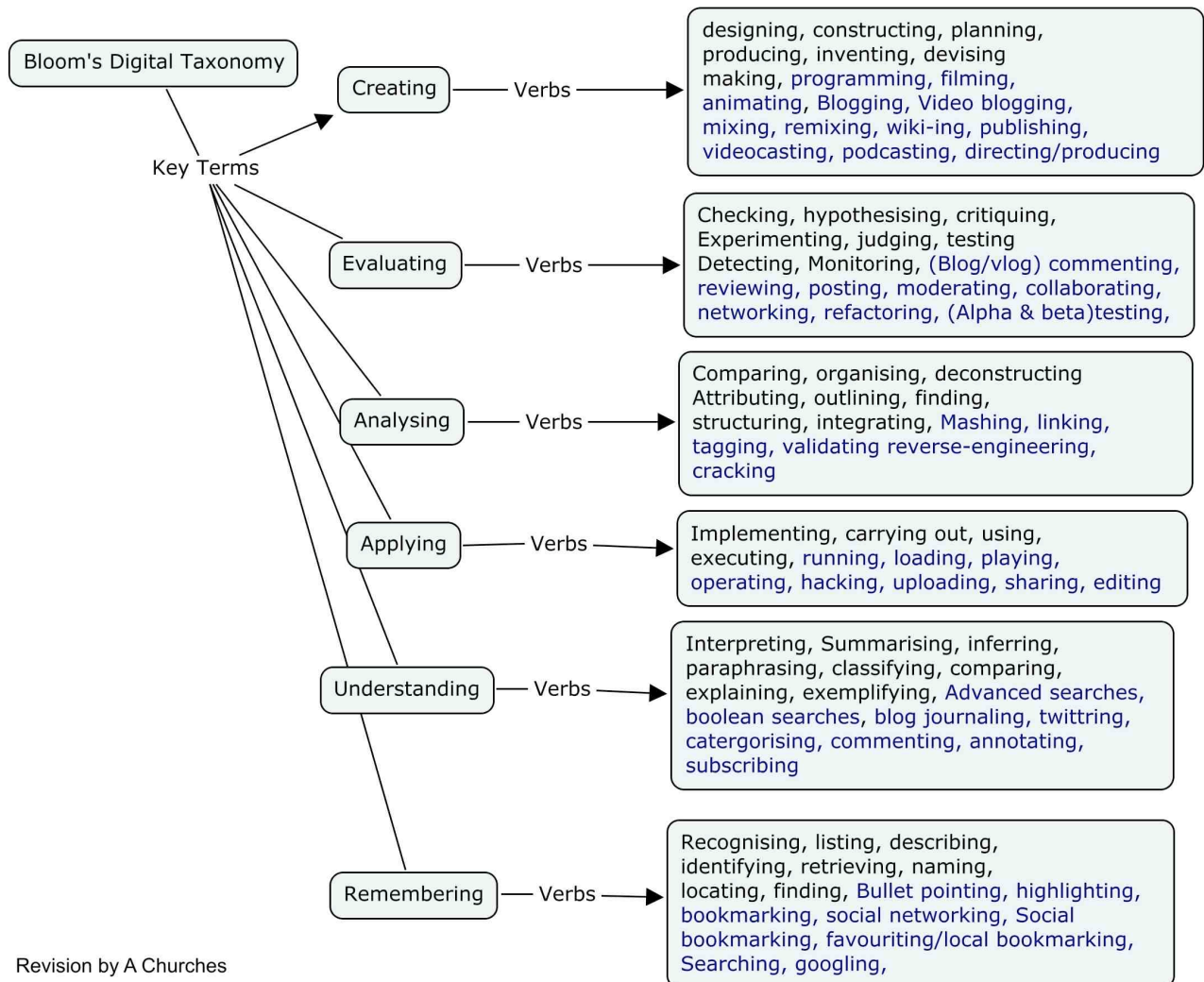
Before we can **evaluate** its impact we must have **analysed** it

Before we can **create** we must have **remembered, understood, applied, analysed, and evaluated.**

Some people may argue about that you do not require some of the stages for each and every task, action or process; some too may argue about the necessity to reach the creation level for all activities. This is the choice of the individual.

Bloom's Digital Taxonomy

Bloom's revised digital taxonomy map



Drawing 3: Mind map of Bloom's Revised Digital Taxonomy

Key:

Elements colour in black are recognised and existing verbs, Elements coloured in blue are new digital verbs

Remembering

The following are some of the key terms for this aspect of the Taxonomy.

- Recognising
- Listing
- Describing
- Identifying
- Retrieving
- Naming
- Locating
- Finding

Anderson and Krathwohl's taxonomy – Remembering

1. **Remembering: Retrieving, recalling or recognising** knowledge from memory. Remembering is when memory is used to produce definitions, facts or lists, or recite or retrieve material.

This element of the taxonomy does infer the retrieval of material. This is a key element given the growth in knowledge and information.

The digital additions and their justifications are as follows:

- **Bullet pointing** - This is analogous with listing but in a digital format.
- **Highlighting** – This is a key element of most productivity suits, encouraging students to pick out and highlight key words and phrases is a techniques for recall.
- **Bookmarking or favouriting** – this is where the students mark for later use web sites, resources and files for later access. Students can then organise these.
- **Social networking** – this is where people develop networks of friends and associates. It forges and creates links between different people. Like social bookmarks (see below) a social network can form a key element of collaborating and networking
- **Social bookmarking** – this is an online version of local bookmarking or favourites, more advanced because you can draw on others bookmarks and tags. While higher order thinking skills like, collaborating and sharing, can and do make use of these skills, this is its simplest form - a simple list of sites saved to an online format rather than locally to the machine.
- **Searching or “googling”** - Search engines and their use are now key elements of students research. At its simplest for (here) student are just entering a key word or phrase into the basic entry pane of the search engine. This skill does not refine the search beyond the key work or term

Key Terms - Remembering:

Recognising, listing, describing, identifying, retrieving, naming, locating, finding, Bullet pointing, highlighting, bookmarking, social networking, Social bookmarking, favouriting/local bookmarking, Searching, googling,

Understanding

The following are some of the key terms for this aspect of the Taxonomy.

- Interpreting
- Summarising
- Inferring
- Paraphrasing
- Classifying
- Comparing
- Explaining
- Exemplifying

Anderson and Krathwohl's taxonomy – Understanding

2. Understanding: Constructing meaning from different types of function be they written or graphic.

The digital additions and their justifications are as follows:

- **Advanced and Boolean Searching** - This is a progression from the previous category. Students require a greater depth of understanding to be able to create, modify and refine searches to suit their search needs.
- **Blog Journalling** – This is the simplest of the uses for a blog, simply a student “talks” “writes” or “type” a daily or task specific journal. This show a basic understanding of the activity report upon. The blog can be used to develop higher level thinking when used for discussion and collaboration.
- **Twittering** – twitters fundamental question is “what are you doing?” This is can be in its most simplistic for a one or two word answer, but when developed this is a tool that lends itself to developing understanding and potential starting collaboration.
- **Categorising** – digital classification - organising and classify files, web sites and materials using folders etc
- **Commenting and annotating** – a variety of tools exist that allow the user to comment and annotate on web pages, pdf files and other documents. The user is developing understanding by simply commenting on the pages. This is analogous with writing notes on hand outs, but is potentially more powerful as you can link and index these.
- **Subscribing** – Subscription takes bookmarking in its various forms and simple reading one level further. The act of subscription by itself does not show or develop understanding but often the process of reading and revisiting the subscribe feed leads to greater understanding.

Key Terms - Understanding:

Interpreting, Summarising, inferring, paraphrasing, classifying, comparing, explaining, exemplifying, Advanced searches, boolean searches, blog journalling, twittering, categorising and tagging, commenting, annotating, subscribing

Applying

The following are some of the key terms for this aspect of the Taxonomy.

- Carrying out
- Using
- Executing
- Implementing
- Showing
- Exhibiting

Anderson and Krathwohl's taxonomy – Applying

3. Applying: Carrying out or using a procedure through executing or implementing. Applying related and refers to situations where learned material is used through products like models, presentation, interviews and simulations.

The digital additions and their justifications are as follows:

- **Running and operating** - This the action of initiating a program. This is operating and manipulating hardware and applications to obtain a basic goal or objective.
- **Playing** – The increasing emergence of games as a mode of education leads to the inclusion of this term in the list.
- **Uploading and Sharing** - uploading materials to websites and the sharing of materials via sites like flickr etc. This is a simple form of collaboration, a higher order skill.
- **Hacking** – hacking in its simpler forms is applying a simple set of rules to achieve a goal or objective.
- **Editing** – With most media editing is a process or a procedure that the editor employs

Key Terms - Applying:

Implementing, carrying out, using, executing, running, loading, playing, operating, hacking, uploading, sharing, editing

Analysing

The following are some of the key terms for this aspect of the Taxonomy.

- Comparing
- Organising
- Deconstructing
- Attributing
- Outlining
- Finding,
- Structuring
- Integrating

Anderson and Krathwohl's taxonomy – Analysing

4. Analysing: Breaking material or concepts into parts, determining how the parts relate or interrelate to one another or to an overall structure or purpose. Mental actions include differentiating, organizing and attributing as well as being able to distinguish between components.

The digital additions and their justifications are as follows:

- **Mashing** - mash ups are the integration of several data sources into a single resource. Mashing data currently is a complex process but as more options and sites evolve this will become an increasingly easy and accessible means of analysis
- **Linking** – this is establishing and building links within and outside of documents and web pages.
- **Reverse-engineering** - this is analogous with deconstruction. It is also related to cracking often with out the negative implications associated with this.
- **Cracking** – cracking requires the cracker to understand and operate the application or system being cracked, analyse its strengths and weaknesses and then exploit these.
- **Validating** – With the wealth of information and the lack of authentication of data the students of today and tomorrow must be able to validate the veracity of their information sources. To do this they must be able to analyse the data sources and make judgements based on these.
- **Tagging** – This is organising and attributing online data, meta-tagging web pages etc. Student need to be able understand and analyse the content of the pages to be able to tag it.

Key Terms - Analysing:

Comparing, organising, deconstructing, Attributing, outlining, finding, structuring, integrating, Mashing, linking, reverse-engineering, cracking, mind-mapping, validating, tagging

Evaluating

The following are some of the key terms for this aspect of the Taxonomy.

- Checking
- Hypothesising
- Critiquing
- Experimenting
- Judging
- Testing
- Detecting
- Monitoring

Anderson and Krathwohl's taxonomy – Evaluating

5.Evaluating: Making judgements based on criteria and standards through checking and critiquing..

The digital additions and their justifications are as follows:

- **Blog/vlog commenting and reflecting** - Constructive criticism and reflective practice are often facilitated by the use of blogs and video blogs. Student commenting and replying to postings have to evaluate the material in context and reply to this.
- **Posting** – posting comments to blogs, discussion boards, threaded discussions are increasingly comment elements of students daily practice. Good postings like good comments are not simple one line answers rather they structure and constructed to evaluate the topic or concept.
- **Moderating** – This is high level evaluation, the moderator must be able to evaluate a posting or comment from a variety of perspectives, assessing its worth, value and appropriateness.
- **Collaborating and networking** – Collaboration is an increasing feature of education. In a world increasingly focused on communication, collaboration, leading to collective intelligence is a key aspect. Effective collaboration involves evaluating the strengths and abilities of the the participants and evaluating the contribution they make. Networking is a feature of collaboration, contacting and communicating with relevant person via a network of associates.
- **Testing (Alpha and Beta)** – Testing of applications, processes and procedures is a key element in the development of any tool. To be an effective tester you must have the ability of analyse the purpose of the tool or process, what its correct function should be and what its current function is.

Key Terms - Evaluating:

Checking, hypothesising, critiquing, experimenting, judging, testing, detecting, monitoring, (Blog/vlog) commenting, reviewing, posting, moderating, collaborating, networking, reflecting, (Alpha & beta) testing.

Creating

The following are some of the key terms for this aspect of the Taxonomy.

- Designing
- Constructing
- Planning
- Producing
- Inventing
- Devising
- Making

Anderson and Krathwohl's taxonomy – Creating

6. Creating: Putting the elements together to form a coherent or functional whole; reorganising elements into a new pattern or structure through generating, planning or producing.

The digital additions and their justifications are as follows:

- **Programming** - Whether it is creating their own applications, programming macros or developing games or multimedia applications within structured environments, students are routinely creating their own programs to suit their needs and goals
- **Filming, animating, videocasting, podcasting, mixing and remixing** – these relate to the increasing trend and availability of multimedia and multimedia editing tools. Students frequently capture, create, mix and remix content to produce unique products.
- **Directing and producing** – to directing or producing a product, performance or production is a highly creative product. It requires the student to have vision, understand the components and meld these into a coherent product.
- **Publishing** – whether via the web or from home computers publishing in text, media or digital formats is increasingly possible. Again this requires a huge overview of not only the content being published, but the process and product. Related to this concept are also **Video blogging** – the production of video blogs, **blogging** and also **wiki-ing** - creating, adding to and modify content in wikis.

Key Terms - Creating:

designing, constructing, planning, producing, inventing, devising, making, programming, filming, animating, Blogging, Video blogging, mixing, remixing, wiki-ing, publishing, videocasting, podcasting, directing/producing

Bibliography

Churches A, 2007, Edorigami, blooms taxonomy and digital approaches
<http://edorigami.wikispaces.com/Bloom%27s+and+ICT+tools>

Anderson, L.W., and D. Krathwohl (Eds.) (2001). A Taxonomy for Learning, Teaching and Assessing: a Revision of Bloom's Taxonomy of Educational Objectives. Longman, New York.